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Phase II/III
RCRA Facility Investigation Report

Safety-Kleen Corp. Recycle Center
Dolton, Illinois
ILD980613913

November 29, 1996

PROJECT NO.: 032-008

RCRA FACILITY INVESTIGATION
PHASE II EXTENT OF RELEASE ASSESSMENT
AND
PHASE III GROUND-WATER RELEASE ASSESSMENT REPORT
SAFETY-KLEEN CORP. RECYCLE CENTER
DOLTON, ILLINOIS
(ILD 980613913)

November 29, 1996

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CHAPTER 1.0

INTRODUCTION

Safety-Kleen Corp. (S-K) purchased and has operated a recycling facility (SIC 2851) in Dolton, Illinois since 1987. The facility is located at 633 E. 138th Street in Cook County, Illinois. The location of the facility is shown on Figure 1-1. Prior to S-K ownership, Barker Chemical Company (1951-1981) and Foremost McKesson, Inc. (1981-1987) owned the property and operated facilities on the site to manufacture coatings and adhesives and for reclamation of paint solvents and lacquer thinner wastes. Under S-K operation, the facility accepts spent organic chemicals and solvent wastes from S-K service centers, other S-K recycle centers, and industrial and commercial facilities. Spent materials brought to the facility are recycled and regenerated into product or blended for use as a fuel in cement kilns. Principal wastes managed at the facility are paint waste, lacquer thinner, mineral spirits, and waste oil.

The Dolton Recycle Center is permitted to store and treat RCRA hazardous wastes (ILD980613913; RCRA Log B-121). The Permit was issued by the Illinois Environmental Protection Agency (IEPA) on September 29, 1993. As a condition of the RCRA permit, IEPA required that S-K conduct a RCRA Facility Investigation (RFI). In accordance with the RCRA permit, the RFI was divided into three phases: Phase I (Release Assessment); Phase II (Extent of Release Assessment); and Phase III (Ground-Water Release Assessment).

S-K conducted the Phase I RFI in 1994; results were presented in the Phase I Release Assessment Report dated March 2, 1995. IEPA approved the Phase I RFI Report in correspondence dated August 17, 1995 (copy included in Appendix A), and requested that S-K conduct Phase II and Phase III Investigations at the site. IEPA also concurred with the S-K recommendation that the Phase II and Phase III investigations be conducted on the basis of groups of Solid Waste Management Units (SWMUs) due to their proximity to one another. These areas or groups of SWMUs are referred to as Investigation Areas in this report.

In the August 17, 1995 letter, IEPA also agreed that subsequent investigations at the former Barker Chemical Property (700 138th Street), located north of 138th Street, should be conducted separately. A Phase II Release Assessment Workplan for the former Barker Chemical Company property was submitted on November 13, 1995. The Phase II RFI Report for the former Barker Chemical Company strip of property was submitted to IEPA on September 13, 1996.

S-K submitted the Phase II/III RFI Workplan for the Dolton Recycle Center on October 13, 1995. IEPA approved the Phase II/III RFI Workplan with conditions in a letter dated February 21, 1996 (copy included in Appendix A). The Phase II/III RFI activities were initiated at the Dolton Recycle Center, located south of 138th Street, in May 1996. The Phase II/III activities were conducted in accordance with the Workplan and the February 21, 1996 IEPA approval letter.

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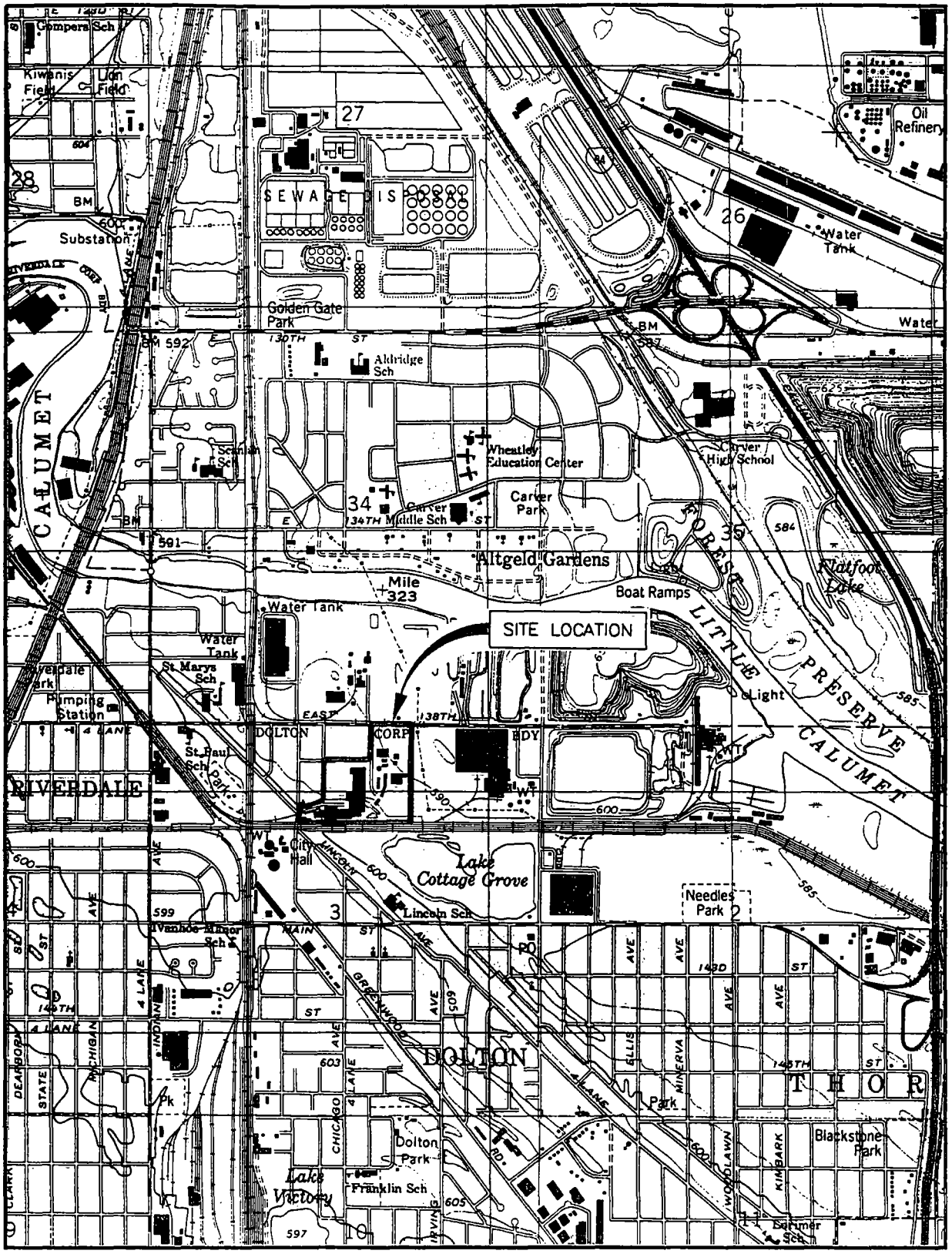

FIGURE 1-1 :VICINITY MAP, SAFETY-KLEEN CORP. RECYCLE CENTER, DOLTON, ILLINOIS (ILD980613913)

1.1 RFI Objectives

To evaluate impacts (if any) from designated SWMUs at the S-K Dolton Recycle Center a three-phase RFI was incorporated into the Permit. The objectives of the Phase I through Phase III RFI are presented below:

- Phase I - Release Assessment - Phase I was designed to provide information on the characteristics and integrity of each SWMU and to determine if a SWMU has released, is currently releasing, or has the potential to release hazardous waste and/or hazardous constituents to the soil or air. The results of the Phase I investigation were presented in the March 2, 1995 RFI Phase I Release Assessment Report.

- Phase II - Extent of Release Assessment - Phase II was designed to define the extent of releases to soil (if any) from the subject SWMUs.

- Phase III - Ground-Water Release Assessment - Phase III was designed to define the extent of ground water impacts (if any) from the SWMU releases identified in Phases I and II. The Phase III objectives focused on determining the concentrations, lateral and vertical extent, and rate of migration of hazardous waste or hazardous constituents in ground water from possible SWMU releases. Phase III was conducted concurrently with Phase II. The Phase II/III Workplan was submitted to IEPA on October 13, 1995, and approved with conditions by IEPA in correspondence dated February 21, 1996.

1.2 RFI History

The following section describes the RFI history conducted at the Dolton facility. A list of pertinent correspondence is presented with the chronological summary.

March 4, 1994:	S-K submits the Phase I RFI Workplan.
March 9, 1994:	IEPA correspondence outlines and clarifies the SWMUs to be targeted as part of the RFI.
August 30, 1994:	IEPA approves the Phase I Workplan with conditions.
September 1994:	S-K conducts Phase I RFI.
March 2, 1995:	S-K submits the RFI Phase I Release Assessment Report.
August 17, 1995:	IEPA approves the Phase I Report, with conditions and requests S-K conduct a Phase II RFI. IEPA also concurred that the RFI activities at the Barker site be conducted separately.
October 13, 1995:	S-K submits the RFI Phase II/III Release Assessment Workplan.

February 21, 1996: IEPA approves the Phase II/III Workplan with conditions.

May - June 1996: S-K conducts the initial Phase II/III RFI activities.

December 1996: S-K submits draft report summarizing the results of the initial Phase II/III RFI Activities.

A second ground-water monitoring event has been planned as part of the Phase II/III RFI activities to confirm the initial sampling results. The second monitoring event is scheduled for mid-December 1996, approximately six months following the initial Phase II/III ground-water monitoring event. The results of the second event will be evaluated relative to the initial results and presented as an addendum to the Phase II/III RFI Report in February 1996.

1.2 Organization of the Phase II/III RFI Report

A description of the SWMUs and Investigation Areas covered by the Phase II/III RFI is presented in Chapter 2.0. Relevant historical data and Phase I results are summarized in Chapter 3.0. The Phase II investigation procedures used to determine the extent of soil impacts are presented in Chapter 4.0, and the Phase III investigation procedures used to evaluate the extent of ground-water impacts are presented in Chapter 5.0. The results of the soil and ground-water sampling events are presented in Chapters 6.0 and 7.0, respectively. Chapter 8.0 contains a brief conclusion and discussion of future activities. A list of references is presented in Chapter 9.0.

Chapter 7.0 contains the results for the first of two Phase II/III RFI-required ground-water quality monitoring events. In accordance with Condition 7 of the February 21, 1996 IEPA approval letter, the results of the second ground-water monitoring event will be conducted subsequent to the submittal of this report. The procedures used to conduct the second ground-water monitoring event will be consistent with the procedures described in Chapter 5.0. The results of the second ground-water monitoring event will be submitted as an addendum to this report on or by February 1, 1996.

CHAPTER 2.0

PHASE II/III INVESTIGATION AREAS

During the Phase II/III RFI, the target SWMUs were grouped into Investigation Areas based on their proximity and the results of the Phase I RFI activities. This approach was approved by IEPA in the August 17, 1995 correspondence (Phase I RFI Report approval letter). The SWMUs were organized into four Investigation Areas (Figure 2-1). A description of the SWMUs located in each of the four Investigation Areas are presented in subsequent sections below.

2.1 The East Field Investigation Area

The East Field Investigation Area consists of a single SWMU known as the East Field. The East Field Investigation Area is located in the northeastern corner of the facility (Figure 2-1). Barker Chemical Company reportedly used the area to dispose of empty drums. As reported in the RFA (Illinois Environmental Protection Agency, 1991), approximately 400 drums and soil were excavated from the area in December 1979 and January 1980 by Barker Chemical Company. An additional 12 drums were uncovered and disposed of in 1991 while digging a trench for a sewer line in an open area east of Container Storage Area No. 1.

2.2 The Southern Investigation Area

A total of four designated SWMUs are located in the southern portion of the facility. The Southern Investigation Area consists of the following SWMUs:

Former Tank Farm D. This former tank farm was located in the southwestern corner of the facility (Figure 2-1). S-K records indicate this tank farm was in operation until 1987 for the storage of reclaimed product. S-K decommissioned the tank farm shortly after purchase of the facility. The site is currently a vacant area and roadway to Truck Station No. 3. The former tank farm was reported to have had an earthen floor and earthen dike for secondary containment.

Former Southeast Tank Farm. During preparation of the Phase I RFI Workplan, S-K discovered that a former above-ground tank farm had existed in the southeastern part of the plant (Figure 2-1). In the Phase I Workplan, S-K had included the former Southeast Tank Farm as an Area of Concern (AOC). In the Phase I Workplan approval letter, dated August 30, 1994, and in subsequent correspondence, IEPA has listed the former Southeast Tank Farm as a SWMU. Barker Chemical Company reportedly installed the tank farm, consisting of 15 tanks, prior to 1961. The aboveground tank farm was used until 1984, when McKesson replaced it with 22 underground storage tanks (USTs) in the same area. McKesson reportedly had used the aboveground tanks (prior to 1984) and USTs (after 1984) for the storage of product. S-K removed the USTs in 1987 shortly after acquiring the facility.

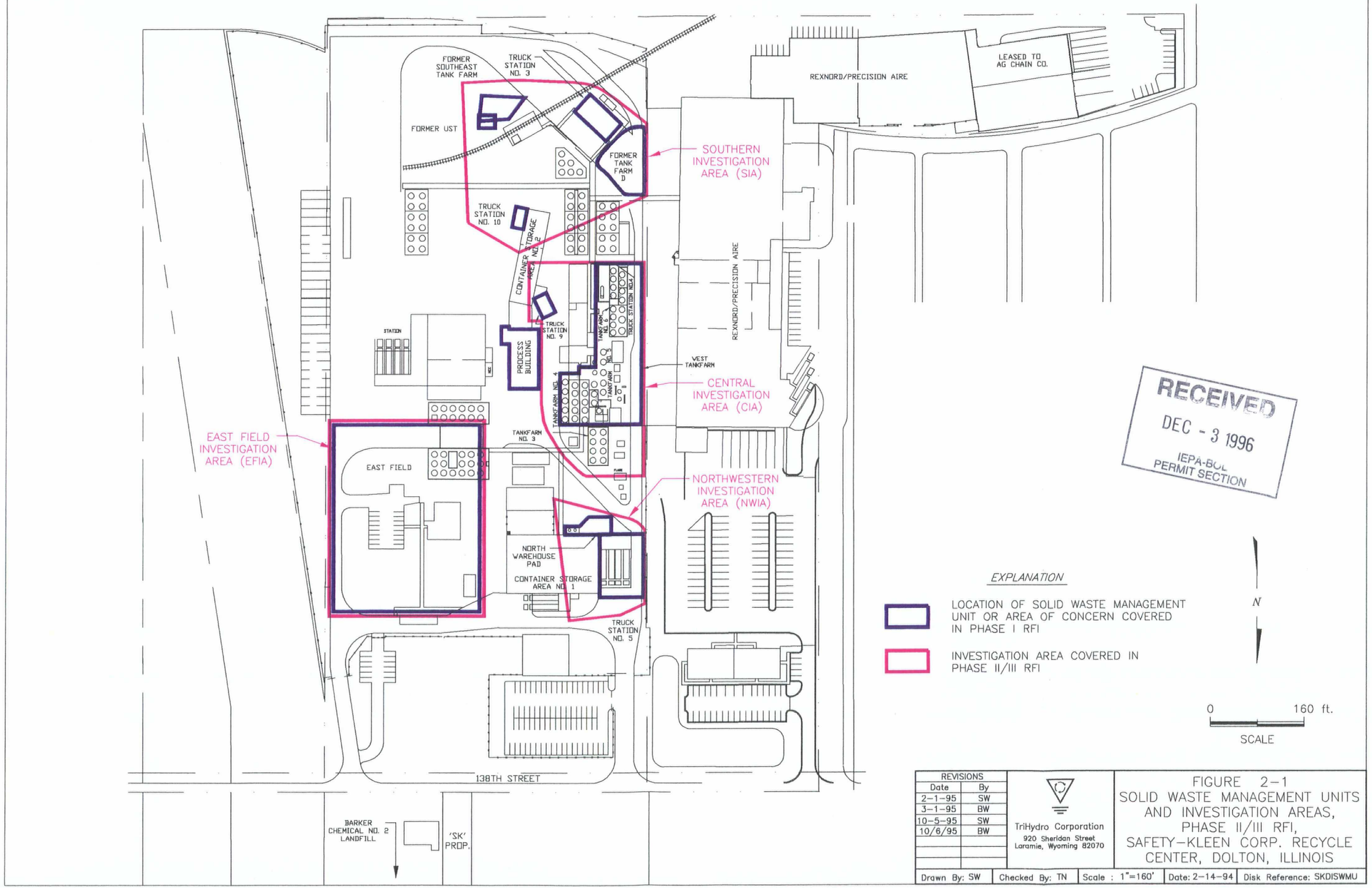

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FIGURE 2-1
SOLID WASTE MANAGEMENT UNITS AND INVESTIGATION AREAS, PHASE II/III RFI, SAFETY-KLEEN CORP. RECYCLE CENTER, DOLTON, ILLINOIS

Drawn By: SW | Checked By: TN | Scale : 1"=160' | Date: 2-14-94 | Disk Reference: SKDISWMU

Truck Station No. 3. This truck station was constructed by S-K in 1990 in the southwestern corner of the facility (Figure 2-1). Prior to that time, the area was reported to be vacant, undisturbed ground. S-K uses the truck station to receive bulk wastes (principally mineral spirits), and for shipping bulk reclaimed mineral spirits and fuels. The station is a covered, reinforced concrete structure equipped with secondary containment to contain spills. A spill of approximately 250 gallons of waste oil occurred at the station in 1991. The spill occurred entirely within the secondary containment area and was reported to have been immediately cleaned up.

Truck Station No. 10. The truck station is located on the east side of Container Storage Area No. 2 (Figure 2-1). The station is a sloped, reinforced concrete pad 36 feet wide by 20 feet long with concrete side walls/curbs to contain potential spills. The station has a capacity to service four truck trailers and has been in use since 1991 for the internal transfer of containerized wastes to and from the container storage area. The area was used for a loading dock prior to 1991.

2.3 The Central Investigation Area

Three designated SWMUs are located in the central portion of this facility near the recycle center process units. The Central Investigation Area SWMUs are identified as follows:

West Tank Farm. The West Tank Farm (Figure 2-1) includes waste transportation, transfer, process, and storage facilities in the west-central part of the facility. The tank farm has been in place at least since 1961, based on site records. The West Tank Farm contains the following units:

- Driveway to the Facility. A concrete road that runs along the western edge of the facility. The driveway is used to truck bulk wastes to Truck Station No. 3, and to transfer bulk fuels at Truck Station No. 4.

- Truck Station No. 4. Truck Station No. 4 consists of an uncovered, sloped, reinforced concrete pad 12 feet wide by 103 feet long with capacity for a single tanker trailer. The truck station is used for transfer of bulk fuels to Tank Farm No. 6.

- Tank Farm No. 4. Tank Farm No. 4 consists of fifteen aboveground 15,000-gallon carbon steel tanks permitted for the storage of hazardous waste and two secondary containment systems with capacities in excess of 100% of the volume of the largest tank. The tanks contain wastes to be blended into the fuels program in Tank Farm No. 6. The tank farm floor and dike walls are constructed of reinforced concrete to control spillage, leakage, and stormwater. The floor and dike walls are coated with epoxy.

- Tank Farm No. 5. Tank Farm No. 5 includes a process area which contains seven carbon steel and two stainless steel tanks, and several process units to reclaim mineral spirits, paint wastes, and lacquer thinner. Two former RCRA tanks (Nos. 55 and 56) were clean closed; all tanks are now used for storage of in-process (distilled) products. The process units, include a thin

film evaporator to reclaim solvents, solvent dryers #1 through #4, a distillation column, and pot stills #1 and #2 to adjust the color of the reclaimed products. All process units are located within the Tank Farm No. 5 secondary containment system. The reinforced concrete floor and dike walls are coated with epoxy. The secondary containment system has a capacity more than twice the volume of the largest tank (15,000 gallons).

- Tank Farm No. 6 (Former J Tank Farm). Tank Farm No. 6 contains fifteen above-ground carbon steel tanks permitted for the storage of hazardous wastes. Twelve tanks have a capacity of 15,000 gallons, two are 20,000 gallon tanks and one is a 17,500 gallon tank. The tanks are used to blend various streams into fuels. The tank farm floor is epoxy-coated reinforced concrete with perimeter and internal epoxy-coated dike walls. There are two secondary containment systems with capacities in excess of 100% of the volume of the largest tank.

Truck Station No. 9. This truck station is located on the west side of container Storage Area No. 2 (Figure 2-1). It has been in use since at least 1987. S-K uses the truck station for the internal transfer of containerized wastes to and from the container storage area. Truck Station No. 9 is a sloped, reinforced concrete pad 23 feet wide by 50 feet long with the capacity for two truck trailers. The station is equipped with curbs to collect and contain potential spills. A stormwater catch basin is located immediately northwest of the truck station to collect stormwater and prevent it from entering the truck station.

Process Area in South Warehouse. The process area occupies the northern third of the South Warehouse (Figure 2-1). This indoor area has been used since at least 1983 to liquefy containerized semi-solid wastes prior to fuel blending in the West Tank Farm. As requested by IEPA, an inspection of the process building was conducted by an independent registered professional engineer to assess the integrity of the concrete floor and secondary containment structures. The engineer determined that the floor and secondary containment structures appeared to be intact, and of sound integrity at the time of the inspection. During the Phase I RFI, soil samples were collected as requested in Condition 4 of the August 30, 1994 IEPA approval letter. The sample analysis confirmed that there had not been a release from the process area. Subsequently, the process area in the South Warehouse was removed from the list of potential SWMUs to be investigated as part of the Phase II/III RFI.

2.4 The Northwestern Investigation Area

Two SWMUs are located in the Northwest portion of the facility. The Northwestern Investigation Area consists of the following SWMUs:

North Warehouse Pad (Former Truck Station No. 6). The north warehouse pad is located in the northwestern corner of the facility south of Container Storage Area #1 (Figure 2-1). It has been in use since at least 1987. The former truck station was a partially covered, sloped, reinforced concrete structure 28 feet wide by 53 feet long with capacity for a single transfer truck. S-K used the former truck station for the

internal transfer of containerized waste from Container Storage Area No. 1 to Container Storage Area No. 2.

Truck Station No. 5. This truck station is located in the northwestern corner of the facility, northwest of Container Storage Area #1 (Figure 2-1). It has been in use since at least 1987. S-K uses the truck station for unloading containerized wastes from truck trailers, and loading containerized wastes that are to be transported and treated at other facilities. The trailer parking area of Truck Station No. 5 was gravel until 1989. Currently, the station consists of a covered, reinforced concrete ramp, 55 feet wide by 90 feet long, including curbing, walls and a dock area, with capacity for four truck trailers. A concrete-lined trench was constructed on the north side of the truck ramp to collect stormwater. The pad is sloped toward the dock area to contain and collect potential spills.

CHAPTER 3.0

PREVIOUS ASSESSMENT RESULTS

Seven soil investigations and four ground-water investigations were conducted at the facility prior to the Phase II/III RFI. S-K conducted pre-RFI environmental investigations at the site in 1988, 1990 and 1990-1991. S-K is also aware of investigations conducted at the site in 1979, 1981 and 1983 by previous owners. The data collected at the site prior to the initial Phase I RFI were referenced and described in detail in the Phase I RFI Workplan, dated March 4, 1994 and the Phase I Release Assessment Report dated March 2, 1995. Previous data pertinent to the Phase II/III investigation are discussed and summarized in this chapter.

Prior to the RFI, a considerable amount of qualitative information and quantitative data had been collected on soil lithology, hydraulic conductivity, soil quality, ground-water occurrence, ground-water flow direction, and ground-water quality in the vicinity of the designated SWMUs and Investigation Areas. The results of the Phase I RFI were generally consistent with previous soil and ground-water monitoring data collected from the site. The Phase II and III investigations were designed to provide data to complement the existing information to the extent practicable and were focused on accomplishing the remaining specific RFI objectives (see Section 1.1).

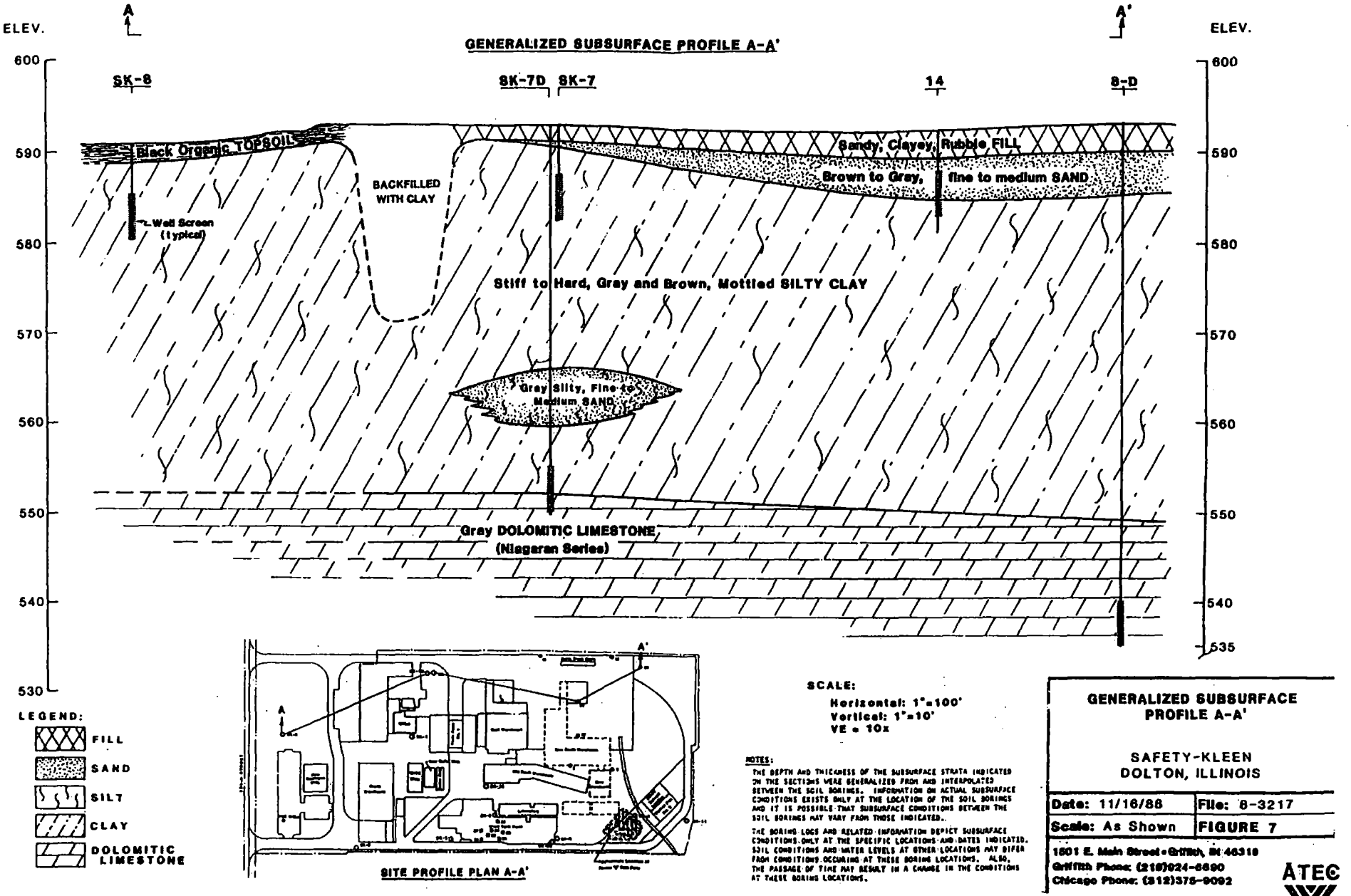
3.1 Previous Soil Data

The previous investigations included installation of numerous soil borings to characterize the lithology and soil quality. A soil gas survey and an electromagnetic survey were also conducted prior to the RFI. The results of the soil gas survey and electromagnetic survey were presented in the Phase I Release Assessment Report dated March 2, 1995. S-K utilized the results of these previous assessment activities to focus this RFI and assist in siting appropriate sampling locations.

3.1.1 Lithology

The large number of soil borings and their distribution throughout the site have provided S-K with considerable information relative to subsurface lithology. The lithology underlying the site consists predominantly of low permeability silts and clays, with a few interbedded sand lenses. The sediments generally appear to become coarser to the south. However, at least 30 feet of low-permeability silts and clays have been documented to underlie the entire site.

Lithologic cross sections, based on data collected prior to the RFI, are shown on figures 3-1 and 3-2. The lithology appears to be generally consistent across the site. The surface horizon consists of a layer of topsoil (silty clay loam) or fill, which appears to range from 1 to 4 feet thick. The fill consists of clay, silt, sand, gravel and rubble. The area backfilled with clay, which is shown on Figure 3-1, corresponds geographically with the area where drums were reportedly excavated by previous facility owners.



3-2

FIGURE 3-1 :CROSS SECTION A–A', SAFETY–KLEEN CORP. RECYCLE CENTER, DOLTON, ILLINOIS

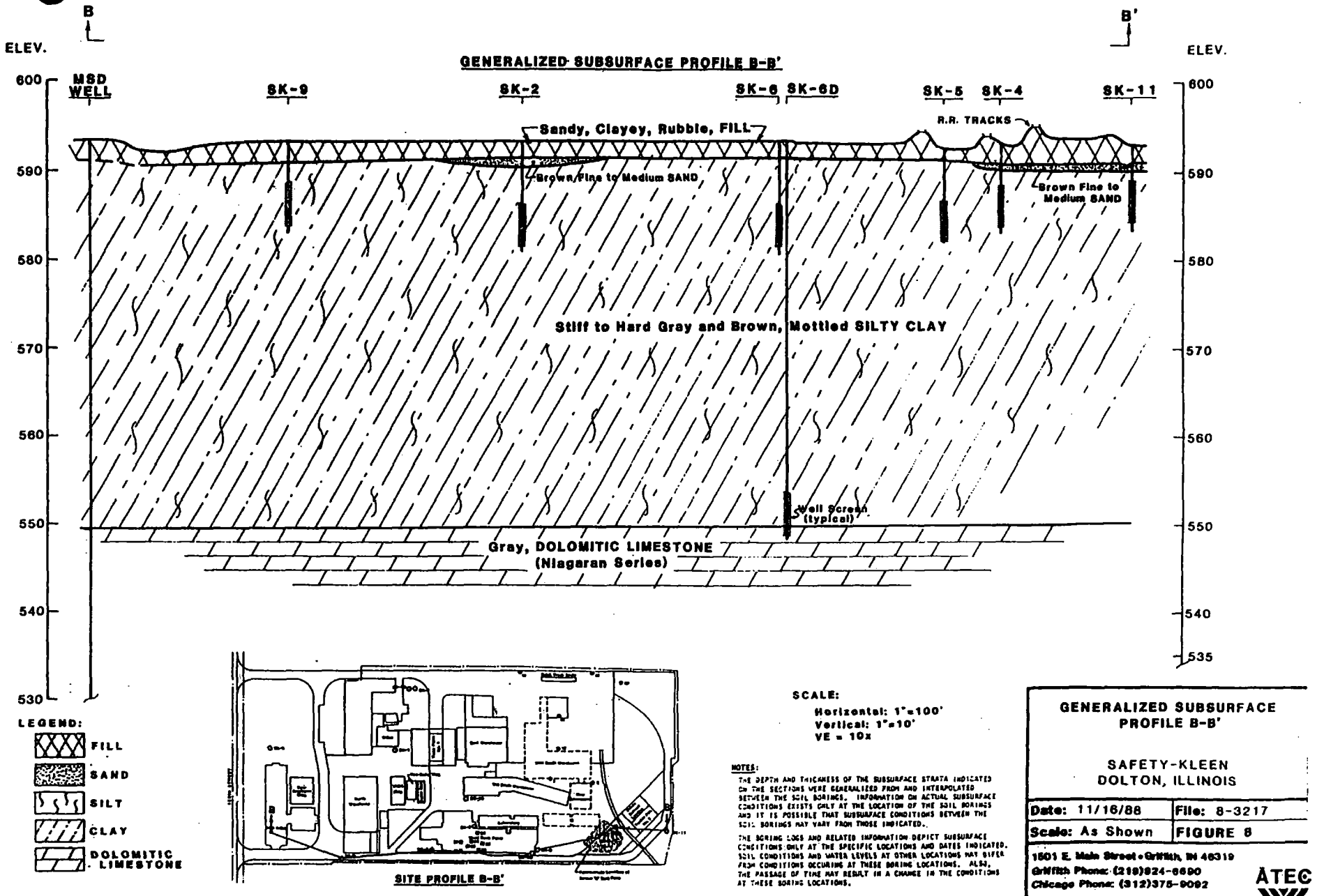


FIGURE 3-2 :CROSS SECTION B–B', SAFETY–KLEEN CORP. RECYCLE CENTER, DOLTON, ILLINOIS

Low-permeability, gray to brown silty clays and clayey silts constitute the predominant shallow lithology beneath the topsoil/fill at the site. Based on the borehole logs, the clays are 35 to 40 feet thick across the entire site, and extend to bedrock. The character of the clays changes from stiff at shallow depths to very stiff and hard near bedrock, approximately 45 feet below ground surface (ft-bgs).

Based on logs from four 1988 boreholes, where were drilled at the corners of the property, the upper bedrock contact occurs consistently at a depth of approximately 45 ft-bgs. The uppermost bedrock is reported to be a hard, gray dolomite (the Silurian-age Niagaran Dolomite) which is moderately fractured in the upper several feet, but less fractured with depth. No open voids were encountered in the bedrock during drilling (ATEC, 1989).

The Phase I RFI soil borings were constructed to a depth of 20 ft-bgs. The subsurface lithologies encountered during the Phase I RFI were similar to those previously encountered at the site. In the northeast corner, fill is absent and clay extends from ground surface to the total investigated depth. At two locations (in the former Southeast Tank Farm in the Southern Investigation Area, and in the former drum disposal area in the East Field), excavation fill material (gravel, sand) was encountered to depths of approximately 8 ft-bgs.

At all other locations, fill material consisting of medium-fine silty sand with occasional gravel and brick fragments was encountered from ground surface to a depth of approximately 3 ft-bgs. Below the fill, a gray-brown silty clay with 5 to 10 percent sand and minor gravel was encountered to the total investigated depth of 20 ft-bgs.

3.1.2 Phase I Soil Quality Data

Soil samples were collected at 25 locations and analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs) and eight RCRA metals during the Phase I RFI. The Phase I RFI soil quality data were summarized in detail in the Phase I Release Assessment Report. The constituents detected in Phase I soil samples were compared to USEPA Draft Soil Screening Levels (SSGLs, 1994). As described in the Phase I RFI Report, several constituents detected in Phase I (most notably phenol and phthalates), were not considered to be indicative of facility-related impacts.

3.1.2.1 Phase I Lateral Extent Soil Sample Results

S-K collected and analyzed shallow soil samples to address the Phase I objective of determining whether a release had occurred from any of the SWMUs under investigation. Phase I RFI indicator constituents were detected in shallow soil samples, collected in the vicinity of the East Field Investigation Area, the Southern Investigation Area, the Central Investigation Area, and the Northwest Investigation Area. The constituents that were detected during the Phase I RFI were similar to those detected during investigations performed prior to S-K operations at the facility. The Phase I RFI data did not provide any evidence of soil quality impacts in the vicinity of the Process Building and Truck Station Nos. 3 and 5.

The Phase I shallow soil quality data are summarized on figures 3-3 through 3-6. Abbreviations used on the figures are shown in Table 3-1. Based on the Phase I results, S-K also identified some constituents (phenol and phthalates) that did not appear to be representative of facility-related impacts. The results of the Phase II RFI have confirmed that

these constituents do not appear to be representative of facility-related impacts (Chapter 6.0).

3.1.2.1 Phase I Vertical Extent Soil Sample Results

In addition to the shallow soil quality assessment (Phase I), S-K collected deeper soil samples to evaluate the vertical extent of potential SWMU-related impacts. Deep soil samples were collected at a depth of 18 to 20 ft-bgs from 23 locations at the facility. A summary of the constituents detected in the deep soil samples from each Investigation Area were presented in the Phase I Report. Of the constituents detected in the deep soil samples from each Investigation Area, only four VOCs (methylene chloride, 1,2-dichloropropane, toluene and 1,1-dichloroethene) were detected in the deeper soil samples at concentrations above the established SSGLs.

The Phase I deeper soil quality data are also summarized on figure 3-3 through 3-6. The two potential non-indicator SVOCs, phenol and phthalates, were commonly detected in the deeper samples; 20 of 23 deep samples for phenol and 16 of 23 deep samples for phthalates. The results of the Phase II RFI sampling and analysis have confirmed that these constituents do not appear to be associated with the detected facility-related impacts.

During the Phase I RFI minor concentrations of a few constituents were detected in many of the 18-20 ft-bgs soil samples. These low levels of impacts were not detected during Phase I field screening. This observation is consistent with previous assessments, which indicated no apparent impacts below depths of between 4 and 15 ft-bgs in the Central Investigation Area, 6.5 to 8.5 ft-bgs in the East Field Investigation Area, and 4 ft-bgs in the Northwestern Investigation Area.

3.2 Previous Ground-Water Data

Four previous ground-water investigations including the Phase I RFI were conducted at the site, prior to the Phase II/III activities. The pre-Phase II/III RFI ground-water investigations consisted of permeability tests on soil samples collected from within the perched water-bearing zone and underlying clay aquitard, and fluid level data from the perched water-bearing zone and three locations in the dolomite aquifer. Ground-water quality data was also collected from the perched water-bearing zone and three locations in the dolomite aquifer.

S-K performed a preliminary ground-water investigation during the Phase I RFI to characterize potential impacts to ground-water quality. The ground-water samples were collected from temporary monitoring points installed with a hydropunch-type rig. The Phase I ground-water quality results were consistent with the Phase I soil sample data in terms of the constituents identified and relative locations. In addition, the data identify site-specific conditions, which should limit the potential for migration of ground-water impacts (i.e. clay aquitard). The data pertinent to the RFI Phase II/III ground-water investigation are summarized in the following subsections.

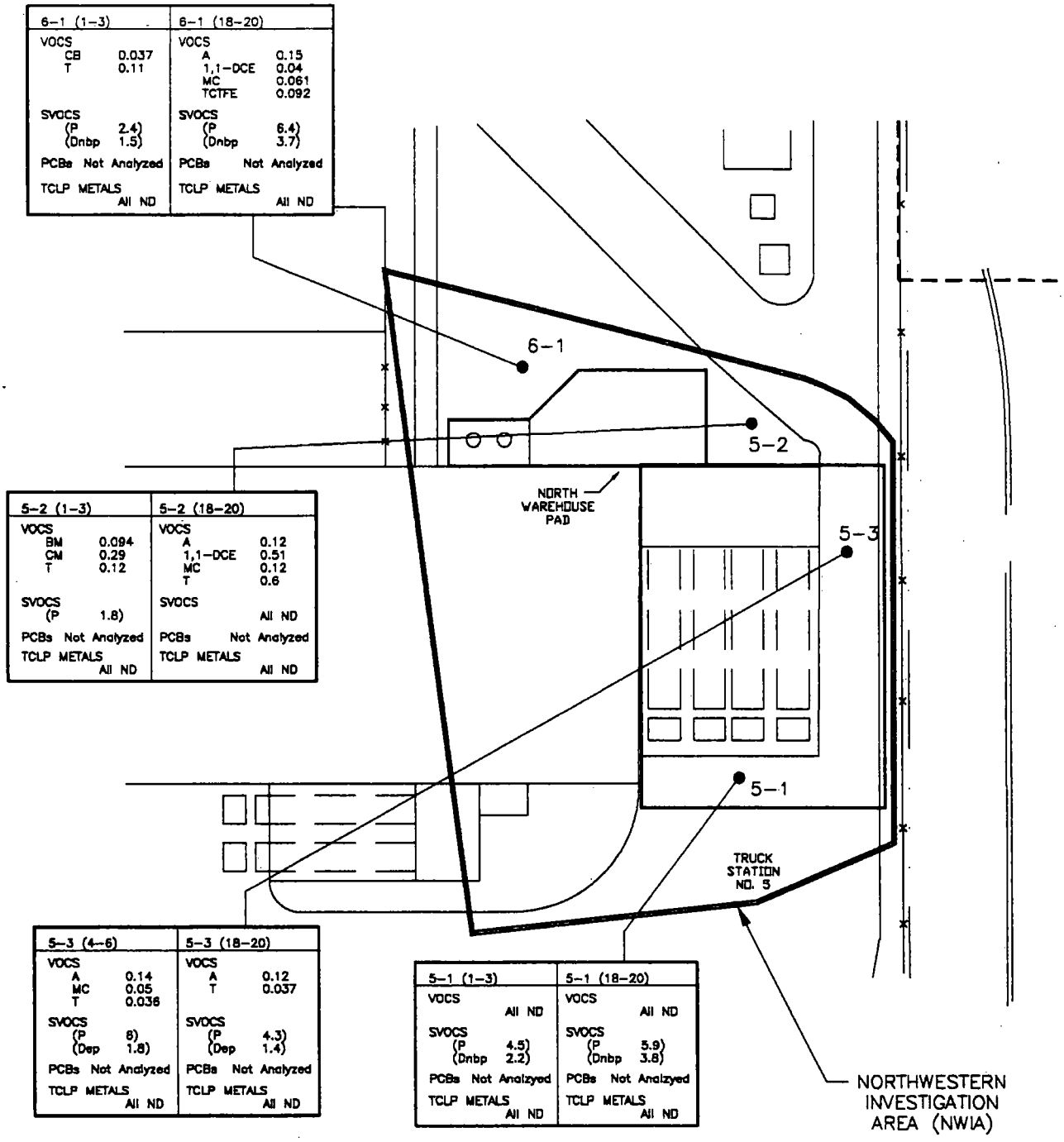


FIGURE 3-3 :SOIL QUALITY DATA, NORTHWESTERN INVESTIGATION AREA, RFI PHASE I RELEASE ASSESSMENT, SAFETY-KLEEN CORP. RECYCLE CENTER, DOLTON, ILLINOIS (1994)

SKDI5ISQ

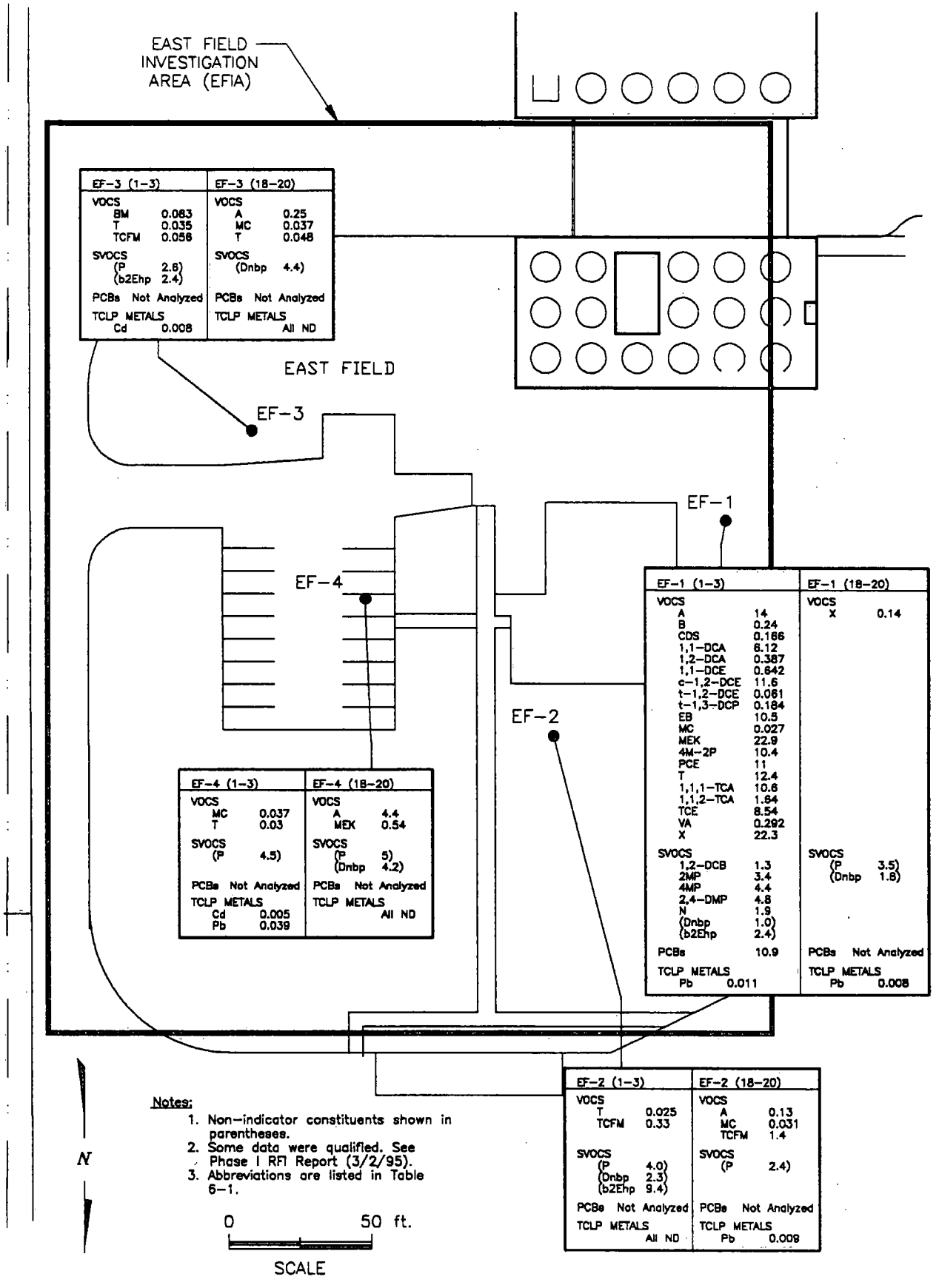


FIGURE 3-4 :SOIL QUALITY DATA, EAST FIELD INVESTIGATION AREA, RFI PHASE I RELEASE ASSESSMENT, SAFETY-KLEEN CORP. RECYCLE CENTER, DOLTON, ILLINOIS (1994)

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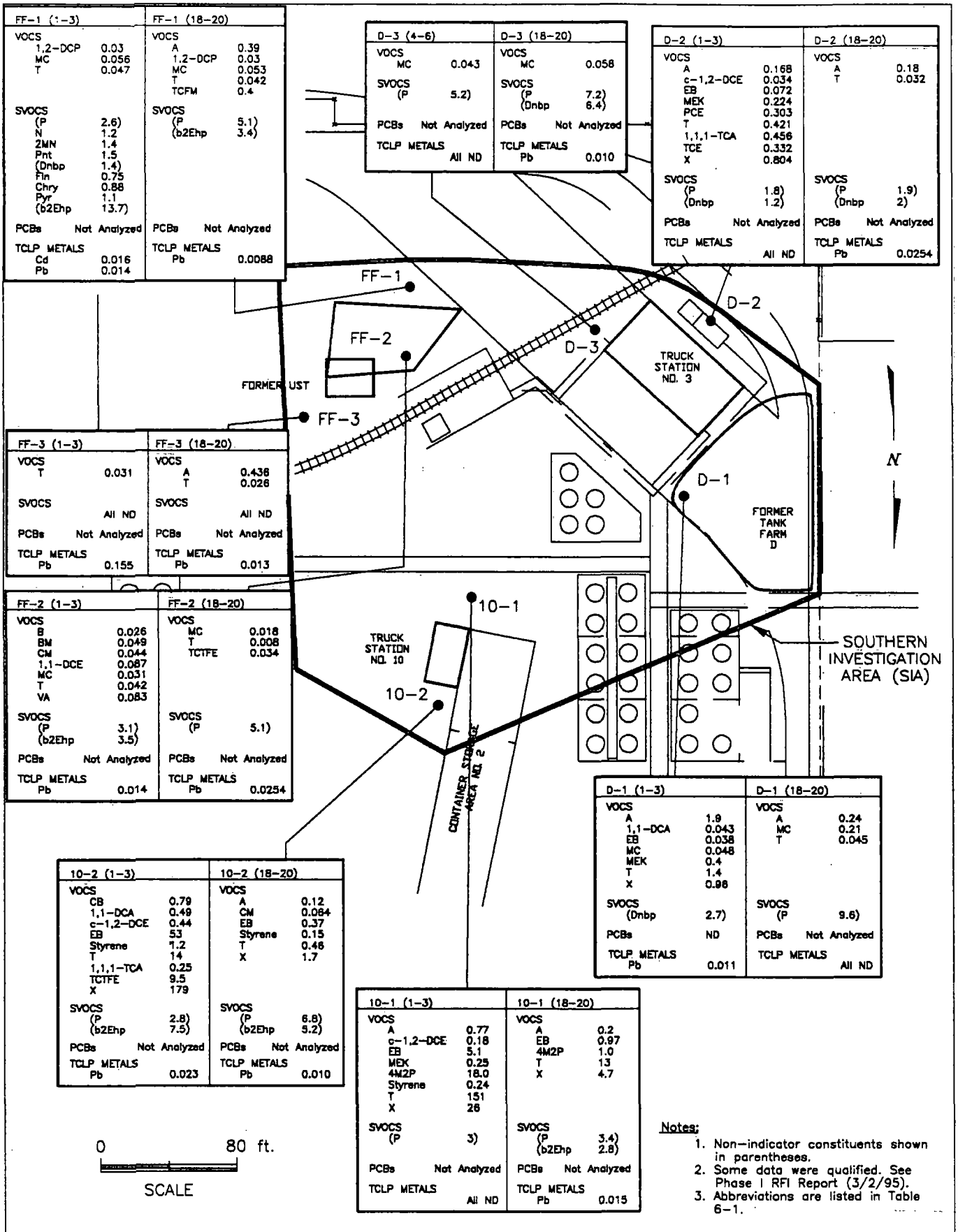
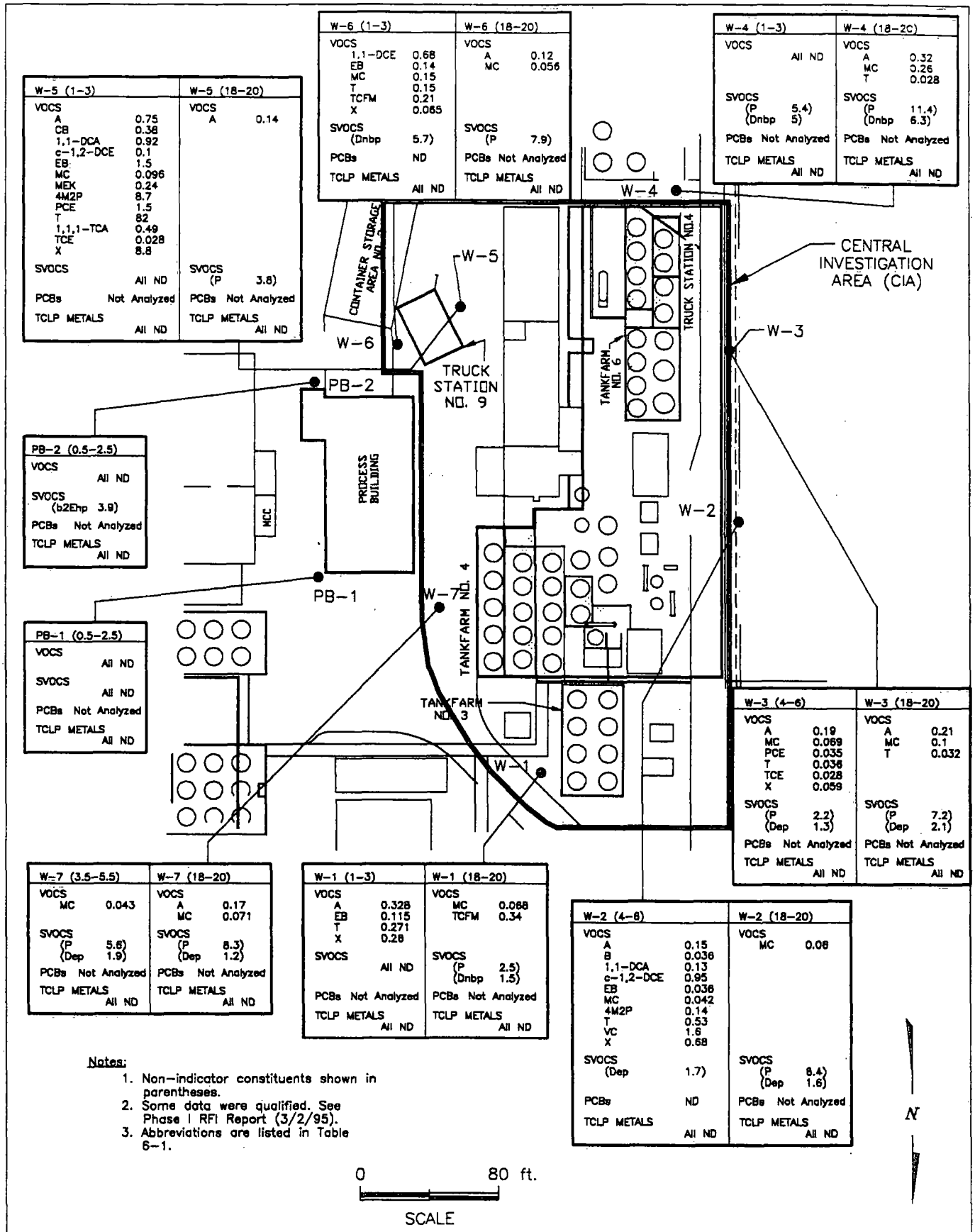


FIGURE 3-5 :SOIL QUALITY DATA, SOUTHERN INVESTIGATION AREA, PHASE I RELEASE ASSESSMENT, SAFETY-KLEEN CORP. RECYCLE CENTER, DOLTON, ILLINOIS (1994)

SKDI11SQ



Notes:

1. Non-indicator constituents shown in parentheses.
2. Some data were qualified. See Phase I RFI Report (3/2/95).
3. Abbreviations are listed in Table 6-1.

FIGURE 3-6 :SOIL QUALITY DATA, CENTRAL INVESTIGATION AREA, RFI PHASE I RELEASE ASSESSMENT, SAFETY-KLEEN CORP. RECYCLE CENTER, DOLTON, ILLINOIS (1994)

SKDIWISQ

Table 3-1. List of Abbreviations for Constituents, RFI Phase I Release Assessment, Safety-Kleen Recycle Center, Dolton, Illinois.

Constituent	Symbol	Constituent	Symbol
VOCs		SVOCs	
Acetone	A	Phenol	P
Benzene	B	1,2-Dichlorobenzene	1,2-DCB
Bromomethane	BM	Naphthalene	N
Carbon disulfide	CDS	2-Methyl Napthalene	2-MN
Chlorobenzene	CB	2-Methylphenol	2-MP
Chloroethane	CE	4-Methylphenol	4-MP
Chloroform	CF	2,4-Dimethyl phenol	2,4-DMP
Chloromethane	CM	Phenanthrene	Pnt
1,1-Dichloroethane	1,1-DCA	Di-n-butyl phthalate	Dnbp
1,2-Dichloroethane	1,2-DCA	Fluoranthene	Fln
1,1-Dichloroethene	1,1-DCE	bis(2-Ethylhexyl)phthalate	b2Ehp
cis-1,2-Dichloroethene	c-1,2-DCE	Diethyl phthalate	Dep
trans-1,2-Dichloroethene	t-1,2-DCE	Pyrene	Pyr
trans-1,3-Dichloropropene	t-1,3-DCP	Butylbenzylphthalate	Bbp
1,2-Dichloropropane	1,2-DCP	Chrysene	Chry
Ethylbenzene	EB	Benzo(k)fluoranthene	Bkf
2-Hexanone	2HEX		
Methylene Chloride	MC		
2-Butanone	MEK	Metals	
4-Methyl-2-Pentanone	4M2P	Barium	Ba
Styrene	Sty	Cadmium	Cd
Tetrachloroethene	PCE	Lead	Pb
Toluene	T	Mercury	Hg
1,1,1-Trichloroethane	1,1,1-TCA		
1,1,2-Trichloroethane	1,1,2-TCA		
Trichloroethene	TCE		
Trichlorofluoromethane	TCFM		
1,1,2-Trichloro trifluoro ethane	TCTFE		
Vinyl Acetate	VA		
Vinyl Chloride	VC		
Xylenes (total)	X		

3.2.1 Regional Hydrogeology

The regional hydrogeologic units include two shallow water-bearing zones: a near-surface water-bearing zone perched on low-permeability clays and silts and the Silurian-age Niagaran Dolomite aquifer. The shallow perched zone consists primarily of glacial fill and occurs at a depth of 4 to 5 ft-bgs and appears to be 10 to 20 feet thick. The Silurian Dolomite water-bearing zone has been reported to begin at a depth of approximately 45 ft-bgs.

A clay aquitard, at least 30 feet thick, appears to underlie the entire facility. Previous falling head permeability test results on clays from two locations (on the east and west sides of the facility at 22 ft-bgs and 30 ft-bgs) yielded average permeabilities of 2.7 to 5.5 x 10^{-8} cm/sec (ATEC, 1989). Based on this low permeability and thicknesses greater than 30 feet, the clay layer should serve as an effective aquitard to minimize the potential for downward migration of constituents from the perched zone to the dolomite aquifer.

The contact between the clay aquitard and the underlying Silurian Dolomite aquifer has been reported to occur at a reported depth of 45 ft-bgs. Ground water was encountered near the bedrock surface in the three shallow bedrock monitoring wells, previously installed at the site. The Silurian Dolomite aquifer is reported to be capable of producing significant yields of potable water. Water supply wells near the facility are reported to have been completed considerably deeper in the bedrock. Records indicate that the nearest supply well to the facility is located approximately 1500 feet to the northeast. Total depths of the water supply wells are a minimum of 210 ft-bgs.

3.2.2 Ground-Water Occurrence

Prior to the Phase I RFI, thirty-eight monitoring wells had been installed at the site: one by the Metropolitan Sanitary District and 37 by current or past owners of the site. Minimal information was available on the completion and integrity of these wells. Therefore, most of these wells have been plugged and abandoned.

During the Phase I RFI, ground water was generally encountered at depths of 4 to 5 ft-bgs. In the vicinity of Container Storage Area No. 2, ground water was encountered approximately 2 ft-bgs in the low-permeability sediments. This perched zone extends to at least 10 to 15 ft-bgs in the southeastern corner of the facility. The clay encountered at 20 ft-bgs was described as wet or saturated at six locations, moist at 14 locations, and dry at three locations.

3.2.3 Ground-Water Flow Direction

Because the topography in the area is flat, the hydraulic gradients in the perched zone are low. Shallow ground water generally flows toward the nearest surface water body; however, it has been noted previously that the flow direction can be locally influenced by leaky water lines and sewers and sump pumps (ATEC, 1989). The regional flow direction in the underlying Silurian dolomite aquifer is reported to be generally east or southeast, in the direction of bedrock dip (ATEC, 1989).

The ground-water flow direction in the shallow perched zone, determined during the Phase I RFI, is to the northeast across the site. This flow direction is consistent with the results of previous ground-water investigations at the site.

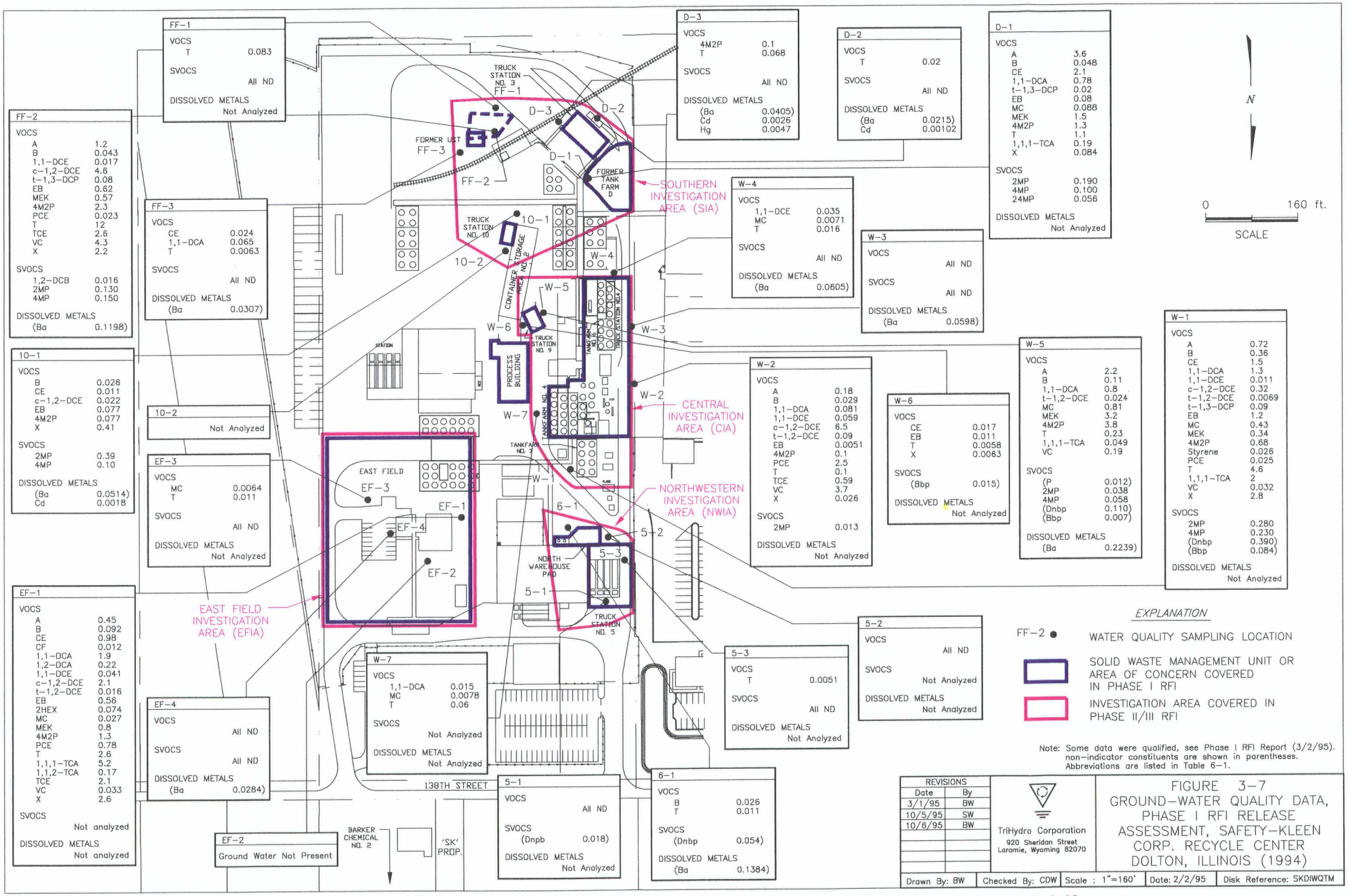
3.2.4 Phase I RFI Ground-Water Quality Data

Ground water was sampled at 21 locations and analyzed for VOCs, SVOCs, and eight RCRA metals during the Phase I RFI. The Phase I ground-water quality data are shown on Figure 3-7. The Phase I ground-water quality data were used to design the Phase III investigation. The Phase I ground-water results are summarized as follows:

- VOCs were detected in Phase I shallow ground water samples at SWMUs where indicator constituents were identified in the Phase I shallow soil samples.

- Indicator SVOCs were present in Phase I shallow ground-water samples at the SWMUs where these indicators were generally identified in the Phase I shallow soil samples. In the Northwestern Investigation Area, indicator SVOCs were not detected in the shallow soils samples. In the East Field, there was insufficient water to collect a sample for SVOC analysis at the location where the highest SVOC concentrations were detected in the shallow soil samples.

- Cadmium and mercury were detected at low concentrations in several ground-water samples from the southwest corner of the facility. Lead, which was present in shallow and deep soils samples collected near several SWMUs, was not detected in the Phase I ground-water samples. Barium was present in many ground-water samples, but was not detected in any soil sample. The ubiquitous presence of barium in ground water suggests a naturally occurring rather than a facility-related source.



Note: Some data were qualified, see Phase I RFI Report (3/2/95). non-indicator constituents are shown in parentheses. Abbreviations are listed in Table 6-1.

REVISIONS	
Date	By
3/1/95	BW
10/5/95	SW
10/6/95	BW

TriHydro Corporation
920 Sheridan Street
Laramie, Wyoming 82070

FIGURE 3-7
GROUND-WATER QUALITY DATA, PHASE I RFI RELEASE ASSESSMENT, SAFETY-KLEEN CORP. RECYCLE CENTER DOLTON, ILLINOIS (1994)

Drawn By: BW	Checked By: CDW	Scale : 1"=160'	Date: 2/2/95	Disk Reference: SKDIWQTM

CHAPTER 4.0

PHASE II SOIL SAMPLING PROCEDURES

The objective of the Phase II RFI (Extent of Release Assessment) at the Dolton Recycle Center was to define the lateral and vertical extent of soil quality impacts that were associated with the designated SWMUs within the Investigation Areas. As discussed in Chapter 2.0, the designated SWMUs have been grouped into Investigation Areas. These include the East Field Investigation Area; Southern Investigation Area, Central Investigation Area, and Northwestern Investigation Area. The Phase II soil quality investigation was conducted in May and June 1996.

This chapter presents the investigative procedures that were used to accomplish the Phase II objectives. Sampling and analysis procedures were implemented in accordance with the approved Workplan procedures, and associated Quality Assurance Project Plan (QAPjP, Part VII of the Phase I RFI Workplan). In summary, the goals established in the Workplan and QAPjP were to obtain precise, accurate, complete, comparable and representative data. Adherence to the approved procedures ensured that these goals were achieved.

4.1 Lateral Extent Soil Quality Sampling

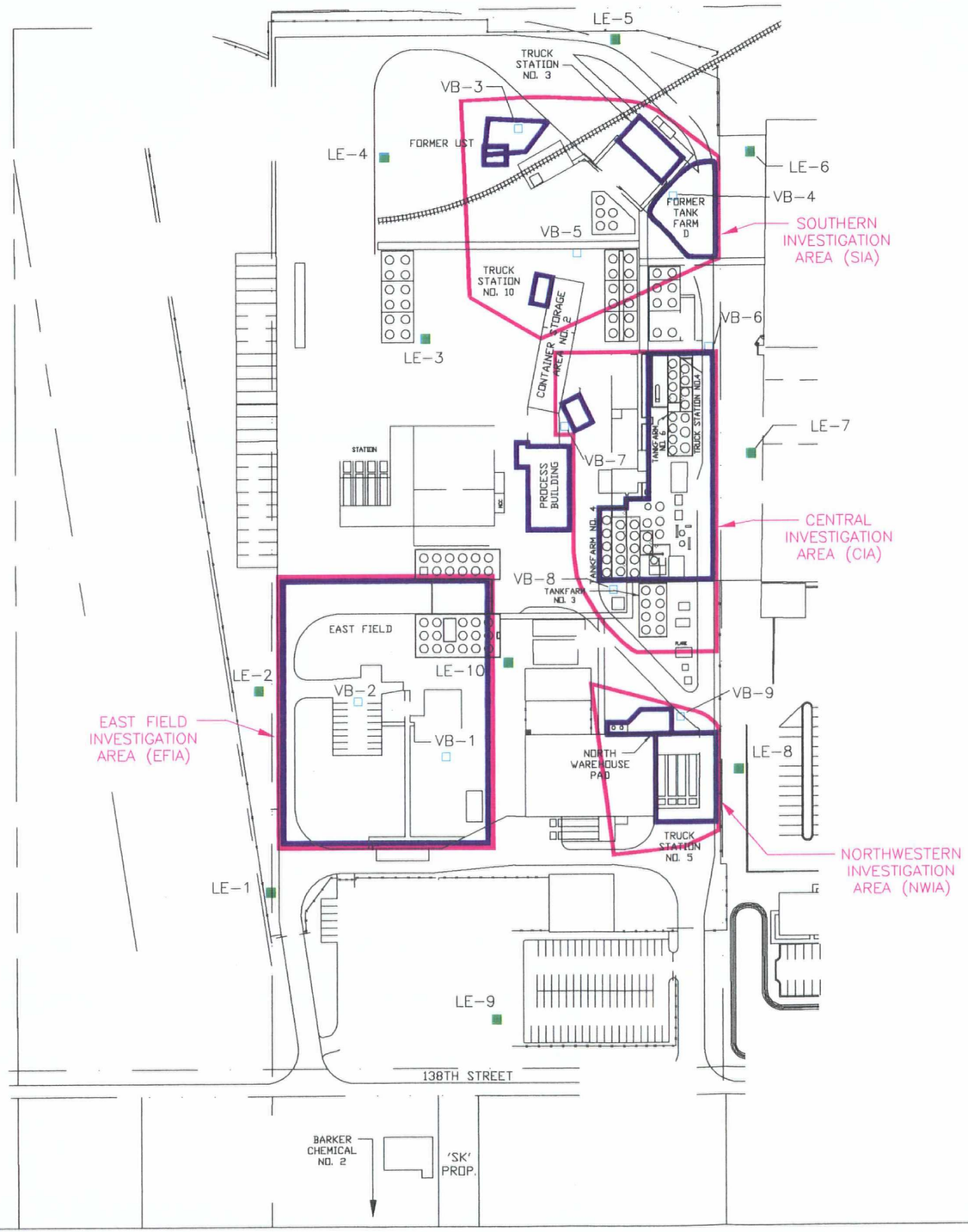
The lateral extent of impacts surrounding the Investigation Areas was not completely defined during the previous investigations at the Dolton facility. The Phase I RFI results and the findings from previous investigations were used to design an effective program to achieve the Phase II objectives. The rationale for the lateral extent soil sampling program is described in the following subsections.

4.1.1 Lateral Extent Soil Sampling Locations

The lateral extent soil sampling locations are presented on Figure 4-1. These locations were selected to provide coverage at the perimeters of the impacted portions of the site (i.e., the Investigation Areas), based on locations where one or more constituents identified in Phase I exceeded the SSGLs. In the February 21, 1996 approval letter, IEPA requested an additional sample location be added in the East Field Investigation Area. This location is shown as Boring LE-10 on Figure 4-1.

4.1.2 Lateral Extent Soil Sampling Depths

To evaluate the lateral extent of soil quality impacts, samples were collected continuously in 2-foot intervals from ground surface to a total depth equal to the deepest sample interval in which impacts were identified in the nearest Phase I boring or deeper depending on the Phase II field screening results. Samples were selected for laboratory analysis based on the following rationale:



EXPLANATION

LE-4 ■ PHASE II RFI LATERAL EXTENT SOIL SAMPLING LOCATION

VB-5 □ PHASE II RFI VERTICAL EXTENT SOIL SAMPLING LOCATION

SOLID WASTE MANAGEMENT UNIT OR AREA OF CONCERN COVERED IN PHASE I RFI

INVESTIGATION AREA COVERED IN PHASE II/III RFI

N

0 160 ft.

SCALE

REVISIONS	
Date	By
10/6/95	BW
7/15/96	CC

TriHydro Corporation
920 Sheridan Street
Laramie, Wyoming 82070

FIGURE 4-1
SOIL SAMPLING LOCATIONS, RFI PHASE II/III RFI, SAFETY-KLEEN CORP. RECYCLE CENTER DOLTON, ILLINOIS (June 1996)

Drawn By: SW | Checked By: TN | Scale : 1"=160' | Date: 10/5/95 | Disk Reference: SKDISSL2

1. The interface between the permeable fill and low-permeability clay was considered to be a likely zone for constituents from a release to accumulate. Therefore, if field screening indicated that no soil impacts were present (field screening procedures are described in a subsequent section), one soil sample was selected from the base of the fill zone. A second sample was submitted from the depth equal to the deepest sample interval in which impacts were identified in the nearest Phase I or II boring.

2. As described in the approved Workplan, if field screening results indicated potential soil impacts at one of the lateral extent boreholes, a soil sample was not to be submitted for laboratory analysis. One or more additional locations (sited radially away from the Investigation Area) were to be sampled until the criteria in Item 1 above were achieved or the property line was reached. The Phase II field screening results did not indicate evidence of potential soil impacts in the originally proposed lateral extent borings. Therefore, additional borings were not considered necessary to complete the Phase II RFI.

4.2 Vertical Extent Soil Quality Sampling

The vertical extent of soil quality impacts was not completely defined during the previous investigations. Data collected during previous investigations and the Phase I RFI were used to design a Phase II vertical extent sampling program in conjunction with the lateral extent investigation. The rationale for the Phase II vertical extent soil sampling program is described in the following subsections.

4.2.1. Vertical Extent Soil Sampling Locations

The locations of the Phase II vertical extent borings are shown on Figure 4-1. As discussed in the October 1995 Workplan, the following criteria were used to establish vertical extent sampling locations:

1. Spatial distribution within the Investigation Areas.

2. Collecting samples at or near areas where the highest levels of VOCs were detected in the deep soil samples (18-20 ft-bgs) during the Phase I RFI.

3. Collecting samples at or near areas where concentrations of specific constituents exceeded the SSGLs in the deep Phase I soil samples.

4. Collecting samples at or near areas where relatively high concentrations of phenol and phthalate were detected in the deep Phase I soil samples in accordance with Condition 4 of the August 17, 1995 IEPA approval letter.

The detected concentrations of only four VOCs (methylene chloride, 1,1-dichloroethene, 1,2-dichloropropane and toluene) exceeded the SSGLs in the deep samples at one or more locations during the Phase I RFI.

As shown on Figure 4-1, at least one specific vertical extent sampling location (nine total) was proposed for each investigation area. Note, the lateral extent soil borings also provided information relative to the vertical extent of facility-related impacts. The rationale for the specific vertical extent boring locations as approved by IEPA in the February 21, 1996 correspondence is summarized in Table 4-1.

4.2.2 Vertical Extent Soil Sampling Depths

Based on the Phase I RFI and on the previous investigative results, it was anticipated that only minor impacts would be encountered in the soils below a depth of approximately 10 ft-bgs and that the level of impacts may be below that typically detectable by field screening methods. Therefore, special attention was given to identifying the bottom of the saturated perched zone during the Phase II lithologic logging activities. The bottom of this zone had been reported to be at approximately 15 ft-bgs. During the Phase I RFI the clay encountered at 20 ft-bgs was described as wet or saturated at six locations, moist at 14 locations, and dry at 3 locations.

The vertical extent soil borings were continuously sampled from approximately 18 ft-bgs to total depth. Total depth and sample selection for laboratory analysis in the vertical extent borings were based on the following criteria:

1. If field screening indicated no VOCs in unsaturated soils at a depth of 20 ft-bgs, and the lithology below 20 ft-bgs consisted of gray-brown silty clay (as was anticipated), then one sample was collected from 22-24 ft-bgs.

2. If saturated soil conditions occurred below a depth of 20 ft-bgs, and field screening indicated the absence of VOCs, then a sample was collected from immediately below the apparent saturated zone.

3. If field screening indicated the potential presence of VOCs below the apparent base of the saturated zone, then a sample was collected from immediately below the deepest interval where field screening indicated that VOCs may be present.

4. In all cases, a second sample was collected at a depth of approximately 4 feet below the first vertical extent sample.

5. At three locations (VB-3, VB-6, and VB-8), in the vicinity of deep Phase I samples where elevated concentrations of phenol and phthalates were detected, a total of three samples were collected and submitted for laboratory analysis per Condition 4 of the August 17, 1995 IEPA approval letter.

4.3 Soil Sampling Procedures

The soil sampling procedures implemented during the Phase II RFI were designed to meet the Phase II objectives and the goals presented in the QAPjP (Section VII of the Phase I RFI Workplan). The borehole drilling and sampling, field screening, decontamination and borehole abandonment procedures are described in the following subsections:

Table 4-1. Rationale for Selection of Vertical Extent Soil Sampling Locations, Phase II/III RFI, Safety-Kleen Corp. Recycle Center, Dolton, Illinois.

East Field Investigation Area (EFIA)

VB-1: Methylene chloride exceeded the SSGL in the Phase I deep sample from EF-2.

VB-2: Methylene chloride exceeded the SSGL in the Phase I deep sample from EF-3.

Southern Investigation Area (SIA)

VB-3: Between FF-1 and FF-2, where methylene chloride exceeded the SSGL in deep samples. Adjacent to FF-1 where 1,2-Dichloropropane exceeded the SSGL and relatively high concentrations of phenol (5.1 mg/kg) and bis(2-ethylhexyl)phthalate (3.4 mg/kg) were detected in this deep sample. Provides spatial distribution within SIA.

VB-4: Near location D-1, where the highest methylene chloride concentration was detected in the deep samples from the SIA and where the highest phenol concentration was detected in the SIA. Provides good spatial distribution within SIA.

VB-5: Near location 10-1, where highest total organic vapor (TOV) concentrations were detected in the deep samples, and where toluene exceeded the SSGL in the deep sample. Phenol and bis (2-ethylhexyl) phthalate were also detected in the deep sample at this location.

Central Investigation Area (CIA)

VB-6: Near location W-4, where the highest phenol, di-n-butyl phthalate, and methylene chloride concentrations were detected in the deep samples from the entire Phase I RFI.

VB-7: Close to location W-6, where methylene chloride exceeded the SSGL and where a relatively high concentration of phenol was detected in the deep sample. Also provides spatial distribution within the CIA.

VB-8: Between locations W-7 and W-1, where methylene chloride exceeded the SSGL in the deep sample. Relatively high phenol concentration and diethyl phthalate detected in the deep sample at W-7. Phenol and di-n-butyl phthalate were also detected at W-1. Provides spatial distribution of deep sampling within the CIA.

Northwest Investigation Area (NWIA)

VB-9: Between two locations (6-2 and 5-2) where methylene chloride and 1,1-dichloroethene exceeded the SSGL in the deep sample.

4.3.1 Borehole Drilling and Soil Sample Collection Procedures

A conventional drill rig equipped with hollow stem augers (HSAs) and split-spoon (SS) samplers was used to collect soil samples during the Phase II RFI. The SS sampler (2-foot length) was lined with four 6-inch long clean brass liners. The HSA drilling technique was selected because sampling was generally performed within and below the shallow perched water-bearing (saturated) zone. The auger flights were generally effective in sealing off the low-permeability saturated zone while collecting the sample, thus minimizing the potential for contamination of deeper soil samples by downward migration of shallow ground water. This technique was particularly important for determining the vertical extent of impacts in areas with previously identified shallow soil and/or ground-water impacts.

Utilities were cleared in advance at each boring location. The drill rig equipped with decontaminated HSAs advanced the borehole to the top of the desired soil sampling interval. A clean/decontaminated SS sampler fitted with clean brass liners was attached to drive rods and inserted through the hollow stem of the HSA. The SS sampler was driven to the bottom of each sample interval (2-feet). The number of blow counts required to advance the sampler to the bottom of each sample interval were recorded on the boring logs. The SS sampler was retrieved from the borehole, opened and presented to the on-site geologist.

The brass liners within the SS sampler were separated, and in most cases the middle two liners were reserved for potential laboratory analysis. The samples in the middle liners were selected because soil contained within this interval was considered to be most representative (i.e., not exposed to air which may allow the potential release of volatiles). However, because one of the Phase II objectives was to collect a sample at the base of the fill, the appropriate brass liner representing the fill/clay interface was submitted for laboratory analysis. Therefore, in some of the shallow samples, the bottom brass liner was selected to satisfy this objective.

The ends of the brass liners selected for potential laboratory analysis were covered with Teflon sheets and slip-on plastic caps. The brass liners were labeled and immediately placed on ice in an opaque cooler. This soil sample collection, handling and preservation protocol is in accordance with the IEPA "Soil Volatile Sampling Procedures," except that teflon sheeting rather than aluminum foil was used to seal each end of the brass rings.

An aliquot of representative sample from each interval was subjected to the field screening procedures described in the next subsection. The soil within the brass liners selected for potential laboratory analysis was not subjected to field screening. The soil in the uppermost brass liner was generally discarded from each sample interval in accordance with the approved Workplan, because of the possibility that it may contain slough.

The soil cuttings generated from sampling activities were containerized in 55-gallon drums. Discarded soil from field screening and lithologic logging were also placed in the 55-gallon drums. The drums were sealed, labeled according to borehole location and managed in accordance with applicable regulations.

4.3.2 Field Screening Procedures

Soil was extruded from the bottom brass ring for field screening by the on-site geologist. An aliquot of the soil was immediately placed into a clean Ziploc bag. The soil

within the bag was allowed to equilibrate to ambient temperature (± 70-degrees). The probes of two portable photo-ionization detectors (PID) were inserted into a small opening in the seal of the Ziplock bag. The highest total organic vapor (TOV) reading indicated by each PID was recorded on the field boring logs.

Two PIDs were used during the Phase II RFI soil screening activities. One PID was equipped with an 11.8 electron volt (eV) lamp and the second PID was equipped with a 10.6 eV lamp. The 11.8 eV lamp PID was employed because of the potential presence of methylene chloride. Methylene chloride has an ionization potential of 11.3 eV and would not be detected by the 10.6 eV PID. The 10.6 eV PID was used in conjunction with the 11.8 eV PID for comparison with previous field screening results. The TOV readings from both PIDs were recorded on the boring logs in parts per million (ppm) relative to a 100 ppm isobutylene standard.

4.3.3 Lithologic Logging

A soil sample from each interval was described by the onsite geologist in terms of texture (per ASTM Method D-2488), moisture content, staining, and any other pertinent information. The soil lithology was described using the Unified Soil Classification System (ASTM Method D-2487). Physical descriptions and classification of the Phase II soil samples were recorded on the boring logs. The Phase II/III soil boring logs are included in Appendix B of this report.

4.3.4 Laboratory Analysis

Soil samples were retained from each sample interval for possible laboratory analysis. Soil samples were selected following the criteria presented in sections 4.1.2 and 4.2.2 above. The soil samples selected for laboratory analysis were stored on ice in opaque coolers. Soil samples that were not selected were extruded into a 55-gallon drum and managed in accordance with applicable regulations.

In addition to the investigative soil samples, several brass liners were also retained for blind duplicate analysis. The original sample label was removed and re-labeled as XX-1, XX-2 etc., and submitted to the laboratory for analysis. Blind duplicates were collected at a rate of one per ten investigative samples in accordance with the requirements of the RFI QAPjP. Five blind duplicate soil samples were collected during the Phase II RFI activities.

Sample coolers were transported to the S-K Environmental Laboratory in Elk Grove Village, Illinois by courier within 48 hours of collection. The coolers were sealed with a custody seal, and accompanied by a Chain-of-Custody/Sample Analysis Request (COC/SAR) form. For each shipment, the field team leader confirmed sample arrival at the laboratory by telephone.

Each soil sample was analyzed for VOCs by Method 8240, SVOCs by Method 8270, and TCLP metals by extraction Method 1311 and 6000/7000 series analytical methods. Samples that were collected in the vicinity of the East Field Investigation Area were also analyzed for polychlorinated biphenyls (PCBs) by Method 8080. As requested by IEPA, the laboratory was instructed to meet the respective EQLs listed in SW-846 for each of the specified analytical methods. The laboratory was also instructed to follow the level of QA/QC effort established in the QAPjP. A quality assurance/quality control evaluation of the soil

quality data is presented in Appendix C of this Phase II/III RFI Report. The RFI Phase II soil assessment results are presented in Chapter 6.0.

4.3.5. Geotechnical Analysis

Representative soil samples were collected and submitted for geotechnical analysis to provide information to assess the fate, transport and rate of migration of potential groundwater impacts. Samples for geotechnical analyses were collected from within and below the saturated zone. Samples were collected with a Shelby tube sampler that was advanced hydraulically using the drill rig. The Shelby tube was retrieved from the borehole, covered with plastic caps and submitted to Midwest Engineering Services, Inc. (MES), in Orland Park, Illinois. The Shelby tube soil samples were analyzed for falling head permeability, grain size distribution, Atterberg limits, bulk density, bulk porosity, moisture content, and organic content.

In addition to the Shelby tube samples, twelve other representative samples collected in various locations throughout the site were selected for analysis of one or more of the following: grain size distribution, Atterberg limits, bulk density, bulk porosity, moisture content and organic content. These samples were selected to characterize the lithology and to determine the lithologic variation throughout the site. The results of the geotechnical analyses are presented in Chapter 6.0.

4.3.6. Decontamination Procedures

The drill rig was decontaminated prior to entering and before leaving the site. The down-hole drilling equipment (auger flights and split-spoon rods) were decontaminated within a designated containment area with high pressure spray/steam prior to drilling at each location.

The sampling equipment (including brass liners, split-spoon samplers, and cutting shoes) were decontaminated with a detergent/water solution and rinsed in warm tap water and distilled water prior to use at each borehole and sample interval. The decontaminated brass liners were air-dried and stored in clean plastic bags.

All wash and rinse water was containerized within a decontamination containment area and transferred to 55-gallon drums. The drums were sealed, labeled and managed in accordance with applicable regulations.

4.3.7. Borehole Abandonment

The Phase II soil borings which were not completed as monitoring wells were plugged by pouring bentonite chips in the borehole and hydrating in approximately two-foot lifts to prevent bridging. The hydrated bentonite seal was brought to within approximately 6 inches of the ground surface. The top 6 inches were patched with soil, asphalt, or concrete to match existing grade.

CHAPTER 5.0

PHASE III GROUND-WATER INVESTIGATION PROCEDURES

The objective of the Phase III Ground-Water Release Assessment RFI was to define the extent of ground-water quality impacts that may be associated with the designated SWMUs. Preliminary ground-water sampling was also conducted in conjunction with the Phase I RFI. The previous assessment and the RFI Phase I ground-water quality results (Chapter 3.0) were used to design the Phase III ground-water assessment activities. This chapter summarizes the procedures that were implemented to evaluate the extent of ground-water impacts. Monitoring well installation and ground-water monitoring procedures were conducted in accordance with the approved Phase II/III RFI Workplan and the associated QAPjP. In summary, the goals established in the QAPjP were to obtain precise, accurate, complete, comparable and representative data. Adherence to the approved procedures ensured that these goals were achieved.

5.1 Monitoring Well Locations

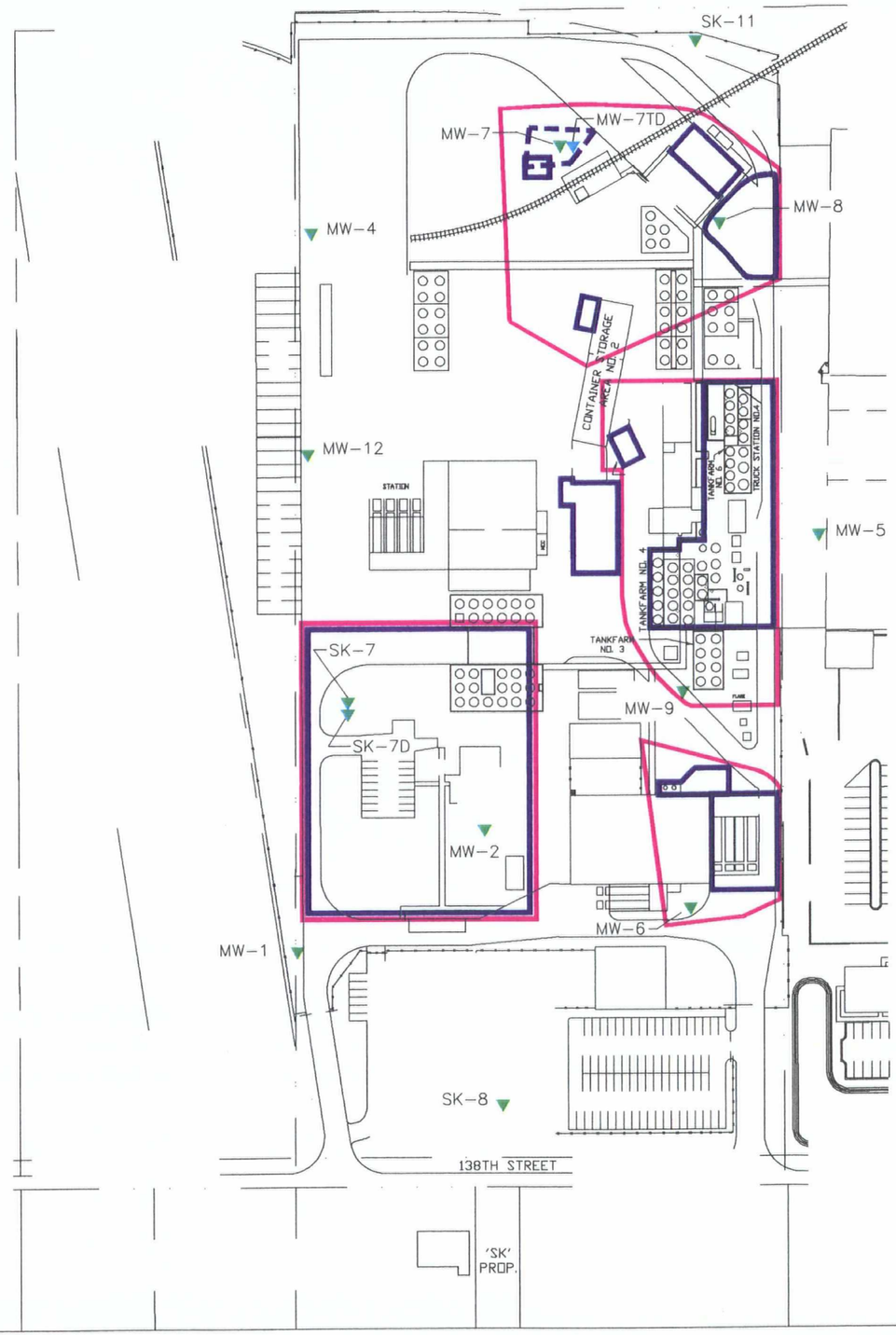
S-K installed nine monitoring wells at the Dolton facility during the Phase II/III RFI activities between May 30 and June 7, 1996. The monitoring well locations are shown on Figure 5-1. Some of the monitoring well locations, and the total number of wells installed were modified from those proposed in the approved Workplan. The proposed modifications were discussed with IEPA prior to implementation during teleconferences on June 5 and 6, 1996. A correspondence summarizing the teleconference is included in Appendix A. Modifications to the monitoring well network were necessary due to overhead obstructions, utility corridors, recently constructed buildings and/or Phase II field screening results.

Permanent monitoring wells were installed within three of the four Investigation Areas (MW-2 in the East Field; MW-7 and MW-8 in the Southern Investigation Area; and MW-9 in the Central Investigation Area) to monitor the nature and degree of potential ground-water impacts associated with SWMU releases. The other permanent monitoring wells were sited around the perimeter of the Investigation Areas to define the lateral extent of potential ground-water impacts.

As agreed in a teleconference with IEPA on June 6, 1996, S-K installed a temporary deep monitoring well in the Southern Investigation Area. Temporary Well MW-7TD was installed based on soil quality results during the Phase II investigation. Monitoring well installation, development and sampling procedures are described in a subsection below.

5.2 Monitoring Well Screen Intervals

The permanent monitoring wells were installed to evaluate potential degradation in the shallow perched water-bearing zone. The top of the well screen was placed to intersect the water table and allow for seasonal fluctuation in water table elevation. Based on data



EXPLANATION

- MW-3 ▼ MONITORING WELL LOCATION
- MW-7TD ▼ TEMPORARY MONITORING WELL LOCATION
- SOLID WASTE MANAGEMENT UNIT OR AREA OF CONCERN COVERED IN PHASE I RFI
- INVESTIGATION AREA COVERED IN PHASE II/III RFI

N

0 160 ft.

SCALE

REVISIONS	
Date	By

TriHydro Corporation
920 Sheridan Street
Laramie, Wyoming 82070

FIGURE 5-1
MONITORING WELL LOCATIONS, PHASE II/III RFI, SAFETY-KLEEN CORP. RECYCLE CENTER, DOLTON, ILLINOIS

Drawn By: SW	Checked By: BC	Scale: 1"=160'	Date:11/13/96	Disk Reference: SKDIWEL2

collected during the Phase I RFI, the depth to ground water in the shallow perched zone was estimated to be 5 ft-bgs. The depth to the water table was verified in the existing monitoring wells, and during the Phase II/III soil borings/monitoring well installation activities. The screened interval was placed at approximately 5 to 15-ft-bgs in each of the shallow monitoring wells. Ten-foot well screens were used, in accordance with Condition 4 of the February 21, 1996 IEPA approval letter.

During the installation of Boring VB-3 in the South Field Investigation Area, a sample collected from a sand layer 22 to 24 ft-bgs exhibited elevated headspace TOV concentrations. S-K and IEPA agreed to install a temporary well (Well MW-7TD) to intersect this sand layer and collect a ground-water sample for laboratory analysis. A 5-foot screen interval was selected to ensure that a discrete ground-water sample would be collected from the 22 to 24 ft-bgs sand interval. The temporary well screen interval was placed at 20 to 25 ft-bgs.

5.3 Monitoring Well Installation Procedures

Permanent monitoring wells were constructed in accordance with the approved Phase II/III RFI Workplan. Boreholes for the monitoring wells were initially installed during Phase II activities (Chapter 4.0). The boreholes were installed using a drill rig equipped with 6.5-inch O.D. HSAs. Following completion of the Phase II soil sampling activities, the boreholes were sealed with bentonite chips up to the bottom of the anticipated well total depth (15 to 16 ft-bgs). The boreholes were then enlarged using clean/decontaminated 11.25-inch O.D. HSAs, fitted with a clean plastic bottom plug to prevent intrusion of formation materials. After well total depth was reached, the bottom plug was knocked out, and the monitoring wells were constructed through the hollow stem of the augers.

The permanent monitoring wells were constructed with a 4-inch I.D. flush joint, threaded Schedule 40 PVC well casing and screen. The 10-foot well screen was factory slotted (0.010-inch slot size) with four slots/inch. The wells were completed such that at least 70 percent of the well screen was placed below the water table at the time of completion. The annular space adjacent to the screen was filled with appropriately-sized silica sand (Global # 8) to a point at least 0.5 feet above the top of the well screen. The filter sand was emplaced in 1 to 2-foot lifts to prevent bridging, and ensure adequate filter material around the well screen.

A minimum 2-foot thickness of sodium bentonite pellets was placed in the annular space atop the sand filter pack. The bentonite pellets were hydrated following emplacement to seal the annular space between the filter pack and ground surface. Approximately 1-foot of bentonite grout was prepared and emplaced on top of the bentonite seal.

Each well casing (except for Well MW-5) terminated in a flush-to-grade steel protective vault and was fitted with a locking J-plug and padlock. Each well was completed in a sloping concrete apron pad. The concrete pads were constructed to protect the steel vault and facilitate drainage away from the well.

The surface completion at Well MW-5 (Figure 5-1) consisted of an above ground protective riser. A flush mount protective casing was not used at this location due to construction activities in the vicinity of Well MW-5 at the time of completion. Well

construction details are shown in Well Completion Reports, submitted to IEPA in the July 30, 1996 Quarterly Progress Report, and included in Appendix D of this report.

Well construction procedures for the temporary well (MW-7TD) were similar to those described above except that a 2-inch diameter well casing and screen was used with a 5-foot screen length. The shorter screened interval was used to sample a discrete depth where the sand layer was detected (22 to 24 ft-bgs) in soil boring VB-3. Due to the smaller diameter well materials, the temporary well was installed in a 6.5-inch borehole. Filter sand was emplaced in the annular space adjacent to the screened interval. Sodium bentonite chips were used to seal the remaining annular space. The bentonite chips were emplaced and hydrated in 2-foot lifts to ground surface. The top of the well casing was cut-off at approximately 1-foot above ground surface, fitted with a locking J-plug and padlock, and completed with a temporary protective casing.

5.4 Monitoring Well Development

Initial well development was conducted two to nine days following well installation. Development was conducted by surging and bailing until produced water was free of sediment to the extent practicable. Approximately two well volumes were evacuated during the initial development because the wells bailed dry. Development continued on June 24, 1996, when an additional two volumes were removed prior to sampling. Specific conductance and pH readings were measured during development. Development was considered complete when the water was relatively free of sediment/turbidity and indicated field measurements stabilized to within ± 10 percent.

The development water was containerized and managed through the S-K waste processing system at the Dolton Recycle Center in accordance with applicable regulations. Well development information, including physical characteristics of the ground water, volume developed, date, development method, and field parameters are presented in Table 5-1. Copies of the field forms were presented in the July 30, 1996 Quarterly Progress Report, and are included in Appendix E of this report.

There was insufficient water in the temporary monitoring well MW-7TD to facilitate development during the week following installation. The well was developed to the extent practicable on June 24, 1996. A copy of the development form is included in Appendix E.

5.5 Monitoring Well Surveying

The well elevations were surveyed by E.J. Hutson (Chesterton, Indiana), a licensed land surveyor. A measuring point was established and clearly marked at the top of the north side of each well casing. The elevation of the measuring point was determined relative to mean sea level and surveyed to an accuracy of ±0.01 feet. The survey information is included on the well completion diagrams. Subsequent water level measurements were recorded relative to the survey mark.

Table 5-1. Summary of Well Development Information, Phase II/III RFI, Safety-Kleen Corp. (S-K) Recycle Center, Dolton, Illinois (6/96)

Well	Date	Volume Removed	pH	Specific Conductance (µS/cm)	Comments
MW-1	6/9/96	10	7.21	1966	Gray; clear to slightly turbid. Bailed dry.
	6/24/96	12	7.19	1700	Clear. Bailed dry
	6/25/96	–	7.16	1670	No sediment on filter, clear.
MW-2	6/9/96	10	7.17	1842	Clear to gray. Bailed dry.
	6/24/96	12	6.88	2270	Clear to slight yellow. Bailed dry.
	6/25/96	–	6.75	2210	
MW-4	6/9/96	7	7.37	1210	Very turbid, opaque, brown. Bailed dry.
	6/24/96	12	7.23	1770	Clear. Bailed Dry.
	6/25/96	–	7.11	1506	
MW-5	6/9/96	15	9.25	614	Very turbid, opaque, brown. Bailed dry.
	6/24/96	12	8.23	960	Slightly cloudy. Bailed Dry.
	6/25/96	12	7.42	1300	Moderately turbid after surging. Bailed Dry.
	6/25/96	–	7.35	1310	Moderately turbid.
MW-6	6/9/96	16	7.64	1266	Slightly-moderately turbid. Bailed dry.
	6/24/96	12	7.32	1157	Clear to fairly turbid after surging. Bailed Dry.
	6/25/96	–	7.11	1330	Clear.
MW-7	6/9/96	24	7.42	1036	Slight-mod turbid. Bailed dry.
	6/24/96	12	7.33	992	Moderately turbid. Bailed Dry.
	6/25/96	–	7.13	1219	Clear.
MW-7TD	6/24/96	0.3	7.83	851	Bailed dry.
	6/25/96	–	7.81	995	
MW-8	6/9/96	6	7.23	2200	Slightly turbid. Bailed dry.
	6/24/96	12	6.97	2230	Clear. Slightly turbid upon surging. Bailed Dry.
	6/25/96	–	6.74	2020	Clear.
MW-9	6/9/96	12	7.92	669	Very turbid. Bailed dry.
	6/24/96	10	7.7	731	Clear but slight green-yellow color. Bailed Dry.
	6/25/96	–	7.75	759	
MW-12	6/9/96	8	7.07	3220	Moderately turbid. brown. Bailed dry.
	6/24/96	10	6.76	3580	Clear. Slightly turbid on surging. Bailed Dry.
	6/25/96	–	6.83	3410	Clear.

5.6 Well Preparation for Sampling

The nine new monitoring wells (MW-1, MW-2, MW-4 through MW-9 and MW-12), three existing wells (SK-7, SK-8, and SK-11) and temporary well MW-7TD were monitored for ground-water quality on June 24 and 25, 1996. This allowed approximately a two week equilibration period for the newly constructed wells after they were initially developed. Fluid levels were measured in the new and existing monitoring wells to a precision of ±0.01 foot using an electronic oil/water interface probe. Any part of the fluid level measuring device which contacted the water and/or well casing was decontaminated and rinsed with distilled/deionized water between wells. The ground-water elevation was recorded on the field forms (Appendix F).

Ground water was evacuated from each well using a clean PVC bailer and dedicated polypropylene rope prior to sampling. The bailers were decontaminated using a water/detergent solution followed by rinses with tap water and distilled water prior to use. The purge water was containerized and managed through the S-K waste processing system at the Dolton Recycle Center in accordance with applicable regulations.

Three casing volumes were intended to be evacuated from each well prior to collecting water samples; however, due to the low permeability of the shallow perched water bearing zone, the wells bailed dry after removing approximately one and one-half casing volumes. Specific conductance and pH measurements were monitored during well purging to ensure that evacuation procedures produced representative ground-water quality samples.

5.7 Ground-Water Sample Collection and Handling

A clean stainless steel bailer was used to collect the ground-water samples. The rope used to lower the bailer into each well was dedicated to that well. The stainless steel bailer was decontaminated prior to use at each well location. Decontamination procedures consisted of washing the bailer in a water/detergent solution and rinsing with tap water and then distilled water.

The stainless steel bailer was slowly lowered into each well to collect the ground-water sample. Water produced from the well was not unnecessarily agitated during sampling. The water was transferred directly from the sample bailer to the appropriate sample containers. Samples to be potentially analyzed for dissolved metals were transferred to a barrel filter unit and pressurized through a 0.45 µm filter with nitrogen gas before filling the sample containers. Clean sample containers with appropriate preservatives were provided by the laboratory. The containers and preservatives were prepared in accordance with EPA (SW-846) protocol.

The casing in Well SK-11 was bent and did not allow the stainless steel sample bailer to reach total depth of the well; however, the well casing appeared to be intact. A peristaltic pump with clean flexible tubing was used to purge and sample Well SK-II. The pump was set at a low flow rate to minimize agitation. The sample containers were filled directly from the discharge end of the tubing. The discharge end of the tubing was fitted with an in-line (0.45 micron) filter to collect samples for potential dissolved metals analysis.

Blind duplicate samples were collected at a frequency of one per ten investigative samples and submitted to the laboratory for QA/QC, in accordance with the requirements of the QAPjP. Additionally, one set of trip and field blanks were submitted with the ground-water samples for QA/QC. The trip blank was prepared by the laboratory using reagent water. The trip blank accompanied the sample cooler holding the VOC sample containers throughout the field sampling activities and during transport to and from the laboratory. Field blanks were prepared by pouring distilled water (used for decontamination) directly into laboratory provided sample containers.

Two sets of equipment blanks were prepared and submitted for analysis for QA/QC purposes. One set was prepared by pouring distilled water through the sample bailer and barrel filter prior to transferring to the sample containers. The second set was prepared by transferring distilled water from the discharge end of the peristaltic pump tubing and in-line filter into the sample containers.

The sample containers were labeled and immediately placed into opaque coolers, packed with ice. The samples were delivered within 48 hours to the S-K Environmental Laboratory, Elk Grove Village, Illinois, for chemical analysis. COC/SAR forms were completed and accompanied the samples to the laboratory.

5.8 Laboratory Analysis

Each ground-water sample was analyzed for VOCs by Method 8240, SVOCs by Method 8270, and total metals by the respective 6000/7000 series Methods. In addition, those samples, in which total metals concentrations exceeded ground-water standards, were subsequently analyzed for dissolved metals. As requested by IEPA, all constituents on the 8240 and 8270 analytical lists in SW-846 were analyzed. The laboratory was instructed to meet the respective EQLs listed in SW-846 for each of the specified analytical methods and to follow the level of QA/QC effort established in the QAPjP. An evaluation of QA/QC data for the ground-water sample analyses is presented in Appendix C of this Phase II/III RFI Report. The RFI Phase III ground-water assessment results are presented in Chapter 7.0.

CHAPTER 6.0

PHASE II SOIL INVESTIGATION RESULTS

The Phase II soil sampling program at the S-K Dolton Recycle Center was conducted on May 30 through June 7, 1996. Soil sampling locations were proposed in the Phase II/III Workplan based on S-K knowledge of the site and previous investigation results. The purpose of the Phase II soil sampling program was to evaluate the lateral and vertical extent of facility-related impacts, which may be associated with the designated SWMUs. Photodocumentation and field documentation forms for the Phase II activities are presented in Appendices G and H, respectively.

6.1 Lithologic Descriptions

The lithology encountered during the Phase II soil sampling was consistent with the lithology described during previous investigations. The borehole logs for the Phase II investigation are presented in Appendix B of this report. In summary, the lithology at the Dolton facility consists primarily of sand/gravel fill from ground surface to a depth of approximately 4.5 ft-bgs. The fill extended to 10.5 ft in the east-central portion of the facility (Boring LE-3). Gray/brown silty clay underlies the fill and was continuous to total depth of the soil borings. A minor silty-sand interval occurred in borings located on the northern portions of the facility (LE-2, VB-1, VB-2, LE-10 and MW-6) and in borings at the southern end of the facility (VB-3 and VB-5). The silty-sand interval was found at depths ranging from the 22 to 24 ft-bgs and the 24 to 26 ft-bgs sample intervals.

6.2 Geotechnical Sample Results

S-K submitted representative soil samples to be analyzed for geotechnical and physical parameters. The geotechnical analyses were conducted to provide site-specific information that may be useful in evaluating the potential rate of migration of constituents in soil or ground water. The physical parameter and geotechnical analytical results and COC/SAR forms are presented in Appendix I.

Twelve samples were submitted for grain size distribution, Atterberg limits, bulk porosity, bulk density, moisture content and organic content analyses. Four samples collected with a Shelby tube sampler were submitted for falling head permeability in addition to the above analyses. A sufficient number of samples were collected and analyzed to characterize the physical and geotechnical properties of sediments across the site. As described in Chapter 4.0, the intervals selected for falling head permeability were within the shallow saturated zone, and in the interval immediately beneath the shallow saturated zone.

The laboratory permeability results ranged from 7.3×10^{-5} cm/sec, in the sample collected from within the saturated zone [Boring LE-8(10-12)] to 9.4×10^{-9} cm/sec in the sample collected from the interval beneath the saturated zone [Boring VB-5(22-24)]. The

sample collected from Boring LE-8 may not be truly representative of the hydraulic conductivity. The laboratory indicated that there was a vertical sand stringer present in this sample, which would influence the hydraulic conductivity for the falling head permeability test. The actual hydraulic conductivity is expected to be lower than the results reported. The range of other hydraulic conductivities determined (9.4×10^{-9} cm/sec to 1.8×10^{-8} cm/sec) are considered to be representative of subsurface conditions at the site.

6.3 Soil Quality Results - Field Screening

During the Phase II soil boring activities, an aliquot of each sample interval was reserved for field screening. The field screening procedures were presented in Chapter 4.0 of this report. The TOV measurements from the 10.6 eV lamp and 11.8 eV lamp PIDs were recorded on the boring logs. The boring logs are presented in Appendix B. The lateral and vertical extent soil boring locations are shown on Figure 4-1.

Low headspace TOV concentrations were detected in samples from some of the lateral extent borings; however, the results were generally less than 20 ppm. Based on experience, measured headspace TOV concentrations of less than 20 ppm are generally typical of instrument background and/or associated with non-detectable or low concentrations of target VOCs. Therefore, none of the lateral extent borings were discontinued due to elevated TOV results. The 4 to 6 ft-bgs interval sample from Boring LE-10 exhibited elevated TOV readings; this boring was installed (at the request of IEPA) between the Central Investigation Area and the East Field Investigation Area.

Slightly elevated headspace TOV measurements (<150 ppm) were detected over the 4 to 6 ft-bgs and 9 to 11 ft-bgs samples from vertical extent borings VB-5 and VB-8, respectively. The 8 to 10 ft-bgs, 13 to 15 ft-bgs and 22 to 24 ft-bgs samples from boring VB-3 exhibited elevated headspace TOV readings (>150 ppm). Appropriate samples were submitted for laboratory analyses to confirm the field screening results.

6.4 Soil Quality Results - Laboratory Analysis

The results of the May/June 1996 Phase II RFI soil sampling are presented in this section. A total of 49 soil samples, including duplicates, were collected from 11 lateral extent borings and nine vertical extent borings and submitted for laboratory analysis. Laboratory analytical reports and COC/SAR forms are presented in Appendix J. A quality assurance review of the data is presented in Appendix C. The Phase II RFI soil quality data includes the analytical results from samples collected from lateral (shallow) extent borings placed at the perimeter of Investigation Areas and vertical extent borings from within Investigation Areas.

6.4.1 Soil Quality Evaluation Criteria

In accordance with Condition 17 of the February 21, 1996 IEPA approval letter, the Phase II soil quality results have been compared to the IEPA Tiered Approach to Cleanup

Objectives (TACO) guidance, April 1996 version. For most constituents, the most conservative soil Tier I Cleanup Objective is the level listed for the protection of ground water pathway. Therefore, classification of the shallow ground water at the site is important for the selection of appropriate soil quality evaluation criteria.

S-K has previously presented a rationale that the shallow ground water in the area should be appropriately classified as a Class II ground water. The rationale was presented in the "RFI Phase II Extent of Release Assessment Report, Safety-Kleen Corp. Strip of Property, Barker Chemical No. 2 Area, Dolton, Illinois," which was submitted to IEPA on September 14, 1996. The same ground-water classification information which was presented in the Barker report, should be directly applicable to the Dolton facility. As discussed in the Barker report, shallow ground water does not appear to satisfy the criteria for Class I (Potable Resource Groundwater) as specified in 35 IAC 620.210(a). The Illinois Class I ground-water criteria are:

1. Ground water located 10 feet or more below the land surface; and

2. Within the minimum setback of a potable water well; or

3. Within unconsolidated sand and/or gravel more than 5 feet in thickness; or

4. Within sandstone (> 10 feet thick) or fractured carbonate (>15 feet thick); or

5. Within any geologic unit capable of a sustained ground-water yield of 150 gallons per day or more from a thickness of 15 feet or less (12 inch borehole); or

6. Within any geologic unit with a hydraulic conductivity of 1×10^{-4} cm/sec or greater as determined using a permeameter, slug, or pump test.

Based on the previous investigation results (Chapter 3.0) and observations of the onsite geologists during the Phase II/III investigation, the depth to ground water was between 2 to 5 ft-bgs.

The results of a well records search were presented in the Phase I Workplan (dated March 4, 1994). One permitted domestic water well was identified during the records search. As stated in the Phase I Workplan, this well is reported to be located 1,300 feet to the east of the Barker Chemical No. 2 Area; greater than the minimum setback distance for a potable water well (400 feet). The Dolton facility is located 750 feet south of the Barker strip; therefore, the domestic well is located at least 1500 feet northeast of the Dolton facility. It is not known whether the well is currently in use, or has been plugged/abandoned.

The lithology at the Dolton Recycle Center is predominantly clay. Regional information and results from the site specific Phase II/III RFI conducted at the Dolton Recycle Center indicate that the clay in the area extends to a depth of approximately 45 ft-bgs. Regional hydrogeological information was presented in the Phase I RFI

Workplan (dated March 4, 1994). The Phase II soil boring logs, (Appendix B) document that no sand and gravel intervals greater than 5 feet in thickness have been identified beneath the site.

Hydraulic conductivity measurements (falling head permeability results) from shallow saturated soil samples were collected as part of the Phase II/III RFI. The results are consistent with previous hydraulic conductivity data from the site. The data indicate sediments in the shallow water bearing zone exhibit hydraulic conductivities ranging from 7.3×10^{-5} [LE-8 (8-10)] cm/sec to 1.3×10^{-8} cm/sec [LE-9 (10-12)]. As stated in Section 6.2, the hydraulic conductivity results for Boring LE-8(8-10) may not be representative of actual site conditions.

Because the upper water bearing zone at the Dolton facility does not satisfy any of the IEPA criteria for Class I, S-K believes that the shallow ground water may be characterized as Class II (General Resource). Therefore, S-K has used the IEPA Tier I Cleanup Objectives for protection of Class II ground water to evaluate the soil quality results.

6.4.2 Lateral Extent Soil Quality Results

The purpose of the Phase II lateral extent investigation was to determine the horizontal limits of potential impacts in shallow soils and/or soil quality at the perimeters of the Investigation Area boundaries. Soil samples were collected in accordance with the approved Workplan, as discussed in Chapter 4.0. Soil samples submitted for laboratory analysis were selected from intervals where impacts were most likely to be detected (i.e. gravel fill/clay interface). Soil samples were also submitted from beneath the saturated zone. The Phase II soil analytical results are summarized in tables 6-1 through 6-4 and shown on Figure 6-1.

The concentrations of all detected constituents were below the respective Tier 1 CUOs. Minor concentrations of organic constituents were detected in some of the Phase II lateral extent soil samples. The VOCs detected included acetone, methylene chloride chlorobenzene, 4-methyl-2-pentanone, and dichlorobenzenes. The SVOCs detected included the dichlorobenzenes, phenol, naphthalene, di-n-octyl phthalates and butyl benzyl phthalate. The concentration of di-n-octyl phthalate detected was 29.880 mg/kg [at LE-8 (4-6)]. The TACO guidance indicates that the physical and chemical properties of di-n-octyl phthalate are such that migration to ground water is not a rate of concern at any concentration. PCBs were not detected in any of the 10 samples analyzed from the vicinity of the East Field.

Barium was detected in the TCLP extract of each of the Phase II lateral extent samples; however, the detected concentrations were below the Tier 1 CUOs. No other TCLP metals were detected in the lateral extent samples.

None of the detected constituents exceed the Tier 1 CUOs in any of the lateral extent soil samples. Therefore the lateral extent of soil impacts has been defined and appears to be limited to the immediate vicinity of the SWMUs.

Table 6-1. Soil Quality Data Summary VOCs, Phase II/III RFI, Safety-Kleen Recycle Center, Dolton, Illinois (6/96).

Sample ID	Interval	Date	Acetone (mg/kg)	Chloro-Benzene (mg/kg)	1,2-Dichloro benzene (mg/kg)	1,3-Dichloro-benzene (mg/kg)	4-Methyl- 2-Pentanone (mg/kg)	Methylene Chloride (mg/kg)	Toluene (mg/kg)	All Others (mg/kg)
LE-1	(2-4)	5/30/96	ND(0.1)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.05)	0.013	ND(0.005)	ND
LE-1	(18-20)	5/30/96	ND(0.1)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND
LE-2	(4-6)	5/30/96	ND(0.1)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND
LE-2	(18-20)	5/30/96	ND(0.1)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND
LE-3	(20-22)	5/31/96	ND(0.1)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.05)	ND(0.005)	ND(0.005)	ND
LE-4	(4-6)	5/31/96	ND(0.1)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.05)	ND(0.005)	ND(0.005)	ND
LE-4	(18-20)	5/31/96	ND(0.1)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND
LE-5	(2-4)	5/31/96	0.101	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND
LE-5	(18-20)	5/31/96	ND(0.1)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND
LE-6	(4-6)	6/3/96	ND(0.1)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.05)	ND(0.005)	ND(0.005)	ND
LE-6	(18-20)	6/3/96	ND(0.1)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.05)	ND(0.005)	ND(0.005)	ND
LE-7	(4-6)	6/5/96	ND(0.1)	ND(0.025)	ND(0.025)	ND(0.025)	ND(0.05)	ND(0.025)	ND(0.025)	ND
LE-7	(18-20)	6/5/96	ND(0.1)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND
LE-7 Dup	(18-20)	6/5/96	ND(0.1)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND
LE-8	(4-6)	6/7/96	0.183	0.088	0.143	0.311	ND(0.05)	ND(0.05)	ND(0.05)	ND
LE-8	(18-20)	6/7/96	ND(0.5)	ND(0.25)	ND(0.25)	ND(0.25)	ND(0.5)	ND(0.25)	ND(0.25)	ND
LE-9	(2-4)	6/7/96	ND(0.1)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.05)	ND(0.005)	ND(0.005)	ND
LE-9	(18-20)	6/7/96	0.2	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND
LE-9	(22-24)	6/7/96	ND(0.5)	ND(0.25)	ND(0.25)	ND(0.25)	ND(0.5)	ND(0.25)	ND(0.25)	ND
LE-10	(4-6)	6/6/96	0.467	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND
LE-10	(18-20)	6/6/96	0.212	ND(0.05)	ND(0.05)	ND(0.05)	0.08	ND(0.05)	ND(0.05)	ND
LE-10	(24-26)	6/6/96	ND(0.5)	ND(0.25)	ND(0.25)	ND(0.25)	ND(0.5)	ND(0.25)	ND(0.25)	ND
VB-1	(20-22)	6/6/96	0.723	ND(0.25)	ND(0.25)	ND(0.25)	ND(0.5)	ND(0.25)	ND(0.25)	ND
VB-1	(24-26)	6/6/96	0.747	ND(0.25)	ND(0.25)	ND(0.25)	ND(0.5)	ND(0.25)	ND(0.25)	ND
VB-2	(20-22)	5/30/96	ND(0.1)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND
VB-2	(25-27)	5/30/96	ND(1)	ND(0.25)	ND(0.25)	ND(0.25)	ND(0.5)	ND(0.25)	ND(0.25)	ND
VB-3	(22-24)	6/3/96	ND(0.1)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.05)	ND(0.005)	ND(0.005)	ND
VB-3	(32-34)	6/3/96	ND(0.1)	ND(0.05)	ND(0.05)	ND(0.05)	0.066	ND(0.05)	0.102	ND
VB-3	(34-36)	6/3/96	ND(0.1)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND
VB-3	(36-38)	6/3/96	0.26	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.05)	ND(0.005)	0.028	ND
VB-4	(22-24)	6/4/96	ND(0.1)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND
VB-4	(26-28)	6/4/96	ND(1)	ND(0.25)	ND(0.25)	ND(0.25)	ND(0.5)	ND(0.25)	ND(0.25)	ND
VB-4 Dup	(22-24)	6/5/96	ND(0.1)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND
VB-4 Dup	(26-28)	6/5/96	ND(0.1)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND
VB-5	(20-22)	6/7/96	0.158	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND
VB-5 Dup	(20-22)	6/7/96	0.115	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND
VB-5	(24-26)	6/7/96	ND(0.5)	ND(0.25)	ND(0.25)	ND(0.25)	ND(0.5)	ND(0.25)	ND(0.25)	ND
VB-6	(20-22)	6/4/96	ND(1)	ND(0.25)	ND(0.25)	ND(0.25)	ND(0.5)	ND(0.25)	ND(0.25)	ND
VB-6	(24-26)	6/4/96	ND(0.1)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND
VB-6 Dup	(20-22)	6/5/96	ND(0.1)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND
VB-7	(20-22)	6/6/96	ND(0.1)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND
VB-7	(24-26)	6/6/96	ND(0.5)	ND(0.25)	ND(0.25)	ND(0.25)	ND(0.5)	ND(0.25)	ND(0.25)	ND
VB-8	(24-26)	6/5/96	0.124	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	0.055	ND
VB-8	(30-32)	6/5/96	ND(0.1)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	0.118	ND
VB-8	(34-36)	6/5/96	ND(0.1)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND
VB-9	(22-24)	6/4/96	ND(0.1)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND
VB-9	(26-28)	6/4/96	ND(1)	ND(0.25)	ND(0.25)	ND(0.25)	ND(0.5)	ND(0.25)	ND(0.25)	ND
MW-6	(4-6)	6/5/96	ND(0.1)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND
MW-6	(20-22)	6/5/96	ND(0.1)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND
Trip Blank A	(-)	6/4/96	ND(0.1)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.05)	ND(0.005)	ND(0.005)	ND
Trip Blank B	(-)	6/4/96	ND(0.1)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.05)	ND(0.005)	ND(0.005)	ND
IEPA CUO (II)			8	3.0	55	7	12.5	4.5	0.1	–

Table 6-2. Soil Quality Data Summary, SVOCs, Phase II/III RFI, Safety-Kleen Recycle Center, Dolton, Illinois (6/96).

Sample ID	Interval	Date	Butyl Benzyl Phthalate (mg/kg)	1,2-Di-chloro-benzene (mg/kg)	1,3-Di-chloro-benzene (mg/kg)	1,4-Di-chloro-benzene (mg/kg)	Di-n-octyl-phthalate (mg/kg)	2-Methyl-naphthalene (mg/kg)	Naphthalene (mg/kg)	Phenol (mg/kg)	1,2,4-Trichloro-benzene (mg/kg)	All Others (mg/kg)
LE-1	(2-4)	5/30/96	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND
LE-1	(18-20)	5/30/96	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND
LE-2	(4-6)	5/30/96	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND
LE-2	(18-20)	5/30/96	2.06	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND
LE-3	(20-22)	5/31/96	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND
LE-4	(4-6)	5/31/96	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND
LE-4	(18-20)	5/31/96	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND
LE-5	(2-4)	5/31/96	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND
LE-5	(18-20)	5/31/96	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND
LE-6	(4-6)	6/3/96	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND
LE-6	(18-20)	6/3/96	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND
LE-7	(4-6)	6/5/96	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND
LE-7	(18-20)	6/5/96	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND
LE-7 Dup	(18-20)	6/5/96	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND
LE-8	(4-6)	6/7/96	ND(0.66)	ND(0.66)	1.69	6.57	29.88	ND(0.66)	ND(0.66)	7.33	7.45	ND
LE-8	(18-20)	6/7/96	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND
LE-9	(2-4)	6/7/96	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND
LE-9	(18-20)	6/7/96	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND
LE-9	(22-24)	6/7/96	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND
LE-10	(4-6)	6/6/96	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	0.99	ND(0.66)	ND(0.66)	ND
LE-10	(18-20)	6/6/96	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND
LE-10	(24-26)	6/6/96	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND
VB-1	(20-22)	6/6/96	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND
VB-1	(24-26)	6/6/96	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	0.66	ND(0.66)	ND(0.66)	ND(0.66)	ND
VB-2	(20-22)	5/30/96	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND
VB-2	(25-27)	5/30/96	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND
VB-3	(22-24)	6/3/96	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND
VB-3	(32-34)	6/3/96	1.13	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND
VB-3	(34-36)	6/3/96	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND
VB-3	(36-38)	6/3/96	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND
VB-4	(22-24)	6/4/96	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND
VB-4	(26-28)	6/4/96	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND
VB-4 Dup	(22-24)	6/5/96	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND
VB-4 Dup	(26-28)	6/5/96	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND
VB-5	(20-22)	6/7/96	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND
VB-5 Dup	(20-22)	6/7/96	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND
VB-5	(24-26)	6/7/96	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND
VB-6	(20-22)	6/4/96	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND
VB-6	(24-26)	6/4/96	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND
VB-6 Dup	(20-22)	6/5/96	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND
VB-7	(20-22)	6/6/96	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND
VB-7	(24-26)	6/6/96	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND
VB-8	(24-26)	6/5/96	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND
VB-8	(30-32)	6/5/96	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND
VB-8	(34-36)	6/5/96	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND
VB-9	(22-24)	6/4/96	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND
VB-9	(26-28)	6/4/96	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND
MW-6	(4-6)	6/5/96	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND
MW-6	(20-22)	6/5/96	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND(0.66)	ND
IEPA CUO (II)												

IEPA CUO (II) IEPA Clean-Up Objective listed in the Tiered Approach to Cleanup Objectives (TACO) guidance - April 1996 version. Values listed above are derived from Tier 1, migration to Class II ground water.

Table 6-3. Soil Quality Data Summary, Polychlorinated Biphenyls (PCBs), Phase II/III RFI, Safety-Kleen Corp. Recycle Center, Dolton, Illinois (6/96).

Sample	Total PCBs (mg/kg)
LE-1 (2-4)	ND(1.0)
LE-1 (18-20)	ND(1.0)
LE-2 (4-6)	ND(1.0)
LE-2 (18-20)	ND(1.0)
LE-10 (4-6)	ND(1.0)
LE-10 (18-20)	ND(1.0)
VB-1 (20-22)	ND(1.0)
VB-1 (24-26)	ND(1.0)
VB-2 (20-22)	ND(1.0)
VB-2 (25-27)	ND(1.0)

Note: Samples from the East Field Investigation Area (only), were analyzed for PCBs.

Table 6-4. Soil Quality Data Summary, TCLP Metals, Phase II/III RFI, Safety-Kleen Recycle Center, Dolton, Illinois (6/96).

Sample ID	Interval (ft-bgs)	Date	Barium, Total (mg/L)	Cadmium, Total (mg/L)	Lead, Total (mg/L)	Mercury, Total (mg/L)
LE-1	(2-4)	5/30/96	0.379	ND(0.05)	ND(0.4)	ND(0.0008)
LE-1	(18-20)	5/30/96	0.8065	ND(0.05)	ND(0.4)	ND(0.0008)
LE-2	(4-6)	5/30/96	0.6275	ND(0.05)	ND(0.4)	ND(0.0008)
LE-2	(18-20)	5/30/96	0.5385	ND(0.05)	ND(0.4)	ND(0.0008)
LE-3	(20-22)	5/31/96	0.798	ND(0.05)	ND(0.4)	ND(0.0008)
LE-4	(4-6)	5/31/96	0.485	ND(0.05)	ND(0.4)	ND(0.0008)
LE-4	(18-20)	5/31/96	0.8145	ND(0.05)	ND(0.4)	ND(0.0008)
LE-5	(2-4)	5/31/96	0.5695	ND(0.05)	ND(0.4)	ND(0.0008)
LE-5	(18-20)	5/31/96	0.769	ND(0.05)	ND(0.4)	ND(0.0008)
LE-6	(4-6)	6/3/96	0.651	ND(0.05)	ND(0.4)	ND(0.0008)
LE-6	(18-20)	6/3/96	0.945	ND(0.05)	ND(0.4)	ND(0.0008)
LE-7	(4-6)	6/5/96	1.133	ND(0.05)	ND(0.4)	ND(0.0008)
LE-7	(18-20)	6/5/96	0.817	ND(0.05)	ND(0.4)	ND(0.0008)
LE-7 Dup	(18-20)	6/5/96	0.719	ND(0.05)	ND(0.4)	ND(0.0008)
LE-8	(4-6)	6/7/96	0.32	ND(0.05)	ND(0.4)	ND(0.0008)
LE-8	(18-20)	6/7/96	0.689	ND(0.05)	ND(0.4)	ND(0.0008)
LE-9	(2-4)	6/7/96	0.354	ND(0.05)	ND(0.4)	ND(0.0008)
LE-9	(18-20)	6/7/96	0.331	ND(0.05)	ND(0.4)	ND(0.0008)
LE-9	(22-24)	6/7/96	0.71	ND(0.05)	ND(0.4)	ND(0.0008)
LE-10	(4-6)	6/6/96	0.701	ND(0.05)	ND(0.4)	ND(0.0008)
LE-10	(18-20)	6/6/96	0.629	ND(0.05)	ND(0.4)	ND(0.0008)
LE-10	(24-26)	6/6/96	0.38	ND(0.05)	ND(0.4)	ND(0.0008)
VB-1	(20-22)	6/6/96	0.857	ND(0.05)	ND(0.4)	ND(0.0008)
VB-1	(24-26)	6/6/96	0.417	ND(0.05)	ND(0.4)	ND(0.0008)
VB-2	(20-22)	5/30/96	0.67	ND(0.05)	ND(0.4)	ND(0.0008)
VB-2	(25-27)	5/30/96	0.361	ND(0.05)	ND(0.4)	ND(0.0008)
VB-3	(22-24)	6/3/96	0.604	ND(0.05)	ND(0.4)	ND(0.0008)
VB-3	(32-34)	6/3/96	0.923	ND(0.05)	ND(0.4)	ND(0.0008)
VB-3	(36-38)	6/3/96	1.028	ND(0.05)	ND(0.4)	ND(0.0008)

Table 6-4. Soil Quality Data Summary, TCLP Metals, Phase II/III RFI, Safety-Kleen Recycle Center, Dolton, Illinois (6/96).

Sample ID	Interval (ft-bgs)	Date	Barium, Total (mg/L)	Cadmium, Total (mg/L)	Lead, Total (mg/L)	Mercury, Total (mg/L)
VB-4	(22-24)	6/4/96	0.82	ND(0.05)	ND(0.4)	ND(0.0008)
VB-4 Dup	(22-24)	6/5/96	0.81	ND(0.05)	ND(0.4)	ND(0.0008)
VB-4	(26-28)	6/4/96	0.542	ND(0.05)	ND(0.4)	ND(0.0008)
VB-4 Dup	(26-28)	6/5/96	0.76	ND(0.05)	ND(0.4)	ND(0.0008)
VB-5	(20-22)	6/7/96	0.675	ND(0.05)	ND(0.4)	ND(0.0008)
VB-5 Dup	(20-22)	6/7/96	0.719	ND(0.05)	ND(0.4)	ND(0.0008)
VB-5	(24-26)	6/7/96	0.882	ND(0.05)	ND(0.4)	ND(0.0008)
VB-6	(20-22)	6/4/96	0.319	ND(0.05)	ND(0.4)	ND(0.0008)
VB-6 Dup	(20-22)	6/5/96	0.383	ND(0.05)	ND(0.4)	ND(0.0008)
VB-6	(24-26)	6/4/96	0.832	ND(0.05)	ND(0.4)	ND(0.0008)
VB-7	(20-22)	6/6/96	0.639	ND(0.05)	ND(0.4)	ND(0.0008)
VB-7	(24-26)	6/6/96	0.582	ND(0.05)	ND(0.4)	ND(0.0008)
VB-8	(24-26)	6/5/96	0.733	ND(0.05)	ND(0.4)	ND(0.0008)
VB-8	(30-32)	6/5/96	0.751	ND(0.05)	ND(0.4)	ND(0.0008)
VB-8	(34-36)	6/5/96	0.682	ND(0.05)	ND(0.4)	ND(0.0008)
VB-9	(22-24)	6/4/96	0.947	ND(0.05)	ND(0.4)	ND(0.0008)
VB-9	(26-28)	6/4/96	0.76	ND(0.05)	ND(0.4)	ND(0.0008)
MW-6	(4-6)	6/5/96	0.54	ND(0.05)	ND(0.4)	ND(0.0008)
MW-6	(20-22)	6/5/96	0.717	ND(0.05)	ND(0.4)	ND(0.0008)
IEPA CUO(II)			2.0	0.05	0.1	0.01

IEPA-CUO(II) IEPA Class II ground-water clean-up objectives. Values derived from the Tiered Approach to Clean-Up Objectives (TACO) guidance (April 1996 version), Appendix B, Table E. CUOs in bold refer to actual Class II Ground-Water Standards in IAC Part 620. Concentrations presented in mg/L of TCLP extract.

collected during the Phase I RFI, the depth to ground water in the shallow perched zone was estimated to be 5 ft-bgs. The depth to the water table was verified in the existing monitoring wells, and during the Phase II/III soil borings/monitoring well installation activities. The screened interval was placed at approximately 5 to 15-ft-bgs in each of the shallow monitoring wells. Ten-foot well screens were used, in accordance with Condition 4 of the February 21, 1996 IEPA approval letter.

During the installation of Boring VB-3 in the South Field Investigation Area, a sample collected from a sand layer 22 to 24 ft-bgs exhibited elevated headspace TOV concentrations. S-K and IEPA agreed to install a temporary well (Well MW-7TD) to intersect this sand layer and collect a ground-water sample for laboratory analysis. A 5-foot screen interval was selected to ensure that a discrete ground-water sample would be collected from the 22 to 24 ft-bgs sand interval. The temporary well screen interval was placed at 20 to 25 ft-bgs.

5.3 Monitoring Well Installation Procedures

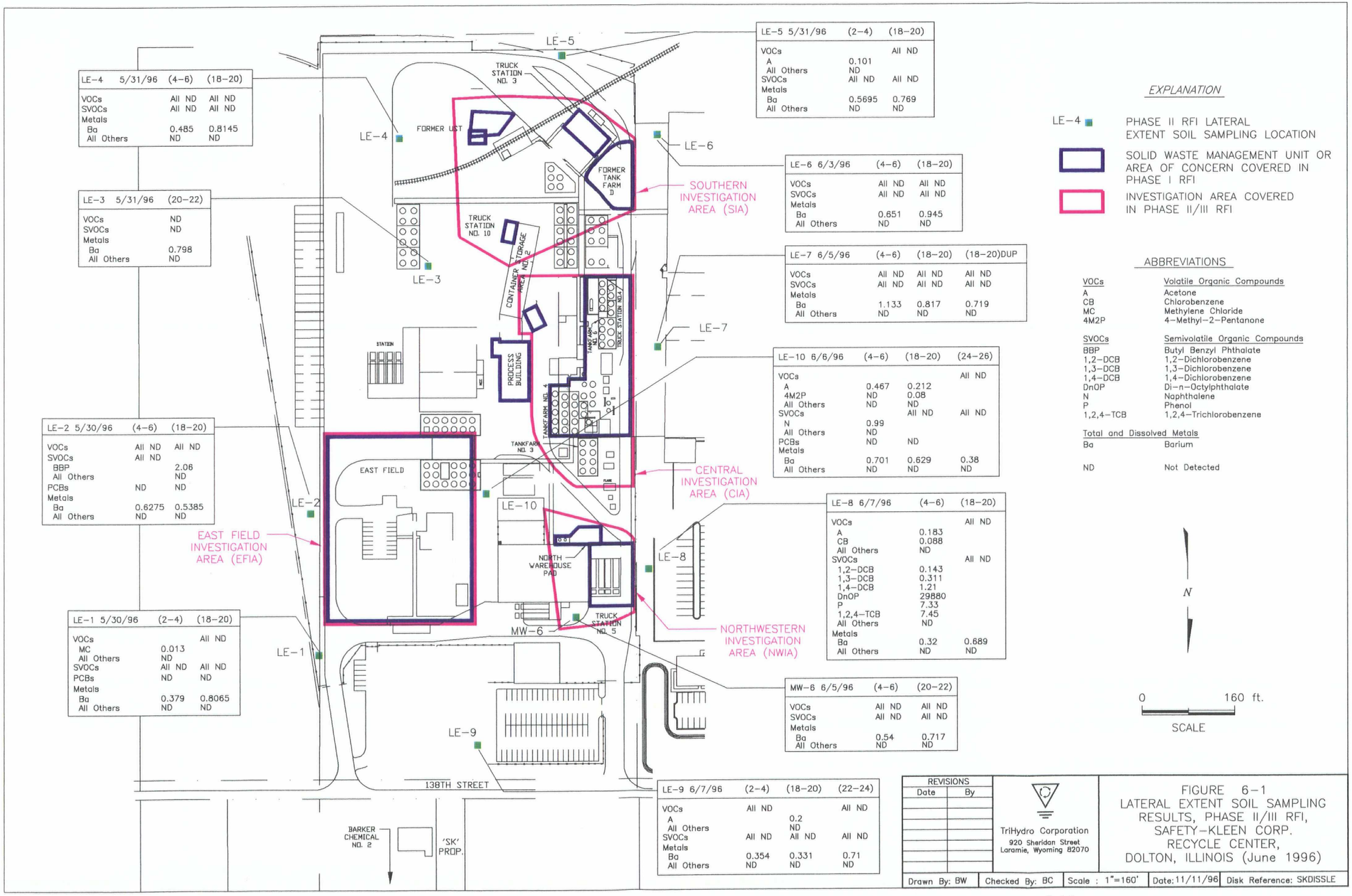
Permanent monitoring wells were constructed in accordance with the approved Phase II/III RFI Workplan. Boreholes for the monitoring wells were initially installed during Phase II activities (Chapter 4.0). The boreholes were installed using a drill rig equipped with 6.5-inch O.D. HSAs. Following completion of the Phase II soil sampling activities, the boreholes were sealed with bentonite chips up to the bottom of the anticipated well total depth (15 to 16 ft-bgs). The boreholes were then enlarged using clean/decontaminated 11.25-inch O.D. HSAs, fitted with a clean plastic bottom plug to prevent intrusion of formation materials. After well total depth was reached, the bottom plug was knocked out, and the monitoring wells were constructed through the hollow stem of the augers.

The permanent monitoring wells were constructed with a 4-inch I.D. flush joint, threaded Schedule 40 PVC well casing and screen. The 10-foot well screen was factory slotted (0.010-inch slot size) with four slots/inch. The wells were completed such that at least 70 percent of the well screen was placed below the water table at the time of completion. The annular space adjacent to the screen was filled with appropriately-sized silica sand (Global # 8) to a point at least 0.5 feet above the top of the well screen. The filter sand was emplaced in 1 to 2-foot lifts to prevent bridging, and ensure adequate filter material around the well screen.

A minimum 2-foot thickness of sodium bentonite pellets was placed in the annular space atop the sand filter pack. The bentonite pellets were hydrated following emplacement to seal the annular space between the filter pack and ground surface. Approximately 1-foot of bentonite grout was prepared and emplaced on top of the bentonite seal.

Each well casing (except for Well MW-5) terminated in a flush-to-grade steel protective vault and was fitted with a locking J-plug and padlock. Each well was completed in a sloping concrete apron pad. The concrete pads were constructed to protect the steel vault and facilitate drainage away from the well.

The surface completion at Well MW-5 (Figure 5-1) consisted of an above ground protective riser. A flush mount protective casing was not used at this location due to construction activities in the vicinity of Well MW-5 at the time of completion. Well



LE-4 5/31/96	(4-6)	(18-20)
VOCs	All ND	All ND
SVOCs	All ND	All ND
Metals		
Ba	0.485	0.8145
All Others	ND	ND

LE-3 5/31/96	(20-22)
VOCs	ND
SVOCs	ND
Metals	
Ba	0.798
All Others	ND

LE-2 5/30/96	(4-6)	(18-20)
VOCs	All ND	All ND
SVOCs	All ND	
BBP		2.06
All Others		ND
PCBs	ND	ND
Metals		
Ba	0.6275	0.5385
All Others	ND	ND

LE-1 5/30/96	(2-4)	(18-20)
VOCs		All ND
MC	0.013	
All Others	ND	
SVOCs	All ND	All ND
PCBs	ND	ND
Metals		
Ba	0.379	0.8065
All Others	ND	ND

LE-5 5/31/96	(2-4)	(18-20)
VOCs		All ND
A	0.101	
All Others	ND	
SVOCs	All ND	All ND
Metals		
Ba	0.5695	0.769
All Others	ND	ND

LE-6 6/3/96	(4-6)	(18-20)
VOCs	All ND	All ND
SVOCs	All ND	All ND
Metals		
Ba	0.651	0.945
All Others	ND	ND

LE-7 6/5/96	(4-6)	(18-20)	(18-20)DUP
VOCs	All ND	All ND	All ND
SVOCs	All ND	All ND	All ND
Metals			
Ba	1.133	0.817	0.719
All Others	ND	ND	ND

LE-10 6/6/96	(4-6)	(18-20)	(24-26)
VOCs			All ND
A	0.467	0.212	
4M2P	ND	0.08	
All Others	ND	ND	
SVOCs		All ND	All ND
N	0.99		
All Others	ND		
PCBs	ND	ND	
Metals			
Ba	0.701	0.629	0.38
All Others	ND	ND	ND

LE-8 6/7/96	(4-6)	(18-20)
VOCs		All ND
A	0.183	
CB	0.088	
All Others	ND	
SVOCs		All ND
1,2-DCB	0.143	
1,3-DCB	0.311	
1,4-DCB	1.21	
DnOP	29880	
P	7.33	
1,2,4-TCB	7.45	
All Others	ND	
Metals		
Ba	0.32	0.689
All Others	ND	ND

MW-6 6/5/96	(4-6)	(20-22)
VOCs	All ND	All ND
SVOCs	All ND	All ND
Metals		
Ba	0.54	0.717
All Others	ND	ND

LE-9 6/7/96	(2-4)	(18-20)	(22-24)
VOCs	All ND		All ND
A		0.2	
All Others		ND	
SVOCs	All ND	All ND	All ND
Metals			
Ba	0.354	0.331	0.71
All Others	ND	ND	ND

EXPLANATION

LE-4 PHASE II RFI LATERAL EXTENT SOIL SAMPLING LOCATION

SOLID WASTE MANAGEMENT UNIT OR AREA OF CONCERN COVERED IN PHASE I RFI

INVESTIGATION AREA COVERED IN PHASE II/III RFI

ABBREVIATIONS

VOCs	Volatile Organic Compounds
A	Acetone
CB	Chlorobenzene
MC	Methylene Chloride
4M2P	4-Methyl-2-Pentanone
SVOCs	**Semivolatile Organic Compounds**
BBP	Butyl Benzyl Phthalate
1,2-DCB	1,2-Dichlorobenzene
1,3-DCB	1,3-Dichlorobenzene
1,4-DCB	1,4-Dichlorobenzene
DnOP	Di-n-Octylphthalate
N	Naphthalene
P	Phenol
1,2,4-TCB	1,2,4-Trichlorobenzene
Total and Dissolved Metals	
Ba	Barium
ND	Not Detected

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Laramie, Wyoming 82070

FIGURE 6-1
LATERAL EXTENT SOIL SAMPLING RESULTS, PHASE II/III RFI, SAFETY-KLEEN CORP. RECYCLE CENTER, DOLTON, ILLINOIS (June 1996)

Drawn By: BW | Checked By: BC | Scale : 1"=160' | Date: 11/11/96 | Disk Reference: SKDISSLE

6.4.3 Vertical Extent Soil Sampling Results

The vertical extent borings were installed to define the vertical extent of impacts where shallow impacts were identified in Phase I. The vertical extent borings were placed within Investigation Areas where previous impacts were detected. The results of the vertical extent borings are also presented in tables 6-1 through 6-4, shown on Figure 6-2.

Minor concentrations of VOCs (acetone, toluene and 4 methyl-2-pentanone) and SVOCs (butyl-benzyl phthalate and 2 methyl naphthalene) were detected in one or more of the Phase II vertical extent soil samples. PCBs were not detected in any of the vertical extent soil samples collected in the vicinity of the East Field. Barium was detected in the TCLP extract of each of the vertical extent soil samples. No other constituents were detected.

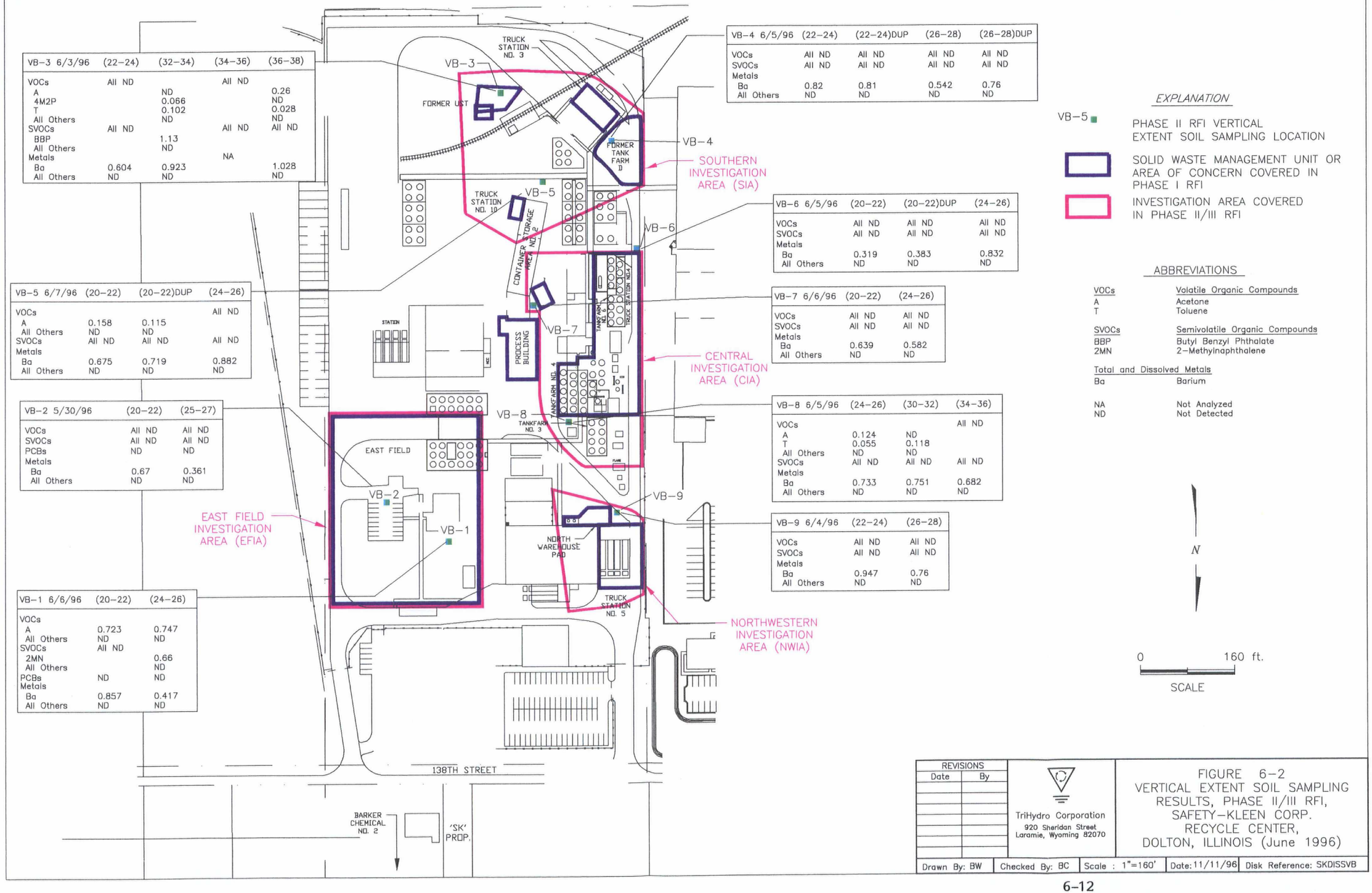
The concentrations of all detected constituents were below the respective Tier 1 CUOs. Therefore, the vertical extent of soil impacts has been defined and appears to be limited to the shallow soils ($\leq$20 ft-bgs).

6.4.4 Phenol/Phthalate Comparisons

One of the objectives of the Phase II sampling program was to further investigate the Phase I detections of phenol and phthalates in several soil samples collected from 18-20 ft-bgs. As requested in Condition 4 of the August 17, 1995 IEPA approval letter, the vertical extent sampling program was designed in part to evaluate whether phenol and phthalate concentrations decreased with depth.

Phenol was not detected in any of the Phase II vertical extent samples. The only phthalate compound detected in the vertical extent samples was butyl benzyl phthalate in the sample from Boring VB-3(32-34) at a concentration of 1.13 mg/kg, well below the Tier 1 CUO of 340 mg/kg. Butyl benzyl phthalate was not detected in the three other depth intervals sampled at this location.

S-K believes that the phenol and phthalate detections in Phase I soil samples were the result of the shrink-wrap plastic that encompass the brass liners used for the hydraulic probe rig soil sampler. The phenol/phthalate issue is addressed further in the quality assurance report, presented in Appendix C. The Phase II results confirm that phenol and phthalate are not site-related constituents, and in accordance with Condition 4 of the August 17, 1995 approval letter, no further action appears to be warranted with respect to phenol and phthalates.



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920 Sheridan Street
Laramie, Wyoming 82070

FIGURE 6-2
VERTICAL EXTENT SOIL SAMPLING RESULTS, PHASE II/III RFI, SAFETY-KLEEN CORP. RECYCLE CENTER, DOLTON, ILLINOIS (June 1996)

Drawn By: BW | Checked By: BC | Scale : 1"=160' | Date: 11/11/96 | Disk Reference: SKDISSVB

CHAPTER 7.0

PHASE III GROUND-WATER INVESTIGATION RESULTS

The objectives of the Phase II/III RFI ground-water investigation were to determine the nature, degree, extent, and potential rate of migration of SWMU-related impacts (if any) and confirm the Phase I preliminary ground-water quality results. Ground-water quality was monitored at nine newly installed monitoring wells, three existing wells and one temporary monitoring well during the Phase II/III RFI. The monitoring well locations, depths and installation procedures were discussed in Chapter 5.0. This chapter summarizes the results from the initial Phase II/III RFI ground-water monitoring event (June 1996). A second Phase II/III monitoring event is scheduled for December 1996; the additional results will be presented in a RFI report addendum.

7.1 Ground-Water Occurrence and Flow

Ground water occurs at a depth of approximately 1 to 5 ft-bgs in a shallow perched zone beneath most of the site. The perched zone occurs in the gravel/sand fill, which generally occurs from ground surface to a depth of 4.5 ft-bgs, to 10.5 ft-bgs in the southern portion of the facility. The underlying silty clay appears to be saturated to a depth of approximately 10 feet below the base of the fill. As reported in the Phase I RFI the low permeability silty clay contacts the underlying Niagaran Dolomite at a depth of approximately 45 ft-bgs beneath the facility. As discussed in Chapter 6.0, the ground water in the shallow perched zone appears to meet the criteria for Class II ground water.

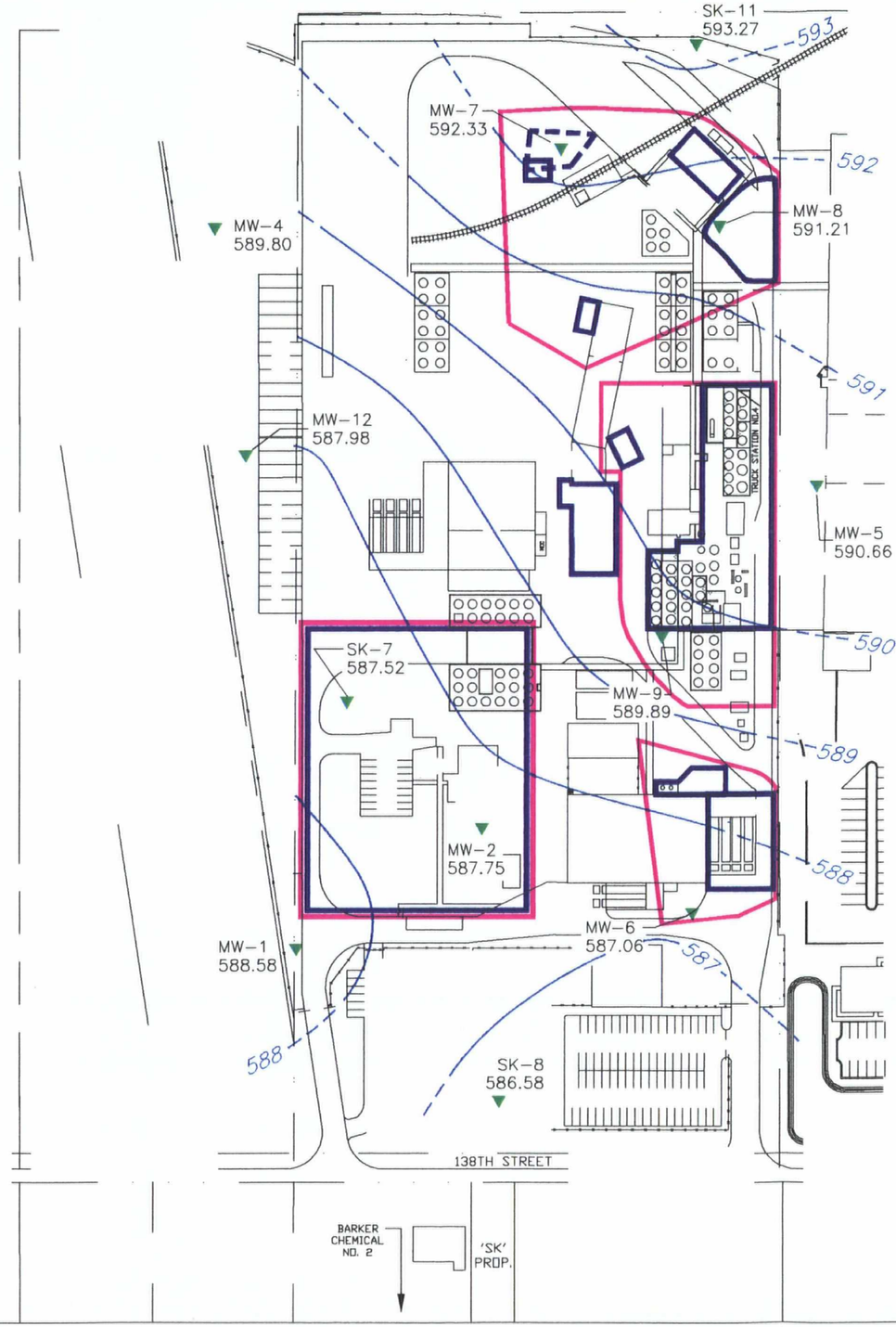
Fluid levels were measured in the permanent monitoring wells using an electronic oil/water interface probe. Well completion information and fluid level data for the June 1996 monitoring event are presented in Table 7-1. Free-phase hydrocarbon was not detected in any of the monitoring wells. The depth to ground water during the June 1996 monitoring event occurred between two to six ft-bgs, slightly higher than previous results. A wet spring in northern Illinois may have resulted in the slightly higher ground-water elevation. Water levels will be measured again during the December 1996 monitoring event.

The water elevation data were used to create a potentiometric surface contour map (Figure 7-1). As shown on Figure 7-1, the shallow ground-water flow was generally toward the northeast in June 1996. This result is consistent with the Phase I data and the results from other previous investigations performed prior to the RFI. A summary of the previous site data was presented in Chapter 3.0 and the RFI Phase II/III Workplan. Based on the June 1996 fluid level measurements, the estimated hydraulic gradient was 0.006 ft/ft across the site in the direction of ground-water flow (gradient measured between wells MW-7 and MW-2).

Table 7-1. Summary of Monitoring Well Completion Information and Water Level Elevations, Phase II/III RFI, Safety-Kleen Corp. Recycle Center, Dolton, Illinois (June 1996).

Well	Date	Ground Surface Elevation (ft-msl)	Protective Cover Elevation (ft-msl)	Measuring Point Elevation (ft-msl)	Depth to Top of Screen (ft-bmp)	Total Depth (ft-bmp)	Depth to Ground Water (ft-bmp)	Elevation of Ground-Water Surface (ft-msl)
MW-1	6/24/96	591.2	591.20	590.73	4.98	15.22	2.15	588.58
MW-2	6/24/96	591.1	591.30	590.89	4.83	15.29	3.14	587.75
MW-4	6/24/96	592.2	592.21	591.86	5.04	15.11	2.06	589.80
MW-5	6/24/96	594.4	597.12	597.05	8.04	18.28	6.39	590.66
MW-6	6/24/96	591.6	591.56	591.15	5.00	15.23	4.09	587.06
MW-7	6/24/96	596.0	595.96	595.49	6.00	16.05	3.16	592.33
MW-7TD	6/24/96	595.9	--	596.62	20.72	26.21	25.59	571.03
MW-8	6/24/96	593.7	593.70	593.39	5.04	13.54	2.18	591.21
MW-9	6/24/96	592.5	592.53	592.10	5.08	15.10	2.21	589.89
MW-12	6/24/96	592.6	592.55	592.27	5.02	15.30	4.29	587.98
SK-7	6/24/96	591.1	592.73	592.62	6.84	11.99	5.10	587.52
SK-7D	6/24/96	591.3	592.58	592.51	39.49	44.36	28.62	563.89
SK-8	6/24/96	589.9	591.53	591.34	6.66	11.71	4.76	586.58
SK-11	6/24/96	596.0	598.16	597.94	6.27	11.33	4.67	593.27

ft-bmp = feet below measuring point elevation (measuring point located at top of PVC casing, north side)
ft-msl = feet above mean sea level



EXPLANATION

MW-1 ▼ 588.58 — MONITORING WELL LOCATION WITH RESPECTIVE WATER LEVEL (ft.–msl)

592 - - - — LINE OF ELEVATION OF POTENTIOMETRIC SURFACE (dashed where inferred, ft.–msl)

SOLID WASTE MANAGEMENT UNIT OR AREA OF CONCERN COVERED IN PHASE I RFI

INVESTIGATION AREA COVERED IN PHASE II/III RFI

N

0 160 ft.

SCALE

REVISIONS		TriHydro Corporation 920 Sheridan Street Laramie, Wyoming 82070	FIGURE 7–1 POTENTIOMETRIC SURFACE MAP, PHASE II/III RFI, GROUND–WATER RELEASE ASSESSMENT, SAFETY–KLEEN CORP. RECYCLE CENTER, DOLTON, ILLINOIS (June 1996)		
Drawn By: BW	Checked By: CD	Scale : 1"=160'	Date: 6/25/96	Disk Reference: SKDIS696	

7.2 Estimation of Rate of Potential Migration

To estimate a conservative potential rate of constituent migration, a variation of Darcy's Law was used to determine ground-water velocity. Using ground-water velocity as an estimate for contaminant transport does not take into account the effects of advection, dispersion, retardation, adsorption and/or degradation, which would reduce the rate of constituent migration. Input parameters for the velocity equation consist of hydraulic conductivity, hydraulic gradient, and effective porosity. To estimate a conservative velocity, the largest value of the hydraulic conductivity from the shallow saturated zone samples was used (7.3×10^{-5} cm/s at Boring LE-8) as input. Porosity results from the geotechnical analysis of sample LE-8 (8-10) was 33.5 %; consistent with the results from other Phase II soil samples and previous data. The calculations used to estimate ground-water flow velocity are presented in Table 7-2. Based on these calculations, ground-water flow velocity and conservative rate of potential contaminant migration may be estimated at approximately 1.4 ft/year across the facility to the northeast.

7.3 Ground-Water Quality Results

The ground-water samples, which were collected during the first of two Phase II/III RFI monitoring events, were analyzed for VOCs, SVOCs and total/dissolved metals (barium, cadmium, lead, and mercury). The data evaluation includes a summary of the constituents detected during the June 1996 monitoring event, location of detected constituents, and comparisons to Tier 1 ground-water CUOs.

7.3.1 Lateral Extent Ground-Water Quality Results

The June 1996 ground-water quality results from the shallow monitoring well network are summarized in tables 7-3 through 7-5, and shown by location on Figure 7-2. Comparisons to Tier 1 CUOs are also presented in the tables. Laboratory data sheets, QA/QC reports and COC/SAR forms for the ground-water samples are presented in Appendix K. A quality assurance evaluation of the ground-water data is presented in Appendix C.

As shown in tables 7-3 and 7-4, a few VOC and SVOC constituents were detected in ground-water samples collected during the June 1996 monitoring event. As shown on Figure 7-2, no facility-related organic constituents were detected in any sample collected from a perimeter monitoring well. Facility-related constituents were only detected in samples collected from wells installed within Investigation Areas.

Total lead was detected in the sample from Well MW-5 at a concentration of 0.011 mg/L. The detected total lead concentration exceeded the Class I Ground-Water CUO, but did not exceed the Class II CUO. Dissolved lead was not detected in the filtered aliquot of this sample. No other total metals were detected in any of the June 1996 ground-water samples collected from the shallow permanent monitoring wells.

Table 7-2. Ground-Water Velocity Calculations, Phase II/III RFI, Safety-Kleen Corp. Recycle Center, Dolton, Illinois.

K_{LE-8} = 7.3 x 10^{-5} cm/s

dh/dl = 0.006

$$V = \frac{K(dh/dl)}{n}$$

$$V = \frac{7.3 \times 10^{-5} cm/s)(0.006)}{0.35} = 1.3 \times 10^{-6} \; cm/s \; (\frac{3.15 \times 10^{7} \; s/yr}{30.48 \; cm/ft})$$

= 1.4 ft/yr

Notes:

K = hydraulic conductivity ("worst case" hydraulic conductivity obtained from geotechnical analysis in the sample from Boring LE-8)

dh/dl = hydraulic gradient observed at the facility (June 1996).

V = ground-water velocity

n = porosity (0.335 obtained from geotechnical results in the sample collected from Boring LE-8)

Table 7-3. Water Quality Data Summary, VOCs, Phase II/IIII RFI, Safety-Kleen Recycle Center, Dolton, Illinois (6/95).

Sample ID	Date	Acetone (mg/L)	Benzene (mg/L)	Chloro-Benzene (mg/L)	Chloro-ethane (mg/L)	Cis-1,2-Dichloro ethene (mg/L)	1,1- Dichloro ethane (mg/L)	Ethyl-benzene (mg/L)	4-Methyl- 2-Pentanone (mg/L)	Toluene (mg/L)	1,1,1-Trichloro-ethane (mg/L)	Trichloro-ethene (mg/L)	Vinyl Chloride (mg/L)	Xylenes, Total (mg/L)	All Others (mg/L)
MW-1	6/25/96	ND(0.1)	ND(0.005)	ND(0.005)	ND(0.01)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.05)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.01)	ND(0.005)	ND
MW-2	6/25/96	ND(0.1)	ND(0.005)	ND(0.005)	ND(0.01)	0.016	ND(0.005)	ND(0.005)	ND(0.05)	ND(0.005)	ND(0.005)	0.009	0.011	ND(0.005)	ND
MW-4	6/25/96	ND(0.1)	ND(0.005)	ND(0.005)	ND(0.01)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.05)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.01)	ND(0.005)	ND
MW-5	6/25/96	ND(0.1)	ND(0.005)	ND(0.005)	ND(0.01)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.05)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.01)	ND(0.005)	ND
MW-6	6/25/96	ND(0.1)	ND(0.005)	ND(0.005)	ND(0.01)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.05)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.01)	ND(0.005)	ND
MW-7	6/25/96	ND(0.1)	0.116	0.01	ND(0.01)	0.006	0.008	0.155	0.383	330	ND(0.005)	0.016	ND(0.01)	0.284	ND
MW-7 Dup	6/25/96	ND(0.1)	0.136	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	0.168	0.336	314	ND(0.05)	ND(0.05)	ND(0.05)	0.313	ND
MW-7TD	6/25/96	ND(0.1)	ND(0.005)	ND(0.005)	ND(0.01)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.05)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.01)	ND(0.005)	ND
MW-8	6/25/96	0.102	ND(0.005)	ND(0.005)	0.087	ND(0.005)	0.071	ND(0.005)	ND(0.05)	ND(0.005)	0.008	ND(0.005)	ND(0.01)	ND(0.005)	ND
MW-9	6/25/96	ND(0.1)	0.007	ND(0.005)	ND(0.01)	ND(0.005)	0.068	0.091	0.118	0.166	0.009	ND(0.005)	ND(0.01)	0.084	ND
MW-9 Dup	6/25/96	ND(0.1)	0.007	ND(0.005)	ND(0.01)	ND(0.005)	0.061	0.089	0.108	0.178	0.008	ND(0.005)	ND(0.01)	0.077	ND
MW-12	6/25/96	ND(0.1)	ND(0.005)	ND(0.005)	ND(0.01)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.05)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.01)	ND(0.005)	ND
SK-7	6/25/96	ND(0.1)	ND(0.005)	ND(0.005)	ND(0.01)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.05)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.01)	ND(0.005)	ND
SK-8	6/25/96	ND(0.1)	ND(0.005)	ND(0.005)	ND(0.01)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.05)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.01)	ND(0.005)	ND
SK-11	6/25/96	ND(0.1)	ND(0.005)	ND(0.005)	ND(0.01)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.05)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.01)	ND(0.005)	ND
Trip Blank 1	6/25/96	ND(0.1)	ND(0.005)	ND(0.005)	ND(0.01)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.05)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.01)	ND(0.005)	ND
Trip Blank 2	6/25/96	ND(0.1)	ND(0.005)	ND(0.005)	ND(0.01)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.05)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.01)	ND(0.005)	ND
Trip Blank 3	6/25/96	ND(0.1)	ND(0.005)	ND(0.005)	ND(0.01)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.05)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.01)	ND(0.005)	ND
Trip Blank 4	6/25/96	ND(0.1)	ND(0.005)	ND(0.005)	ND(0.01)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.05)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.01)	ND(0.005)	ND
EB-1	6/25/96	ND(0.1)	ND(0.005)	ND(0.005)	ND(0.01)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.05)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.01)	ND(0.005)	ND
EB-2	6/25/96	ND(0.1)	ND(0.005)	ND(0.005)	ND(0.01)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.05)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.01)	ND(0.005)	ND
FB	6/25/96	ND(0.1)	ND(0.005)	ND(0.005)	ND(0.01)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.05)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.01)	ND(0.005)	ND
IEPA CUO (II)		0.7	**0.025**	**0.5**	--	**0.2**	3.5	**1.0**	--	**2.5**	**1.0**	**0.025**	**0.01**	**10**	--

IEPA CUO (II) IEPA Class II ground-water clean-up objectives. Values derived from the Tiered Approach to Clean-Up Objectives (TACO) guidance (April 1996 version), Appendix B, Ta
CUOs in bold refer to actual Class II Ground-Water Standards in IAC Part 620.

Table 7-4. Water Quality Data Summary, SVOCs, Phase II/III RFI, Safety-Kleen Recycle Center, Dolton, Illinois (6/96).

Sample ID	Date	2-Methyl phenol (mg/L)	4-Methyl phenol (mg/L)	All Others (mg/L)
MW-1	6/25/96	ND(0.011)	ND(0.01)	ND
MW-2	6/25/96	ND(0.011)	ND(0.01)	ND
MW-4	6/25/96	ND(0.011)	ND(0.01)	ND
MW-5	6/25/96	ND(0.011)	ND(0.01)	ND
MW-6	6/25/96	ND(0.011)	ND(0.01)	ND
MW-7	6/25/96	0.056	0.075	ND
MW-7 Dup	6/25/96	0.054	0.073	ND
MW-7TD	6/25/96	–	–	–
MW-8	6/25/96	ND(0.011)	ND(0.01)	ND
MW-9	6/25/96	ND(0.011)	ND(0.01)	ND
MW-9 Dup	6/25/96	ND(0.011)	ND(0.01)	ND
MW-12	6/25/96	ND(0.011)	ND(0.01)	ND
SK-7	6/25/96	ND(0.011)	ND(0.01)	ND
SK-8	6/25/96	ND(0.011)	ND(0.01)	ND
SK-11	6/25/96	ND(0.011)	ND(0.01)	ND
Trip Blank 1	6/25/96	–	–	–
Trip Blank 2	6/25/96	–	–	–
Trip Blank 3	6/25/96	–	–	–
Trip Blank 4	6/25/96	–	–	–
EB-1	6/25/96	ND(0.011)	ND(0.01)	ND
EB-2	6/25/96	ND(0.011)	ND(0.01)	ND
FB	6/25/96	ND(0.011)	ND(0.01)	ND
IEPA CUO (II)		0.35	–	

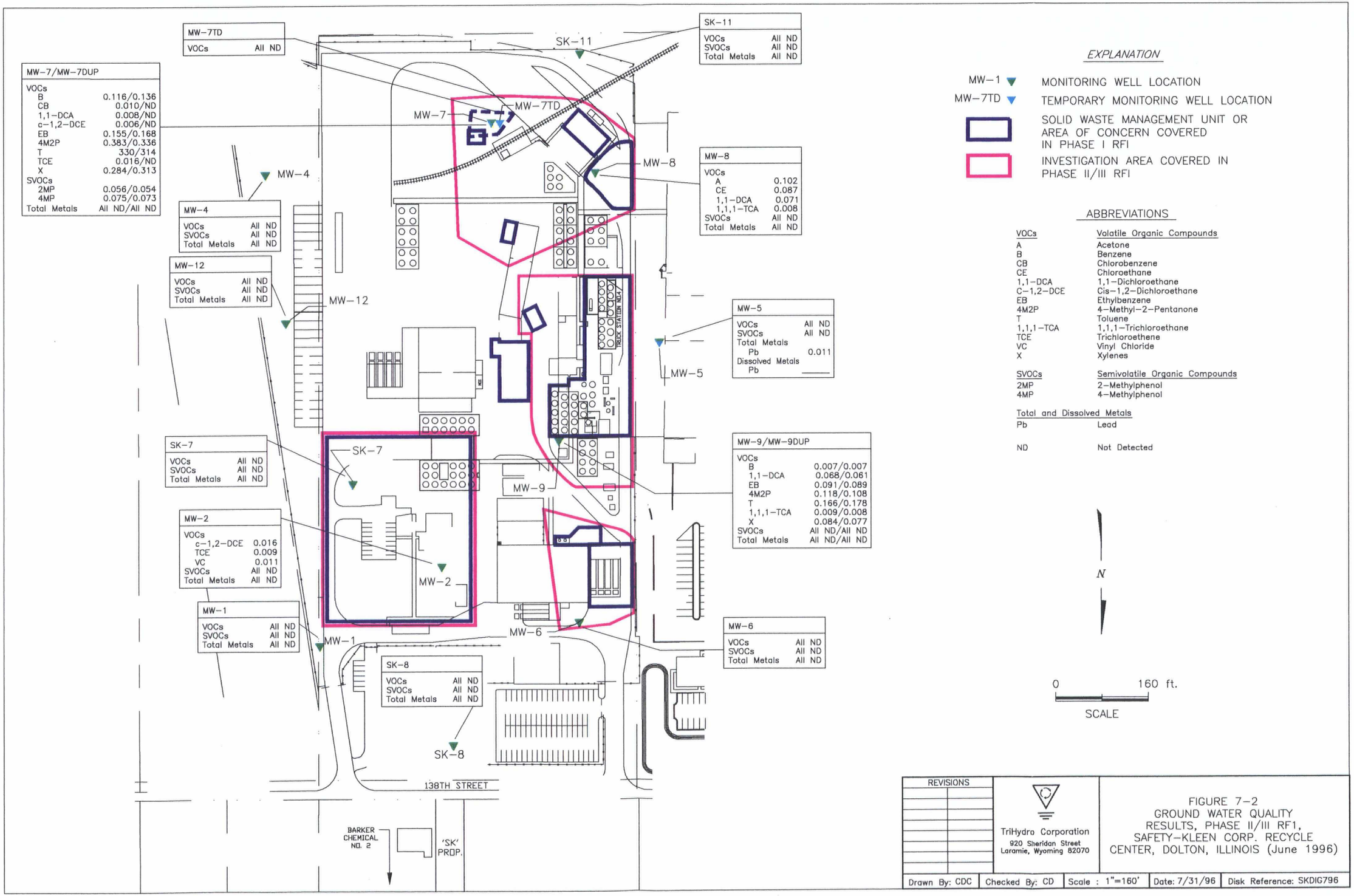
IEPA CUO (II) IEPA Class II ground-water clean-up objectives. Values derived from the Tiered Approach to Clean-Up Objectives (TACO) guidance (April 1996 Version),

Table 7-5. Water Quality Data Summary, Metals, Phase II/III RFI, Safety-Kleen Recycle Center, Dolton, Illinois (6/96).

Sample ID	Date	Barium, Total (mg/L)	Cadmium, Total (mg/L)	Lead, Total (mg/L)	Mercury, Total (mg/L)
MW-1	6/25/96	ND(2)	ND(0.005)	ND(0.0075)	ND(0.002)
MW-2	6/25/96	ND(2)	ND(0.005)	ND(0.0075)	ND(0.002)
MW-4	6/25/96	ND(2)	ND(0.005)	ND(0.0075)	ND(0.002)
MW-5	6/25/96	ND(2)	ND(0.005)	0.011/ND(0.0075)[1]	ND(0.002)
MW-6	6/25/96	ND(2)	ND(0.005)	ND(0.0075)	ND(0.002)
MW-7	6/25/96	ND(2)	ND(0.005)	ND(0.0075)	ND(0.002)
MW-7 Dup	6/25/96	ND(2)	ND(0.005)	ND(0.0075)	ND(0.002)
MW-8	6/25/96	ND(2)	ND(0.005)	ND(0.0075)	ND(0.002)
MW-9	6/25/96	ND(2)	ND(0.005)	ND(0.0075)	ND(0.002)
MW-9 Dup	6/25/96	ND(2)	ND(0.005)	ND(0.0075)	ND(0.002)
MW-12	6/25/96	ND(2)	ND(0.005)	ND(0.0075)	ND(0.002)
SK-7	6/25/96	ND(2)	ND(0.005)	ND(0.0075)	ND(0.002)
SK-8	6/25/96	ND(2)	ND(0.005)	ND(0.0075)	ND(0.002)
SK-11	6/25/96	ND(2)	ND(0.005)	ND(0.0075)	ND(0.002)
EB-1	6/25/96	ND(2)	ND(0.005)	ND(0.0075)	ND(0.002)
FB	6/25/96	ND(2)	ND(0.005)	ND(0.0075)	ND(0.002)
IEPA CUO (II)		2.0	0.05	0.1	0.01

IEPA CUO (II) IEPA Class II ground-water clean-up objectives. Values derived from the Tiered Approach to Clean-Up Objectives (TACO) guidance (April 1996 version), Appendix B, Table E. CUOs in bold refer to actual Class II Ground-Water Standards in IAC Part 620.

[1] Represents dissolved lead analysis.



REVISIONS	TriHydro Corporation 920 Sheridan Street Laramie, Wyoming 82070	FIGURE 7-2 GROUND WATER QUALITY RESULTS, PHASE II/III RF1, SAFETY-KLEEN CORP. RECYCLE CENTER, DOLTON, ILLINOIS (June 1996)		
Drawn By: CDC	Checked By: CD	Scale : 1"=160'	Date: 7/31/96	Disk Reference: SKDIG796

7.3.2 Vertical Extent Ground-Water Quality Results

In addition to the ground-water samples collected from the shallow permanent monitoring wells, a sample was also collected from a temporary deeper well (Well MW-7TD). As described in Chapter 5.0, this well was installed because soil quality results indicated potential VOC impacts in a sand interval sampled in Boring VB-3 [sample VB-3 (22-24)]. The well (screened 20 to 25 ft-bgs) was installed following a teleconference on June 5 and 6, 1996 with IEPA. S-K and IEPA agreed to install and monitor the ground-water quality from this discrete interval for one sampling event.

A sample was collected from temporary Well MW-7TD and submitted for analysis of VOCs in June 1996. The results are summarized in tables 7-3 and 7-4. No constituents were detected in the June 1996 sample collected from this well. Since no constituents were identified, S-K has scheduled abandonment of this well for December 1996. As discussed in the Quarterly Progress Report dated October 31, 1996, provisions for plugging and abandoning this temporary well were coordinated with IEPA during the June 1996 teleconferences.

The elevated TOV detected in the headspace of soil sample VB-3 (22-24) may have been the result of impacted shallow ground water migrating to the deeper portion of the formation during drilling activities. Perched ground-water was encountered during the shallow drilling activities at this location, as noted on the boring logs. Additionally, Boring VB-3 was installed near the location of shallow soil impacts identified in the Phase I Investigation. Benzene and toluene were detected in the shallow from adjacent shallow Well MW-7. Based on the absence of target VOCs in the sample from temporary well MW-7TD, the extent of the ground-water impacts appears to be limited to the shallow perched water-bearing zone ($\leq$ 15 ft-bgs) beneath the facility.

7.3.3 Comparison with Phase I Ground-Water Quality Results

The Phase III results were generally consistent with the results of Phase I, which indicated the presence of shallow ground-water impacts in the East Field, Southern and Central Investigation Areas. During the Phase III investigation fewer constituents were detected and the concentrations of similarly detected constituents were less than during Phase I. No constituents were detected above Class II CUOs in samples collected from wells in the Northwestern and Central Investigation Areas. Vinyl chloride was detected in one sample from Well MW-2 (East Field) and benzene and toluene were detected in samples from Well MW-7 (Southern Investigation Area) of the levels above the respective Class II CUOs. Additionally, no constituents were detected above the Class II CUOs in samples from the wells located at the perimeter of the facility.

7.3.4 Second Ground-Water Monitoring Event

As per the Workplan a second ground-water monitoring event is scheduled for mid-December 1996, subsequent to the submittal of this report. The results from the December 1996 confirmation monitoring event will be presented in an addendum to this report, on or before February 1, 1997. Final conclusions concerning ground-water quality will be presented in the addendum.

CHAPTER 8.0

CONCLUSIONS AND FUTURE ACTIVITIES

S-K has completed the Phase II RFI activities at the Dolton Recycle Center. Phase II and the first of two ground-monitoring events necessary to complete Phase III were completed in accordance with the approved Workplan (October 13, 1996), and the February 21, 1996 IEPA approval letter. During the three phases of the RFI, S-K has generated considerable information regarding subsurface conditions, the nature, degree and extent of soil and ground-water quality impacts and the possible rates of constituent migration.

8.1 Phase I and Phase II RFI Soil Quality Results

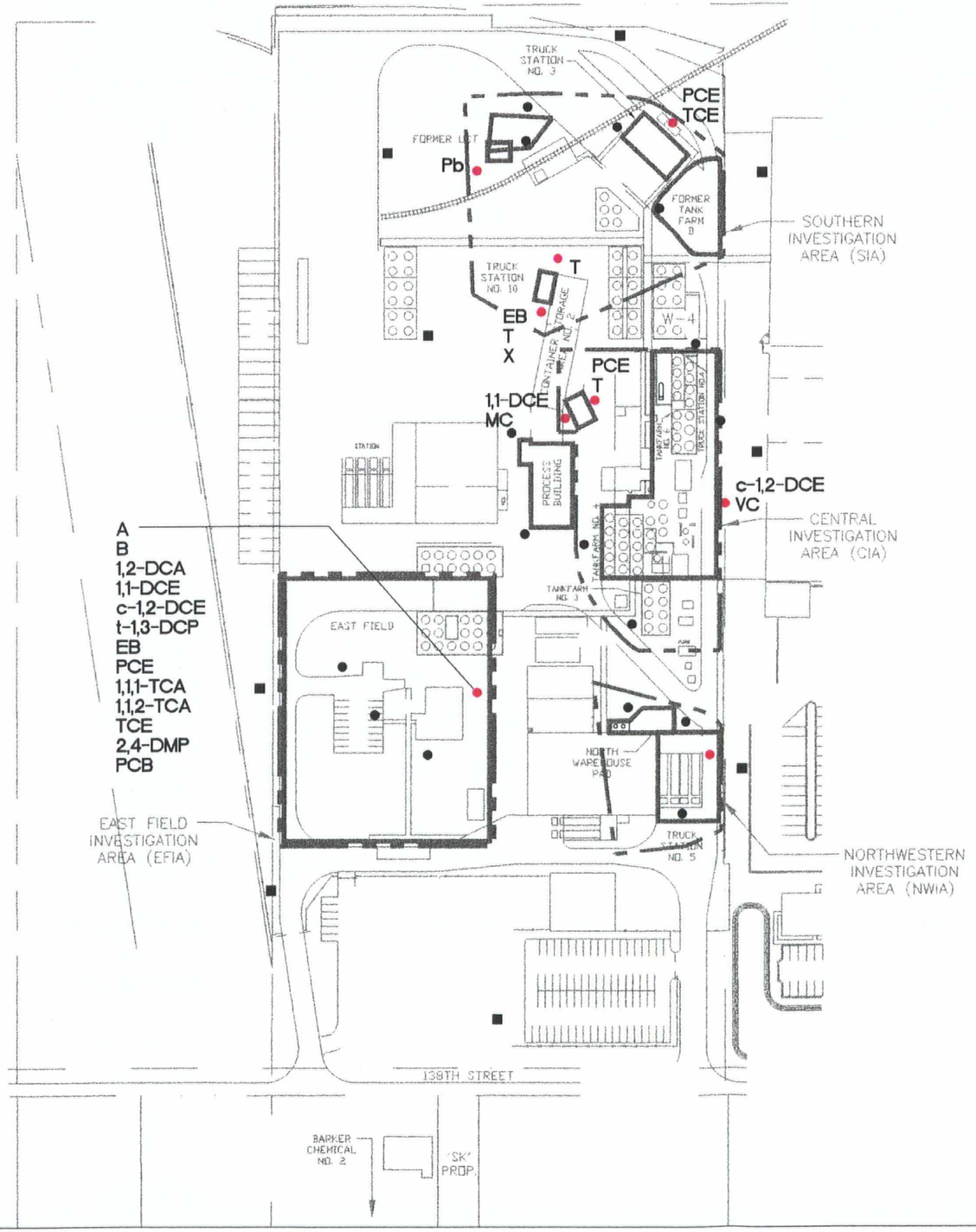
The results of the Phase I and Phase II shallow soil investigations are summarized on Figure 8-1. The results of the Phase I RFI indicated target constituents in shallow soil samples adjacent to SWMUs at the Dolton Recycle Center. Samples collected during Phase I were analyzed for 37 VOCs, 59 SVOCs, PCBs and eight metals, therefore characterizing the nature and degree of soil quality impacts in the investigation area.

The objectives of the Phase II RFI were to define the lateral and vertical extent of soil impacts. The constituent concentrations detected during Phase II do not exceed any Tier 1 migration to Class II ground-water CUOs. Therefore, soil impacts appear to be limited to the immediate vicinity of the SWMUs in the East Field, Central and Southern Investigation Areas. The deeper soil quality data from the Phase I and Phase II investigations indicate soil impacts appear to be limited vertically to the shallow soils (less than 20 ft-bgs). Elevated concentrations of facility-related constituents were not detected in samples from the lateral extent borings or deep samples from the vertical extent borings.

8.2 Phase I and Phase III Ground-Water Quality Results

The results of the Phase I and Phase III ground-water investigations are summarized on Figure 8-2. Facility-related constituents were detected in the June 1996 samples from wells in the East Field, Central and Southern Investigation Areas. These results are consistent with the Phase I ground-water investigation in which ground-water impacts were detected in the immediate vicinity of some of the target SWMUs. The constituents detected during the ground-water investigations were similar to those detected in shallow soil samples from the same areas.

Target constituents were not detected in the June 1996 samples from shallow wells located around the perimeter of the Investigation Areas (i.e., between the Investigation Areas and property boundaries). The limited extent of ground-water impacts appears to be consistent with the low permeability silty-clay materials and flow calculations, which indicate low anticipated rates for potential migration.



N

0 160 ft.

SCALE

ABBREVIATIONS

VOCs	Volatile Organic Compounds
A	Acetone
B	Benzene
1,2-DCA	1,2-Dichloroethene
1,1-DCE	1,1-Dichloroethene
c-1,2-DCE	cis-1,2-Dichloroethane
t-1,3-DCP	trans-1,3-Dichloropropene
EB	Ethylbenzene
MC	Methylene Chloride
PCE	Tetrachloroethene
T	Toluene
1,1,1-TCA	1,1,1-Trichloroethane
1,1,2-TCA	1,1,2-Trichloroethane
TCE	Trichloroethene
VC	Vinyl Chloride
X	Xylene
SVOCs	**Semi-Volatile Organic Compounds**
2,4-DMP	2,4-Dimethylphenol
Total and Dissolved Metals	
Pb	Lead
PCB	Polychlorinated Biphenyl
ND	Not Detected

EXPLANATION

FF-2 ● PHASE I RFI SOIL SAMPLING LOCATION

LE-4 ■ PHASE II RFI LATERAL EXTENT SOIL SAMPLING LOCATION

SOLID WASTE MANAGEMENT UNIT OR AREA OF CONCERN COVERED IN PHASE I RFI

INVESTIGATION AREA COVERED IN PHASE II/III RFI

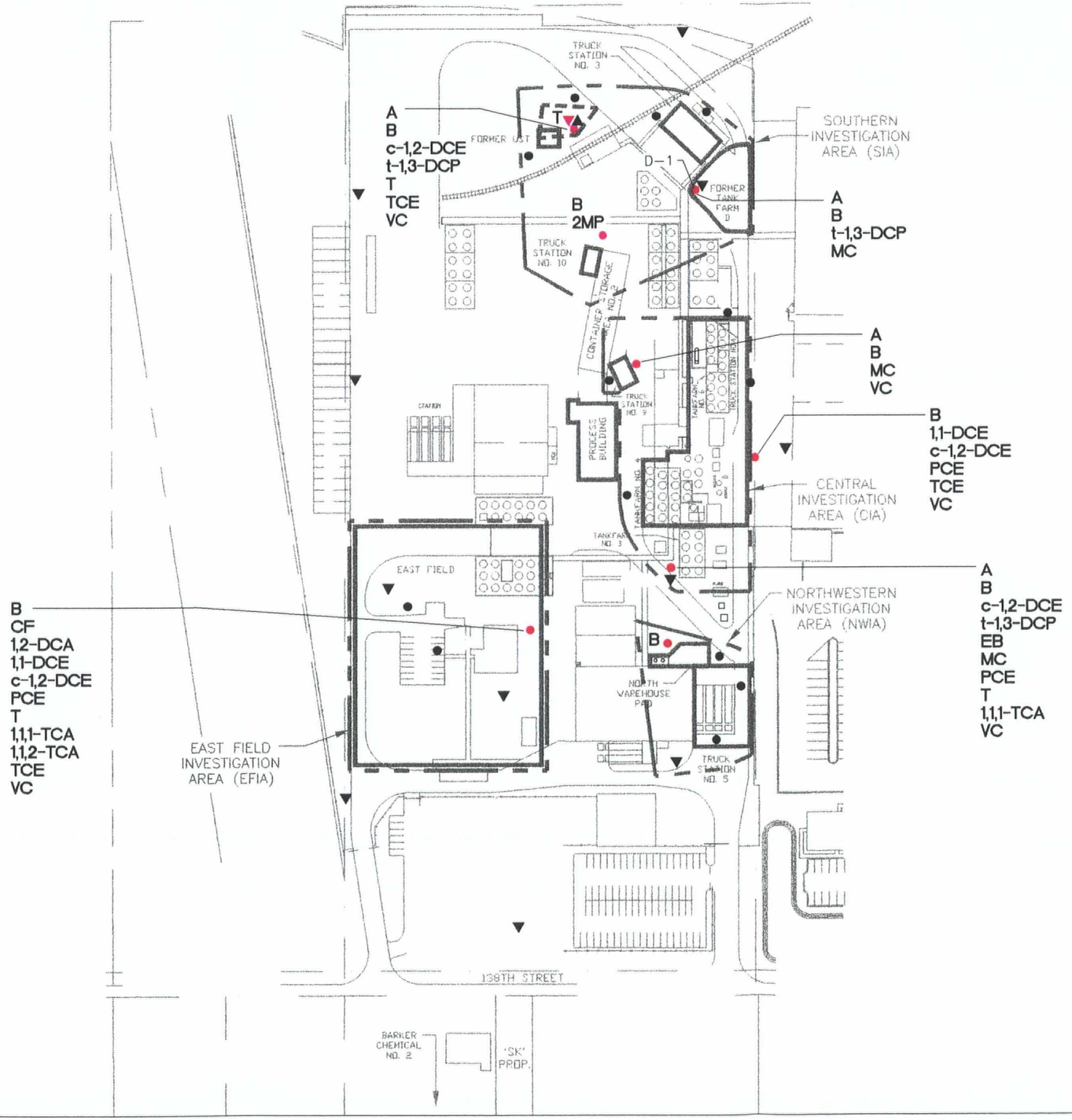
RED indicates constituent concentrations in shallow soils exceed IEPA Tier 1 CUOs (Migration to Class II groundwater)

REVISIONS	
Date	By

TriHydro Corporation
920 Sheridan Street
Laramie, Wyoming 82070

FIGURE 8-1
SUMMARY OF RFI SHALLOW SOIL QUALITY RESULTS, SAFETY-KLEEN CORP. RECYCLE CENTER, DOLTON, ILLINOIS

Drawn By: BW	Checked By: CDW	Scale : 1"=160'	Date:11/11/96	Disk Reference: SKDISSSQ



0 160 ft.

SCALE

ABBREVIATIONS

VOCs	Volatile Organic Compounds
A	Acetone
B	Benzene
CF	Chloroform
1,2-DCA	1,2-Dichloroethene
1,1-DCE	1,1-Dichloroethene
c-1,2-DCE	cis-1,2-Dichloroethane
t-1,3-DCP	trans-1,3-Dichloropropene
EB	Ethylbenzene
MC	Methylene Chloride
PCE	Tetrachloroethene
T	Toluene
1,1,1-TCA	1,1,1-Trichloroethane
1,1,2-TCA	1,1,2-Trichloroethane
TCE	Trichloroethene
VC	Vinyl Chloride

SVOCs	Semi-Volatile Organic Compounds
2MP	2-Methylphenol

EXPLANATION

MW-3 ▼ PHASE III MONITORING WELL LOCATION

MW-7TD ▲ PHASE III TEMPORARY MONITORING WELL LOCATION

FF-2 ● PHASE I SAMPLING LOCATION

SOLID WASTE MANAGEMENT UNIT OR AREA OF CONCERN COVERED IN PHASE I RFI

INVESTIGATION AREA COVERED IN PHASE II/III RFI

RED indicates constituent concentrations in shallow groundwater exceed IEPA Tier 1 CUOs (Class II groundwater)

REVISIONS	
Date	By

TriHydro Corporation
920 Sheridan Street
Laramie, Wyoming 82070

FIGURE 8-2
SUMMARY OF RFI GROUND-WATER QUALITY RESULTS, SAFETY-KLEEN CORP. RECYCLE CENTER, DOLTON, ILLINOIS

Drawn By: BW	Checked By: CDW	Scale : 1"=160'	Date:11/15/96	Disk Reference: SKDISGWQ

S-K believes the SWMU-related subsurface impacts occurred prior to purchase of the property in 1987. The extent of detected soil and ground-water impacts appear to be limited horizontally and vertically. The potential for considerable migration appears to be low, since the majority of the SWMU sources that may have contributed to the impacts have been removed, excavated, backfilled, paved and/or placed within secondary containment to control future releases. In addition, the detected impacts have been relatively contained due to the subsurface lithological characteristics and slow ground-water flow. Natural degradation, volatilization and adsorption should also limit the migration potential of SWMU-related constituents.

8.3 Future Activities

In accordance with Condition 7 of the February 21, 1996 IEPA approval letter, S-K will conduct a second ground-water monitoring event, subsequent to the submittal of this report. The second ground-water monitoring event will be conducted in accordance with the procedures described in Chapter 5.0. The monitoring event is tentatively scheduled for mid December 1996. The results will be used to confirm the initial (June 1996) ground-water monitoring results. A summary of the December 1996 monitoring event will be submitted in an addendum to this report in accordance with the IEPA approval letter.

The second ground-water monitoring event will complete the Phase III RFI activities at the Dolton facility. Future activities and recommendations will be presented in the Phase II/III RFI addendum, following confirmation of ground-water quality. Based on the Phase II/III RFI results collected to date, the constituents in soil and ground water at the facility do not appear to pose an immediate risk to human health and the environment. Following completion of the RFI activities, S-K proposes to work with IEPA to develop an appropriate Corrective Action program for the site (if necessary).

APPENDIX A

PERTINENT CORRESPONDENCE

PHASE II/III RCRA FACILITY INVESTIGATION
SAFETY-KLEEN CORP. RECYCLE CENTER
DOLTON, ILLINOIS

State of Illinois
ENVIRONMENTAL PROTECTION AGENCY

Mary A. Gade, Director

2200 Churchill Road, Springfield, IL 62794-9276

217/524-3300

March 9, 1994

RECEIVED
MAR 14 1994
Env. Dept. - Remediation
SAFETY-KLEEN CORP.

Mr. Scott Davies
Safety-Kleen
1000 North Randall Road
Elgin, Illinois 60123-7857

Re: 0310690006 - Cook County
Safety-Kleen/Dolton
ILD980613913
Received: November 17, 1993
Log No.: B-120
RCRA Permit

Dear Mr. Davies:

This letter is in response to your correspondence of November 12, 1993 regarding revision of the approach of the corrective action investigations for the above referenced Safety-Kleen facility. Since the date of the letter, Agency representatives were given the opportunity to visit the site and inspect the Solid Waste Management Units (SWMUs) for which corrective action investigations were required in the permit. Based upon the results of this site inspection and discussions with Safety-Kleen representatives, the following provides a modification of the list of SWMUs for which corrective action investigations are required, and Agency recommendations for corrective action investigations for each:

No.	SWMU Name	Required Phase I Action
1.	Process Building	Integrity evaluation
2.	West Tank Farm Area (includes Tank Farms #3, 4, 5, and 6 and Process Areas)	Sampling/analysis
3.	Former South Tank Farm Area	Sampling/analysis
4.	East Field	Sampling/analysis
5.	Truck Stations #3, 4, 5, 6, , 9, and 10	Sampling/analysis around perimeter of concrete pads
6.	Driveway to the Facility	Sampling/analysis
7.	Newly Sited Areas:	
	Former Barker Chemical Property	Sampling/analysis
	Former Rexnord/Precision Aire Property	Waste management assessment, sampling/analysis as necessary
	Agri-Chain	Waste management assessment, sampling/analysis as necessary

The required Phase I action for the Process Building should consist of an assessment of its base. It must be conducted by an independent registered professional engineer to determine if the integrity of the pavement and secondary containment structures is such that former releases and potential future spills have not had/do not have a direct migration pathway to the underlying or surrounding soils. The results of this integrity evaluation should be documented in a report which outlines the assessment procedures, and provides a recommendation of whether further corrective actions are necessary based upon the results of the assessment.

In addition, the Agency has revised the list of SWMUs to delete those units regulated under the terms, conditions and requirements of the facility's RCRA Part B permit. The Agency hereby notes that these units will be subject to the RCRA closure standards and requirements of 35 Ill. Adm. Code 724, of which the requirements for environmental investigation are similar, but not identical to corrective action. Of obvious exception to this, the Agency has recommended sampling and analytical activities in the areas of the facility Truck Stations. Information contained in Agency files and in the facility RCRA Part B permit application indicate a number of releases occurring within and in the area of the facility truck stations and loading/unloading areas. During the site inspection, it was evident that some of the truck stations lacked secondary containment structures (i.e., curbs, etc.) to keep large-quantity spills from migrating to surrounding, unpaved areas. In addition, it is unclear from review of available information when such secondary containment structures were constructed or in use during operations by previous owners of this property.

Finally, the required Phase I action for the areas where Rexnord/Precision Aire and Agri-Chain are located or are currently operating consists of an assessment of the waste management activities. The results of such a waste management assessment must be provided to the Agency in the form of a report, and include the following information, at a minimum:

1. A review of current business activities at each site, including waste generation and disposal;

2. A review of historical business activities at each site, including information regarding historic waste generation, management and disposal activities;

3. A discussion of the procedures and the results of a site inspection conducted by a qualified environmental professional which identifies specific historical waste management procedures or current waste management activities which have caused, are suspected to have caused, or are currently causing adverse environmental impact. Of special concern is the identification of any solid waste management units at these properties. This report should include facility maps indicating those areas of concern;

4. Photographs of those areas and/or units identified under 3. above; and

5. A summary of the results of the waste management assessment for the facility, including a discussion of informational gaps and a recommendation for the necessity of further environmental investigations for those units or areas specifically identified under 3. above based on the findings of the review and site inspection.

These reports would be required to be submitted to the Agency for review and approval by no later than December 31, 1997. Based upon the results of this assessment, the Agency and Safety-Kleen would determine the necessity for RFI Phase I activities, including sampling/analysis if necessary, at those suspect locations and/or units identified within the waste management assessment report. It is respectfully requested that Safety-Kleen contact the Agency prior to conducting the site inspection at these two locations and provide the Agency with an opportunity to accompany Safety-Kleen personnel during these inspections.

Currently, the facility RCRA Part B calls for submission of the RFI Phase I Workplan by March 4, 1994. Should additional time be needed to complete this submittal, Safety-Kleen should contact the Agency to modify the submission date.

Should you have any questions regarding this letter, please contact Eric Minder at 217/524-3300.

Sincerely,

Douglas W. Clay, P.E.
Hazardous Waste Branch Manager
Permit Section, Bureau of Land

DWC:EM
SKM

cc: USEPA Region V - George Hamper

State of Illinois
ENVIRONMENTAL PROTECTION AGENCY

Mary A. Gade, Director
2200 Churchill Road, Springfield, IL 62794-9276
217/524-3300

August 30, 1994

Mr. Scott Davies
Safety-Kleen Envirosystems
1000 N. Randall Road
Elgin, Illinois 60123-7857

Re: 0310690006 -- Cook County
Safety-Kleen Envirosystems
ILD980613913
Date Received: March 7, 1994
Log No. B-120-CA 1

Dear Mr. Davies:

The RCRA Facility Investigation (RFI) Phase I Workplan for the above-referenced facility submitted by Safety-Kleen Envirosystems has been reviewed by this Agency. This workplan was submitted in accordance with Condition IV.B.2 of the RCRA Part B permit issued for the above-referenced facility (Log No. B-120) on September 29, 1993. The workplan is hereby approved subject to the following conditions and modifications:

1. This RFI Phase I Workplan shall be carried out to investigate for possible releases from the following solid waste management units (SWMUs):

SWMU NO.	NAME
1	Process Area
2	West Tank Farm Area (including Tank Farms #3, 4, 5 and 6 and Process Areas)
3	Former Southeast Tank Farm Area
4	East Field
5	Truck Stations #3, 4, 5, 6, 9 & 10
6	Driveway to Facility
7	Newly Sited Areas:

a. Former Barker Chemical Property
b. Former Rexnord/Precision Aire Property
c. Ayri-chain Property

As stated in Condition IV.A.1 of the RCRA Part B Permit issued for the Safety-Kleen/Dolton facility, the purpose of the required Phase I investigation is to demonstrate whether or not hazardous wastes or hazardous constituents have been released from the SWMUs identified above. Therefore, the review of this RFI Phase I Workplan was conducted with this goal in mind.

2. RFI Phase I activities be completed by February 1, 1995. When Phase I is complete, the owner or operator must submit to the Agency certification both by a responsible officer of the owner or operator and by an independent registered professional engineer that the facility completed Phase I in accordance with the specifications in the approved RFI Phase I workplan. In addition, a certification statement meeting the requirements of 35 IAC 702.126 must be provided by a responsible officer of the laboratory which conducted the chemical analyses that the requirements of this letter were met during the chemical analyses of all samples. This certification must address the applicable sample collection, preservation, handling preparation and analytical requirements set forth in this letter. These certifications must be received at this Agency after completing Phase I, or by eight months for certification March 3, 1995. These dates may be extended if Safety-Kleen submits information to the Agency indicating that it is attempting to complete the required activities in a timely manner but needs additional time to complete the investigation.

   The attached certification forms must be used. Signatures must meet the requirements of 35 Ill. Adm. Code Section 702.126. The independent engineer should be present at all critical, major points (activities) during the RFI. These might include soil sampling, soil removal, backfilling, final cover placement, etc. The frequency of inspections by the independent engineer must be sufficient to determine the adequacy of each critical activity.

   The Illinois Professional Engineering Act (Ill. Rev. Stat., Ch. 111, par. 5105 et. seq.) requires that any person who practices professional engineering in the State of Illinois or implies that he (she) is a professional engineer must be registered under the Illinois Professional Engineering Act (par. 5101, Section 1). Therefore, any certification or engineering services which are performed for a RFI workplan in the State of Illinois must be done by an Illinois P.E.

   Plans and specifications, designs, drawings, reports, and other documents rendered as professional engineering services, and revisions of the above must be sealed and signed by a professional engineer in accordance with par. 5119, Section 13.1 of the Illinois Professional Engineering Act.

   As part of the certification, to document the RFI Phase I activities at your facility, please submit a Phase I Report and Summary which includes, at a minimum:

   a. The information identified in Condition 29 below regarding the required soil sampling/analysis effort at each SWMU where such an investigation is necessary;

   b. Information which the workplan indicates will be in the report;

   c. A chronological summary of Phase I activities and the cost involved.

d. Color photo documentation of Phase I activities;

e. A description of the qualifications of personnel performing and directing the RFI activities including contractor personnel; and

f. A general discussion of the activities which should be carried out as part of Phase 2 of the RCRA Facility Investigation.

The original and two (2) copies of all certifications, logs, or reports which are required to be submitted to the Agency by the facility should be mailed to the following address:

Illinois Environmental Protection Agency
Division of Land Pollution Control -- #33
Permit Section
2200 Churchill Road
Post Office Box 19276
Springfield, Illinois 62794-9276

3. If the Agency determines that implementation of this RFI Workplan fails to satisfy the requirements of Section IV of the RCRA Part B Permit (Log No. B-120), the Agency reserves the right to require that additional work be completed to satisfy these requirements. Revisions of RFI Workplans are subject to the appeal provisions of Section 40 of the Illinois Environmental Protection Act.

(4.) The Agency cannot accept the proposed recommendation of no further investigation of the Process Area located within the South Warehouse Building, based on the results of a previous integrity evaluation. It was noted that the primary objective of the integrity inspection conducted by the registered professional engineer was to assess the existing integrity of the pavement and secondary containment structures relative to preventing migration of releases to underlying and/or surrounding soils. As such, the certification does not provide an evaluation of the potential for any past migration through the pavement or secondary containment structures.

Information regarding environmental investigations in the area of the Process Building indicate some contamination is likely present beneath and/or around the building. Samples collected from the borehole designated as 1979-2 indicated gasoline odors at the 2.5 and 5 foot depth interval (no mention of chemical odors were noted from the samples collected from the deeper intervals). Releases of hazardous wastes/hazardous constituents within the secondary containment system of the South Warehouse are documented. It is also stated within the subject submittal that minimal information regarding operations within the building is available for operations within the building prior to 1987. Therefore, it is possible that releases within the building occurred prior to 1987.

As such, the issue of whether the pavement and secondary containment system were adequate at that time is the issue; one which cannot be evaluated now. The integrity evaluation presented within the subject submittal did not demonstrate conclusively that the pavement and containment system of the Process Area have been impermeable over the entire operating life of the structure. Therefore, in order to determine whether the secondary containment system of the Process Area prevented migration of hazardous wastes/hazardous constituents, limited sampling/analysis should be conducted around the perimeter of the building. A minimum of four borings shall be performed around the perimeter of the Process Area building, with soil samples collected from the 6-12 and 18-24 inch depth interval. Boring locations shall be biased towards locations where released materials may be present, such as locations near deteriorated area of the containment system, low lying areas, and stained areas. All soil samples collected must be analyzed for volatile organics in accordance with the analytical method outlined in Condition 11. The results of this investigation must be included in the RPI Phase I report required by Condition 22 below.

5. Should the proposed environmental investigations in the area of the West Tank Farm include coring through the secondary containment system then the corings must be properly sealed to ensure the requirements of 35 IAC 724, Subpart J are met. After the corings are sealed, an integrity evaluation, in accordance with the procedures outlined below, must be conducted after the proposed sampling/analysis activities have been completed for the West Tank Farm area.

   The integrity evaluation should be conducted as follows:

   An independent registered professional engineer shall inspect the integrity of the concrete surfaces. These surfaces shall be inspected for cracks which penetrate through the concrete/asphalt. In addition, all construction joints must be inspected to ensure that they are watertight. This inspection must be carried out in accordance with the standards and recommendations of professional/technical entities such as the American Concrete Institute, the Portland Cement Association, the American Society for Testing and Materials, the American Society of Civil Engineers, etc., which relate to the ability of the concrete/asphalt to contain liquids. The results of this inspection shall be submitted in the form of a report. The report must include (1) a discussion of the procedures used to conduct the inspection, including reference to the standards/recommended procedure used, (2) the results of the inspection, (3) scaled drawings showing the location of all cracks and construction joints observed during the investigation, (4) conclusions reached regarding any cracks or construction joints observed in the areas of concern, (5) justification for the conclusions reached (e.g., information must be provided which indicates that any construction joints in the areas are indeed watertight), and (6) photographs to support the conclusions reached.

Additionally, if environmental investigations include coring through the concrete/asphalt surfaces of the tank farm, Safety-Kleen should provide diking around the cored area until the surfaces have been adequately sealed. This diking is necessary to minimize the potential for any release of hazardous waste/hazardous constituents into the underlying soils while this investigation is being conducted.

6. A review of Agency files indicates disposal activities may have taken place on the Barker Chemical site located north of the Safety-Kleen facility on 138th Street. A June 20, 1985 report by Ecology and Environment states that solvent contaminated still bottoms were dumped directly onto the ground, and numerous containers holding wastes were observed to be leaking during IEPA and USEPA inspection. Since it appears that waste disposal practices may have been conducted at this site, the proposed environmental investigations should be expanded in an effort to demonstrate that no contamination is present on the property now owned by Safety-Kleen. To demonstrate that no contamination exists, the Permittee shall conduct a soil gas survey of the soils in this area. The soil gas sample locations shall be based on a sampling grid with a sample interval of no greater than 40 feet. Soil samples shall be collected at locations where soil gas concentrations exceed background levels. Should the soil gas survey indicate no evident impact to the soils from suspected operations, a minimum of two soil samples shall be collected from the "disturbed area" at shallow intervals, and analyzed in accordance with Condition 11 below. Should the results of such investigations indicate no environmental impacts, then the Barker Chemical property will not be considered a SWMU of concern, and no additional RFI investigations will be required for this area.

7. The proposed analytical parameter list proposed in the subject submittal appears adequate to detect most of the parameters which were managed at the facility. However, since little information is known regarding the types or volumes of wastes managed at the facility while under Barker Chemical operation, the possibility of parameters outside the list proposed in the submittal is possible. One of the Agency's concerns is the potential for mismanagement/releases of waste oils containing PCBs at the site. Therefore, soil samples collected from the borings designated as EF-1, W-2, W 6, D-1 and one boring from the Barker Chemical property for laboratory analysis must be analyzed for PCBs in accordance with SW-846 Method 8080. Should the Phase I investigation results indicate that PCBs are not constituents of concern at this facility, the requirement for analysis for these parameters will be dropped from the Phase II assessment.

8. In the event that soil conditions do not allow complete recovery in accordance with Attachment 7, Safety-Kleen must conduct sampling in a manner to minimize volatilization of organic compounds. Such procedures should include minimization of disturbance of the sample (i.e., no mixing, no compositing, no aeration), minimal handling of the samples between collection and preservation, and adequate preservation of the samples (e.g., no headspace, storage of the samples on ice).

21. Reports must be prepared and submitted to the Agency which describe the activities completed each quarter of the calendar year while the Phase I investigation is being carried out. The quarterly reports shall contain at a minimum:

    a. An estimate of the percentage of the investigation completed;

    b. Summary of activities completed during the reporting period;

    c. Summaries of all actual or proposed changes to the Workplan or its implementation;

    d. Summaries of all actual or potential problems encountered during the reporting period;

    e. Proposal for correcting any problems;

    f. Projected work for the next reporting period; and

    g. Other information or data as requested in writing by the Agency's DLPC.

22. A quarterly report for the work completed from the date of this letter to October 1, 1994 (the first quarter of the current calendar year during which the required Phase I investigation is taking place) must be submitted to the Agency by October 15, 1994. Subsequent quarterly reports must be submitted in a similar manner until the final Phase I RFI Report is submitted to the Agency.

23. The portion of the final RFI Phase I report documenting the results of the required soil sampling/analysis effort must contain the following information, for each SWMU investigated:

    a. A discussion of (1) the reason for the sampling/analysis effort conducted at each SWMU and (2) the goals of the sampling analysis effort conducted at each SWMU;

    b. A scaled drawing showing the horizontal and vertical location where all soil samples were collected at each SWMU;

    c. Justification for the locations from which soil samples were collected;

    d. A description of the procedures used for:

        1. Sample collection;

        2. Sample preservation;

3. Chain of custody; and

4. Decontamination of sampling equipment.

e. Visual classification of each soil sample collected for analysis;

f. A discussion of the results of any field screening efforts;

g. A description of the soil types encountered during the investigation, including scaled cross-sections;

h. A description of the procedures used to analyze the soil samples, including:

1. The analytical procedure used, including the procedures, if any, used to prepare the sample for analysis;

2. Any dilutions made to the original sample;

3. Any interferences encountered during the analysis of each sample; and

4. The practical quantitation limit achieved, including justification for reporting PQLs which are above those set forth in SW-846.

i. A description of all quality control/quality assurance analyses conducted, including the analysis of lab blanks, trip blanks and field blanks;

j. A description of all quality assurance/quality control efforts made overall;

k. A summary of all analytical data, including QA/QC results, in tabular form;

l. Copies of the final laboratory sheets which report the results of the analyses, including final sheets reporting quality assurance/quality control data;

m. Colored photographs documenting the sampling effort; and

n. A discussion of the collected data. This discussion should identify those sample locations where contaminants were detected and the concentrations of the contaminants. Conclusions which can be drawn from the information compiled should also be included in this discussion.

Should you have any questions regarding this matter, please contact Eric Minder at 217/524-3274.

Sincerely,

Douglas W. Clay, P.E.
Hazardous Waste Branch Manager
Permit Section, Bureau of Land

DWC:EM/mls/sp323W/1-11
JCM

Attachments: RFI Phase I Certification
RFI Phase I Laboratory Certification Statement

cc: USEPA Region V -- George Hamper

State of Illinois
ENVIRONMENTAL

Mary A. Gade, Director
217/524-3300

August 17, 1995

RECEIVED
AUG 21 1995
EHS Dept - Remediation
SAFETY-KLEEN CORP.

Safety-Kleen Corporation
Attn: Mr. Gary Long, Manager-Remediation
1000 North Randall Road
Elgin, Illinois 60123

Re: 0310690006 -- Cook County
Safety-Kleen Envirosystems (Dolton)
ILD980613913
Date Received: March 3, 1995
Log No. B-120-CA-1
RCRA - Permit

Dear Mr. Long:

This letter is in response to the Phase I RCRA Facility Investigation ("RFI") Report for the above-referenced facility which you submitted February 27, 1995. This report was prepared on your behalf by TriHydro Corporation and was submitted in accordance with Condition 2 of this Agency's August 30, 1994 RFI Phase I Workplan approval letter and the final RCRA permit issued to the above-referenced facility. The subject Phase I RFI report is hereby approved subject to the following conditions and modifications:

1. Based upon a review of the subject submittal, a Phase II investigation should be conducted at the following areas. The "Areas" listed below have been created in order to group together SWMUs which are in close physical proximity to each other. Any references to SWMUs in this letter is intended to refer to these Areas. Phase II of the RCRA corrective action process should concentrate on the Areas as a whole and not on individual units:

   a. Southern Area: This area includes former Tank Farm D, the Former Southeast Tank Farm, Truck Station Nos. 3 and 10, and the former UST.

   b. Central Area: This area includes Truck Station Nos. 4 and 9, and Tankfarm Nos. 3, 4, 5, and 6.

   c. Northwestern Area: This area includes the North Warehouse Pad and Truck Station Nos. 5 and 6.

   d. East Field: This area includes the East Field and Tank Farm No. 2.

   e. Barker Chemical Property

   f. Rexnord/Precision Aire Property

   g. Agri-Chain Area

2. It is understood that reports as summarized in the Agency's March 9, 1994 letter for the Former Rexnord/Precision Aire Property and the Agri-Chain area SWMUs present at the subject facility will be submitted to the Agency for review and approval by no later than December 31, 1997.

3. Due to the unique nature of the Barker Chemical Property area relative to the other SWMUs at this facility, further corrective action activities at this SWMU should be carried out separately from such activities at the other SWMUs of concern at this facility. Therefore, a separate workplan for this SWMU for further corrective action activities at this SWMU should be submitted to the Agency by November 15, 1995. This workplan should contain a general description of the corrective action activities which Safety-Kleen would propose to carry out at this SWMU. A thorough description of the initial investigation efforts and/or interim measures to be carried out must also be provided in this workplan. This workplan should be developed in general accordance with the final RCRA permit issued to the subject facility and IEPA/USEPA guidance regarding RCRA corrective action.

4. While the Agency agrees with the last paragraph on Page 6-11 of the subject submittal which was concerned with the idea that the phenol and phthalates detected throughout the site are not related to any past or present releases, the Agency is still unable to explain their presence in numerous soil samples. The possibility of larger values at an even greater depth needs to be evaluated. Therefore, the Agency is requesting that three additional borings be conducted as part of the Phase II investigation at depths sufficient enough to demonstrate conclusively that the levels of phenols and phthalates are decreasing with depth. If this is demonstrated, then no further action will be required for the levels of phenols and phthalates currently found on site.

5. The next step in the general RCRA corrective action process for the subject facility is the development of a Phase II RFI Workplan for further investigation at the Areas (SWMUs) identified in Condition 1.a through 1.d above. Phase II of the RFI should focus on determining the rate and extent of migration of hazardous waste or hazardous constituents and the concentration of the hazardous waste or hazardous constituents in the soil at each SWMU of concern. This Phase II Workplan should be submitted to the Agency by October 15, 1995 and should be developed in accordance with this letter, and Section IV and Attachment F of the September 29, 1993 final RCRA permit issued to the above-referenced facility (B-120).

   a. Safety-Kleen may propose to conduct certain Phase III activities (investigation for possible groundwater contamination) in conjunction with Phase II activities in order to avoid duplication of effort and to shorten the amount of time necessary for the corrective action process. Development of any portions of this Phase II workplan which deal with a groundwater investigation (Phase III investigation) should be carried out in accordance with

Attachment F of the final RCRA permit issued to the subject facility.

b. The Agency understands that certain activities to be proposed by Safety-Kleen as part of the Phase II investigation may include investigations near the SWMUs referenced in Condition 2 above.

Should you have any questions regarding this matter, please contact Michael A. Heaton at 217/524-3312.

Sincerely,

Edwin C. Bakowski, P.E.
Manager, Permit Section
Bureau of Land

ECB:mah

cc: USEPA Region V -- George Hamper
Jack G. Bedessem, P.E. -- TriHydro Corporation (Laramie, WY)

State of Illinois
ENVIRONMENTAL PROTECTION AGENCY

Mary A. Gade, Director

2200 Churchill Road, Springfield, IL 62794-9276

217/524-3300

February 21, 1996

Safety-Kleen Corporation
Attn: Ms. Anne Lunt, Remediation
1000 North Randall Road
Elgin, Illinois 60123

Re: 0310690006 -- Cook County
Safety-Kleen Envirosystems (Dolton)
ILD980613913
Date Received: October 16, 1995
Log No. B-120-CA-1
RCRA - Permit

Dear Ms. Lunt:

This letter is in response to a document which you submitted entitled "RCRA Facility Investigation Phase II Extent of Release Assessment and Phase III Groundwater Release Assessment Workplan", dated October 13, 1995. This document was submitted in accordance with Condition 5 of the Agency's August 17, 1995 RFI Phase I Report approval letter regarding RCRA corrective action activities being carried out in accordance with the final RCRA permit issued for operation of the above referenced facility. As stated in Condition 3 of the Agency's August 17, 1995 letter, it is understood that the subject document does not contain information related to the Barker Chemical No. 2 Area and that RFI activities for the Barker Chemical No. 2 Area are being conducted under a separate report (a workplan for Phase II activities for the Barker Chemical No. 2 Area was received by the Agency on December 7, 1995).

This Phase II Extent of Release Assessment and the Phase III Groundwater Release Assessment Workplan is hereby approved subject to the following conditions and modifications:

1. The proposed soil sampling locations as shown on Figure 4-1 of the subject submittal are acceptable to the Agency, with one minor addition. One additional 'lateral extent' sampling location should be added approximately forty feet west of previous soil sampling location EF-1 in the East Field Investigation Area. The purpose of this additional soil sample is to determine if the constituents detected in the shallow interval at EF-1 has migrated westward.

2. Each soil sample should be analyzed for those parameters listed in Table 4-2 of the subject submittal using the appropriate test methods. Soil samples that are collected in the vicinity of the East Field Investigation Areas should also be analyzed for polychlorinated biphenols (PCBs).

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3. Section 4 of the subject submittal describes the procedures for abandoning boreholes drilled during the investigation. Safety-Kleen must meet the abandonment and reporting requirements listed in 77 IAC Part 920 for the Illinois Department of Public Health.

4. The proposed use of 15' screens in the design of new monitoring wells due to the low permeability of the silty clay subsurface is unacceptable to the Agency. The screen lengths must not exceed 10'.

5. The proposed use of PVC casing material for the construction of the new monitoring wells may be unsatisfactory due to the nature of contamination detected and expected in the soil and groundwater. Therefore, where high concentrations of volatile and/or semi-volatile organic compounds are expected or detected in the groundwater, stainless steel or an equally inert material shall be used.

6. Boreholes shall be logged by a qualified geologist, using Agency-acceptable boring log forms (attached). Monitoring well construction details shall be recorded on Agency-acceptable forms (attached) and submitted to the Agency in the report required by Condition 7 below. Additionally, Safety-Kleen must meet the well construction and reporting requirements listed in 77 IAC Part 920 for the Illinois Department of Public Health.

7. A report documenting the results of the efforts approved by this letter should be submitted to the Agency by December 1, 1996. If Safety-Kleen finds that additional time is needed to complete the Phase II Report a time extension may be granted by the Agency. This report should contain (a) a summary of the Phase II data, including conclusions concerning extent of impacts defined during the Phase II investigation and (b) a quality assurance evaluation of the data generated by the Phase II RFI. It is understood that the above referenced December 1, 1996 date will allow for one sampling event of groundwater monitoring data to be included in the subject report. The sampling data from the second groundwater sampling event should be submitted as an addendum to the report. This addendum should be submitted to the Agency by February 1, 1997 and should contain sampling event results as well as any conclusions reached from this data. Information in the report regarding soil sampling/analysis efforts should be developed in general accordance with the attached document entitled "Recommended Contents of RCRA Soil and/or Groundwater Investigation Reports" and the procedures set forth in the subject submittal.

8. An independent professional engineer licensed to practice in the State of Illinois, or his designee, must oversee all activities approved by this letter.

9. The certification requirements set forth in 35 Ill. Adm. Code 702.126 must be met when submitting the report required by Condition 7 above. This certification must indicate that the combined Phase II/Phase III investigation was carried out in accordance with the

approved workplan, including any modifications/conditions contained in the Agency's letter approving the workplan. The certification statement which must be signed to meet this requirement is attached (entitled Certification Statement, Combined Phase II/III of the RCRA Facility Investigation, Safety-Kleen, Dolton, Illinois, Log No. B-120-CA-1).

The certification statement identified above must be signed by a responsible officer of the owner or operator, as defined in 35 Ill. Adm. Code 702.126(a). In addition, the independent licensed professional engineer overseeing the proposed activities, as identified in Condition 8 above, must also sign and seal the certification statement mentioned above. By signing this certification statement, both the owner/operator and the licensed professional engineer overseeing the proposed activities certify that the activities were carried out in accordance with Agency approved procedures.

Finally, a second certification statement must be signed by a responsible officer of the laboratory which conducted any required chemical analyses associated with this combined Phase II/III RFI. This certification must indicate that all applicable sample collection, preservation, handling, preparation and analytical procedures for which the laboratory was responsible were carried out in accordance with the approved workplan, including any conditions/modifications imposed in the Agency's letter approving the workplan. This second certification must also be signed by a responsible officer of Safety-Kleen. The certification statement which must be signed to meet this requirement is attached (entitled Laboratory Certification Statement, Combined Phase II/III of the RCRA Facility Investigation, Safety-Kleen, Dolton, Illinois, Log No. B-120-CA-1).

10. If the Agency determines that implementation of this RFI Workplan fails to satisfy the requirements of Section IV of the RCRA Part B Permit (Log No. B-120), the Agency reserves the right to require that additional work be completed to satisfy these requirements. Revisions of RFI Workplans are subject to the appeal provisions of Section 40 of the Illinois Environmental Protection Act.

11. All soil samples shall be analyzed individually (i.e., no compositing). Analytical procedures shall be conducted in accordance with Test Methods for Evaluating Solid Wastes, Third Edition (SW-846). When a SW-846 (Third Edition) analytical method is specified, all the chemicals listed in the Quantitation Limits Table for that method shall be reported unless specifically exempted in writing by the Agency. Apparent visually contaminated material within a sampling interval shall be included in the sample portion of the interval to be analyzed.

12. The following procedure must be utilized in the collection of all required soil samples:

    a. The procedures used to collect the soil samples must be sufficient so that all soil encountered is classified in accordance with ASTM Method D-2488.

b. If a drill rig or similar piece of equipment is necessary to collect required soil samples, then:

1. The procedures specified in ASTM Method D-1586 (Split Spoon Sampling) or D-1587 (Shelby Tube Sampling) must be used in collecting the samples.

2. Soil samples must be collected continuously at several locations to provide information regarding the shallow geology of the area where the investigation is being conducted;

c. All soil samples which will be analyzed for volatile organic compounds (VOCs) must be collected in accordance with Attachment 7 of the Agency's RCRA closure plan instructions;

d. Soil samples not collected explicitly for VOC analysis should be field-screened for the presence of VOCs at all locations where VOCs are a concern;

e. All other soil samples must be collected in accordance with the procedures set forth in SW-846; and

f. When visually discolored or contaminated material exists within an area to be sampled, horizontal placement of sampling locations shall be adjusted to include such visually discolored and/or contaminated areas. Sample size per interval shall be minimized to prevent dilution of any contamination.

13. Quality assurance/quality control procedures which meet the requirements of SW-846 must be implemented during all required sampling/analysis efforts. In addition, sample collection, handling, preservation, preparation and analysis must be conducted in accordance with the procedures set forth in SW-846 and the requirements set forth in this letter.

14. If Safety-Kleen Corporation conducts a Phase II investigation which differs from the described above, then it must provide adequate justification in the report required by Condition 7 above for the variances.

15. The Health and Safety Plan contained in the subject workplan is neither approved nor disapproved. Under the provisions of 29 CFR 1910 (51 FR 15,654, December 19, 1986), cleanup operations must meet the applicable requirements of OSHA's Hazardous Waste Operations and Emergency Response standard. These requirements include hazard communication, medical surveillance, health and safety programs, air monitoring, decontamination and training. General site workers engaged in activities that expose or potentially expose them to hazardous substances must receive a minimum of 40 hours of

safety and health training off site plus a minimum of three days of actual field experience under the direct supervision of a trained experienced supervisor. Managers and supervisors at the cleanup site must have at least an additional eight hours of specialized training on managing hazardous waste operations.

16. Reports must be prepared and submitted to the Agency which describe the activities completed each quarter of the calendar year while the Phase II/III investigation is being carried out. The quarterly reports shall contain at a minimum:

    a. An estimate of the percentage of the investigation completed;

    b. Summary of activities completed during the reporting period;

    c. Summaries of all actual or proposed changes to the Workplan or its implementation;

    d. Summaries of all actual or potential problems encountered during the reporting period;

    e. Proposal for correcting any problems;

    f. Projected work for the next reporting period; and

17. The report required by Condition 7 above should contain a general evaluation of the need for corrective measures at the various areas investigated. Guidance regarding the procedures which should be followed in making this determination is contained in the attached guidance document entitled Tiered Approach to Cleanup Objectives. It must be noted that any final Agency action on the development of cleanup objectives will be subject to the appeal provisions of Section 39(a) and 40(a) of the Illinois Environmental Protection Act.

18. The first quarterly report for the months of January-March, 1996 should be submitted to the Agency by April 30, 1996. Reports for future quarters of the calendar year should be submitted in a similar fashion (i.e., at the end of the month which follows the quarter for which the report is due).

Should you have any questions regarding this matter, please contact Michael A. Heaton at 217/524-3312.

Sincerely,

Edwin C. Bakowski, P.E.
Manager, Permit Section
Bureau of Land

ECB:MAH:bjh\963632S.WPD

Attachments: Recommended Contents of RCRA Soil and/or Groundwater Investigation Reports
Agency Groundwater Boring Logs
Monitoring Well Construction Form
Certification Statement
Laboratory Certification Statement
Tiered Approach to Cleanup Objectives

cc: USEPA Region V -- Hak Cho
Jack G. Bedessem, P.E. -- TriHydro Corporation (w/o att)

OVERNIGHT DELIVERY
RETURN RECEIPT REQUESTED

June 26, 1996

Mr. Ken Lovett
Illinois Environmental Protection Agency
2200 Churchill Road
Springfield, IL 62794-9276

RE: Results of Teleconferences Between Safety-Kleen Corp and the Illinois Environmental Protection Agency Regarding the RCRA Facility Investigation at the S-K Recycle Center, Dolton, Illinois (ILD 980613913)

Dear Mr. Lovett:

The purpose of this letter is to document and summarize the June 5 and 6, 1996 teleconferences between Safety-Kleen Corp. (S-K) and the Illinois Environmental Protection Agency (IEPA) The teleconferences focused on the ground-water assessment portion of the RCRA Facility Investigation being conducted at S-K recycle center in Dolton, IL. Anne Lunt (S-K), Ken Lovett (IEPA) and Charlie DeWolf (TriHydro Corporation) participated in the discussions.

June 5, 1996 Teleconference

S-K faxed two maps showing proposed monitoring well location changes and preliminary field screening data to IEPA, prior to the teleconference. The map showing the proposed monitoring well changes is presented as Figure 1. S-K proposed monitoring well location changes based on the following rationale:

1. Delete MW-3. Based on existing ground-water flow information, proposed monitoring wells MW-3, MW-4 and MW-12 were located downgradient of the Southern Investigation Area. S-K proposed using the results of the initial upcoming ground-water monitoring event (July 1996) to determine whether MW-3 is necessary and/or located appropriately. S-K indicated that a temporary ground-water monitoring point may be installed in this general area based on the results of the July 1996 monitoring.

2. Delete MW-11. This well is located side gradient to the impacted areas, based on the previously documented ground-water flow direction. However, during the Phase I investigation, an apparent ground-water mound was identified at the location of wells D-1 and W-4 (Figure 1). S-K proposed to use the results of the initial ground-water monitoring event (July 1996) to confirm the existence of the apparent ground-water mound. If the July 1996 data confirm that this location is downgradient of facility related impacts, S-K will coordinate installation of a well in the general area of proposed location MW-11.

3. Move MW-6. S-K proposed to install this well immediately downgradient of the Northern Investigation Area, at a location where impacts from the Northern Investigation Area (if

any) would most likely be detected. Based on re-evaluation, the revised location should be more accessible, and better capable of detecting impacts, if present.

4. Delete MW-10. S-K proposed to use the results of the July 1996 monitoring to determine whether installation of this well in the general area shown is appropriate. The location as shown on Figure 1 is inaccessible due to the presence of buried utilities.

5. Move MW-13. S-K proposed to move MW-13 to the north due to access restrictions and the presence of underground utilities in the original location.

6. Move MW-9. S-K proposed to move MW-9 slightly south due to access restrictions and the presence of an overhead pipe rack at the original location.

Mr. Lovett (IEPA) indicated that IEPA was in agreement with the proposed changes.

The hand drafted map showing the field screening data is presented as Figure 2. The field screening data consisted of total organic vapor concentrations (TOV) measured on soil headspace. Two photoionization detectors (PIDs), equipped with 11.7 eV and 10.6 eV lamps, were used to measure relative TOV concentrations.

Figure 2 shows that TOV was detected in the headspace of samples collected at depths greater than 20 feet below ground surface (ft-bgs) from borehole VB-3. Samples from three intervals in boring VB-3 were submitted to the laboratory for 24-hour rush analysis by EPA Method 8240. The sample intervals were 22-24 ft-bgs, 34-36 ft-bgs, and 36-38 ft-bgs. The purpose of the rush analyses was to determine whether the low TOV concentrations (recorded in the headspace of the soil samples between 0 and 6 ppm) were due to background instrument readings or the presence of volatile organic constituents.

The elevated TOV concentration was recorded in the headspace of the 22-24 ft-bgs interval. This sample was collected from a silty sand layer that appeared to be saturated with water. Mr. Lovett requested that S-K consider constructing an intermediate well at this location, depending on the results of the laboratory soil sample analyses. The well should be screened across the saturated sand in the 22-24 ft-bgs interval. S-K proposed to discuss the laboratory results with IEPA on June 6, 1996.

June 6, 1996 Teleconference

During the June 6, 1996 teleconference, S-K reported the preliminary results of the rush analyses to IEPA. The preliminary results of the volatile organic compound analyses are summarized below:

VB-3(32-34): Toluene 0.06 mg/kg; All others not detected.

VB-3(34-36): Toluene 0.042 mg/kg; All others not detected.

VB-3(36-38): Acetone 0.26 mg/kg; Toluene 0.0275 mg/kg; All others not detected.

The detected constituent concentrations do not exceed any of the IEPA Tier I cleanup objectives. Therefore, S-K proposed that deeper soil or ground-water sampling did not appear to be necessary. S-K indicated intent to install a temporary monitoring well, screened across 22 to 24 ft-bgs, to determine whether this interval may serve as a potential pathway for the migration of ground-water impacts from the upper (5-15 ft-bgs) saturated interval. S-K proposed to pull the casing and abandon the temporary well, if sampling results indicated that ground-water quality met IEPA Class II objectives.

Temporary Well Installation

S-K installed a temporary well adjacent to MW-7 on June 7, 1996. The temporary well was constructed of 2-inch Schedule 40 screen and riser with a screened interval between 20 and 25 ft-bgs. A filter pack was emplaced against the screen and a seal of hydrated bentonite chips was emplaced between ground surface and 19.5 ft-bgs.

The temporary well was checked for the presence of water on June 7, 1996 and June 9, 1996. No water had entered the temporary well as of June 9, 1996. S-K intends to check the temporary well for the presence of water during the week of June 24, 1996, and will purge and sample the well if possible. Water level and analytical results (if any) from the temporary well will be reported to IEPA in the next quarterly report, which is scheduled to be submitted by July 31, 1996.

S-K appreciates the cooperation and assistance that IEPA has provided with this project. If you have any questions concerning this submittal, please feel free to contact me at (847) 468-2216 or Charlie DeWolf (TriHydro Corporation) at (307) 745-7474.

Sincerely,
SAFETY-KLEEN CORP.

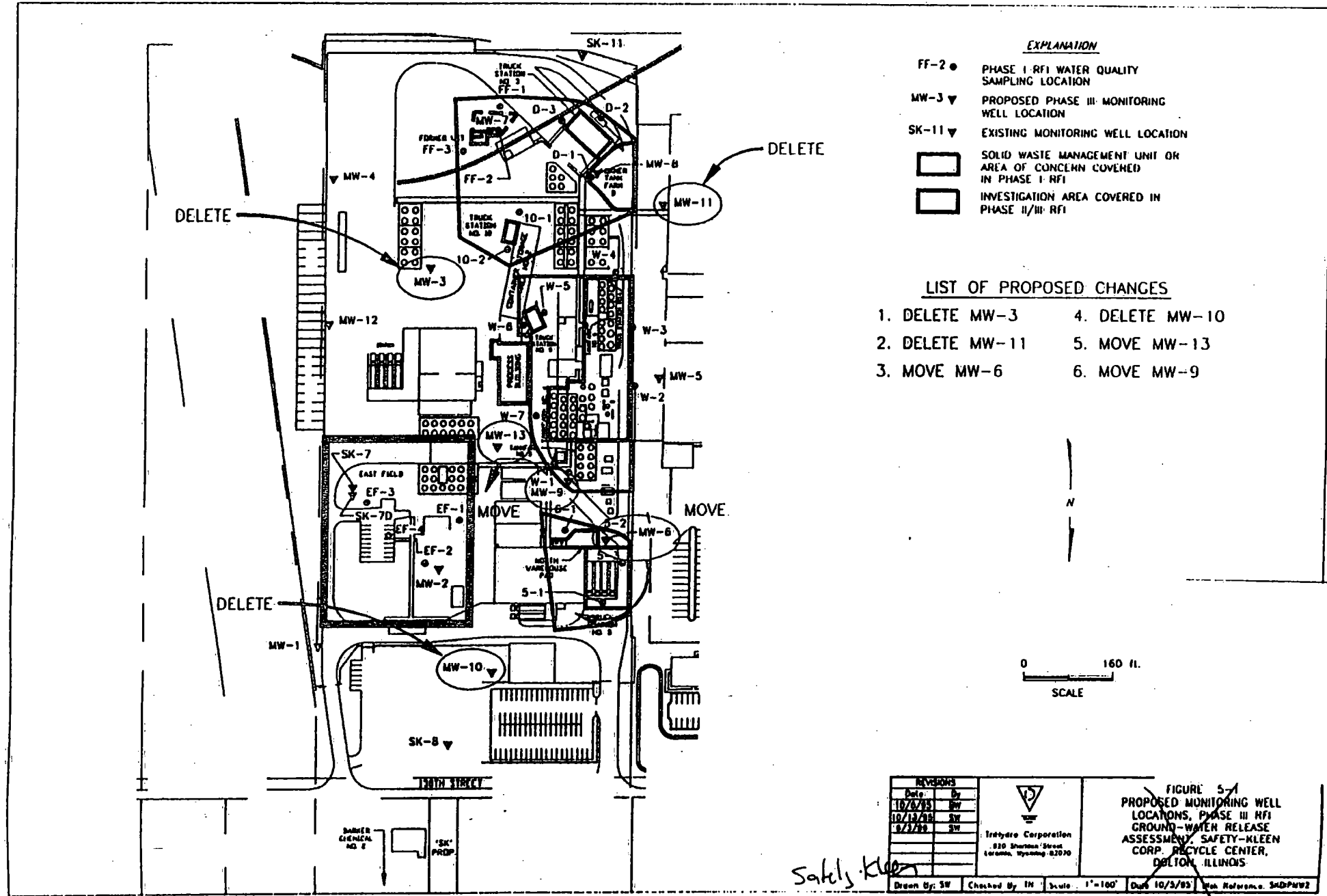
Anne Lunt

Anne Lunt
Senior Project Manager - Remediation

AL:CD:ab/32-08

Enclosures

cc: Mike Heaton (IEPA)
Keith Marcott (S-K, Elgin)
John Valerius (S-K, Dolton)
Ed Desocio (S-K, Dolton)
TriHydro Corporation



Safety Kleen

FIGURE 1. Proposed Monitoring Well Location Changes, Dolton Recycle Center, Dolton, Illinois.

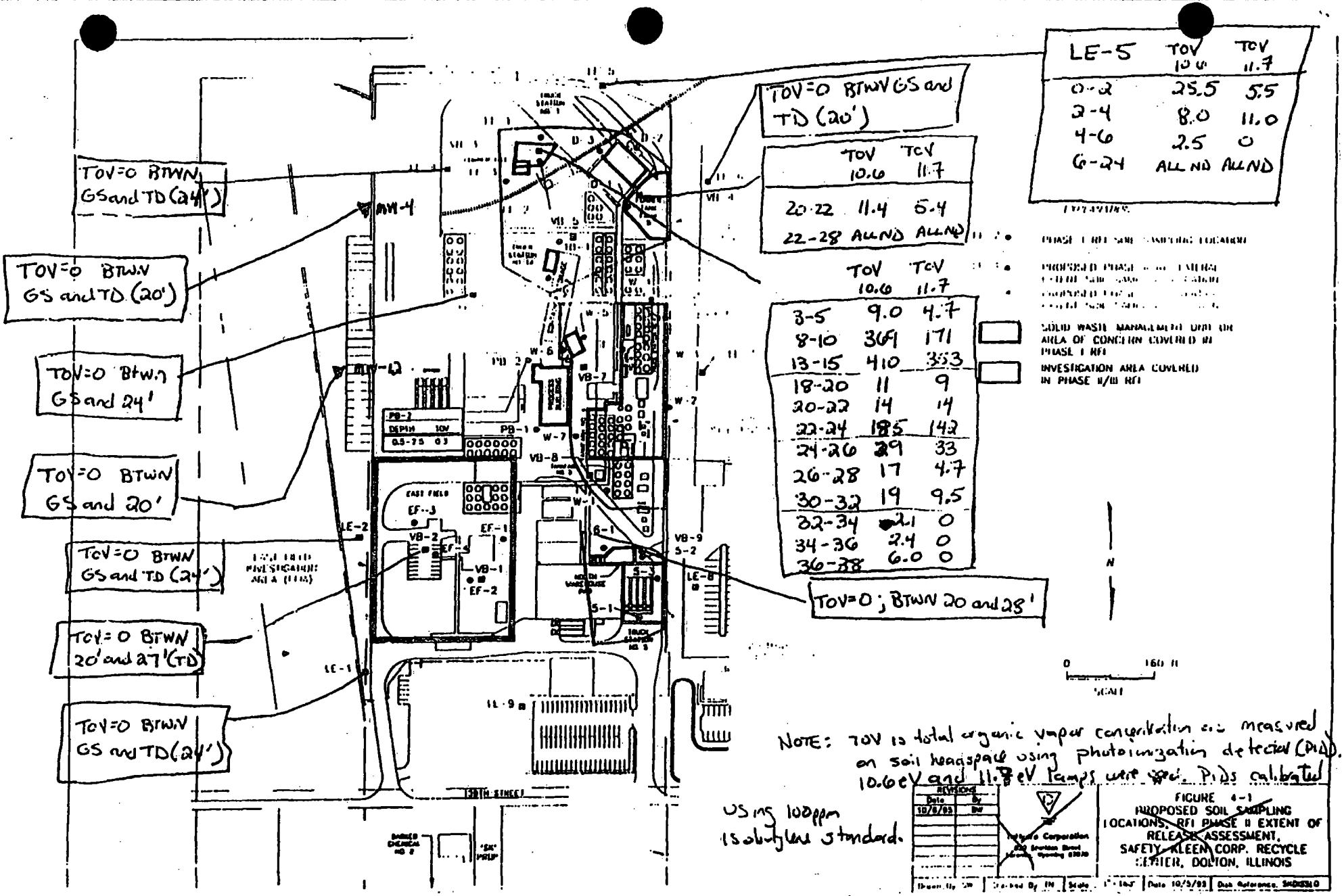


Figure 2. Field screening results through June 4, 1996, RCRA Facility Investigation, Safety-Kleen Corp Recycle Center, Dolton Illinois

9. All Quality Assurance/Quality Control (QA/QC) procedures must be conducted in accordance with those as outlined in SW-846, Chapters 1 and 2. The use to these standardized procedures for QA/QC will allow a standardized review of the analytical data. All preservation and handling, including chain of custody, of the samples shall be conducted in accordance with the appropriate procedures outlined in SW-846, Chapter 2, and any required procedures outlined in the specific sample analytical method.

10. In accordance with an agreement between Safety-Kleen and Agency representatives, background sampling and analysis, if necessary, will be deferred until after submittal of the RFI Phase I report.

11. Since the results of the photoionization unit analysis will be useful in determination of the extent of contamination within each of the boreholes, the Agency requires that Safety-Kleen provide the Agency with a report detailing the results of the photoionization unit analysis in tabular form. This report should include at a minimum: 1) documentation that the unit was operated in accordance with the manufacturer's specifications, 2) a description of the calibration procedures used as part of each investigation effort, 3) analysis procedures, and 4) a summary of the analytical results by depth and by borehole. This information should be presented in the RFI Phase I Report.

12. All soil samples shall be analyzed individually (i.e., no compositing). Analytical procedures shall be conducted in accordance with Test Methods for Evaluating Solid Wastes, Third Edition (SW-846). When a SW-846 (Third Edition) analytical method for organic analytes is specified, all the organic chemicals listed in the Quantitation Limits Table for that method shall be reported unless specifically exempted in writing by the Agency. Apparent visually contaminated material within a sampling interval shall be included in the sample portion of the interval to be analyzed. To demonstrate a parameter is not present in a sample, analysis results must show a detection limit at least as low as the PQL for that parameter in the third edition of SW-846. For inorganic parameters, the detection limit achieved during the analysis of the TCLP extract must be at least as low as the RCRA Groundwater Detection Limits, as referenced in SW-846 (Third Edition) Volume 1A, pages TWO-29 and TWO-30, Table 2-15. Unless specified otherwise above, each soil sample collected for laboratory analysis must be analyzed for, at minimum;

    - SW-846 Method 8240 for volatile organic compounds;
    - SW-846 Method 8270 for semi-volatile compounds;
    - SW-846 Method 8080 for PCBs; and ;
    - SW-846 Methods 1311, 2060, 6010, 7470 and 7740 for metals (note that the analyses for metals must be conducted on the extract from the TCLP test)

13. The following procedure must be utilized in the collection of all required soil samples:

a. The procedures used to collect the soil samples must be sufficient so that all soil encountered is classified in accordance with ASTM Method D-2488.

b. If a drill rig or similar piece of equipment is necessary to collect required soil samples, then:

   1. The procedures specified in ASTM Method D-1586 (Split Spoon Sampling) or D-1587 (Shelby Tube Sampling) must be used in collecting the samples.

   2. Soil samples must be collected continuously at several locations to provide information regarding the shallow geology of the area where the investigation is being conducted;

c. All soil samples which will be analyzed for volatile organic compounds (VOCs) must be collected in accordance with Attachment 7 of the Agency's RCRA closure plan instructions;

d. Soil samples not collected explicitly for VOC analysis should be field-screened for the presence of VOCs at all locations where VOCs are a concern;

e. All other soil samples must be collected in accordance with the procedures set forth in SW-846; and

f. When visually discolored or contaminated material exists within an area to be sampled, horizontal placement of sampling locations shall be adjusted to include such visually discolored and/or contaminated areas. Sample size per interval shall be minimized to prevent dilution of any contamination.

14. If the Agency's DLPC determines, based on the data obtained from the Phase I Workplan activities, that there has been no release of hazardous waste or hazardous constituents to the environment from a SWMU identified in Condition 1 above, then no further investigative action will be required for that SWMU. If the Agency's DLPC determines, based on the data, that there has been a release of hazardous waste or hazardous constituents to the environment or that the data is inconclusive, the Permittee will be notified by the Agency's DLPC.

15. If Safety-Kleen conducts a Phase I investigation which differs from the described above, then it must provide adequate justification in the report required by Condition 2.a above for the variances. As stated in Condition 1 above, the Agency feels that the requirements set forth in this letter are necessary to reach a conclusion that there has not been a release from a given SWMU. If the goals of Safety-Kleen are somewhat different than this, then there <u>may be</u> justification for varying from the requirements set forth in this letter.

16. All wastes generated as a result of corrective action activities (e.g., soil cuttings, purged groundwater, equipment decontamination wash and rinsewaters, etc.) are considered Pollution Control Wastes under the provisions of 35 Ill. Adm. Code Part 809, and therefore, at a minimum, classified as a special waste. Safety-Kleen must appropriately characterize these wastes to determine if they are hazardous by characteristic or listing. Should it be determined that these wastes are hazardous, they must be managed as a hazardous waste. In any event, these wastes are considered special wastes, and must be managed as a special waste.

17. The Agency does not accept the use of the corrective action values specified in 55 FR 30798-30884 (July 17, 1990) as a criteria to determine if a particular SWMU has had an impact on human health and the environment. The Agency notes that these levels are proposed, and have not gone into effect on the State or Federal level. When these values were proposed, IEPA submitted substaantial comments regarding their inadequacy. Also, it must be noted that the proposed soil action levels did not address the impact the residual soil contamination would have on groundwater. The Agency requires that any action level or cleanup objectives used in Safety-Kleen corrective action plan be demonstrated not to adversely impact human health and the environment.

18. Financial assurance for completion of the approved RFI Phase I activities must be provided to the Agency within 60 days of the Agency approval date of the Phase I RFI Workplan.

19. In accordance with 35 Ill. Adm. Code 702.126, Safety Kleen must provide the Agency with certification of the Phase I RFI Workplan report to be submitted to the Agency after completion of the approved Phase I activities. In addition, the Agency requires that a certification be provided for all laboratory work performed for the purpose of the Phase I activities be provided. Forms for both certifications described above are included as attachments to this Agency response.

20. The Health and Safety Plan contained in the subject workplan is neither approved nor disapproved. Under the provisions of 29 CFR 1910 (51 FR 15,654, December 19, 1986), cleanup operations must meet the applicable requirements of OSHA's Hazardous Waste Operations and Emergency Response standard. These requirements include hazard communication, medical surveillance, health and safety programs, air monitoring, decontamination and training. General site workers engaged in activities that expose or potentially expose them to hazardous substances must receive a minimum of 24 hours of safety and health training off site plus a minimum of one day of actual field experience under the direct supervision of a trained experienced supervisor. Managers and supervisors at the cleanup site must have at least an additional eight hours of specialized training on managing hazardous waste operations.

APPENDIX B

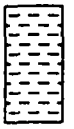
SOIL BORING LOGS

PHASE II/III RCRA FACILITY INVESTIGATION
SAFETY-KLEEN CORP. RECYCLE CENTER
DOLTON, ILLINOIS

FIELD BORING LOG EXPLANATION

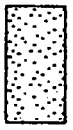
LITHOLOGY[1]

LEAN CLAY (CL)


LOAM (OL)

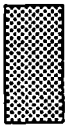
SILTY SAND (SM)

FILL


WELL SORTED SAND (SP)

CLAYEY GRAVEL (GC)

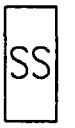
GRAVEL (GP)


WELL GRADED SAND (SW)

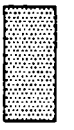
POORLY SORTED SAND/GRAVEL (SW/GW)

FAT CLAY (CH)

SAMPLE TYPE



SPLITSPOON


BRASS TUBE SPLITSPOON

SHELBY TUBE

[1] USCS CLASSFICATION DESIGNATION IN PARENTHESES (ASTM-D2488)

Illinois Environmental Protection Agency — Field Boring Log

Site File No. 0310690006 County Cook Boring No. LE-1 Monitor Well No. MW-1

Site File Name Safety-Kleen Corp., Dolton, Illinois Surface Elev. 591.0 Completion Depth 22.0

Fed. ID. No. ILD980613913 Auger Depth 22 Rotary Depth NA

Quadrangle Lake Calumet, IL-IN Sec. 3 T. 36N R. 14E Date: Start 5/30/96 Finish 5/30/96

UTM Coord. N. _____ E. _____

Boring Location NE main office E main drive N of 1st intersection

Drilling Equipment Diedrich D-120

Personnel: G - B. Culnan/C. Dewolf; D - D. Jackson; H - M. Stege; H -

Elev.	DESCRIPTION	Graphic Log	Depth in feet	Sample No.	Sample Type	Sample Recovery (%)	Pocket Penatrometer (tsf)	N Values (Blows)	OVA or PID readings (ppm)	REMARKS
	0.0-2.0 LOAM (OL) to 1', fill with brick material to 2'.					95		6 9 14 15	0 0.8	Start time 14:15 Surface elev. approximate (+/- 1') Top OVA number meas. with 11.8eV PID. Bottom number meas. with 10.6eV PID.
590.0			1							
589.0	2.0-4.0 Fill to 3', saturated SAND (SP) @3.5 TO 4'.		2			80		6 4 5	0 1.4	
588.0			3					6		
587.0	4.0-6.0 Saturated SAND (SP) to 4.5' gray CLAY (CL), mottled brown and yellow, moist semi-soft semi-malleable grading to soft @6'.		4			100		3 3 4	0.0 1.2	
586.0			5		SS			5		
585.0	6.0-8.0 Gray brown silty CLAY (CH), homogenous moist high plasticity maleable.		6			100		4 4 4	0 1.2	
584.0			7		SS			6		
583.0	8.0-10.0 Same as above, at approximately 7' approximately 1" thick sand lens, occasional small shale pebbles/gravel.		8			100		3 3 4	0 1.2	
582.0			9		SS			4		
581.0	10.0-12.0 as above, soft at top grading to stiffer less plastic and less malleable at 11'.		10			100		3 3 4	0 1.4	
580.0			11		SS			5		Approximate base of saturated zone.
579.0	12.0-14.0 CLAY (CL), same color as all above, stiffer, less malleable.		12			100		3 5 7	0 1.2	
578.0			13		SS			8		
577.0	14.0-16.0 Same as above.		14			100		4 6 8	0 1.4	
576.0			15		SS					

Illinois Environmental Protection Agency — Field Boring Log

Site File No. 0310690006 County Cook Boring No. LE-1 Monitor Well No. MW-1

Personnel: G - B. Culnan/C. Dewolf; D - D. Jackson; H - M. Stege; H -

Elev.	DESCRIPTION	Graphic Log	Depth in feet	Sample No.	Sample Type	Sample Recovery (%)	Pocket Penetrometer (tsf)	N Values (Blows)	OVA or PID readings (ppm)	REMARKS
								11		
					SS					
575.0	16.0-18.0 Same as above.		16			100		4	0	
								5	1.9	
								7		
574.0			17		SS			8		
573.0	18.0-20.0 Same as above.		18			100		4	0	
								6	1.9	
								8		
572.0			19		SS			10		
571.0	20.0-22.0 Gray brown silty clay (CL), harder, stiffer and not as malleable as above.		20					9	1.6	Boring completed 15:30.
								16		
								28		
570.0			21					44		
569.0			22							

Illinois Environmental Protection Agency — Field Boring Log

Site File No. 0310690006 County Cook Boring No. LE-2 Monitor Well No. NA

Site File Name Safety-Kleen Corp., Dolton, Illinois Surface Elev. 592.0 Completion Depth 24.0

Fed. ID. No. ILD980613913 Auger Depth 22 Rotary Depth NA

Quadrangle Lake Calumet, IL-IN Sec. 3 T. 36N R. 14E Date: Start 5/30/96 Finish 5/30/96

UTM Coord. N. _____ E. _____

Boring Location East of main office, East of the main drive

Drilling Equipment Diedrich D-120

Personnel: G - B. Culnan/C. Dewolf; D - D. Jackson; H - M. Stege; H -

Elev.	DESCRIPTION	Graphic Log	Depth in feet	Sample No.	Sample Type	Sample Recovery (%)	Pocket Penetrometer (tsf)	N Values (Blows)	OVA or PID readings (ppm)	REMARKS
	0.0-2.0 Loam dark brown, some mottled yellow brick material @ 2'.					70		5 7 9 13	0 1.8	Surface elevation approximate (+/- 1ft)
591.0			1							Start time 12:15
590.0	2.0-4.0 Fill material, limestone, gravel/sand not much recovery.		2			10		8 8	0 2.1	Top OVA number measured with 11.8eV PID. Bottom number measured with 10.6eV PID.
	ADJACENT BOREHOLE							8		
589.0	Fill material grading to sand @3.0', saturated sand, clay @ bottom of 3rd 6" brass ring (3.5")		3					8		
588.0	4.0-6.0 Fill material to 4.5' gray clay mottled yellow from 4.5', moist, plastic, fairly malleable.		4			75		5 7 8	0 2.3	
587.0			5					10		
586.0	6.0-8.0 CLAY (CH), yellow brown, grading to gray brown, plastic, moist, very malleable, few small pebbles.		6			100		3 5 6	0 1.4	
585.0			7					8		
584.0	8.0-10.0 CLAY (CH), yellow brown, gray, grading to gray brown, small pebbles, plastic, moist, malleable.		8			100		3 4 5	0 1.6	
583.0			9					7		
582.0	10.0-12.0 CLAY (CH), gray brown, some iron oxide staining, small pebbles, more than above, very plastic and malleable, moist, moisture on outside of sleeves.		10			100		3 5 7	0 1.2	
581.0			11					9		
580.0	12.0-14.0 CLAY (CH), gray brown, no iron as above, fewer and smaller pebbles, very soft, plastic and malleable.		12			100		3 4 5	0 1.9	
579.0			13					7		
578.0	14.0-16.0 CLAY (CH), same as above.		14			100		4 5 8	0 1.6	
577.0			15							

Illinois Environmental Protection Agency — Field Boring Log

Site File No. 0310690006 County Cook Boring No. LE-2 Monitor Well No. NA

Personnel
G - B. Culnan/C. Dewolf
D - D. Jackson
H - M. Stege
H -

Elev.	DESCRIPTION	Graphic Log	Depth in feet	Sample No.	Sample Type	Sample Recovery (%)	Pocket Penetrometer (tsf)	N Values (Blows)	OVA or PID readings (ppm)	REMARKS
								15		
576.0	16.0-18.0 CLAY (CL), same as above except getting stiffer and not as plastic or malleable.		16			100		4 7 9	0 1.9	
575.0			17					13		
574.0	18.0-20.0 CLAY (CL), same as above, softer at top,grading to stiffer.		18			100		5 8 12	0 2.1	Approximate base of saturated zone.
573.0			19					17		
572.0			20							
571.0			21							
570.0	22.0-24.0 CLAY (CL), gray brown, hard, stiff, brittle, dry, grading to silty sand, moist, semi-cohesive.		22			100		14 27 42	0 2.1	more blow counts stiffer material stop @ 13:15
569.0			23					54		
568.0			24							

Illinois Environmental Protection Agency — Field Boring Log

Site File No. 0310690006 County Cook Boring No. LE-3 Monitor Well No. NA

Site File Name Safety-Kleen Corp., Dolton, Illinois Surface Elev. 593.0 Completion Depth 24.0

Fed. ID. No. ILD980613913 Auger Depth 22 Rotary Depth NA

Quadrangle Lake Calumet, IL-IN Sec. 3 T. 36N R. 14E Date: Start 5/31/96 Finish 5/31/96

UTM Coord. N. _____ E. _____

Boring Location NW corner tank farm on SE portion of facility

Drilling Equipment Diedrich D-120

Personnel: G - B. Culnan/C. Dewolf; D - D. Jackson; H - M. Stege; H -

Elev.	DESCRIPTION	Graphic Log	Depth in feet	Sample No.	Sample Type	Sample Recovery (%)	Pocket Penetrometer (tsf)	N Values (Blows)	OVA or PID readings (ppm)	REMARKS
	0.0-4.0' No recovery.									Start time 9:00
592.0			1							Surface elev. approximate (+/- 1') Top OVA number meas. with 11.8eV PID. Bottom number meas. with 10.6eV PID.
591.0			2			0		14		
								22		
								28		
590.0			3					14		
589.0	4.0-6.0 SAND (SW), gray brown, moist, cohesive, saturated at 5'.		4			90		6	0	Sand result of previous excavation backfill.
								9	1.2	
588.0			5					8		
								8		
587.0	6.0-8.0 SAND (SW) same as above, with minor, small (<0.5 cm) shell fragments.		6			100		1	0	
								2	1.7	
								2		
586.0			7					3		
585.0	8.0-10.0 Fine to medium, saturated SAND (SW).		8			100		2	0	
								2	4.0	
								1		
584.0			9		SS			2		
583.0	10.0-12.0 SAND (SW) turns to CLAY (CH) at 10.5', wet saturated clay, gray brown, plastic, malleable, soft layer of crushed shell fragments at clay interval.		10			100		2	0	
								4	1.7	
								5		
582.0			11		SS			7		
581.0	12.0-14.0 CLAY (CL), not as soft or malleable, wet, stiffer, occasional small black shale pebbles but still fairly soft.		12			100		5	0	Approximate base of saturated zone.
								7	2.3	
								12		
580.0			13		SS			13		
579.0	14.0-16.0 CLAY (CL), Same as above.		14			100		4	0	
								6	1.5	
					SS			8		
578.0			15							

Illinois Environmental Protection Agency — Field Boring Log

Site File No. 0310690006 County Cook Boring No. LE-3 Monitor Well No. NA

Personnel: G - B. Culnan/C. Dewolf; D - D. Jackson; H - M. Stege; H -

Elev.	DESCRIPTION	Depth in feet	Sample No.	Sample Type	Sample Recovery (%)	Pocket Penetrometer (tsf)	N Values (Blows)	OVA or PID readings (ppm)	REMARKS
							12		
				SS					
577.0	16.0-18.0 Same as above, slightly stiffer.	16			100		5	0	
							8	1.2	
							12		
576.0		17		SS			17		
575.0	18.0-20.0 No Recovery	18			0		3		
							5		
							9		
574.0		19					7		
573.0	20.0-22.0 CLAY (CL), Same as above, a few more shale pebbles.	20			100		4	0	
							6	1.2	
							7		
572.0		21					11		
571.0	22.0-24.0 Same as above, slightly stiffer and less malleable.	22			100		14	0	Finish time 10:00.
							16	1.2	
							22		
570.0		23					33		
569.0		24							

Illinois Environmental Protection Agency — Field Boring Log

Site File No. 0310690006 County Cook Boring No. VB-4 Monitor Well No. MW-8

Site File Name Safety-Kleen Corp., Dolton, Illinois Surface Elev. 594.0 Completion Depth 28.0

Fed. ID. No. ILD980613913 Auger Depth 24 Rotary Depth NA

Quadrangle Lake Calumet, IL-IN Sec. 3 T. 36N R. 14E Date: Start 6/4/96 Finish 6/4/96

UTM Coord. N. E.

Boring Location N of #4 truck bay

Drilling Equipment Diedrich D-120

Personnel: G - B. Culnan/C. Dewolf; D - D. Jackson; H - M. Stege; H -

Elev.	DESCRIPTION	Graphic Log	Depth in feet	Sample No.	Sample Type	Sample Recovery (%)	Pocket Penetrometer (tsf)	N Values (Blows)	OVA or PID readings (ppm)	REMARKS
593.0			1							Start time 9:40 Surface elev. approx.(+/- 1') Top OVA number meas. with 11.8eV PID. Bottom number meas. with 10.6eV PID.
592.0			2							
591.0	3.0-5.0 Sand and gravel, wet, to 4', gray brown mottled CLAY (CL), soft plastic and malleable.		3			100		5	0	
								5	2.2	
590.0			4		SS			3 5		
589.0			5							
588.0			6							
587.0			7							
586.0	8.0-10.0 Gravelly CLAY (CL), small shale pebbles, clay at 9', sand stringer at 9', soft, plastic and malleable.		8			100		3	0	
								5	4.7	
585.0			9		SS			7 8		
584.0			10							Bottom of saturated zone btwn 10 and 13'.
583.0			11							
582.0			12							
581.0	13.0-15.0 Gray brown silty CLAY (CL), slightly stiffer, than above.		13			100		5	0	
								9	3.3	
580.0			14		SS			12 15		
579.0			15							

Illinois Environmental Protection Agency — Field Boring Log

Site File No. 0310690006 County Cook Boring No. VB-4 Monitor Well No. MW-8

Personnel: G - B. Culnan/C. Dewolf; D - D. Jackson; H - M. Stege; H -

Elev.	DESCRIPTION	Graphic Log	Depth in feet	Sample No.	Sample Type	Sample Recovery (%)	Pocket Penetrometer (tsf)	N Values (Blows)	OVA or PID readings (ppm)	REMARKS
578.0			16							
577.0			17							
576.0	18.0-20.0 CLAY (CL), as above.		18			100		5 9 12 15	0 3.6	
575.0			19							
574.0	20.0-22.0 As above, slightly softer.		20			100		4 5 10 11	5.4 11.4	
573.0			21							
572.0	22.0-24.0 As above, except stiff.		22			100		8 12 18 22	0 0.2	XX-3 duplicate.
571.0			23							
570.0	24.0-26.0 As above, some larger shale pebbles, approximately 1/2 cm in diameter.		24			100		8 16 24 32	0 0.2	
569.0			25							
568.0	26.0-28.0 Very stiff, brittle, very little moisture.		26			100		32 44 52 64	0 0.2	XX-2 Duplicate
567.0			27							Finish 10:45.
566.0			28							

Illinois Environmental Protection Agency — Field Boring Log

Site File No. 0310690006 County Cook Boring No. LE-10 Monitor Well No. NA

Personnel
G - B. Culnan/C. Dew
D - D. Jackson
H - M. Stege
H -

Elev.	DESCRIPTION	Graphic Log	Depth in feet	Sample No.	Sample Type	Sample Recovery (%)	Pocket Penetrometer (tsf)	N Values (Blows)	OVA or PID readings (ppm)	REMARKS
								8		
					SS					
575.0			16							
574.0			17							
573.0	18.0-20.0 Gray brown silty CLAY (CL), no gravel, few small shale pebbles, fairly stiff, moist and still fairly malleable.		18			100		7 9 15	0 4.2	Bottom of saturated zone btwn 16 and 18'.
572.0			19		SS			20		
571.0	20.0-22.0 As above, softer at top, stiff and hard at bottom.		20			100		5 9 22	0 2.8	
570.0			21					27		
569.0	22.0-24.0 Hard stiff CLAY (CL) to 3rd ring (23.5-24.0'), fine grained silty SAND (SM), interface at 3rd ring.		22			100		12 22 32	0 1.2	
568.0			23					56		
567.0	24.0-26.0 Some sand, mostly hard silty CLAY (CL), middle 2 rings capped for sample, hard to tell where sand stops and clay starts. Bottom ring 25.5 to 26' had the same silty fine grained sand, dry and crumbly.		24					13 24 28	0 0.2	
566.0			25					38		Finish time 14:30.
565.0			26							

Illinois Environmental Protection Agency — Field Boring Log

Site File No. 0310690006 County Cook | Boring No. VB-5 Monitor Well No. NA

File Name Safety-Kleen Corp., Dolton, Illinois | Surface Elev. 593.0 Completion Depth 28.0

Fed. ID. No. ILD980613913 | Auger Depth 22 Rotary Depth NA

Quadrangle Lake Calumet, IL-IN Sec. 3 T. 36N R. 14E | Date: Start 6/7/96 Finish 6/7/96

UTM Coord. N. _____ E. _____

Boring Location In gravel road S of container storage area #2

Drilling Equipment Diedrich D-120

Personnel: G - B. Culnan/C. Dewolf; D - D. Jackson; H - M. Stege; H -

Elev.	DESCRIPTION	Graphic Log	Depth in feet	Sample No.	Sample Type	Sample Recovery (%)	Pocket Penetrometer (tsf)	N Values (Blows)	OVA or PID readings (ppm)	REMARKS
592.0			1							Start time 12:00 Surface elev. approx. +/- 1' Top OVA number meas. with 11.8eV PID. Bottom number meas. with 10.6eV PID.
591.0			2							
590.0			3							
589.0	4.0-6.0 Gravel fill at top/slough, gray brown mottled CLAY (CL), from 3.5' to bottom. Clay not as soft or malleable as other boreholes in this interval.		4			70		4 4 5 6	115 131	
588.0			5		SS					
587.0			6							
586.0			7							
585.0			8							
584.0	9.0-11.0 Typical gray brown, silty CLAY (CL), a few tiny shale pebbles/gravel, semi-soft, moist, fairly plastic and malleable.		9			100		4 5 9 14	12 16	
583.0			10		SS					
582.0			11							Base of saturated zone btwn 11 and 14'.
581.0			12							
580.0			13							
579.0	14.0-16.0 CLAY (CL), stiffer than above, moist, but less plastic and malleable than above.		14			100		5 7 8	12 13	
578.0			15		SS					

Illinois Environmental Protection Agency — Field Boring Log

Site File No. 0310690006 County Cook Boring No. VB-5 Monitor Well No. NA

Personnel
G - B. Culnan/C. Dev
D - D. Jackson
H - M. Stege
H -

Elev.	DESCRIPTION	Graphic Log	Depth in feet	Sample No.	Sample Type	Sample Recovery (%)	Pocket Penetrometer (tsf)	N Values (Blows)	OVA or PID readings (ppm)	REMARKS
								9		
					SS					
577.0			16							
576.0			17							
575.0	18.0-20.0 As above, a little more gravel in the 18.5 to 19.0' interval. Stiff and hard, moist, still malleable as above.		18			100		6 10 16	12 9	
574.0			19					22		
573.0	20.0-22.0 As above, slightly more gravel than above at the 21 to 22' interval. Stiff and hard as above, more brittie, but still moist.		20			100		7 11 20	0 4.6	XX-5
572.0			21					26		
571.0	22.0-24.0 Shelby Tube		22							
570.0			23							
569.0	24.0-26.0 SILTY SAND (SM), hard, slightly moist, crumbly.		24			40		10 21 38	0 4.8	
568.0			25					59		
567.0	26.0-28.0 Shelby tube.		26							
566.0			27							Finish time 13:30.
565.0			28							

Illinois Environmental Protection Agency — Field Boring Log

Site File No. 0310690006 County Cook Boring No. VB-6 Monitor Well No. NA

File Name Safety-Kleen Corp., Dolton, Illinois Surface Elev. 592.0 Completion Depth 26.0

Fed. ID. No. ILD980613913 Auger Depth 22 Rotary Depth NA

Quadrangle Lake Calumet, IL-IN Sec. 3 T. 36N R. 14E Date: Start 6/4/96 Finish 6/4/96

UTM Coord. N. _____ E. _____

Boring Location In gravel W TF#6

Drilling Equipment Diedrich D-120

Personnel: G - B. Culnan/C. Dewolf; D - D. Jackson; H - M. Stege; H -

Elev.	DESCRIPTION	Graphic Log	Depth in feet	Sample No.	Sample Type	Sample Recovery (%)	Pocket Penetrometer (tsf)	N Values (Blows)	OVA or PID readings (ppm)	REMARKS
591.0			1							Start time 14:00. Surface elev. approx. (+/- 1') Top OVA number meas. with 11.8eV PID. Bottom number meas. with 10.6eV PID.
590.0			2							
589.0			3							
588.0	4.0-6.0 Gravelly fill.		4		SS	50		4 4 5 8	0 0	
587.0			5							
586.0			6							
585.0			7							
584.0			8							
583.0	9.0-11.0 Gravelly CLAY (CL), mottled gray brown, moderately soft, plastic.		9		SS	100		8 9 10 13	0 0	
582.0			10							
581.0			11							Bottom of saturated zone btwn 11 and 14'.
580.0			12							
579.0			13							
578.0	14.0-16.0 gray brown silty CLAY (CL), stiff, only moist, slightly malleable, breaks but cohesive.		14		SS	100		6 9 13	0 0	
577.0			15							

Illinois Environmental Protection Agency — Field Boring Log

Site File No. 0310690006 County Cook Boring No. VB-6 Monitor Well No. NA

Personnel
G - B. Culnan/C. Dewo
D - D. Jackson
H - M. Stege
H -

Elev.	DESCRIPTION	Graphic Log	Depth in feet	Sample No.	Sample Type	Sample Recovery (%)	Pocket Penetrometer (tsf)	N Values (Blows)	OVA or PID readings (ppm)	REMARKS
					SS			18		
576.0			16							
575.0			17							
574.0	18.0-20.0 Gravelly CLAY (CL), poorly sorted gravel, coarse grained sand interbedded in clay.		18			60		9 17 15 15	0 0.5	
573.0			19							
572.0	20.0-22.0 As above.		20			75		12 16 21 25	0 0.5	XX-4 Duplicate
571.0			21							
570.0	22.0-24.0 Very hard, stiff CLAY (CL), gray brown with small occasional shale pebbles.		22			100		11 21 46 54	0 0.8	
569.0			23							
568.0	24.0-26.0 Very hard stiff CLAY (CL), easily breaks apart, but still slightly moist.		24			100		9 21 28 40	0 0.5	
567.0			25							
566.0			26							

Illinois Environmental Protection Agency — Field Boring Log

Site File No. 0310690006 County Cook Boring No. VB-7 Monitor Well No. NA

Site File Name Safety-Kleen Corp., Dolton, Illinois Surface Elev. 591.0 Completion Depth 26.0

Fed. ID. No. ILD980613913 Auger Depth 24 Rotary Depth NA

Quadrangle Lake Calumet, IL-IN Sec. 3 T. 36N R. 14E Date: Start 6/6/96 Finish 6/6/96

UTM Coord. N. _____ E. _____

Boring Location In gravel E of angled truck station #9

Drilling Equipment Diedrich D-120

Personnel: G - B. Culnan/C. Dewolf; D - D. Jackson; H - M. Stege; H -

Elev.	DESCRIPTION	Graphic Log	Depth in feet	Sample No.	Sample Type	Sample Recovery (%)	Pocket Penetrometer (tsf)	N Values (Blows)	OVA or PID readings (ppm)	REMARKS
590.0			1							Start time 15:30. Surface elev. approximate (+/- 1')
589.0			2							
588.0			3							
587.0	4.0-6.0 Gravelly fill in top of spoon. Below CLAY (CL) gray brown mottled, smooth, soft, malleable. No gravel, saturated.		4			100		3	0	
								8	0.5	
586.0			5		SS			5		
								5		
585.0			6							
584.0			7							
583.0			8							
582.0	9.0-11.0 Gravelly CLAY (CL), soft to slightly stiff, fairly plastic, malleable, no free moisture.		9			100		5	0	
								6	0	
								9		
581.0			10		SS			11		
580.0			11							
579.0			12							
578.0			13							
577.0	14.0-16.0 Silty gravelly CLAY (CL), slightly stiffer than above.		14			100		6	0	Base of saturated zone btwn 11 and 14'.
					SS			7	0	
576.0			15					10		

Illinois Environmental Protection Agency — Field Boring Log

Site File No. 0310690006 County Cook Boring No. VB-7 Monitor Well No. NA

Personnel
G - B. Culnan/C. Dew
D - D. Jackson
H - M. Stege
H -

Elev.	DESCRIPTION	Graphic Log	Depth in feet	Sample No.	Sample Type	Sample Recovery (%)	Pocket Penetrometer (tsf)	N Values (Blows)	OVA or PID readings (ppm)	REMARKS
					SS			11		
575.0			16							
574.0			17							
573.0	18.0-20.0 As above, stiffer		18			100		6 8	0 0	
572.0			19		SS			10 12		
571.0	20.0-22.0 Very stiff, as above, with some larger pebble size grains, dry.		20			100		6 10	0 2.8	
570.0			21					15 22		
569.0	22.0-24.0 As above, stiff, becoming more brittle.		22			100		9 16	0 2.2	
568.0			23					26 31		
567.0	24.0-26.0 CLAY (CL), stiff, brittle, had very little gravel, dry.		24			100		11 21	0 2.5	
566.0			25					31 32		Finish time 16:30
565.0			26							

Illinois Environmental Protection Agency — Field Boring Log

Site File No. 0310690006 County Cook | Boring No. VB-8 | Monitor Well No. MW-9

Site File Name Safety-Kleen Corp., Dolton, Illinois | Surface Elev. 591.0 | Completion Depth 36.0

Fed. ID. No. ILD980613913 | Auger Depth 32 | Rotary Depth NA

Quadrangle Lake Calumet, IL-IN | Sec. 3 | T. 36N | R. 14E | Date: Start 6/5/96 | Finish 6/5/96

UTM Coord. N. _____ E. _____

Boring Location In gravel N of tank farm #1

Drilling Equipment Diedrich D-120

Personnel: G - B. Culnan/C. Dewolf; D - D. Jackson; H - M. Stege; H -

Elev.	DESCRIPTION	Graphic Log	Depth in feet	Sample No.	Sample Type	Sample Recovery (%)	Pocket Penetrometer (tsf)	N Values (Blows)	OVA or PID readings (ppm)	REMARKS
590.0			1							Time start 15:00 Surface elev. approx. (+/- 1') Top OVA number meas. with 11.8eV PID. Bottom number meas. with 10.6eV Pid.
589.0			2							
588.0			3							
587.0	4.0-6.0 Gray brown mottled CLAY (CL), soft, plastic, malleable.		4			60		3 4 4	0 0	Saturated zone begins at approx. 4'.
586.0			5		SS			4		
585.0			6							
584.0			7							
583.0			8							
582.0	9.0-11.0 Gray brown silty CLAY (CL), to 10', soft gravelly clay beginning at 10' to bottom of spoon @ 11'.		9			100		6 8 9	19 42	
581.0			10		SS			11		
580.0			11							
579.0			12							
578.0			13							
577.0	14.0-16.0 Gray brown silty CLAY (CL), soft grading to stiffer at 15', still malleable, occasional tiny shale pebbles.		14			90		4 6 8	0 28	Water coming up from hole, sat. cuttings look like flowing mud.
576.0			15		SS					

Illinois Environmental Protection Agency — Field Boring Log

Site File No. 0310690006 County Cook Boring No. VB-8 Monitor Well No. MW-9

Personnel
G - B. Culnan/C. Dew
D - D. Jackson
H - M. Stege
H -

Elev.	DESCRIPTION	Graphic Log	Depth in feet	Sample No.	Sample Type	Sample Recovery (%)	Pocket Penetrometer (taf)	N Values (Blows)	OVA or PID readings (ppm)	REMARKS
								10		grout, very wet. Approximate bottom of saturated zone 15-18'.
575.0			16		SS					
574.0			17							
573.0	18.0-20.0 As above.		18			100		7 9 11 15	0 9.2	
572.0			19							
571.0	20.0-22.0 As above, lots of moisture on spoon, GRAVEL (GC) between 21-22'.		20			100		5 8 14 14	0 12	Moisture on spoon.
570.0			21		SS					
569.0	22.0-24.0 Gray brown silty CLAY (CL), fairly stiff, still malleable, shale pebbles, no gravel, lots of moisture on spoon.		22			80		7 14 20 35	6.8 16.4	Moisture on spoon, possibly from above, blow counts increasing.
568.0			23							
567.0	24.0-26.0 As above, bottom ring (25.5-26.0') contains hard stiff and brittle clay, only 1" of recovery in this ring.		24			80		8 18 26 40	0 12.2	
566.0			25							
565.0	26.0-28.0 CLAY (CL), hard, stiff.		26			100		7 23 36 44	0 10.6	Moisture on spoon.
564.0			27							
563.0	28.0-30.0 As above.		28			100		12 14 18 48	0 10.3	Moisture on spoon.
562.0			29							
561.0	30.0-32.0 As above.		30			100		6 9 15 20	0 5.8	Moisture on spoon.
560.0			31							
559.0			32							

Illinois Environmental Protection Agency — Field Boring Log

Site File No. 0310690006 County Cook Boring No. VB-8 Monitor Well No. MW-9

Personnel
G - B. Culnan/C. Dewolf
D - D. Jackson
H - M. Stege
H -

Elev.	DESCRIPTION	Graphic Log	Depth in feet	Sample No.	Sample Type	Sample Recovery (%)	Pocket Penetrometer (tsf)	N Values (Blows)	OVA or PID readings (ppm)	REMARKS
	32.0-34.0 Gray brown silty CLAY (CL), hard stiff, moist but fairly brittle, lots of moisture in sampler.					100		10 28 17 37	0 3.9	Moisture on spoon.
558.0			33							
557.0	34.0-36.0 Same as above.		34			100		14 28 29 54	0 1.4	Moisture on spoon
556.0			35							Finish time 16:00
555.0			36							

Illinois Environmental Protection Agency — Field Boring Log

Site File No. 0310690006 County Cook | Boring No. VB-9 Monitor Well No. NA

Site File Name Safety-Kleen Corp., Dolton, Illinois | Surface Elev. 591.0 Completion Depth 28.0

Fed. ID. No. ILD980613913 | Auger Depth 26 Rotary Depth NA

Quadrangle Lake Calumet, IL-IN Sec. 3 T. 36N R. 14E | Date: Start 6/4/96 Finish 6/4/96

UTM Coord. N. _____ E. _____

Boring Location MW facility in gravel S of drum receiving BLDG15

Drilling Equipment Diedrich D-120

Personnel: G - B. Culnan/C. Dewolf; D - D. Jackson; H - M. Stege; H -

Elev.	DESCRIPTION	Graphic Log	Depth in feet	Sample No.	Sample Type	Sample Recovery (%)	Pocket Penetrometer (tsf)	N Values (Blows)	OVA or PID readings (ppm)	REMARKS
590.0			1							Start time 16:00 Surface elev. approximate (+/- 1')
589.0			2							11.7 PID only.
588.0			3							
587.0	4.0-6.0 Gray brown silty CLAY (CH), mottled brown, soft plastic, malleable.		4		SS	100		4 5 6 6	0	
586.0			5							
585.0			6							
584.0			7							
583.0			8							
582.0	9.0-11.0 CLAY (CH), as above, no brown mottling, uniform gray brown color, homogenous, soft plastic, malleable.		9		SS	100		5 7 9 12	0	
581.0			10							
580.0			11							
579.0			12							Bottom of saturated zone located btwn 11 and 14'.
578.0			13							
577.0	14.0-16.0 Gray brown silty CLAY (CL), stiffer than above, small shale pebbles @15.5'.		14		SS	100		5 7 9	0	
576.0			15							

Illinois Environmental Protection Agency — Field Boring Log

Site File No. 0310690006 County Cook Boring No. VB-9 Monitor Well No. NA

Personnel
G - B. Culnan/C. Dewolf
D - D. Jackson
H - M. Stege
H -

Elev.	DESCRIPTION	Graphic Log	Depth in feet	Sample No.	Sample Type	Sample Recovery (%)	Pocket Penetrometer (tsf)	N Values (Blows)	OVA or PID readings (ppm)	REMARKS
								12		
575.0			16		SS					
574.0			17							
573.0	18.0-20.0 As above.		18			100		5 7 10 14	0	
572.0			19							
571.0	20.0-22.0 No recovery.		20			0		5 7 10 13	NA	
570.0			21							
[illegible]	22.0-24.0 Gray brown silty CLAY (CL), homogenous, stiff, moist, hard.		22			100		9 14 20 29	0	
568.0			23							
567.0	24.0-26.0 As above, very hard and stiff, brittle, some moisture, but crumbly.		24			100		17 19 28 38	0	
566.0			25							
565.0	26.0-28.0 As above.		26			100		41 42 51 59	0	
564.0			27							Finish time 17:15
563.0			28							

Illinois Environmental Protection Agency — Field Boring Log

Site File No. 0310690006 County Cook

Site File Name Safety-Kleen Corp., Dolton, Illinois

Fed. ID. No. ILD980613913

Quadrangle Lake Calumet, IL-IN Sec. 3 T. 36N R. 14E

UTM Coord. N. _____ E. _____

Boring Location E of trailer parking area S of MW-12

Drilling Equipment Diedrich D-120

Boring No. MW-4 Monitor Well No. MW-4

Surface Elev. 594.0 Completion Depth 20.0

Auger Depth 18 Rotary Depth NA

Date: Start 6/3/96 Finish 6/3/96

Personnel: G - B. Culnan/C. Dewolf; D - D. Jackson; H - M. Stege; H -

Elev.	DESCRIPTION	Graphic Log	Depth in feet	Sample No.	Sample Type	Sample Recovery (%)	Pocket Penetrometer (tsf)	N Values (Blows)	OVA or PID readings (ppm)	REMARKS
	0.0-2.0 LOAM (OL), moist, root material, small pebbles, no fill.					60		2 4 5 6	0 0.5	Start time 10:30
593.0			1		SS					Surface elev. approximate (+/- 1')
592.0	2.0-4.0 CLAY/LOAM (OL), grading to wet sand (saturated), grading to gray brown mottled CLAY (CH), very plastic and malleable.		2			100		4 6 7 5	0 0.8	Top OVA number meas. with 11.8eV PID. Bottom number meas. with 10.6eV PID.
591.0			3							
590.0	4.0-6.0 Gray brown CLAY (CH), slightly mottled brown, very soft and plastic and malleable.		4			100		2 2 3 4	0 0.5	
589.0			5							
588.0	6.0-8.0 Gray brown silty CLAY (CL), homogenous, slightly stiffer, semi-soft and malleable.		6			100		4 5 7 8	0 0.8	
587.0			7		SS					
586.0	8.0-10.0 Same as above, but more soft and malleable grading to gravelly, sandy clay @ 9'.		8			100		4 6 7 8	0 1.0	
585.0			9		SS					
584.0	10.0-12.0 Gray brown silty CLAY (CH), very soft, plastic, malleable, minor gravel.		10			100		4 6 8 10	0 0.8	Moisture on split spoon.
583.0			11		SS					
582.0	12.0-14.0 Gray brown CLAY (CL), stiffer and less plastic than above, minor gravel.		12			100		4 6 6 10	0 0.8	
581.0			13		SS					
580.0	14.0-16.0 Same as above.		14			100		4 7 11	0 1	
579.0			15		SS					

Illinois Environmental Protection Agency — Field Boring Log

Site File No. 0310690006 County Cook Boring No. MW-4 Monitor Well No. MW-4

Personnel
G - B. Culnan/C. Dewolf
D - D. Jackson
H - M. Stege
H -

Elev.	DESCRIPTION	Graphic Log	Depth in feet	Sample No.	Sample Type	Sample Recovery (%)	Pocket Penetrometer (tsf)	N Values (Blows)	OVA or PID readings (ppm)	REMARKS
								15		
					SS					
578.0	16.0-18.0 As above, pretty stiff.		16			100		5	0	
								6	1	
								8		
577.0			17		SS			11		
576.0	18.0-20.0 As above.		18					4	0	Finish time 11:10
								6	0.8	
								10		
575.0			19					15		
574.0			20							

Illinois Environmental Protection Agency — Field Boring Log

Site File No. 0310690006 County Cook | Boring No. MW-6 Monitor Well No. MW-6

Site File Name Safety-Kleen Corp., Dolton, Illinois | Surface Elev. 591.6 Completion Depth 22.0

Fed. ID. No. ILD980613913 | Auger Depth 22 Rotary Depth NA

Quadrangle Lake Calumet, IL-IN Sec. 3 T. 36N R. 14E | Date: Start 6/5/96 Finish 6/5/96

UTM Coord. N. _____ E. _____

Boring Location In grass NE of truck station #5

Drilling Equipment Diedrich D-120

Personnel: G - B. Culnan/C. Dewolf; D - D. Jackson; H - M. Stege; H -

Elev.	DESCRIPTION	Graphic Log	Depth in feet	Sample No.	Sample Type	Sample Recovery (%)	Pocket Penetrometer (tsf)	N Values (Blows)	OVA or PID readings (ppm)	REMARKS
	0.0-2.0 LOAM (OL) 6", then gravel fill to 2.0'.					50		5 7 12 7	0 0	Start time 12:00
590.6			1		SS					Surface elev. approximate (+/- 1')
589.6	2.0-4.0 Gravel fill to clayey gravel fill at 2.5' (not much recovery), sample collected at 3'.		2			85		11 7 10 12	0 0	Top OVA number meas. with 11.8eV PID. Bottom number meas. with 10.6eV PID.
588.6			3							
587.6	4.0-6.0 Gray brown mottled CLAY (CL), soft, plastic and malleable, sand at bottom of brass ring (5-5.5'), collected for sample.		4			75		4 4 5 6	0 1	
586.6			5							
585.6	6.0-8.0 Gray brown mottled CLAY (CL), grading to typical gray brown clay at 7', slightly stiffer at transition.		6			100		4 5 7 8	0 1.4	
584.6			7		SS					
583.6	8.0-10.0 Gray brown silty CLAY (CL), homogenous, fairly soft and malleable.		8			100		3 4 5 6	0 1	
582.6			9		SS					
581.6	10.0-12.0 As above.		10			100		3 5 6 8	0 0	
580.6			11							
579.6	12.0-14.0 As above, semi-soft CLAY (CL), to fine sand (SP) at 13.5', saturated, red spots/streaks in clay, possibly iron staining.		12			100		5 7 9 14	0 1	
578.6			13		SS					
577.6	14.0-16.0 SAND (SP) interval extending down from above to 14.5', gray brown silty CLAY (CL), below this, semi-soft, fairly plastic and malleable.		14			100		5 5 7	0 1.7	Sand collected in jar for possible lab sample.
576.6			15		SS					

Illinois Environmental Protection Agency — Field Boring Log

Site File No. 0310690006 County Cook Boring No. MW-6 Monitor Well No. MW-6

Personnel
G - B. Culnan/C. Dewolf
D - D. Jackson
H - M. Stege
H -

Elev.	DESCRIPTION	Graphic Log	Depth in feet	Sample No.	Sample Type	Sample Recovery (%)	Pocket Penetrometer (tsf)	N Values (Blows)	OVA or PID readings (ppm)	REMARKS
								9		
					SS					
575.6	16.0-18.0 As above with small pebbles. Gravelly CLAY (CL), interval at 17' approximately 2" thick. Clay to 18' fairly soft.		16			100		4 6 8	0 1.0	
574.6			17		SS			9		
573.6	18.0-20.0 Fairly soft, gray brown CLAY (CL), with occasional shale pebbles, minor gravel (GW) at 19' to bottom 20'.		18			100		3 4 6	0 1.5	
572.6			19					10		
571.6	20.0-22.0 As above, gravelly sand to poorly sorted sand coarse (SW/GW) to fine at 20.5' approx. 2" thick. Fairly stiff CLAY (CL) at bottom of sand interval 20.5 to 21.5'. Silty sand, fine SAND interval (SM) at 21.5'.		20			100		6 7 10	0 0	Sand at 20.5' collected in sample jars
570.6			21					14		Finish time 13:00.
569.6			22							

Illinois Environmental Protection Agency — Field Boring Log

Site File No. 0310690006 County Cook

Site File Name Safety-Kleen Corp., Dolton, Illinois

Fed. ID. No. ILD980613913

Quadrangle Lake Calumet, IL-IN Sec. 3 T. 36N R. 14E

UTM Coord. N. _____ E. _____

Boring Location E of trailer parking, ap. midpoint facility (N-S)

Drilling Equipment Diedrich D-120

Boring No. MW-12 Monitor Well No. MW-12

Surface Elev. 592.6 Completion Depth 20.0

Auger Depth 22 Rotary Depth NA

Date: Start 5/31/96 Finish 5/31/96

Personnel: G - B. Culnan/C. Dewolf; D - D. Jackson; H - M. Stege; H -

Elev.	DESCRIPTION	Graphic Log	Depth in feet	Sample No.	Sample Type	Sample Recovery (%)	Pocket Penetrometer (tsf)	N Values (Blows)	OVA or PID readings (ppm)	REMARKS
	0.0-2.0 Loam top 6", some gravel, no sample collected.					25		4 4 5 9	0 0.7	Start 16:00 *Surface elev. approximate (+/- 1')* Top OVA number meas. with 11.8eV PID. Bottom number meas. with 10.6eV Pid.
591.6			1							
590.6	2.0-4.0 Gravel fill (rocky fill)		2			80		12 17 19 27	0 0	
589.6			3							
588.6	4.0-6.0 No recovery.		4			0		16 14 12 10		No recovery in anticpated water table interval.
587.6			5							
586.6	6.0-8.0 Gray silty CLAY (CL), mottled with brown semi-soft, malleable, small shale pebbles, some root material.		6			70		6 6 8 9	0 0	
585.6			7		SS					
584.6	8.0-10.0 No recovery.		8			0		7 7 8 10		
583.6			9		SS					
582.6	10.0-12.0 No recovery. Large rock in head of spoon.		10			0		4 4 6 7		
581.6			11		SS					
580.6	12.0-14.0 Gray brown silty CLAY (CL), semi-soft and malleable small pebbles.		12			100		4 6 8 11	0 0	
579.6			13		SS					
578.6	14.0-16.0 Softer and slightly more malleable than above.		14			100		4 4 7	0 0	
577.6			15		SS					

Illinois Environmental Protection Agency — Field Boring Log

Site File No. 0310690006 County Cook Boring No. MW-12 Monitor Well No. MW-12

Personnel
G - B. Culnan/C. Dewolf
D - D. Jackson
H - M. Stege
H -

Elev.	DESCRIPTION	Graphic Log	Depth in feet	Sample No.	Sample Type	Sample Recovery (%)	Pocket Penetrometer (tsf)	N Values (Blows)	OVA or PID readings (ppm)	REMARKS
								9		
					SS					
576.6	16.0-18.0 Same as above.		16			100		7	0	
								8	0	
								10		
575.6			17		SS			11		
574.6	18.0-20.0 Same as above, except becoming more stiff.		18			100		4	0	Finish time 17:00.
								8	0	
								12		
573.6			19		SS			16		
572.6			20							

Illinois Environmental Protection Agency — Field Boring Log

Site File No. 0310690006 County Cook

Site File Name Safety-Kleen Corp., Dolton, Illinois

Fed. ID. No. ILD980613913

Quadrangle Lake Calumet, IL-IN Sec. 3 T. 36N R. 14E

UTM Coord. N. _____ E. _____

Boring Location SE part facility W main drive in gravel S tankfarm

Drilling Equipment Diedrich D-120

Boring No. LE-4 Monitor Well No. NA

Surface Elev. 592.0 Completion Depth 24.0

Auger Depth 22 Rotary Depth NA

Date: Start 5/31/96 Finish 5/31/96

Personnel: G - B. Culnan/C. Dewolf; D - D. Jackson; H - M. Stege; H -

Elev.	DESCRIPTION	Graphic Log	Depth in feet	Sample No.	Sample Type	Sample Recovery (%)	Pocket Penetrometer (tsf)	N Values (Blows)	OVA or PID readings (ppm)	REMARKS
	0.0-2.0 No log.									Start 13:30
591.0			1							Surface elevation approximate (+/- 1') Top OVA number meas. with 11.8eV PID. Bottom number meas. with 10.6eV PID.
590.0	2.0-4.0 Fill		2			50		7 8 10 13		
589.0			3							
588.0	4.0-6.0 Base of fill at 4.5', wet sandy fill, gray brown, mottled yellow stiff CLAY (CL) from 4.5		4			70		6 7 8 8	0 0.5	
587.0			5							
586.0	6.0-8.0 CLAY (CL), gray brown, mottled yellow, stiff.		6			100		5 6 6 7	0 0.7	
585.0			7							
584.0	8.0-10.0 Same as above, less brown mottling.		8			100		4 5 7 8	0 0.7	
583.0			9		SS					
582.0	10.0-12.0 Typical, gray brown silty CLAY (CL), homogenous, slightly softer and more malleable than above.		10			100		3 4 5 6	0 0.7	
581.0			11		SS					
580.0	12.0-14.0 Same as above, still stiff, tiny shale pebbles.		12			100		5 7 8 10	0 0.2	Lots of moisture on spoon.
579.0			13		SS					
578.0	14.0-16.0 Same as above, slightly softer, but still fairly stiff, more malleable.		14			100		7 9 12	0 0.2	Moisture on spoon
577.0			15		SS					

Illinois Environmental Protection Agency — Field Boring Log

Site File No. 0310690006 County Cook Boring No. LE-4 Monitor Well No. NA

Personnel
G - B. Culnan/C. Dewolf
D - D. Jackson
H - M. Stege
H -

Elev.	DESCRIPTION	Graphic Log	Depth in feet	Sample No.	Sample Type	Sample Recovery (%)	Pocket Penetrometer (tsf)	N Values (Blows)	OVA or PID readings (ppm)	REMARKS
					SS			12		
576.0	16.0-18.0 CLAY (CL), no moisture on spoon, less soft and more stiff, still malleable, stiffer at the 17-18' interval.		16			100		4 7	0 0	Dry spoon
								10		
575.0			17		SS			12		
574.0	18.0-20.0 Same as above.		18			100		4 8	0 0.7	
								10		
573.0			19					13		
572.0	20.0-22.0 Same as above, slightly stiffer, but still fairly malleable.		20			100		4 7	0 0.5	
								10		
571.0			21					13		
570.0	22.0-24.0 Same as above, stiffer and less malleable.		22			100		5 7	0 0.5	
								13		
569.0			23					19		Finish 14:30
568.0			24							

Illinois Environmental Protection Agency — Field Boring Log

Site File No. 0310690006 County Cook | Boring No. LE-5 Monitor Well No. NA

Site File Name Safety-Kleen Corp., Dolton, Illinois | Surface Elev. 595.0 Completion Depth 24.0

Fed. ID. No. ILD980613913 | Auger Depth 22 Rotary Depth NA

Quadrangle Lake Calumet, IL-IN Sec. 3 T. 36N R. 14E | Date: Start 5/31/96 Finish 5/31/96

UTM Coord. N. _____ E. _____

Boring Location SW corner facility S gravel parking lot near SK 11

Drilling Equipment Diedrich D-120

Personnel: G - B. Culnan/C. Dewolf; D - D. Jackson; H - M. Stege; H -

Elev.	DESCRIPTION	Graphic Log	Depth in feet	Sample No.	Sample Type	Sample Recovery (%)	Pocket Penetrometer (tsf)	N Values (Blows)	OVA or PID readings (ppm)	REMARKS
	0.0-2.0 Loam at 1', sandy fill to 2'					70		3 7 9 4	5.5 25.5	Start time 10:50 Surface elev. approximate (+/- 1') Top OVA number meas. with 11.8eV PID. Bottom number meas. with 10.6eV PID.
594.0			1							
593.0	2.0-4.0 Fill (sand) blackish with gravel material.		2			60		6 6 7	11.0 8.0	
592.0			3					10		
591.0	4.0-6.0 Wet fine to medium-grained SAND (SP) grading to gray brown CLAY (CL), mottled with yellow at 5.5' wet, soft, malleable.		4			100		5 6 7	0 2.5	
590.0			5					7		
589.0	6.0-8.0 Coarse grained SAND (SW) at 6.5' approximately 2" lens, brown gray mottled CLAY (CL) at 7.0'.		6			100		2 3 3	0 1.2	
588.0			7		SS			4		
587.0	8.0-10.0 CLAY (CL) brown gray grading to gray brown at 9.0' gray brown clay more stiff than above, few tiny shale pebbles.		8			100		3 5 6	0 1.7	Approximate base of saturated zone
586.0			9		SS			6		
585.0	10.0-12.0 Same as above, at 11' is a sand layer approx 1-2" thick, fine saturated sand. Typical gray brown clay below sand.		10			100		3 5 6	0 3.5	
584.0			11		SS			9		
583.0	12.0-14.0 Same as above, homogenous		12			100		4 6 9	0 2.0	
582.0			13		SS			10		
581.0	14.0-16.0 Same as above, fairly stiff, still fairly malleable, moist.		14			100		4 7	0 1.0	
580.0			15		SS			12		

Illinois Environmental Protection Agency — Field Boring Log

Site File No. 0310690006 County Cook Boring No. LE-5 Monitor Well No. NA

Personnel: G - B. Culnan/C. Dewolf; D - D. Jackson; H - M. Stege; H -

Elev.	DESCRIPTION	Graphic Log	Depth in feet	Sample No.	Sample Type	Sample Recovery (%)	Pocket Penetrometer (tsf)	N Values (Blows)	OVA or PID readings (ppm)	REMARKS
								19		
					SS					
579.0	16.0-18.0 Same as above.		16			100		4	0	
								6	1.0	
								7		
578.0			17		SS			8		
577.0	18.0-20.0 Same as above, slightly softer and more malleable.		18			100		5	0	
								7	0.7	
								9		
576.0			19					12		
575.0	20.0-22.0 Same as above.		20			100		4	0	
								5	1.0	
								9		
574.0			21					13		
573.0	22.0-24.0 Gray brown silty CLAY (CL), stiffer than above.		22			100		7	0	
								9	0.7	
								13		
572.0			23					18		Finish time 11:45
571.0			24							

Illinois Environmental Protection Agency — Field Boring Log

Site File No. 0310690006 County Cook

Site File Name Safety-Kleen Corp., Dolton, Illinois

Fed. ID. No. ILD980613913

Quadrangle Lake Calumet, IL-IN Sec. 3 T. 36N R. 14E

UTM Coord. N. _____ E. _____

Boring Location SW facility in rd N of gate, btwn office trailers

Drilling Equipment Diedrich D-120

Boring No. LE-6 Monitor Well No. NA

Surface Elev. 594.0 Completion Depth 20.0

Auger Depth 22 Rotary Depth NA

Date: Start 6/3/96 Finish 6/3/96

Personnel: G - B. Culnan/C. Dewolf; D - D. Jackson; H - M. Stege; H -

Elev.	DESCRIPTION	Graphic Log	Depth in feet	Sample No.	Sample Type	Sample Recovery (%)	Pocket Penetrometer (tsf)	N Values (Blows)	OVA or PID readings (ppm)	REMARKS
	0.0-2.0 Roadbase gravel, fill.									14:45 Start time Surface elev. approx. (+/- 1') Top OVA number meas. with 11.8eV PID. Bottom number meas. with 10.6eV PID.
593.0			1							
592.0	2.0-4.0 Saturated SAND and GRAVEL (SP/GP).		2			60		6 6 8 6	0 0.2	
591.0			3							
590.0	4.0-6.0 Saturated SAND and GRAVEL (GP) to approx. 5', changing to brown CLAY (CH), saturated, soft, malleable and plastic.		4			100		3 3 4 4	0 0	Infiltration water?
589.0			5							
588.0	6.0-8.0 Semi-soft brown CLAY (CL) grading to typical gray brown silty CLAY (CH), soft, homogenous.		6			100		6 7 8 11	0 0	
587.0			7		SS					
586.0	8.0-10.0 Saturated gray brown CLAY (CH) with sand/gravel lens at 9', approximately 2" thick, occasional shale pebbles approx. 1/2 cm. in diameter.		8			100		3 3 5 7	0 0	
585.0			9		SS					
584.0	10.0-12.0 As above, soft clay grading to stiffer at 11.5'.		10			100		3 4 5 7	0 0	
583.0			11		SS					
582.0	12.0-14.0 As above, slightly stiff, semi-soft & malleable CLAY (CL), small shale pebbles.		12			100		5 7 8 9	0 0	Approximate base of saturated zone.
581.0			13		SS					
580.0	14.0-16.0 As above, less malleable than above, slightly stiffer.		14			100		5 8 10	0 0	
579.0			15		SS					

Illinois Environmental Protection Agency — Field Boring Log

Site File No. 0310690006 County Cook Boring No. LE-6 Monitor Well No. NA

Personnel
G - B. Culnan/C. Dewolf
D - D. Jackson
H - M. Stege
H -

Elev.	DESCRIPTION	Graphic Log	Depth in feet	Sample No.	Sample Type	Sample Recovery (%)	Pocket Penetrometer (tsf)	N Values (Blows)	OVA or PID readings (ppm)	REMARKS
								14		
					SS					
578.0	16.0-18.0 As above.		16			100		5	0	
								7	0	
								9		
577.0			17		SS			11		
576.0	18.0-20.0 As above.		18			100		5	0	
								6	0	
								10		
575.0			19					14		
574.0			20							

Illinois Environmental Protection Agency — Field Boring Log

Site File No. 0310690006 County Cook

Site File Name Safety-Kleen Corp., Dolton, Illinois

Fed. ID. No. ILD980613913

Quadrangle Lake Calumet, IL-IN Sec. 3 T. 36N R. 14E

UTM Coord. N. _____ E. _____

Boring Location In gravel W side road across from TF#4 near wrhse

Drilling Equipment Diedrich D-120

Boring No. LE-7 Monitor Well No. MW-5

Surface Elev. 594.0 Completion Depth 22.0

Auger Depth 22 Rotary Depth NA

Date: Start 6/5/96 Finish 6/5/96

Personnel
G - B. Culnan/C. Dewolf
D - D. Jackson
H - M. Stege
H -

Elev.	DESCRIPTION	Graphic Log	Depth in feet	Sample No.	Sample Type	Sample Recovery (%)	Pocket Penetrometer (tsf)	N Values (Blows)	OVA or PID readings (ppm)	REMARKS
	0.0-2.0 Gravel fill. No sample.									Start time 8:30. Surface elev. approx. (+/- 1')
593.0			1							
592.0	2.0-4.0 Gravelly fill, wet.		2			50		6 28 35 9	0	
591.0			3							
590.0	4.0-6.0 Gravelly fill to 5.0', grading to gray brown mottled silty CLAY (CH), soft, plastic and malleable.		4			50		3 4 4 4	0	Sampled gravel fill/clay interface in 2nd ring from bottom.
589.0			5							
588.0	6.0-8.0 As above to 7', grading to gravelly silty CLAY (CL) to 8', moist, soft, plastic and malleable.		6			100		4 6 8 10	0	
587.0			7		SS					Unsure if sat. zone in backfill is due to infiltration water from recent rain.
586.0	8.0-10.0 Gravelly silty CLAY (CL), gravel interval at approx. 9' interbedded with silty clay for 2" then back to gravelly silty clay.		8			70		3 5 6 6	0	
585.0			9		SS					Lots of moisture on sampler.
584.0	10.0-12.0 Mottled gray brown silty CLAY (CL), grading to stiffer and less malleable at 12'.		10			50		4 5 6 9	0	
583.0			11		SS					
582.0	12.0-14.0 Typical gray brown silty CLAY (CL), small shale pebbles fairly soft, plastic and malleable.		12			100		5 6 9 12	0	
581.0			13		SS					
580.0	14.0-16.0 As above.		14			100		5 8 12	0	
579.0			15		SS					

Illinois Environmental Protection Agency — Field Boring Log

Site File No. 0310690006 County Cook Boring No. LE-7 Monitor Well No. MW-5

Personnel
G - B. Culnan/C. Dewolf
D - D. Jackson
H - M. Stege
H -

Elev.	DESCRIPTION	Graphic Log	Depth in feet	Sample No.	Sample Type	Sample Recovery (%)	Pocket Penetrometer (tsf)	N Values (Blows)	OVA or PID readings (ppm)	REMARKS
								16		
					SS					
578.0	16.0-18.0 As above, still semi-soft and malleable.		16			100		5	0	
								7		
								10		
577.0			17		SS			13		
576.0	18.0-20.0 As above, lots of moisture on rings and sampler.		18			100		5	0	Duplicate XX1.
								6		
								7		
575.0			19					12		
574.0	20.0-22.0 No recovery		20			0		9		
								7		
								9		
573.0			21					15		
572.0			22							
										Finish time 9:30.

Illinois Environmental Protection Agency — Field Boring Log

Site File No. 0310690006 County Cook Boring No. LE-8 Monitor Well No. NA

Site File Name Safety-Kleen Corp., Dolton, Illinois Surface Elev. 593.0 Completion Depth 22.0

Fed. ID. No. ILD980613913 Auger Depth 22 Rotary Depth NA

Quadrangle Lake Calumet, IL-IN Sec. 3 T. 36N R. 14E Date: Start 6/7/96 Finish 6/7/96

UTM Coord. N. _____ E. _____

Boring Location W of process area in Distribution Cntr parking lot

Drilling Equipment Diedrich D-120

Personnel: G - B. Culnan/C. Dewolf; D - D. Jackson; H - M. Stege; H -

Elev.	DESCRIPTION	Graphic Log	Depth in feet	Sample No.	Sample Type	Sample Recovery (%)	Pocket Penetrometer (tsf)	N Values (Blows)	OVA or PID readings (ppm)	REMARKS
	0.0-2.0 Loam to 6", fill in remaining spoon.					50		3 5 26 59	18 12	Start time 10:35 Surface elev. approx. (+/- 1') Top OVA number meas. with 11.8eV PID. Bottom number meas. with 10.6eV PID.
592.0			1		SS					
591.0	2.0-4.0 Fill, saturated sand - black coloration.		2			100		4 6 12	0 3	
590.0			3					12		infiltration water?
589.0	4.0-6.0 Sandy/fill material to CLAY (CH) at 5.5', clay - gray brown mottled, soft and plastic at 5.5 to 6'.		4			100		8 9 10	12 14	
588.0			5					12		
587.0	6.0-8.0 Gray brown mottled CLAY (CH), soft, plastic malleable.		6			50		6 6 7	0 6	
586.0			7		SS			9		
585.0	8.0-10.0 Shelby tube, saturated clay at each end.		8							
584.0			9							
583.0	10.0-12.0 Saturated gray brown silty CLAY (CH), no gravel, soft plastic and malleable, slightly stiffer than gray brown clay at 8'.		10			100		6 6 8	0 5	
582.0			11		SS			9		
581.0	12.0-14.0 Gray brown silty CLAY (CL), semi-soft grading to gravelly silty clay at 10.5' to 13.7' in bottom of spoon is typical silty clay.		12			100		6 8 10	0 6	
580.0			13		SS			12		
579.0	14.0-16.0 Gray brown silty gravelly clay - a few shale pebbles/small gravel, slightly stiffer than above.		14			100		6 8	0 6	
578.0			15		SS			12		

Illinois Environmental Protection Agency — Field Boring Log

Site File No. 0310690006 County Cook Boring No. LE-8 Monitor Well No. NA

Personnel
G - B. Culnan/C. Dewolf
D - D. Jackson
H - M. Stege
H -

Elev.	DESCRIPTION	Graphic Log	Depth in feet	Sample No.	Sample Type	Sample Recovery (%)	Pocket Penetrometer (tsf)	N Values (Blows)	OVA or PID readings (ppm)	REMARKS
								15		
					SS					
577.0	16.0-18.- CLAY (CL), as above, slightly stiffer, less pebbles/gravel, moist. Still fairly plastic and malleable.		16			100		6 6 10	0 7	
576.0			17					14		
575.0	18.0-20.0 As above.		18			80		6 8 11	0 4.2	
574.0			19					16		
573.0	20.0-22.0 Gray brown silty CLAY (CL), semi-soft, plastic and malleable.		20					5 7 12	0 3.5	
572.0			21					16		No well defined, base to the saturated zone. Finish time 11:40.
571.0			22							

Illinois Environmental Protection Agency — Field Boring Log

Site File No. 0310690006 County Cook Boring No. LE-9 Monitor Well No. NA

Site File Name Safety-Kleen Corp., Dolton, Illinois Surface Elev. 589.0 Completion Depth 24.0

Fed. ID. No. ILD980613913 Auger Depth 22 Rotary Depth NA

Quadrangle Lake Calumet, IL-IN Sec. 3 T. 36N R. 14E Date: Start 6/7/96 Finish 6/7/96

UTM Coord. N. _____ E. _____

Boring Location In grass/tree area N facility near SK-8

Drilling Equipment Diedrich D-120

Personnel: G - B. Culnan/C. Dewolf; D - D. Jackson; H - M. Stege; H -

Elev.	DESCRIPTION	Graphic Log	Depth in feet	Sample No.	Sample Type	Sample Recovery (%)	Pocket Penetrometer (tsf)	N Values (Blows)	OVA or PID readings (ppm)	REMARKS
	0.0-2.0 LOAM (OL), some gravelly fill (<10%), mostly organic soils.					75		7 8 9	0 4	Start time 15:05
588.0			1		SS			12		Surface elev. approx. (+/- 1") Top OVA number meas. with 11.8eV PID. Bottom number meas. with 10.6eV PID.
587.0	2.0-4.0 Soils as above to 3', some back fill material (gravelly/sand, poorly sorted), grading to gray brown mottled CLAY (CH) at 3'9".		2			70		8 10 10	0 1	
586.0			3					12		
585.0	4.0-6.0 Gray brown mottled CLAY (CH), soft, plastic and malleable.		4			100		5 5 6	0 0	Not as soft (wet) at this interval than in prev. borings.
584.0			5		SS			9		
583.0			6			100		4 6 6	0 1	
582.0	6.0-8.0 Gray brown mottled CLAY (CL) grading to gray brown gravelly clay at 6.5', iron staining, some sand, semi-soft, semi-malleable. Grading to soft gray brown, mottled clay at bottom.		7		SS			12		
581.0	8.0-10.0 Gray brown CLAY (CL) at top soft, plastic and malleable, layer of saturated silt (dark brown) at 8.5' approx. 3" thick grading to gray brown gravelly clay.		8			100		4 4 8	0 0	Sample collected in jar (gravelly clay)
580.0			9		SS			7		
579.0	10.0-12.0 Shelby tube		10							
578.0			11							
577.0	12.0-14.0 Typical gray brown SILTY CLAY (CL), a few small gravels, fairly stiff, but moist and malleable, fairly plastic.		12			100		7 8 10	0 6	
576.0			13		SS			16		
575.0	14.0-16.0 As above except softer, grading to stiffer at 15'.		14			100		7 9 17	6 30	
574.0			15		SS					

Illinois Environmental Protection Agency — Field Boring Log

Site File No. 0310690006 County Cook Boring No. LE-9 Monitor Well No. NA

Personnel: G - B. Culnan/C. Dewolf; D - D. Jackson; H - M. Stege; H -

Elev.	DESCRIPTION	Graphic Log	Depth in feet	Sample No.	Sample Type	Sample Recovery (%)	Pocket Penetrometer (tsf)	N Values (Blows)	OVA or PID readings (ppm)	REMARKS
								26		
					SS					
573.0	16.0-18.0 As above, fairly sitff but still semi-plastic and malleable. A few more shale pebbles & gravels at 17-18'.		16			100		6	0	
								11	6	
								17		
572.0			17		SS			19		
571.0	18.0-20.0 As above except stiffer, slightly more brittle, less gravel.		18			100		8		Approximate base of saturated zone.
								12		
								18		
570.0			19					36		
569.0	20.0-22.0 More gravel again at the 21 to 22' interval, stiff, hard & brittle, still some moisture.		20			100		5	0	
								13	7	
								20		
568.0			21					31		
567.0	22.0-24.0 As above.		22					12	0	5 ppm TOV registered on clean bag.
								16	5	
								28		
566.0			23					32		Finish time 16:00.
565.0			24							

Illinois Environmental Protection Agency — Field Boring Log

Site File No. 0310690006 County Cook Boring No. LE-10 Monitor Well No. NA

Site File Name Safety-Kleen Corp., Dolton, Illinois Surface Elev. 591.0 Completion Depth 26.0

Fed. ID. No. ILD980613913 Auger Depth 22 Rotary Depth NA

Quadrangle Lake Calumet, IL-IN Sec. 3 T. 36N R. 14E Date: Start 6/6/96 Finish 6/6/96

UTM Coord. N. E.

Boring Location In gravel W of tank farm located in E field area.

Drilling Equipment Diedrich D-120

Personnel: G - B. Culnan/C. Dewolf; D - D. Jackson; H - M. Stege; H -

Elev.	DESCRIPTION	Graphic Log	Depth in feet	Sample No.	Sample Type	Sample Recovery (%)	Pocket Penetrometer (tsf)	N Values (Blows)	OVA or PID readings (ppm)
	0.0-4.0 No log.								
590.0			1						
589.0			2						
588.0			3						
587.0	4.0-6.0 Gray brown mottled CLAY (CH), very soft, plastic and malleable, high odor, black staining.		4			80		3 4 4	650 395
586.0			5		SS			5	
585.0			6						
584.0			7						
583.0			8						
582.0	9.0-11.0 Gray brown silty CLAY (CL), fairly soft, plastic and malleable, moist.		9			100		5 7 8	13. 18.5
581.0			10		SS			10	
580.0			11						
579.0			12						
578.0			13						
577.0	14.0-16.0 Gray brown silty CLAY (CL) to 15', gravelly clay from 15' to bottom of spoon, soft, plastic and malleable.		14			100		4 6 7	0 2.1
576.0			15		SS				

REMARKS

Start time 13:30
Surface elev. approximate (+/- 1')
Sample collected in glass jar.
Top OVA number meas. with 11.8eV PID. Bottom number meas. with 10.6eV PID.

Illinois Environmental Protection Agency — Field Boring Log

Site File No. 0310690006 County Cook — Boring No. VB-1 Monitor Well No. MW-2

Site File Name Safety-Kleen Corp., Dolton, Illinois — Surface Elev. 591.0 Completion Depth 26.0

Fed. ID. No. ILD980613913 — Auger Depth 22 Rotary Depth NA

Quadrangle Lake Calumet, IL-IN Sec. 3 T. 36N R. 14E — Date: Start 6/6/96 Finish 6/6/96

UTM Coord. N. _____ E. _____

Boring Location N of main office BLDG in grass

Drilling Equipment Diedrich D-120

Personnel: G - B. Culnan/C. Dewolf; D - D. Jackson; H - M. Stege; H -

Elev.	DESCRIPTION	Graphic Log	Depth in feet	Sample No.	Sample Type	Sample Recovery (%)	Pocket Penetrometer (tsf)	N Values (Blows)	OVA or PID readings (ppm)	REMARKS
590.0			1							Start time 9:30 Surface elev. approx. (+/- 1') Top OVA number meas. with 11.8eV PID. Bottom number meas. with 10.6eV PID.
589.0			2							
588.0			3							
587.0	4.0-6.0 Wet CLAY (CH), gray brown mottled, low recovery.		4			15		12	0	Unsure where saturated zone begins.
								1	0.5	
586.0			5		SS			2		
								2		
585.0			6							
584.0			7							
583.0			8							
582.0	9.0-11.0 Gray brown mottled silty CLAY (CH), soft plastic & malleable.		9			90		4	0	
								5	0	
								5		
581.0			10		SS			6		
580.0			11							
579.0			12							Bottom of saturated zone btwn 11 and 14'.
578.0			13							
577.0	14.0-16.0 Gray brown, silty CLAY (CL), small shale pebbles, fairly stiff, still malleable.		14			100		5	0	
					SS			7	0	
								10		
576.0			15							

Illinois Environmental Protection Agency — Field Boring Log

Site File No. 0310690006 County Cook Boring No. VB-1 Monitor Well No. MW-2

Personnel
G - B. Culnan/C. Dew
D - D. Jackson
H - M. Stege
H -

Elev.	DESCRIPTION	Graphic Log	Depth in feet	Sample No.	Sample Type	Sample Recovery (%)	Pocket Penetrometer (tsf)	N Values (Blows)	OVA or PID readings (ppm)	REMARKS
					SS			13		
575.0			16							
574.0			17							
573.0	18.0-20.0 As above, but slightly stiffer.		18			100		5 8 11	0 0.3	
572.0			19					15		
571.0	20.0-22.0 As above.		20			100		5 8	0 0	
570.0			21					13 16		
569.0	22.0-24.0 As above, but stiffer, dryer, slightly brittle, fine-grained silty sand at 23.5'.		22			100		8 18	0 0	
568.0			23					28 42		
567.0	24.0-26.0 As above, silty sand at top and extending to 26', dry and crumbly, brittle, no moisture.		24			90		11 14	0 0	
566.0			25					26 26		
565.0			26							

Illinois Environmental Protection Agency — Field Boring Log

Site File No. 0310690006 County Cook — Boring No. VB-2 Monitor Well No. NA

File Name Safety-Kleen Corp., Dolton, Illinois — Surface Elev. 591.0 Completion Depth 27.0

Fed. ID. No. ILD980613913 — Auger Depth 22 Rotary Depth NA

Quadrangle Lake Calumet, IL-IN Sec. 3 T. 36N R. 14E — Date: Start 5/30/96 Finish 5/30/96

UTM Coord. N. _____ E. _____

Boring Location East of main office in parking lot.

Drilling Equipment Diedrich D-120

Personnel:
G - B. Culnan/C. Dewolf
D - D. Jackson
H - M. Stege
H -

Elev.	DESCRIPTION	Graphic Log	Depth in feet	Sample No.	Sample Type	Sample Recovery (%)	Pocket Penetrometer (tsf)	N Values (Blows)	OVA or PID readings (ppm)	REMARKS
										Start time 10:00
590.0			1							Surface elev. approximate (+/- 1') Top TOV reading 11.8, bottom reading 10.7
589.0			2							
588.0	3.0-5.0 Gray brown mottled yellow, silty CLAY (CH), saturated plastic malleable, silty sand at top 3-3.5'.		3			80		5 3 3 3	0 0	3-5' clearly saturated.
587.0			4		SS					
586.0			5							
585.0			6							
584.0			7							
583.0	8.0-10.0 Gray brown silty CLAY (CH), gravel/sand at top 8-8.3, plastic, moist, malleable.		8			80		4 4 5 9	0 2	8-10' only moist, possibly perched zone above 8'.
582.0			9		SS					
581.0			10							
580.0			11							
579.0			12							
578.0	13.0-15.0 No recovery in split spoon		13			0		5 7 9 12		13' Water flowing from hole.
577.0			14		SS					
576.0			15							

Illinois Environmental Protection Agency — Field Boring Log

Site File No. 0310690006 County Cook Boring No. VB-2 Monitor Well No. NA

Personnel
G - B. Culnan/C. Dewe
D - D. Jackson
H - M. Stege
H -

Elev.	DESCRIPTION	Graphic Log	Depth in feet	Sample No.	Sample Type	Sample Recovery (%)	Pocket Penetrometer (tsf)	N Values (Blows)	OVA or PID readings (ppm)	REMARKS
575.0			16							
574.0			17							
573.0	18.0-20.0 Gray brown CLAY (CH) as above, few small pebbles wet on outside of sleeves, very moist, plastic and malleable.		18			100		7 11 23 32	0 1.4	
572.0			19							
571.0	20.0-22.0 Gray brown CLAY (CL), as above, few small pebbles, wet on outside, stiffer, slightly brittle, not as plastic or as malleable.		20			100		9 16 29 36	0 2.0	Possible base of a 2nd water-bearing zone @ 20'.
570.0			21							
569.0	22.0-24.0 Gray brown, silty SAND (SM), very fine sand, moist, crumbly, semi-cohesive.		22			100		17 37 53 45	0 1.4	Many blow counts, very stiff.
568.0			23							
567.0			24							
566.0	25.0-27.0 Same as above, approx. 3" layer of gray brown clay at 25', may be slough		25			70		27 42 42 44	0 1.2	
565.0			26							Finished 11:10.
564.0			27							

Illinois Environmental Protection Agency — Field Boring Log

Site File No. 0310690006 County Cook

File Name Safety-Kleen Corp., Dolton, Illinois

Fed. ID. No. ILD980613913

Quadrangle Lake Calumet, IL-IN Sec. 3 T. 36N R. 14E

UTM Coord. N. _____ E. _____

Boring Location S part facility in grass S of RR spur

Drilling Equipment Diedrich D-120

Boring No. VB-3 Monitor Well No. MW-7

Surface Elev. 596.0 Completion Depth 38.0

Auger Depth 36 Rotary Depth NA

Date: Start 6/3/96 Finish 6/3/96

Personnel
G - B. Culnan/C. Dewolf
D - D. Jackson
H - M. Stege
H -

Elev.	DESCRIPTION	Graphic Log	Depth in feet	Sample No.	Sample Type	Sample Recovery (%)	Pocket Penetrometer (tsf)	N Values (Blows)	OVA or PID readings (ppm)	REMARKS
595.0			1							Start time 13:30. Surface elev. approx. (+/- 1') Top OVA number meas. with 11.8eV PID. Bottom number meas. with 10.6eV PID.
594.0			2							
593.0	3.0-5.0 Loam/gravelly fill.		3		SS	60		14 13 16 15	4.7 9.0	
592.0			4							
591.0			5							
590.0			6							
589.0			7							
588.0	8.0-10.0 Coarse grained SAND (SW), at 8.5' sandy gray brown CLAY (CL) to 9.5', fine grained medium sand to 10', dark staining at 9.5', moist, semi-cohesive.		8		SS	100		4 4 3 4	171 369	
587.0			9							
586.0			10							
585.0			11							
584.0			12							
583.0	13.0-15.0 Fine to medium grained saturated SAND (SW), clayey sand interval from 14.0-14.2'.		13		SS	100		3 1 4 4	353 410	Lots of moisture on split spoon.
582.0			14							
581.0			15							

Illinois Environmental Protection Agency — Field Boring Log

Site File No. 0310690006 County Cook Boring No. VB-3 Monitor Well No. MW-7

Personnel: G - B. Culnan/C. Dew; D - D. Jackson; H - M. Stege; H -

Elev.	DESCRIPTION	Depth in feet	Sample No.	Sample Type	Sample Recovery (%)	Pocket Penetrometer (tsf)	N Values (Blows)	OVA or PID readings (ppm)	REMARKS
580.0		16							
579.0		17							
578.0	18.0-20.0 Same as above, SAND (SW), grading to gray brown silty CLAY (CL) at 19'.	18			100		3 7 9 11	9 11	Moisture on brass rings.
577.0		19							
576.0	20.0-22.0 Fine to medium grained SAND (SP) grading to gray brown silty CLAY (CL) at 21'.	20			100		4 7 9 13	14 14	
575.0		21							
574.0	22.0-24.0 Gray brown CLAY (CL), SANDY (SP) interval beginning at 23.5' to bottom, fine grained to bottom. Clay stiff, but moist. Sand appears to be saturated.	22					8 12 16 21	142 185	
573.0		23							
572.0	24.0-26.0 CLAY (CL) beginning at 24.5', stiff.	24					9 14 17 24	33 29	Possible that high TOV result of water from above interval migrating down hole.
571.0		25							
570.0	26.0-28.0 Gray brown silty CLAY (CL).	26					9 14 17 18	4.7 17	
569.0		27							
568.0		28							
567.0		29							
566.0	30.0-32.0 Gray brown silty CLAY (CL), fairly stiff, homogenous, only semi-malleable, slightly brittle.	30			100		11 19 30 32	9.5 19	
565.0		31							
564.0		32							

Illinois Environmental Protection Agency — Field Boring Log

Site File No. 0310690006 County Cook Boring No. VB-3 Monitor Well No. MW-7

Personnel
G - B. Culnan/C. Dewolf
D - D. Jackson
H - M. Stege
H -

Elev.	DESCRIPTION	Graphic Log	Depth in feet	Sample No.	Sample Type	Sample Recovery (%)	Pocket Penetrometer (tsf)	N Values (Blows)	OVA or PID readings (ppm)	REMARKS
	32.0-34.0 Same as above, stiff, moist, more brittle.					85		12 16 19 28	0 2.1	Lots of blow counts.
563.0			33							
562.0	34.0-36.0 As above.		34			100		11 17 29 38	0 2.4	
561.0			35							
560.0	36.0-38.0 As above, slightly more malleable, still fairly stiff.		36			100		12 14 19 26	0 6.0	
559.0			37							Finish time 14:45
558.0			38							

APPENDIX C

QUALITY ASSURANCE REPORT

PHASE II/III RCRA FACILITY INVESTIGATION
SAFETY-KLEEN CORP. RECYCLE CENTER
DOLTON, ILLINOIS

APPENDIX C

QUALITY ASSURANCE PROJECT REPORT

Introduction

This Quality Assurance Project Report summarizes the quality assurance/quality control (QA/QC) evaluations of the investigative (RFI) data, which was collected during the Phase II/III RCRA Facility Investigation at the Safety-Kleen Corp.(S-K) Recycle Center at 633 138th Street in Dolton, Illinois. The evaluations were conducted to ensure that the investigative data are sufficiently precise, accurate, representative, and complete to achieve the RFI project objectives. The evaluations were performed in accordance with the RCRA Facility Investigation Quality Assurance Project Plan (QAPjP), which was included as Appendix D of the RFI Workplan.

Project Description

The purpose of the Phase II/III RFI at the S-K Recycle Center in Dolton, Illinois was to define the extent of soil and ground-water impacts at the site. The Phase II/III investigation involved the following activities:

1. Lateral Extent Soil Sampling (May - June 1996)
2. Vertical Extent Soil Sampling (May - June 1996)
3. Installation of Monitoring Wells (May - June 1996)
4. Collection of ground-water samples (June 1996)

Soil samples were submitted for laboratory analysis of volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and TCLP metals (barium, cadmium, lead, and mercury). Samples collected from the East Field Investigation Area were also submitted for analysis of PCBs.

Ground-water samples were submitted for laboratory analysis of volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and total metals (barium, cadmium, lead and mercury). Based on the results of the total metals analyses, one sample was analyzed for dissolved lead.

Quality Assurance Evaluations

The quality assurance objectives provide quantitative and qualitative measures of the ability to produce high-quality results through a properly designed sampling and analysis program. The objectives of the overall quality assurance/quality control (QA/QC) program were to:

- Ensure that all procedures were documented, including any changes from the Workplan protocol).
- Ensure that all sampling and analytical procedures were conducted according to sound scientific principles.
- Evaluate the quality of the analytical data through a system of quantitative and qualitative criteria.
- Ensure that all data and observations are properly recorded and archived.

The degree to which these objectives were satisfied during the performance of the RFI is discussed below. This analysis is divided into the following:

1. Field Procedures Quality Control Evaluation
2. Laboratory Data Quality Control Evaluation (for Method Detection Limits, Accuracy, Precision, and Completeness)
3. Overall Evaluation of Data Representativeness and Comparability

Field Procedures Quality Control Evaluation

Quality control during the field procedures was attained through:

- Compliance with the Workplan as approved with conditions by IEPA;
- Use of a qualified and experienced field team;
- Proper recording and archiving of all field data;
- Documentation of any changes from the Workplan in daily field memoranda and quarterly progress reports to IEPA;

The field procedures are described in Chapter 3 of the Phase II RFI Workplan and chapters 4 and 5 of this document. The RFI was conducted in accordance with the Workplan, as approved with conditions by IEPA, except that:

- The locations and number of monitoring wells were modified during teleconferences with IEPA on June 5 and 6, 1996.

The project management structure is presented on Figure C-1. The minor changes in management structure from that proposed in the RFI Workplan are indicated on Figure C-1.

Field data are complete with respect to the Workplan requirements for Phase II/III. They are archived as Appendix H of this report. The few changes from the Workplan procedures are documented in the quarterly reports (dated April 9, 1996, July 30, 1996, and October 31, 1996) and in this Phase II/III report.

Laboratory Data Quality Control Evaluation

The objective of the Phase II/III RFI was to determine the extent of soil and ground-water impacts at the S-K Recycle Center. As specified in the RFI Workplan, this determination was made on the basis of laboratory data, which were subjected to data validation procedures described in the Workplan. This section provides the results of the quantitative evaluation of the laboratory data.

The laboratory data were evaluated quantitatively in terms of method detection limits, precision, accuracy, and completeness. Data which did not satisfy the quantitative criteria in the QAPjP were defined as "qualified." Safety-Kleen has taken the conservative approach and qualified all data which do not satisfy the QC limits exactly. Safety-Kleen has also evaluated qualified data and determined if they can be used to achieve the project objectives. Qualified data which were found to be consistent with data which were not qualified were considered useful in achieving project objectives.

The laboratory data collected during the Phase II/III RFI included:

For Soil:

- Analysis of 44 investigative samples and five field duplicates for Volatile Organic Compounds (VOCs) by Method 8240;
- Analysis of 44 investigative samples and five field duplicates for Semivolatile Organic Compounds (SVOCs) by EPA Method 8270
- Analysis of 44 investigative samples and five field duplicates for TCLP barium, cadmium, lead and mercury by EPA inductively coupled plasma and atomic absorption methods.
- Analyses of 10 investigative soil samples for PCBs by EPA Method 8080.

For Ground Water:

- Analysis of 13 investigative samples, two duplicates, two equipment blanks and one field blank for Volatile Organic Compounds (VOCs) by Method 8240;

- Analysis of 12 investigative samples, two duplicates, two equipment blanks and one field blank for Semivolatile Organic Compounds (SVOCs) by EPA Method 8270;

- Analysis of 12 investigative samples, two duplicates, one equipment blank and one field blank for total barium, cadmium, lead, and mercury by EPA inductively coupled plasma and atomic absorption methods.

- Analyses of one sample for dissolved lead.

Quality control data were collected at the following levels in accordance with the Quality Assurance Plan:

1. Field (Blind) Duplicate Samples. At least one field duplicate for every 10 investigative samples.

2. Matrix Spike/Matrix Spike Duplicate. At least one for each 20 samples received.

3. Surrogate Spiking. Added to all soil samples (organic analyses), prior to extraction and analysis.

4. Method Blanks. One for each batch of samples with a minimum of one per twenty samples.

The level of quality control for PCBs was not specified in the QAPjP. The actual QC level for PCBs was; surrogate spikes for each sample and two method blanks for 10 investigative samples. In accordance with the laboratory SOP, matrix spikes are analyzed only if PCBs are detected in a batch of samples. PCBs were not detected in any of the samples analyzed.

Soil Method Detection Limits

The method detection limits (MDLs) goals are listed for each constituent in Table 5-1 of Appendix VII-A of the QAPjP. The actual MDLs for the analysis of each constituent in each sample are provided in the laboratory reports in appendices J and K. In general, the reported MDLs were higher than the MDL goals in most soil samples for VOCs (EPA Method 8240). In general, the MDL goals were achieved for SVOCs, PCBs and metals. The MDLs for each constituent group are discussed below.

VOCs. Thirty-four of the 49 soil samples required dilution in order to obtain QA/QC data within the control limits. The required dilutions are summarized in Table C-1. The

Table C-1. Undiluted Sample Results, Volatile Organic Compounds, Phase II/III RFI, S-K Corp. Recycle Center, Dolton, Illinois

	Undiluted Sample Results											
Sample	Methyl Ethyl Ketone mg/kg	Methylene chloride mg/kg	Tetrachloro ethene mg/kg	1,1,2-Trichloro ethane mg/kg	Trichloro ethene mg/kg	Benzene mg/kg	1,1-Dichloro ethene mg/kg	1,2-Dichloro propane mg/kg	1,2-Dichloro ethane mg/kg	trans- 1,3-Dichloro propene mg/kg	Vinyl Chloride mg/kg	Dilution Required for Acceptable QA/QC
LE-1(18-20)	ND(0.1)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	10x
LE-2(18-20)	ND(0.1)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	10x
LE-2(4-6)	ND(0.1)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	10x
LE-4(18-20)	ND(0.1)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	10x
LE-5(18-20)	ND(0.1)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	10x
LE-5(2-4)	0.107	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	10x
LE-7(18-20)	ND(0.1)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	10x
LE-7(4-6)	ND(0.1)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	5x
LE-8(18-20)	ND(0.1)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	50x
LE-8(4-6)	ND(0.1)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	10x
LE-9(18-20)	ND(0.1)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	10x
LE-9(22-24)	ND(0.1)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	50x
LE-10(18-20)	ND(0.1)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	10x
LE-10(24-26)	ND(0.1)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	50x
LE-10(4-6)	ND(0.1)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	**0.0208**	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	10x
VB-1(20-22)	ND(0.1)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	50x
VB-1(24-26)	ND(0.1)	ND(0.005)	**0.0322**	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	50x
VB-2(20-22)	ND(0.1)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	10x
VB-2(25-27)	ND(0.1)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	50x
VB-3(32-34)	ND(0.1)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	10x
VB-3(34-36)	ND(0.1)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	10x
VB-4(22-24)	ND(0.1)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	10x
VB-4(22-24)/[XX-3]	ND(0.1)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	
VB-4(26-28)	ND(0.1)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	50x

Note: Internal standard recoveries were low on all these analyses.
Samples were diluted to obtain internal standard recoveries within control limits.
Results of diluted samples are presented in the text. Representative aliquots of the undiluted samples were spiked with 5-50 mg/kg of the five selected compounds of possible concern at the site.
Matrix spiked results for undiluted samples are presented only to indicate that 5-50 mg/kg levels of these constituents would have been detectable despite low internal standard results. See text.

BOLD indicates qualified data

Table C-1. Undiluted Sample Results, Volatile Organic Compounds, Phase II/III RFI, S-K Corp. Recycle Center, Dolton, Illinois

	Undiluted Sample Results											
Sample	Methyl Ethyl Ketone mg/kg	Methylene chloride mg/kg	Tetrachloro ethene mg/kg	1,1,2-Trichloro ethane mg/kg	Trichloro ethene mg/kg	Benzene mg/kg	1,1-Dichloro ethene mg/kg	1,2-Dichloro propane mg/kg	1,2-Dichloro ethane mg/kg	trans- 1,3-Dichloro propene mg/kg	Vinyl Chloride mg/kg	Dilution Required for Acceptable QA/QC
VB-5(20-22)	ND(0.1)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	10x
VB-5(20-22)/[XX-5]	ND(0.1)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	
VB-5(24-26)	ND(0.1)	0.017	ND(0.005)	ND(0.005)	ND(0.005)	**0.0098**	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	50x
VB-6(20-22)	ND(0.1)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	50x
VB-6(20-22)/[XX-4]	ND(0.1)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	
VB-6(24-26)	ND(0.1)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	10x
VB-7(20-22)	ND(0.1)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	10x
VB-7(24-26)	ND(0.1)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	50x
VB-8(24-26)	ND(0.1)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	10x
VB-9(22-24)	ND(0.1)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	10x
VB-9(26-28)	ND(0.1)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	50x
Spike Recoveries												
LE-9 (18-20)MS	--	386%	180%	88%	83%	162%	173%	120%	160%	66%	204%	
LE-10 (24-26)MS	--	600%	240%	180%	78%	166%	200%	174%	154%	102%	190%	
VB-1 (20-22)MS	100%	--	98%	101%	97%	110%	96%	103%	103%	97%	98%	

Note: Internal standard recoveries were low on all these analyses.
Samples were diluted to obtain internal standard recoveries within control limits.
Results of diluted samples are presented in the text. Representative aliquots of the undiluted samples were spiked with 5-50 mg/kg of the five selected compounds of possible concern at the site.
Matrix spiked results for undiluted samples are presented only to indicate that 5-50 mg/kg levels of these constituents would have been detectable despite low internal standard results. See text.

BOLD indicates qualified data

primary reason for the dilutions was that internal standard recoveries were below the control limit in the undiluted samples. All internal standard recoveries were within control ranges in the diluted samples. Based on previous experience and on discussions with personnel from several laboratories, low internal standard recoveries appear to be a common problem associated with dense clay matrix soils, such as those at the Dolton Recycle Center. This problem is considered to be due to the adsorption of the internal standard compounds onto the clays. The adsorption may be specific to certain of the internal standard compounds. In this event, the low recovery of the internal standards can result in the overestimation of the concentrations of target constituents.

Due to the required dilution, the MDL goals were not achieved for most constituents in the 34 samples. For ten constituents, the elevated detection limits were above the IEPA Tier I Soil Cleanup Objectives (Class I Ground Water). These constituents are:

Methylene Chloride
Tetrachloroethene
1,1,2-Trichloroethane
Trichloroethene
Benzene
1,1-Dichloroethene
1,2-Dichloropropane
1,2-Dichloroethane
Trans- 1,3-Dichloropropene
Vinyl Chloride

To address this situation, S-K took the following actions:

1. To verify that the constituents of concern (if present) could be detected in the undiluted samples, representative soil samples were spiked with a solution containing the constituents of concern. Methyl ethyl ketone was also added to the spike solution. The concentrations of the constituents in the matrix spike solution were selected to be in the range of the IEPA TACO Tier I Soil Cleanup objectives (0.005 - 0.05 mg/kg). These matrix spiked samples were analyzed without dilution.

   The results of the matrix spike analyses are presented in Table C-1. The spike recoveries for the constituents of concern were 78 -600%. This result indicates that if the constituents of concern were present in the samples, they would likely have been detected in the analyses of the undiluted samples.

2. The results of the analyses of the undiluted samples were reported for the constituents of concern, even though the internal standard recoveries were low. These results are presented in Table C-1. In general, the constituents of concern were not detected in the undiluted samples. The following constituents were detected in the undiluted samples but not in the diluted samples:

   VB-5(24-26); MC- (0.017 mg/kg); B - (0.0098 mg/kg)

LE-5(2-4); MEK - (0.107 mg/kg)
LE-10(4-6); B - (0.0208 mg/kg)
VB-1 (24-26); PCE - (0.0322 mg/kg)

For these four constituents in these samples, the results reported in the tables and figures of the text are those of the diluted samples which passed the QA/QC criteria. However, because of the discrepancy between the diluted and undiluted sample results, these data have been qualified.

SVOCs. The reported soil SVOC MDLs (Method 8270) achieved the goals established in the QAPjP for all samples.

PCBs. The method detection limit goals were achieved for all samples for PCBs analyses.

Metals. The MDL goals were met for all TCLP barium, cadmium and mercury analyses. The MDL goals were not met for lead. The achieved detection limit for lead (0.4 mg/L) was above the Tier I Class II ground-water protection CUO (0.1 mg/L). Therefore, all lead data were qualified. However, as indicated in the text, lead was not detected at a concentration above the Class II CUOs in any of the shallow ground-water samples during Phase I or Phase III. The TCLP lead concentration exceeded the Tier I Class II CUO in only 1 of 25 shallow soil samples collected during the Phase I RFI. Therefore, it is not likely that elevated concentrations of leachable lead exist in the shallow saturated or unsaturated soils at the facility.

Ground-Water Detection Limits

The MDL goals were met for VOCs in all samples except for MW-7 Dup. This sample required dilution (10x) to obtain acceptable QA/QC results due to elevated concentrations of toluene. SW-846 allows for elevated MDLs in samples with possible matrix interferences, such as high concentrations of a target constituent. Therefore, VOC data for MW-7 Dup were not qualified. The MDL goals were met for SVOCs and metals in all of the ground-water samples.

Accuracy and Precision

The following criteria were used to validate data for accuracy and precision:

1. Accuracy
    - Holding Time Requirements
    - Surrogate Recovery Ranges (organic constituents only)
    - Matrix Spike Recovery Ranges
    - Method Blanks

- Laboratory Control Samples (inorganic constituents only)

2. Precision

   - Field Duplicate Results
   - Matrix Spike/ Matrix Spike Duplicate Reproducibility

For each of the criteria (except field duplicate results), quantitative acceptability limits have been established in the QAPjP and in SW-846. No quantitative acceptability ranges for field duplicates were established in the QAPjP or in SW-846. The objective of the laboratory data audit was to determine for which data these limits were not met and what effect those situations had on the use of the data to achieve the RFI objectives.

Completeness of the data was determined based on the percentage of the data which satisfied the quantitative criteria above. The project objective for data completeness, as established in the QAPjP, was 95%.

For Soil:

The results of the soil data quality assurance evaluation are presented below, by analysis type.

Soil VOCs. The quality assurance review resulted in the qualification of 20 of the 2,695 soil VOC data (0.7%). Five of these qualifications were due to the detection of target constituents in undiluted samples (which did not pass QA/QC criteria) and the non-detection of these compounds in the diluted samples (which did pass QA/QC criteria). This situation was described in the previous section titled "Method Detection Limits." The remaining qualifications were due to out of control surrogate recoveries.

Holding times for the soil VOC analyses are presented in Table C-2; all VOC analyses were conducted within the required holding times. VOC QA/QC data on accuracy and precision are summarized in Table C-3. High surrogate recoveries were obtained for 1,2-dichloroethane for several samples. A high surrogate recovery may indicate the overestimation of the concentration of any detected constituent in the same quantitation group as the surrogate. The surrogate quantitation groups for VOCs are presented in Table C-4. The detection of acetone in samples LE-5(2-4), LE-8(4-6), and LE-10(4-6) was therefore qualified.

Low surrogate recoveries of bromofluorobenzene were obtained for samples XX-2, XX-4 and VB-7(24-26). A low surrogate recovery may indicate the underestimation of constituents in the same quantitation group as the surrogate. Therefore, for these samples, data for all constituents (4) in the same quantitation group were qualified. All other VOC QA/QC results were within control limits.

Soil SVOCs. Holding times of the soil SVOC analyses are presented in Table C-2; all soil SVOC analyses were conducted within the required holding times. Soil SVOC QA/QC data on accuracy and precision are summarized in Table C-5. As described below, 247 of the 3,136 SVOC investigative data (7.8%) have been qualified.

Table C-2. Soil Holding Times, Phase II/III RFI, S-K Corp. Recycle Center, Dolton, Illinois

Sample	Sample Collection Date	VOC Analysis Date	SVOC Extraction Date	SVOC Analysis Date	PCB Analysis Date	Metals Leach Dates	Metals Analyses Dates
SW-846 Limit		14 Days	14 Days	40 Days			6 months (Hg 28 days)
LE-1 (2-4)	5/30/96	6/7/96	6/5/96	6/7/96	6/10/96	6/5/96	6/11/96
LE-1(18-20)	5/30/96	6/7/96	6/5/96	6/7/96	6/10/96	6/5/96	6/11/96
LE-2 (4-6)	5/30/96	6/7/96	6/7/96	6/13/96	6/10/96	6/5/96	6/11/96
LE-2 (18-20)	5/30/96	6/7/96	6/7/96	6/13/96	6/10/96	6/5/96	6/11/96
LE-3 (20-22)	5/31/96	6/7/96	6/5/96	6/7/96	NA	6/5/96	6/11/96
LE-4 (4-6)	5/31/96	6/7/96	6/5/96	6/7/96	NA	6/5/96	6/11/96
LE-4 (18-20)	5/31/96	6/11/96	6/5/96	6/7/96	NA	6/5/96	6/11/96
LE-5 (2-4)	5/31/96	6/7/96	6/5/96	6/7/96	NA	6/5/96	6/11/96
LE-5 (18-20)	5/31/96	6/11/96	6/5/96	6/7/96	NA	6/5/96	6/11/96
LE-6 (4-6)	6/3/96	6/6/96	6/7/96	6/13/96	NA	6/4/96	6/7/96 - 6/11/96
LE-6 (18-20)	6/3/96	6/6/96	6/7/96	6/13/96	NA	6/4/96	6/7/96 - 6/11/96
LE-7 (4-6)	6/5/96	6/14/96	6/15/96	6/17/96	NA	6/10/96	6/14/96
LE-7 (18-20)	6/5/96	6/14/96	6/15/96	6/17/96	NA	6/10/96	6/14/96
LE-7 Dup (18-20)/[XX-1]	6/5/96	6/14/96	6/15/96	6/17/96	NA	6/10/96	6/14/96
LE-8 (4-6)	6/7/96	6/18/96	6/13/96	6/18/96	NA	6/12/96	6/17/96 - 6/18/96
LE-8 (18-20)	6/7/96	6/20/96	6/13/96	6/15/96	NA	6/12/96	6/17/96 - 6/18/96
LE-9 (2-4)	6/7/96	6/18/96	6/13/96	6/15/96	NA	6/12/96	6/17/96 - 6/18/96
LE-9 (18-20)	6/7/96	6/18/96	6/13/96	6/15/96	NA	6/13/96	6/17/96 - 6/18/96
LE-9 (22-24)	6/7/96	6/18/96	6/18/96	6/21/96	NA	6/13/96	6/17/96 - 6/18/96
LE-10 (4-6)	6/6/96	6/17/96	6/13/96	6/15/96	6/17/96	6/12/96	6/17/96 - 6/18/96
LE-10 (18-20)	6/6/96	6/17/96	6/13/96	6/15/96	6/17/96	6/12/96	6/17/96 - 6/18/96
LE-10 (24-26)	6/6/96	6/18/96	6/13/96	6/14/96	NA	6/12/96	6/17/96 - 6/18/96
VB-1 (20-22)	6/6/96	6/18/96	6/13/96	6/15/96	6/17/96	6/12/96	6/17/96 - 6/18/96
VB-1 (24-26)	6/6/96	6/17/96	6/13/96	6/15/96	6/17/96	6/12/96	6/17/96 - 6/18/96
VB-2 (20-22)	5/30/96	6/7/96	6/5/96	6/7/96	6/10/96	6/5/96	6/11/96
VB-2 (25-27)	5/30/96	6/7/96	6/5/96	6/7/96	6/10/96	6/5/96	6/11/96
VB-3 (22-24)	6/3/96	6/11/96	6/13/96	6/15/96	NA	6/13/96	6/17/96 - 6/18/96
VB-3 (32-34)	6/3/96	6/6/96	6/7/96	6/13/96	NA	6/4/96	6/7/96 - 6/11/96
VB-3 (34-36)	6/3/96	6/6/96	6/7/96	6/13/96	NA	NA	NA
VB-3 (36-38)	6/3/96	6/6/96	6/7/96	6/13/96	NA	6/4/96	6/7/96 - 6/11/96
VB-4 (22-24)	6/4/96	6/13/96	6/15/96	6/18/96	NA	6/10/96	6/14/96
VB-4 Dup (22-24)/ [XX-3]	6/5/96	6/15/96	6/15/96	6/17/96	NA	6/10/96	6/14/96
VB-4 (26-28)	6/4/96	6/14/96	6/15/96	6/17/96	NA	6/10/96	6/14/96
VB-4 Dup (26-28)/ [XX-2]	6/5/96	6/15/96	6/15/96	6/17/96	NA	6/10/96	6/14/96
VB-5 (20-22)	6/7/96	6/18/96	6/13/96	6/19/96	NA	6/12/96	6/17/96 - 6/18/96
VB-5 Dup (20-22)/ [XX-5]	6/7/96	6/18/96	6/13/96	6/17/96	NA	6/13/96	6/17/96 - 6/18/96
VB-5 (24-26)	6/7/96	6/18/96	6/13/96	6/15/96	NA	6/12/96	6/17/96 - 6/18/96
VB-6 (20-22)	6/4/96	6/14/96	6/15/96	6/19/96	NA	6/10/96	6/14/96
VB-6 Dup (20-22)/ [XX-4]	6/5/96	6/15/96	6/15/96	6/17/96	NA	6/10/96	6/14/96

Table C-2. Soil Holding Times, Phase II/III RFI, S-K Corp. Recycle Center, Dolton, Illinois

Sample	Sample Collection Date	VOC Analysis Date	SVOC Extraction Date	SVOC Analysis Date	PCB Analysis Date	Metals Leach Dates	Metals Analyses Dates
SW-846 Limit		14 Days	14 Days	40 Days			6 months (Hg 28 days)
VB-6 (24-26)	6/4/96	6/13/96	6/15/96	6/17/96	NA	6/10/96	6/14/96
VB-7 (20-22)	6/6/96	6/17/96	6/11/96	6/12/96	NA	6/12/96	6/17/96 - 6/18/96
VB-7 (24-26)	6/6/96	6/18/96	6/11/96	6/12/96	NA	6/12/96	6/17/96 - 6/18/96
VB-8 (24-26)	6/5/96	6/17/96	6/13/96	6/17/96	NA	6/13/96	6/17/96 - 6/18/96
VB-8 (30-32)	6/5/96	6/14/96	6/15/96	6/17/96	NA	6/10/96	6/14/96
VB-8 (34-36)	6/5/96	6/13/96	6/15/96	6/17/96	NA	6/10/96	6/14/96
VB-9 (22-24)	6/4/96	6/13/96	6/13/96	6/17/96	NA	6/10/96	6/14/96
VB-9 (26-28)	6/4/96	6/14/96	6/13/96	6/18/96	NA	6/10/96	6/14/96
MW-6 (4-6)	6/5/96	6/13/96	6/15/96	6/17/96	NA	6/10/96	6/14/96
MW-6 (20-22)	6/5/96	6/14/96	6/15/96	6/17/96	NA	6/10/96	6/14/96

Table C-3. Soil Sample QA/QC Summary, Volatile Organic Compounds, Phase II/III RFI, S-K Corp. Recycle Center, Dolton, Il

	Surrogate Recoveries		
Sample	Toluene	Bromofluorobenzene	1,2-Dichloro-ethane-d4
Quality Control Limit	81-117	74-121	70-121
LE-5(2-4)	110	87	**123**
LE-4(4-6)	107	90	**127**
VB-9(22-24)	92	91	**137**
LE-7 (4-6)	106	83	**127**
VB-8(30-32)	101	86	**125**
LE-10(4-6)	111	91	**126**
VB-5(24-26)	91	80	**126**
LE-8(4-6)	115	85	**123**
LE-9(22-24)	88	81	**140**
VB-3(22-24)	107	88	**124**
XX-2	108	**69**	118
XX-4	111	**72**	115
VB-7 (24-26)	95	**71**	114
Range of other sample surrogate recoveries (46)	88-119	74-99	90-121

Matrix Spikes/Matrix Spike Duplicates

Sample	Benzene	Chlorobenzene	1,1-Dichloroethene	Toluene	Trichloroethene
Quality Control Limit (Spike Recovery)	76-127	75-110	61-145	76-125	71-120
MS/MSD Recoveries					
VB-3(32-34)MS	104	93	92	133	112
VB-3(32-34)MSD	99	95	105	147	117
9603700MS	104	107	96	131	101
9603700MSD	100	99	100	113	101
Range of Other Recoveries (26)	96-110	86-107	81-132	85-125	92-113
Quality Control Limit (% RPD)	20	20	20	20	20
Range of All % RPD (15 pairs)	0-5	0-10	0-17	0-18	0-8

Method Blanks and Blanks

No VOCs detected in any of (16) Method Blanks

Notes: Bold indicates recoveries above QA/QC control limits

Table C-4. Quantitation Groups, Volatile Organic Compounds, Method 8240, Phase I RFI, Safety-Kleen Dolton Recycle Center, Dolton, Illinois.

1,2-Dichloroethane-d4	Toluene-d8	Bromofluorobenzene
Acetone	Bromoform	Chlorobenzene
Benzene	1,2-Dichloropropane	Ethylbenzene
Bromodichloromethane	cis-1,3-Dichloropropene	Styrene
Bromomethane	trans- 1,3-Dichloropropene	Xylenes
Carbon Disulfide	2-Hexanone	
Carbon Tetrachloride	4-Methyl-2-Pentanone	
Chloroethane	1,1,2,2-Tetrachloroethane	
Chloroform	Tetrachlorethene (PERC)	
Chloromethane	Toluene	
Dibromochloromethane	1,1,2-Trichloroethane	
1,1-Dichloroethane		
1,2-Dichloroethane		
1,1-Dichloroethene		
cis-1,2-Dichloroethene		
trans-1,2-Dichloroethene		
Methylene Chloride		
2-Butanone (MEK)		
1,1,1-Trichloroethane		
Trichloroethene		
Trichlorofluoromethane		
1,1,2-Trichlorotrifluoroethane		
Vinyl Acetate		
Vinyl Chloride		

Notes: Quantitation groups based on S-K Lab retention times for EPA method 8240. Dichloroethane group (RT< 14 minutes); Toluene group (RT = 14-18 minutes) ; Bromobenzene group (RT<18 minutes).

Table C-5. Soil Data QA/QC Summary, Semi Volatile Organic Compounds, Phase II/III RFI, S-K Corp. Recycle Center, Dolton, Illinois.

Surrogate Recoveries

Sample	Phenol-d5	2-Fluorophenol	Nitrobenzene-d8	2-Fluorobiphenyl	2,4,6-Tribromophenol
QA/QC limit (SW-846)	13-121	16-108	27-112	34-118	32-123
VB-2(25-27)	81	56	62	76	28
All Others (48)	51-88	47-72	38-81	59-90	36-96

Matrix Spike/Matrix Spike Duplicates

Sample	Phenol	2-Chlorophenol	1,4-Dichloro-benzene	N-Nitroso di-n-propylamine	1,2,4-Trichlorobenzene	4-Chloro 3-Methyl Phenol	Acenapthene	4-Nitrophenol	2,4-Dinitro toluene	Pentachlorophenol	Pyrene
QA/QC Limit (QuAPjP)	32-115	34-118	33-110	47-124	34-107	46-132	44-120	13-111	39-123	19-151	33-119
VB-6 (20-22) MS	73	73	72	80	73	82	84	42	67	6	82
VB-6 (20-22) MSD	69	68	68	72	69	79	80	38	65	4	79
96-03869 MS	51	49	40	47	48	62	64	67	61	45	74
96-03869 MSD	39	36	30	40	38	46	48	46	46	31	51
LE-9 (22-24) MS	76	73	66	74	69	83	79	47	70	10	83
LE-9 (22-24) MSD	77	79	68	76	72	84	82	57	73	13	84
96-026356 MS	104	116	119	161	116	130	139	5	25	69	118
96-026356 MSD	95	108	109	144	106	120	129	5	24	58	116
All Others (8)	39-67	36-70	30-64	39-76	38-63	46-99	48-81	35-83	46-75	20-83	51-79
QA/QC Limit %RPD (QuAPjP)	40	40	40	40	40	40	40	40	40	40	40
96-038690 MS/MSD	25	31	13	34	48	28	43	27	30	17	20
Range of sample % RPD (3 pairs)	2-25	2-31	2-39	1-34	0-35	2-28	3-33	0-27	1-27	3-17	1-23

Method Blanks

No Constituents detected in any of sixr (6) method blanks

Note: **Bold** indicates data above QC limits. ***Bold Italics*** indicate data below QC limits.

As shown in Table C-5, one soil sample [VB-2(25-27)] had one surrogate recovery (2,4,6- Tribromophenol) that was below the control limits. Low surrogate recoveries indicate the possible underestimation of the concentrations of constituents in the same quantitation group as the out-of-control surrogate. SVOC quantitation groups are shown in Table C-6. Because the other surrogate in the same quantitation group (2-Fluorobiphenyl) was within quality control limits, no SVOC data were qualified due to the low surrogate recovery.

As shown in Table C-5, spike recoveries for matrix spike and/or duplicate samples VB-6(20-22), 96-03869 and LE-9, were outside of the control limits for one or more of the following constituents: 1,4-Dichlorobenzene, N-Nitroso-di-n-propylamine, and pentachlorophenol. In each of the cases described above, the matrix spike recoveries and reproducibilities were within control limits for all other matrix spike constituents in the same quantitation group as the out of control spike constituent. The SVOC quantitation groups are shown in Table C-6. Therefore, no data were qualified due to these low matrix spike recoveries.

As shown on Table C-5, several of the matrix spike compounds were outside of control limits for sample 96-026356MS/MSD. All detected SVOC data on samples within the same analytical batch (Batch D) were qualified. Also, all constituents in the same quantitation group as 4-nitrophenol and 2,4-dinitrophenol were qualified for those samples in Batch D. This resulted in qualification of 247 data. All other soil SVOC QA/QC results were within QA/QC limits.

Soil PCBs. Holding times for the PCB analyses are presented on Table C-2; the PCB analyses were conducted within the required holding times. The PCB QA/QC data for accuracy and precision are summarized in Table C-7. The PCB QA/QC data were within control limits. No PCB data were qualified.

Soil TCLP Metals. Forty-eight (48) of 192 soil metals data were qualified (25%). Holding times for the metals analyses are presented in Table C-2; all metals analyses were conducted within the required holding times. The metals QA/QC data for accuracy and precision are summarized in Table C-8. All metals QA/QC data were within the control limits. The lead analyses were qualified due to elevated detection limits. However, because during the Phase I RFI, lead was detected in only one shallow soil sample at a concentration above the CUOs, this qualification should not impact the RFI results No other metals data were qualified.

Soil Data Completeness

Completeness is defined as the percentage of unqualified environmental data. Data are qualified if they do not satisfy the QC limits for accuracy and precision that have been established in the QAPjP. Data qualifications are summarized below:

- 20 of 2,695 soil VOC data (0.7%);
- 247 of 3,136 soil SVOC data (7.8%);

Table C-6. Semivolatile Internal Standards with Corresponding Analytes Assigned for Quantitation.

1. 1,4-Dichlorobenzene-d4
   Benzyl alcohol
   Bis (2-chloroethyl) ether
   Bis (2-chloroisopropyl) ether
   2-Chlorophenol
   1,3-Dichlorobenzene
   1,4-Dichlorobenzene
   1,2-Dichlorobenzene
   2-Fluorophenol (surrogate)
   Hexachloroethane
   2-Methylphenol
   4-Methylphenol
   N-Nitroso-di-n-propylamine
   Phenol
   Phenol-d_5 (surrogate)

2. Naphthalene-d_8
   Benzoic Acid
   Bis(2-chloroethoxy) methane
   4-Chloroaniline
   4-Chloro-3-methylphenol
   2,4-Dichlorophenol
   1,2,4-Trichlorobenzene
   2,4-Dimethylphenol
   Hexachlorobutadiene
   Isophorone
   2-Methylnaphthalene
   Naphthalene
   Nitrobenzene
   Nitrobenzene-d8 (surrogate)
   2-Nitrophenol

3. Acenaphthalene-d_{10}
   Acenapthene
   Acenaphthylene
   2-Chloronaphthalene
   4-Chlorophenyl phenyl ether
   Dibenzofuran
   Diethyl phthalate
   Dimethyl phthalate
   2,4-Dinitrophenol
   2,4-Dinitrotoluene
   2,6-Dinitrotoluene
   Fluorene
   2-Fluorobiphenyl (surrogate)
   Hexachlorocyclopentadiene
   2-Nitroaniline
   3-Nitroanaline
   2,4,6-Tribromophenol (surrogate)
   2,4,6-Trichlorophenol
   2,4,5-Trichlorophenol
   4-Nitrophenol

4a. Phenanthrene-d_{10}
   Anthracene
   4-Bromophenyl phenyl ether
   4,6-Dinitro-2-methylphenol
   Fluoranthene
   Hexachlorobenzene
   N-Nitrosodiphenylamine
   Pentachlorophenol
   Phenanthrene

4b. Chrysene-d_{12}
   Benzo(a)anthracene
   Bis(2-ethylhexyl)phthalate
   Butylbenzylphthalate
   Chrysene
   3,3'-Dichlorobenzidine
   Pyrene

4c. Perylene-d_{12}
   Benzo(b)fluoranthene
   Benzo(k)fluoranthene
   Benzo(g,h,i)perylene
   Benzo(a)pyrene
   Dibenz(a,h)anthracene
   Di-n-octyl phthalate
   Indeno(1,2,3-cd)pyrene

Bold italics indicate matrix spike compounds

Table C-7. Polychlorinated Biphenyl Sample QA/QC Summary, Phase II/III RFI, S-K Corp. Recycle Center, Dolton, Illinois.

Calibration Verification Samples

		PCB 1016	PCB 1260
Quality Control Limit (SW-846)		>50	>50
Sample	Date Prepared	PCB 1016	PCB 1260
NA	6/11/96	131	139
NA	6/14/96	121	143

Surrogate Recoveries

	Decachlorobiphenyl
Quality Control Limit (SW-846)	Recovered
Sample	Decachlorobiphenyl
All (15)	Recovered*

Matrix Spikes/Matrix Spike Duplicates

None**

Method Blanks

No PCBs detected in any of 2 method blanks

* The laboratory SOP indicates two levels of QC limits. If PCBs are detected in the samples then the QC limit for surrogate recovery is >50%. If PCBs are not detected, then the QC limit is detection. The laboratory SOP is attached as Appendix F-1.

** Laboratory SOP indicates that Matrix Spikes are to be run only if PCBs are detected. PCBs were not detected in any samples.

Table C-8. Soil Data QA/QC Summary, Metals, Phase II/III RFI, S-K Corp. Recycle Center, Dolton, Illinois

Laboratory Control Samples

	Ba	Cd	Pb	Hg
Quality Control Limit	80-120	80-120	80-120	–
Laboratory Control Samples				
LCSE611	94.3	84.4	90.7	–
LCSE60796	98.5	89.2	95.8	–
LCSE614	96.0	88.6	98.1	–
LCSE61796	93.4	86.2	93.0	–

Matrix Spike/Matrix Spike Duplicates

	Ba	Cd	Pb	Hg
Quality Control Limit				
MS/MSD Recoveries		80-120	80-120	80-120
9603756	92/91	85/85	90/89	98/100
VB-3(36-38)	95/95	87/88	93/94	–
9603852	94/94	88/88	96/95	–
XX-3	–	–	–	107/107
VB-8(24-26)	91/94	84/86	92/93	111/111
Quality Control Limit				
MS/MSD %RPD	20	20	20	20
9603756	1	0	1	2
VB-3(36-38)	0	1	1	–
9603852	0	0	1	–
XX-3	–	–	–	0
VB-8(24-26)	3	2	1	0

Method Blanks

	Ba	Cd	Pb	Hg
Method Blank Results (Detection Limit in Parentheses)	ND(0.01)	ND(0.010)	ND(0.08)	ND(0.0002)
Number of Method Blanks	3	3	3	3

- 0 of 10 soil PCB data (0.0%); and
- 48 of 192 TCLP metals data (25.0%).

The overall completeness for the soil quality data is 95.0%. This level of completeness meets the QC goal of 95% completeness. A summary of all qualified soil data is presented in Table C-9.

For Ground Water:

The criteria used to evaluate the ground-water data in terms of accuracy and precision, were the same for ground-water as for soil. The evaluations are presented below, by analytical method.

Ground-Water VOCs. The quality assurance review resulted in the qualification of 20 of the 990 ground-water VOC data (2.0%). Holding times for the ground-water VOC analyses are presented in Table C-10; all VOC analyses were conducted within the required holding times.

VOC QA/QC data on accuracy and precision are summarized in Table C-11. Low surrogate recoveries were obtained for toluene for samples MW-7 and MW-7Dup/[Dup 1]. A low surrogate recovery may indicate the underestimation of the concentration of any constituent in the same quantitation group as the surrogate. The surrogate quantitation groups for VOCs are presented in Table C-4. The ten VOCs in the same quantitation group as the toluene surrogate were qualified for both of these samples. The low surrogate recovery of toluene is most likely related to the high concentrations of toluene detected in these samples. All other VOC QA/QC results were within control limits.

Ground-Water SVOCs. Holding times of the ground-water SVOC analyses are presented in Table C-10; all ground-water SVOC analyses were conducted within the required holding times. Ground-water SVOC QA/QC data on accuracy and precision are summarized in Table C-12. As described below, 0 of the 1,088 SVOC investigative data (0%) have been qualified.

As shown in Table C-10, one ground-water sample [SK-7] had one surrogate recovery (phenol) that was below the control limits. Low surrogate recoveries indicate the possible underestimation of the concentrations of constituents in the same quantitation group as the out-of-control surrogate. SVOC quantitation groups are shown on Figure C-6. Because the other surrogate in the same quantitation group (2-Fluorophenol) was within quality control limits, no SVOC data were qualified due to the low surrogate recovery.

As shown in Table C-12, spike recoveries for matrix spike and/or duplicate samples, spike recovery reproducibilities, and method blanks were within the control limits. No ground-water SVOC data were qualified.

Table C-9. Summary of Qualified Soil Data, Phase II/III RFI, S-K Recycle Center, Dolton, Illinois

1. Volatile Organic Compounds (EPA Method 8240)

1a. VOC data qualified due to detection of constituents in undiluted smple

Sample	Constituents
LE-10(4-6)	B(0.0208)
LE-5(2-4)	2B(0.107)
VB-1 (24-26)	PCE (0.032)
VB-5(24-26)	B (0.0098); MC (0.017)

Note: For samples where undiluted sample failed QA/QC but diluted sample MDL exceeded TACO Tier I. See Text

1b. VOC data qualified due to low surrogate recovery (bromofluorobenzene).

Sample	Constituents
XX-2	CB,EB, Sty, X
XX-4	CB,EB, Sty, X
VB-7(24-26)	CB,EB, Sty, X

Note: All samples in quantitaiton group are qualified

2. Semivolatile Organic Compounds (EPA Method 8270)

2a. SVOC data qualified due to low matrix spike recoveries (4-nitrophenol, 2-4-dinitrophenol)

Sample	Constituents
17 samples in Batch D	All in quantitation group

Note: All detected SVOCs (in Batch D) also qualified due to high recoveries of other matrix spikes
A total of 247 data qualified

Table C-10. Ground-Water Sample Holding Times, Phase II/III RFI, S-K Corp. Recycle Center, Dolton, Illinois.

Samples	Sample Collection Date	VOC Analysis Date	SVOC Extraction Date	SVOC Analysis Date	Metals Analysis Dates
SW-846 Limit		14 Days	14 days	40 days	6 months (Hg 28 days)
MW-1	6/25/96	6/27/96	6/26/96	6/28/96	6/27/96-6/28/96
MW-2	6/25/96	6/27/96	6/26/96	6/28/96	6/27/96-6/28/96
MW-4	6/25/96	6/28/96	6/26/96	7/1/96	6/27/96-6/28/96
MW-5	6/25/96	6/28/96	6/26/96	6/28/96	6/27/96-6/28/96
MW-6	6/25/96	6/28/96	6/26/96	6/28/96	6/27/96-6/28/96
MW-7	6/25/96	6/28/96	6/26/96	6/28/96	6/27/96-6/28/96
MW-7 Dup	6/25/96	7/5/96	6/28/96	7/5/96	6/27/96-6/28/96
MW-7TD	6/25/96	7/5/96	NA	NA	NA
MW-8	6/25/96	7/2/96	6/26/96	6/28/96	6/27/96-6/28/96
MW-9	6/25/96	6/28/96	6/26/96	6/28/96	6/27/96-6/28/96
MW-9 Dup	6/25/96	7/5/96	6/28/96	7/1/96	6/27/96-6/28/96
MW-12	6/25/96	6/28/96	6/28/96	7/5/96	6/27/96-7/1/96
SK-7	6/25/96	6/28/96	6/28/96	7/5/96	6/27/96-6/28/96
SK-8	6/25/96	7/2/96	6/28/96	7/5/96	6/27/96-6/28/96
SK-11	6/25/96	7/2/96	6/28/96	7/9/96	6/27/96-6/28/96

NA = Not Analyzed

Table C-11. Ground-Water Sample QA/QC Summary, Volatile Organic Compounds, Phase II/III RFI, S-K Corp. Recycle Center, Dolton, Illinois

	Surrogate Recoveries		
Sample	Toluene	Bromofluorobenzene	1,2-Dichloro-ethane-d4
Quality Control Limit	81-117	74-121	70-121
MW-7	**11**	97	96
MW-7Dup/ [Dup 1]	**79**	95	107
Range of other sample surrogate recoveries (20)	97-103	92-103	94-109

	Matrix Spikes/Matrix Spike Duplicates				
Sample	Benzene	Chlorobenzene	1,1-Dichloroethene	Toluene	Trichloroethene
Quality Control Limit (Spike Recovery)	76-127	75-110	61-145	76-125	71-120
MS/MSD Recoveries					
Range of Recoveries (8)	93-108	76-107	91-102	78-116	97-103
Quality Control Limit (% RPD)	20	20	20	20	20
Range of All % RPD (4 pairs)	0-4	1-14	1-6	0-13	0-5

Method Blanks and Blanks

No VOCs detected in any of (4) Method Blanks

Notes: Bold indicates recoveries above QA/QC control limits

Table C-12. *Ground-Water Data QA/QC Summary, Semi Volatile Organic Compounds, Phase II/III RFI, S-K Corp. Recycle Center, Dolton, Illinois.*

Surrogate Recoveries

Sample	Phenol-d5	2-Fluorophenol	Nitrobenzene-d8	2-Fluorobiphenyl	2,4,6-Tribromophenol
QA/QC limit (SW-846)	13-121	16-108	27-112	34-118	32-123
SK-7	***10***	18	62	63	93
All Others (16)	21-34	27-55	58-86	57-87	72-121

Matrix Spike/Matrix Spike Duplicates

Sample	Phenol	2-Chlorophenol	1,4-Dichloro-benzene	N-Nitroso di-n-propylamine	1,2,4-Trichlorobenzene	4-Chloro 3-Methyl Phenol	Acenapthene	4-Nitrophenol	2,4-Dinitro toluene	Pentachlorophenol	Pyrene
QA/QC Limit (QuAPjP)	32-115	34-118	33-110	47-124	34-107	46-132	44-120	13-111	39-123	19-151	33-119
8WBL0626MS	33	71	36	82	36	86	65	24	75	60	82
8WBL0626 MSD	32	73	35	83	37	90	67	26	78	63	81
8WBL0627MS	33	67	42	102	41	75	67	18	80	75	89
8WBL0627MSD	34	75	42	86	44	87	69	14	79	73	89
QA/QC Limit %RPD (QuAPjP)	40	40	40	40	40	40	40	40	40	40	40
Sample % RPD (2 pairs)	1,1	3,12	2,4	1,17	3,7	5,15	3,3	4,29	1,4	1,4	0,1

Method Blanks

No Constituents detected in any of two (2) method blanks

Note: Bold indicates data above QC limits. ***Bold Italics*** indicate data below QC limits.

Ground-Water Metals. Forty-eight (48) of 65 ground-water metals data were qualified (25%). Holding times for the metals analyses are presented in Table C-10; all metals analyses were conducted within the required holding times. The ground-water metals QA/QC data for accuracy and precision are summarized in Table C-13. All metals QA/QC data were within the control limits. No ground-water metals data were qualified.

Ground-Water Data Completeness

Completeness is defined as the percentage of unqualified environmental data. Data are qualified if they do not satisfy the QC limits for accuracy and precision that have been established in the QAPjP. Data qualifications are summarized below:

- 20 of 990 soil VOC data (2.0%);
- 0 of 1,088 soil SVOC data (0%); and
- *0 of 65 Total and Dissolved Metals data (0%).*

The overall completeness for the ground-water quality data is 99.1%. This level of completeness exceeds the QC goal of 95% completeness.

Overall Evaluation of Data Representativeness and Comparability

Overall project data evaluation was conducted using the qualitative criteria of representativeness and comparability. This section describes this overall project evaluation.

Representativeness

Representativeness expresses the degree to which data accurately and precisely represent an environmental condition. Representativeness is a qualitative parameter which is dependent upon the proper design of the sampling program and proper laboratory protocol.

The soil sampling network was designed to determine the lateral and vertical extent of impacts that had been detected in the immediate vicinity of the SWMUs during the Phase I investigation. The rationale of the sampling network, presented in the text, received close scrutiny from technical professionals at IEPA and Safety-Kleen, and revisions were made in the final copies to reflect their comments. This insured proper design of the sampling and analysis program.

The objective of Phase I was to sample areas of impacts whereas the objective of Phase II/III was to determine the extent of impacts. Therefore, it is not surprising that *many of the constituents detected during Phase I were not detected during Phase II/III.*

Table C-13. Ground-Water Data QA/QC Summary, Metals, Phase II/III RFI, S-K Corp. Recycle Center, Dolton, Illinois

Laboratory Control Samples

	Ba	Cd	Pb	Hg
Quality Control Limit	80-120	80-120	80-120	--*
Laboratory Control Samples				
LCSE614	94.0	104.0	102.8	–
LCSE627	94.0	–	–	–
				–
				–

Matrix Spike/Matrix Spike Duplicates

	Ba	Cd	Pb	Hg
Quality Control Limit				
MS/MSD Recoveries	80-120	80-120	80-120	80-120
EB-1	85/86	–	–	99/102
FB	–	100/102	93/94	–
Quality Control Limit				
MS/MSD %RPD	20	20	20	20
EB-1	1	–	–	3
FB	–	2	1	–

Method Blanks

	Ba	Cd	Pb	Hg
Method Blank Results (Detection Limit in Parentheses)	ND(0.01)	ND(0.005)	ND(0.003)	ND(0.0002)
Number of Method Blanks	1	1	1	1

Phenol and phthalates were detected in many soil samples from the site during Phase I and were generally not detected in the Phase II extent soil samples. S-K believes that the detection of phenol and phthalates during Phase I does not represent soil impacts at the site. Rather, S-K believes that these constituents were contaminants present in the plastic-wrapped brass sample liners and were introduced to the soil during the sampling. This conclusion is based on the following observations:

1. Phenol and phthalates were primarily detected in Phase I samples which were collected using the shrink-wrapped liners. Phenol was also detected in the Phase II samples collected at the adjacent Barker site, also using the shrink-wrapped liners. Phenol was not detected at either site in samples collected using alternate sampling methods (split spoon or hand auger).

2. S-K has confirmed with personnel from the supplier of the shrink-wrapped sampling liners that phenol and phthalates are used in the shrink-wrap process.

3. Phenol, which is highly soluble, was detected in only 1 of the 24 ground-water samples collected during the Phase I RFI. These samples were collected from the same locations and comparable depths to where phenol had been detected in 38 of the 53 Phase I soil samples. Phenol was not detected in any of the Phase III ground-water samples.

S-K believes that these observations constitute strong evidence that the Phase I phenol and phthalate detections are not representative of soil impacts at the site. The concentrations of phenol and phthalates detected were all below the IEPA Tier I Soil Objectives. The Phase II results are considered representative of site conditions at the locations sampled.

Comparability

Comparability expresses the confidence with which one data set can be compared with another. Comparability is judged by compliance with the Workplan protocol. Because the workplan protocol was followed carefully, the data collected during the Phase II RFI should be comparable among themselves and with other data collected using the same collection, analytical and quality assurance procedures.

The data generated during the Phase II RFI appear comparable to previous data generated at the site in that the same geographic pattern of detection of similar constituents are indicated.

APPENDIX D

WELL COMPLETION REPORTS

PHASE II/III RCRA FACILITY INVESTIGATION
SAFETY-KLEEN CORP. RECYCLE CENTER
DOLTON, ILLINOIS

Illinois Environmental Protection Agency

Well Completion Report

Site #: 0310690006 County Cook Well # MW-1

Site Name: Safety-Kleen Corp., Dolton, Illinois Grid Coordinate: Northing _____ Easting: _____

Drilling Contractor: Rock and Soil Drilling Corp. Date Drilled Start: 5-30-96

Driller: Dusty Jackson Geologist: Brian Culnan Date Completed: 5-30-96

Drilling Method: HSA Drilling Fluids (type): None

Annular Space Details

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite grout

Amount of cement: # of bags <1 lbs. per bag 15

Amount of bentonite: # of bags <1 lbs. per bag 2

Type of Bentonite Seal (Granular Pellet): 1/2 " pellet

Amount of bentonite: # of Bags 1.5 lbs. per bag 50

Type of Sand Pack: #8

Source of Sand: Global Drilling Supply

Amount of Sand: # of bags 10 lbs. per bag 50

Well Construction Materials

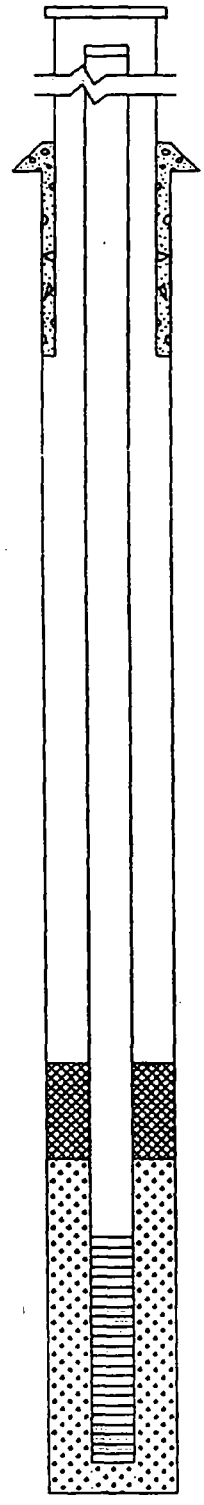
	Stainless Steel Specify Type	Teflon Specify Type	PVC Specify Type	Other Specify Type
Riser coupling joint			Threaded	
Riser pipe above w.t.			Sch. 40	
Riser pipe below w.t.			NA	
Screen			Sch. 40	
Coupling joint screen to riser			Threaded	
Protective casing				Steel 8"

Measurements

to .01 (where applicable)

Riser pipe length	NA
Protective casing length	10"
Screen length	10'
Bottom of screen to end cap	6.5"
Top of screen to first joint	3.75"
Total length of casing	4.98'
Screen slot size	0.010
% of openings in screen	4
Diameter of borehole (in.)	11.25
ID of riser pipe (in.)	4"

Elevations - 0.01 ft.



0	591.20	MSL Top of Protective Casing
.47	590.73	MSL Top of Riser Pipe
		ft. Casing Stickup
0.00	591.20	MSL Ground Surface
1	590.20	ft. Top of annular sealant
2.5	588.70	ft. Top of Seal
2	xxx	ft. Total Seal Interval
4.5	586.70	ft. Top of Sand
5	586.20	ft. Top of Screen
10'	xxx	ft. Total Screen Interval
15	576.20	ft. Bottom of Screen
20.0	571.20	ft. Bottom of Borehole

Completed by: Brian Culnan, TriHydro Surveyed by: E.J. Hutson Ill. registration #: _____

Illinois Environmental Protection Agency — Well Completion Report

Site #: 0310690006 County: Cook Well #: MW-2

Site Name: Safety-Kleen Corp., Dolton, Illinois Grid Coordinate: Northing: Easting:

Drilling Contractor: Rock and Soil Drilling Corp. Date Drilled Start: 6-6-96

Driller: Dusty Jackson Geologist: Brian Culnan Date Completed: 6-6-96

Drilling Method: HSA Drilling Fluids (type): None

Annular Space Details

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite grout

Amount of cement: # of bags <1 lbs. per bag 15

Amount of bentonite: # of bags <1 lbs. per bag 2

Type of Bentonite Seal (Granular Pellet): 1/2 " pellet

Amount of bentonite: # of Bags 1.5 lbs. per bag 50

Type of Sand Pack: #8

Source of Sand: Global Drilling Supply

Amount of Sand: # of bags 9.5 lbs. per bag 50

Well Construction Materials

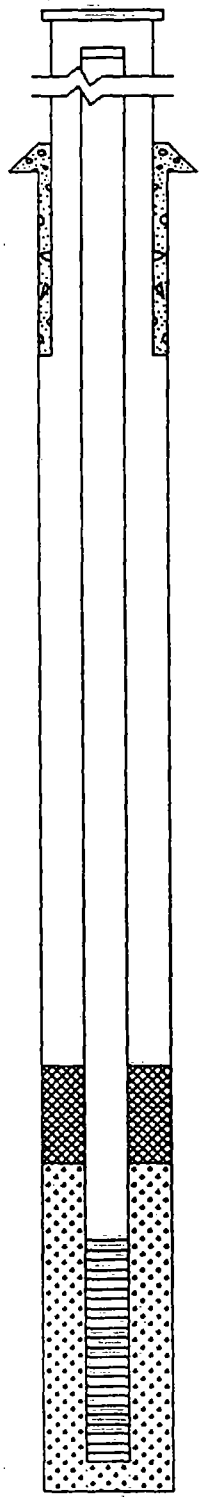
	Stainless Steel Specify Type	Teflon Specify Type	PVC Specify Type	Other Specify Type
Riser coupling joint			Threaded	
Riser pipe above w.t.			Sch. 40	
Riser pipe below w.t.			NA	
Screen			Sch. 40	
Coupling joint screen to riser			Threaded	
Protective casing				Steel 8"

Measurements

to .01 (where applicable)

Riser pipe length	NA
Protective casing length	10"
Screen length	10'
Bottom of screen to end cap	6.5"
Top of screen to first joint	5"
Total length of casing	4.84'
Screen slot size	0.010
% of openings in screen	4
Diameter of borehole (in.)	11.25
ID of riser pipe (in.)	4"

Elevations - 0.01 ft.



-.20	591.30	MSL Top of Protective Casing
.21	590.89	MSL Top of Riser Pipe
		ft. Casing Stickup
0.00	591.10	MSL Ground Surface
1	590.10	ft. Top of annular sealant
2.5	588.60	ft. Top of Seal
2	xxx	ft. Total Seal Interval
4.5	586.60	ft. Top of Sand
5	586.10	ft. Top of Screen
10'	xxx	ft. Total Screen Interval
15	576.10	ft. Bottom of Screen
15.5	575.60	ft. Bottom of Borehole

Completed by: Brian Culnan, TriHydro Surveyed by: E.J. Hutson Ill. registration #:

Illinois Environmental Protection Agency — Well Completion Report

Site #: 0310690006 County Cook Well # MW-4

Site Name: Safety-Kleen Corp., Dolton, Illinois Grid Coordinate: Northing _____ Easting: _____

Drilling Contractor: Rock and Soil Drilling Corp. Date Drilled Start: 6-3-96

Driller: D. Jackson Geologist: B. Culnan/C. Dewolf Date Completed: 6-3-96

Drilling Method: HSA Drilling Fluids (type): None

Annular Space Details

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite grout

Amount of cement: # of bags <1 lbs. per bag 15

Amount of bentonite: # of bags <1 lbs. per bag 2

Type of Bentonite Seal (Granular Pellet): 1/2 " pellet

Amount of bentonite: # of Bags 1.5 lbs. per bag 50

Type of Sand Pack: #8

Source of Sand: Global Drilling Supply

Amount of Sand: # of bags 9 lbs. per bag 50

Well Construction Materials

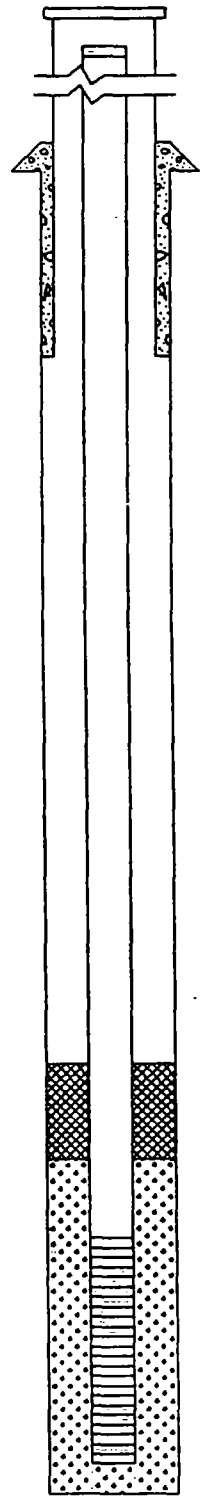
	Stainless Steel Specify Type	Teflon Specify Type	PVC Specify Type	Other Specify Type
Riser coupling joint			Threaded	
Riser pipe above w.t.			Sch. 40	
Riser pipe below w.t.			NA	
Screen			Sch. 40	
Coupling joint screen to riser			Threaded	
Protective casing				Steel 8"

Measurements

to .01 (where applicable)

Riser pipe length	NA
Protective casing length	10"
Screen length	10'
Bottom of screen to end cap	5.25"
Top of screen to first joint	2.5"
Total length of casing	5.5'
Screen slot size	0.010
% of openings in screen	4
Diameter of borehole (in.)	11.25
ID of riser pipe (in.)	4"

Elevations - 0.01 ft.



-.010	592.21	MSL Top of Protective Casing
.34	591.86	MSL Top of Riser Pipe
____	____	ft. Casing Stickup
0.00	592.20	MSL Ground Surface
1	591.20	ft. Top of annular sealant
2.5	589.70	ft. Top of Seal
2	xxx	ft. Total Seal Interval
4.5	587.70	ft. Top of Sand
5	587.20	ft. Top of Screen
10'	xxx	ft. Total Screen Interval
15	577.20	ft. Bottom of Screen
20.0	572.20	ft. Bottom of Borehole

Completed by: Brian Culnan, TriHydro Surveyed by: E.J. Hutson Ill. registration #: _____

Illinois Environmental Protection Agency — Well Completion Report

Site #: 0310690006 County Cook Well # MW-5

Site Name: Safety-Kleen Corp., Dolton, Illinois Grid Coordinate: Northing _____ Easting: _____

Drilling Contractor: Rock and Soil Drilling Corp. Date Drilled Start: 6-5-96

Driller: D. Jackson Geologist: B. Culnan/C. Dewolf Date Completed: 6-5-96

Drilling Method: HSA Drilling Fluids (type): None

Annular Space Details

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite grout

Amount of cement: # of bags <1 lbs. per bag 15

Amount of bentonite: # of bags <1 lbs. per bag 2

Type of Bentonite Seal (Granular Pellet): 1/2 " pellet

Amount of bentonite: # of Bags 1.5 lbs. per bag 50

Type of Sand Pack: #8

Source of Sand: Global Drilling Supply

Amount of Sand: # of bags 7 lbs. per bag 50

Well Construction Materials

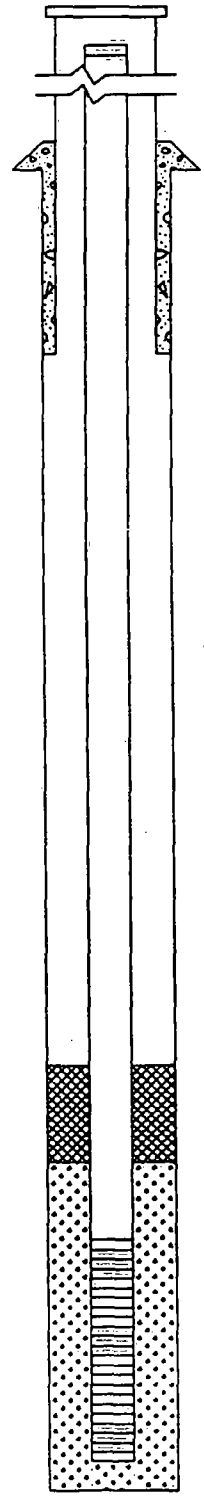
	Stainless Steel Specify Type	Teflon Specify Type	PVC Specify Type	Other Specify Type
Riser coupling joint			Threaded	
Riser pipe above w.t.			Sch. 40	
Riser pipe below w.t.			NA	
Screen			Sch. 40	
Coupling joint screen to riser			Threaded	
Protective casing				Steel 6"

Measurements

to .01 (where applicable)

Riser pipe length	3'
Protective casing length	4'
Screen length	10'
Bottom of screen to end cap	6.5"
Top of screen to first joint	2.5"
Total length of casing	8.5'
Screen slot size	0.010
% of openings in screen	4
Diameter of borehole (in.)	11.25
ID of riser pipe (in.)	4"

Elevations - 0.01 ft.



-2.72	597.12	MSL Top of Protective Casing
-2.65	597.05	MSL Top of Riser Pipe
		ft. Casing Stickup
0.00	594.40	MSL Ground Surface
1	593.40	ft. Top of annular sealant
2.5	591.90	ft. Top of Seal
2	xxx	ft. Total Seal Interval
4.5	589.90	ft. Top of Sand
5	589.40	ft. Top of Screen
10'	xxx	ft. Total Screen Interval
15	579.40	ft. Bottom of Screen
20.0	574.40	ft. Bottom of Borehole

Completed by: Brian Culnan, TrilHydro Surveyed by: E.J. Hutson Ill. registration #: _____

Illinois Environmental Protection Agency — Well Completion Report

Site #: 0310690006 County Cook Well # MW-6

Site Name: Safety-Kleen Corp., Dolton, Illinois Grid Coordinate: Northing _____ Easting: _____

Drilling Contractor: Rock and Soil Drilling Corp. Date Drilled Start: 6-5-96

Driller: D. Jackson Geologist: B. Culnan/C. Dewolf Date Completed: 6-5-96

Drilling Method: HSA Drilling Fluids (type): None

Annular Space Details

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite grout

Amount of cement: # of bags <1 lbs. per bag 15

Amount of bentonite: # of bags <1 lbs. per bag 2

Type of Bentonite Seal (Granular Pellet): 1/2 " pellet

Amount of bentonite: # of Bags 1 lbs. per bag 50

Type of Sand Pack: #8

Source of Sand: Global Drilling Supply

Amount of Sand: # of bags 10 lbs. per bag 50

Well Construction Materials

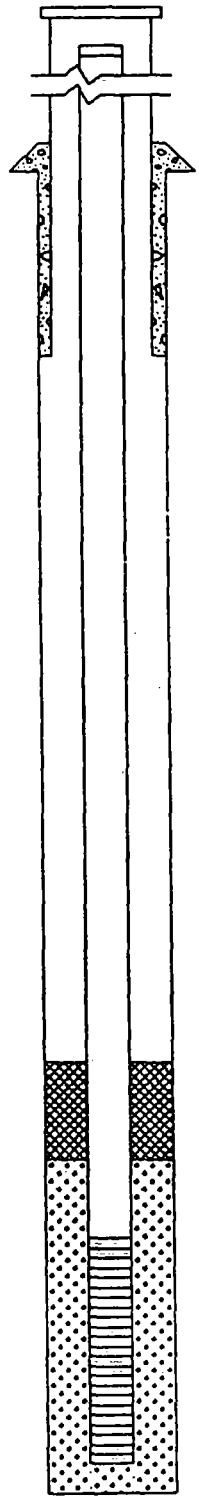
	Stainless Steel Specify Type	Teflon Specify Type	PVC Specify Type	Other Specify Type
Riser coupling joint			Threaded	
Riser pipe above w.t.			Sch. 40	
Riser pipe below w.t.			NA	
Screen			Sch. 40	
Coupling joint screen to riser			Threaded	
Protective casing				Steel 8"

Measurements

to .01 (where applicable)

Riser pipe length	NA
Protective casing length	10"
Screen length	10'
Bottom of screen to end cap	7"
Top of screen to first joint	3"
Total length of casing	5'
Screen slot size	0.010
% of openings in screen	4
Diameter of borehole (in.)	11.25
ID of riser pipe (in.)	4"

Elevations - 0.01 ft.



0.04	591.56	MSL Top of Protective Casing
.45	591.15	MSL Top of Riser Pipe
____	____	ft. Casing Stickup
0.00	591.60	MSL Ground Surface
1	590.60	ft. Top of annular sealant
2.5	589.10	ft. Top of Seal
2	xxx	ft. Total Seal Interval
4.5	587.10	ft. Top of Sand
5	586.60	ft. Top of Screen
10'	xxx	ft. Total Screen Interval
15	576.60	ft. Bottom of Screen
22.0	569.60	ft. Bottom of Borehole

Completed by: Brian Culnan, TriHydro Surveyed by: E.J. Hutson Ill. registration #: _____

Illinois Environmental Protection Agency — Well Completion Report

Site #: 0310690006 County Cook Well # MW-7

Site Name: Safety-Kleen Corp., Dolton, Illinois Grid Coordinate: Northing _____ Easting: _____

Drilling Contractor: Rock and Soil Drilling Corp. Date Drilled Start: 6-3-96

Driller: D. Jackson Geologist: B. Culnan/C. Dewolf Date Completed: 6-3-96

Drilling Method: HSA Drilling Fluids (type): None

Annular Space Details

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite grout

Amount of cement: # of bags <1 lbs. per bag 15

Amount of bentonite: # of bags <1 lbs. per bag 2

Type of Bentonite Seal (Granular Pellet): 1/2 " pellet

Amount of bentonite: # of Bags 1 lbs. per bag 50

Type of Sand Pack: #8

Source of Sand: Global Drilling Supply

Amount of Sand: # of bags 7 lbs. per bag 50

Well Construction Materials

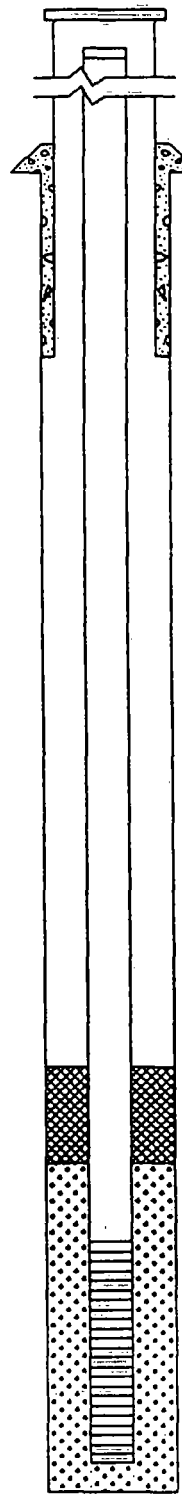
	Stainless Steel Specify Type	Teflon Specify Type	PVC Specify Type	Other Specify Type
Riser coupling joint			Threaded	
Riser pipe above w.t.			Sch. 40	
Riser pipe below w.t.			NA	
Screen			Sch. 40	
Coupling joint screen to riser			Threaded	
Protective casing				Steel 8"

Measurements

to .01 (where applicable)

Riser pipe length	NA
Protective casing length	10"
Screen length	10'
Bottom of screen to end cap	4.5"
Top of screen to first joint	3"
Total length of casing	6'
Screen slot size	0.010
% of openings in screen	4
Diameter of borehole (in.)	11.25
ID of riser pipe (in.)	4"

Elevations - 0.01 ft.



0.04	595.96	MSL Top of Protective Casing
.51	595.49	MSL Top of Riser Pipe
		ft. Casing Stickup
0.00	596.00	MSL Ground Surface
1	595.00	ft. Top of annular sealant
2.5	593.50	ft. Top of Seal
2	xxx	ft. Total Seal Interval
4.5	591.50	ft. Top of Sand
6	590.00	ft. Top of Screen
10'	xxx	ft. Total Screen Interval
16	580.00	ft. Bottom of Screen
38.0	558.00	ft. Bottom of Borehole

Completed by: Brian Culnan, TriHydro Surveyed by: E.J. Hutson Ill. registration #: _____

Illinois Environmental Protection Agency — Well Completion Report

Site #: 0310690006 County: Cook Well #: MW-8

Site Name: Safety-Kleen Corp., Dolton, Illinois Grid Coordinate: Northing: Easting:

Drilling Contractor: Rock and Soil Drilling Corp. Date Drilled Start: 6-4-96

Driller: D. Jackson Geologist: B. Culnan/C. Dewolf Date Completed: 6-4-96

Drilling Method: HSA Drilling Fluids (type): None

Annular Space Details

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite grout

Amount of cement: # of bags <1 lbs. per bag 15

Amount of bentonite: # of bags <1 lbs. per bag 2

Type of Bentonite Seal (Granular Pellet): 1/2 " pellet

Amount of bentonite: # of Bags 1 lbs. per bag 50

Type of Sand Pack: #8

Source of Sand: Global Drilling Supply

Amount of Sand: # of bags 11.5 lbs. per bag 50

Well Construction Materials

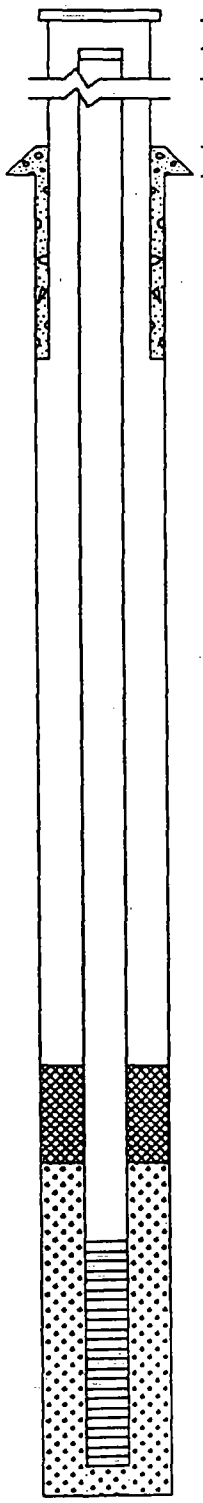
	Stainless Steel Specify Type	Teflon Specify Type	PVC Specify Type	Other Specify Type
Riser coupling joint			Threaded	
Riser pipe above w.t.			Sch. 40	
Riser pipe below w.t.			NA	
Screen			Sch. 40	
Coupling joint screen to riser			Threaded	
Protective casing				Steel 8"

Measurements

to .01 (where applicable)

Riser pipe length	NA
Protective casing length	10"
Screen length	10'
Bottom of screen to end cap	5.25"
Top of screen to first joint	2.5"
Total length of casing	5.5'
Screen slot size	0.010
% of openings in screen	4
Diameter of borehole (in.)	11.25
ID of riser pipe (in.)	4"

Elevations - 0.01 ft.



0	593.70	MSL Top of Protective Casing
.31	593.39	MSL Top of Riser Pipe
		ft. Casing Stickup
0.00	593.70	MSL Ground Surface
1	592.70	ft. Top of annular sealant
2.5	591.20	ft. Top of Seal
2	xxx	ft. Total Seal Interval
4.5	589.20	ft. Top of Sand
5	588.70	ft. Top of Screen
10'	xxx	ft. Total Screen Interval
15	578.70	ft. Bottom of Screen
28.0	565.70	ft. Bottom of Borehole

Completed by: Brian Culnan, TriHydro Surveyed by: E.J. Hutson Ill. registration #:

Illinois Environmental Protection Agency — Well Completion Report

Site #: 0310690006 County: Cook Well #: MW-9

Site Name: Safety-Kleen Corp., Dolton, Illinois Grid Coordinate: Northing: Easting:

Drilling Contractor: Rock and Soil Drilling Corp. Date Drilled Start: 6-5-96

Driller: D. Jackson Geologist: B. Culnan/C. Dewolf Date Completed: 6-5-96

Drilling Method: HSA Drilling Fluids (type): None

Annular Space Details

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite grout

Amount of cement: # of bags <1 lbs. per bag 15

Amount of bentonite: # of bags <1 lbs. per bag 2

Type of Bentonite Seal (Granular Pellet): 1/2 " pellet

Amount of bentonite: # of Bags 1 lbs. per bag 50

Type of Sand Pack: #8

Source of Sand: Global Drilling Supply

Amount of Sand: # of bags 5.5 lbs. per bag 50

Well Construction Materials

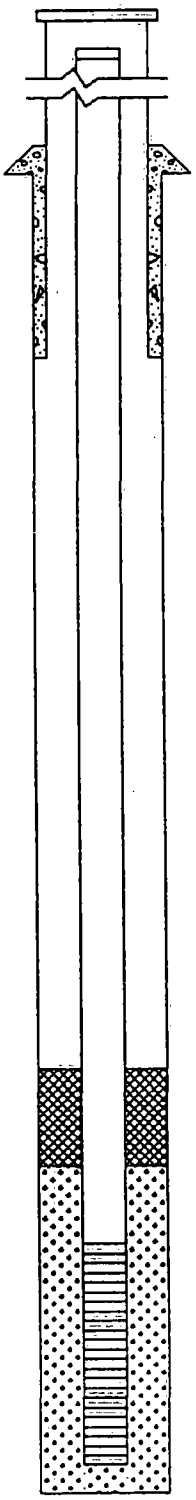
	Stainless Steel Specify Type	Teflon Specify Type	PVC Specify Type	Other Specify Type
Riser coupling joint			Threaded	
Riser pipe above w.t.			Sch. 40	
Riser pipe below w.t.			NA	
Screen			Sch. 40	
Coupling joint screen to riser			Threaded	
Protective casing				Steel 8"

Measurements

to .01 (where applicable)

Riser pipe length	NA
Protective casing length	10"
Screen length	10'
Bottom of screen to end cap	5.25"
Top of screen to first joint	2"
Total length of casing	5.1'
Screen slot size	0.010
% of openings in screen	4
Diameter of borehole (in.)	11.25
ID of riser pipe (in.)	4"

Elevations - 0.01 ft.



-.03	592.53	MSL Top of Protective Casing
.4	592.10	MSL Top of Riser Pipe
		ft. Casing Stickup
0.00	592.50	MSL Ground Surface
1	591.50	ft. Top of annular sealant
2.5	590.00	ft. Top of Seal
2	xxx	ft. Total Seal Interval
4.5	588.00	ft. Top of Sand
5	587.50	ft. Top of Screen
10'	xxx	ft. Total Screen Interval
15	577.50	ft. Bottom of Screen
15.5	577.00	ft. Bottom of Borehole

Completed by: Brian Culnan, TriHydro Surveyed by: E.J. Hutson Ill. registration #:

Illinois Environmental Protection Agency — Well Completion Report

Site #: 0310690006 County Cook Well # MW-12

Site Name: Safety-Kleen Corp., Dolton, Illinois Grid Coordinate: Northing _____ Easting: _____

Drilling Contractor: Rock and Soil Drilling Corp. Date Drilled Start: 5-31-96

Driller: D. Jackson Geologist: B. Culnan/C. Dewolf Date Completed: 6-3-96

Drilling Method: HSA Drilling Fluids (type): None

Annular Space Details

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite grout

Amount of cement: # of bags <1 lbs. per bag 15

Amount of bentonite: # of bags <1 lbs. per bag 2

Type of Bentonite Seal (Granular Pellet): 1/2 " pellet

Amount of bentonite: # of Bags 1.5 lbs. per bag 50

Type of Sand Pack: #8

Source of Sand: Global Drilling Supply

Amount of Sand: # of bags 9 lbs. per bag 50

Well Construction Materials

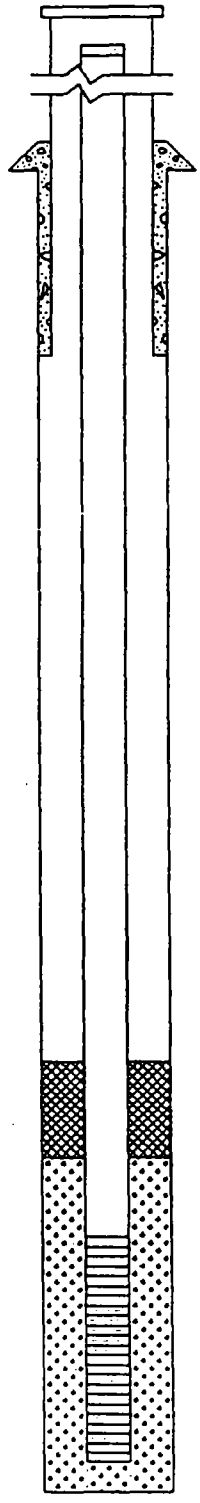
	Stainless Steel Specify Type	Teflon Specify Type	PVC Specify Type	Other Specify Type
Riser coupling joint			Threaded	
Riser pipe above w.t.			Sch. 40	
Riser pipe below w.t.			NA	
Screen			Sch. 40	
Coupling joint screen to riser			Threaded	
Protective casing				Steel 8"

Measurements

to .01 (where applicable)

Riser pipe length	NA
Protective casing length	10"
Screen length	10'
Bottom of screen to end cap	6.75"
Top of screen to first joint	2.75"
Total length of casing	5.25'
Screen slot size	0.010
# of openings in screen	4
Diameter of borehole (in.)	11.25
ID of riser pipe (in.)	4"

Elevations - 0.01 ft.



.33	592.27	MSL Top of Protective Casing
0.05	592.55	MSL Top of Riser Pipe
_____	_____	ft. Casing Stickup
0.00	592.60	MSL Ground Surface
1	591.60	ft. Top of annular sealant
2.5	590.10	ft. Top of Seal
2	xxx	ft. Total Seal Interval
4.5	588.10	ft. Top of Sand
5	587.60	ft. Top of Screen
10'	xxx	ft. Total Screen Interval
15	577.60	ft. Bottom of Screen
20.0	572.60	ft. Bottom of Borehole

Completed by: Brian Culnan, TriHydro Surveyed by: E.J. Hutson Ill. registration #: _____

APPENDIX E

WELL DEVELOPMENT FORMS

PHASE II/III RCRA FACILITY INVESTIGATION
SAFETY-KLEEN CORP. RECYCLE CENTER
DOLTON, ILLINOIS

WELL DEVELOPMENT AND SAMPLING INFORMATION

Project Number 32-08

Well Designation MW-1 Time 1030 Date 6/9/96

Total Depth 15.2 ft Well Diameter 4 in

Depth to Hydrocarbon — ft Gallons/ft 0.67 gal

Depth to Water 4.60 ft Gallons/Casing volume 7.1 gal

Water Column 10.6 ft Total Purge Volume _____ gal

Volume Removed	Time	pH	Sp. Cond.	Temp. °C	Notes
10	1030	7.21	1,966	—	Clear Gray - SI turbid
					Bailed dry

Remarks

Fluid level @ 3:30 PM 8.55 ft-bmp

Previous fluid levels 6/5/96 DTW = 8.6 ft

6/4/96 DTW = 10.3

WELL DEVELOPMENT AND SAMPLING INFORMATION

Project Number 32-08

Well Designation MW-2 Time 1100 Date 6/9/96

Total Depth 15.3 ft Well Diameter 4 in

Depth to Hydrocarbon — ft Gallons/ft 0.67 gal

Depth to Water 4.75 ft Gallons/Casing volume 7.0 gal

Water Column 10.5 ft Total Purge Volume _____ gal

Volume Removed	Time	pH	Sp. Cond.	Temp. °C	Notes
10	1000	7.17	1842		Clear - gray
					Bailed dry

Remarks Fluid level @ 330 PM 8.05 ft-bmp

Previous —

WELL DEVELOPMENT AND SAMPLING INFORMATION

Project Number 32-08

Well Designation MW-4 Time 1200 Date 6/9/96

Total Depth 15.1 ft Well Diameter 4 in

Depth to Hydrocarbon — ft Gallons/ft 0.67 gal

Depth to Water 9.55 ft Gallons/ Casing volume 3.7 gal

Water Column 5.5 ft Total Purge Volume _____ gal

Volume Removed	Time	pH	Sp. Cond.	Temp. °C	Notes
7	1200	7.37	1,210	—	Bailed dry. Very turbid
					during early development
					to slightly turbid @ end

Remarks Fluid level @ 330 PM 11.7 ft-bgs.

Previous Fluid level 6/5/96 12.7 ft-bgs

WELL DEVELOPMENT AND SAMPLING INFORMATION

Project Number 32-08

Well Designation MW-5 Time 1300 Date 6/9/96

Total Depth 18.3 ft Well Diameter 4 in

Depth to Hydrocarbon — ft Gallons/ft 0.67 gal

Depth to Water 6.2 ft Gallons/ Casing volume 8.1 gal

Water Column 12.1 ft Total Purge Volume — gal

Volume Removed	Time	pH	Sp. Cond.	Temp. °C	Notes
15	1300	9.25	614	—	Very turbid. Lots of brown silt viscous.

Remarks Bailed dry FL @ 1600 = 12.7 ft-~~bgs~~ bmp

Previous DTW 6.5 6/5/96

WELL DEVELOPMENT AND SAMPLING INFORMATION

Project Number 32-08

Well Designation MW-6 Time 1230 Date 6/9/96

Total Depth 15.2 ft Well Diameter 4 in

Depth to Hydrocarbon — ft Gallons/ft 0.67 gal

Depth to Water 4.95 ft Gallons/ Casing volume 6.8 gal

Water Column 10.2 ft Total Purge Volume _____ gal

Volume Removed	Time	pH	Sp. Cond.	Temp. °C	Notes
16	1230	7.64	1266	—	Bailed dry. Slight to mod turbid.

Remarks Fluid Level @ 330 7.4 ft-bmp

Previous - DTW 6/5/96 = 14 ft-bmp

WELL DEVELOPMENT AND SAMPLING INFORMATION

Project Number 32-08

Well Designation MW-7 Time 1430 Date 6/9/96

Total Depth 16.0 ft Well Diameter 4 in

Depth to Hydrocarbon — ft Gallons/ft 0.67 gal

Depth to Water 3.1 ft Gallons/ Casing volume 8.7 gal

Water Column 13.0 ft Total Purge Volume ____ gal

Volume Removed	Time	pH	Sp. Cond.	Temp. °C	Notes
12	6/7/96	-	-	-	Very turbid. Bailed dry
12	1430	7.42	1036	-	Sl. turbid. Bailed dry

Remarks Previous fluid levels 6/5/96 = 2.6 ft-bmp

WELL DEVELOPMENT AND SAMPLING INFORMATION

Project Number 32-08

Well Designation MW-8 Time 1330 Date 6/9/96

Total Depth 13.5 ft Well Diameter 4 in

Depth to Hydrocarbon - ft Gallons/ft 0.67 gal

Depth to Water 9.5 ft Gallons/ Casing volume 2.68 gal

Water Column 4.0 ft Total Purge Volume - gal

Volume Removed	Time	pH	Sp. Cond.	Temp. °C	Notes
6	1330	7.23	2200	-	Generally clear - sl. turbid

Remarks At 4pm DTW = 10.7 ft. bmp
on 6/15/96 this well was dry.

WELL DEVELOPMENT AND SAMPLING INFORMATION

Project Number 32-08

Well Designation MW-9 Time 1400 Date 6/9/96

Total Depth 15.0 ft Well Diameter 4 in

Depth to Hydrocarbon — ft Gallons/ft 0.67 gal

Depth to Water 2.5 ft Gallons/ Casing volume 8.3 gal

Water Column 13.5 ft Total Purge Volume — gal

Volume Removed	Time	pH	Sp. Cond.	Temp. °C	Notes
12	1400	7.92	669	—	Bailed dry. Very turbid
					Viscous.

Remarks

WELL DEVELOPMENT AND SAMPLING INFORMATION

Project Number 32-08

Well Designation MW-12 Time ~~1130~~ 1130 Date 6/9/96

Total Depth 15.3 ft Well Diameter 4 in

Depth to Hydrocarbon - ft Gallons/ft 0.67 gal

Depth to Water 6.25 ft Gallons/ Casing volume 6.0 gal

Water Column 9.0 ft Total Purge Volume _____ gal

Volume Removed	Time	pH	Sp. Cond.	Temp. °C	Notes
8	1130	7.07	3,220	-	Mod turbid. Bailed dry

Remarks At 4PM FL = 9.6 ft bmp

Previous FLs 6/5/96 12.6 ft-bmp

6/4/96 14.7 ft-bmp

APPENDIX F

GROUND-WATER SAMPLING FIELD FORMS

PHASE II/III RCRA FACILITY INVESTIGATION
SAFETY-KLEEN CORP. RECYCLE CENTER
DOLTON, ILLINOIS

Project # 32-08

FIELD RECORD
GROUND-WATER SAMPLING

1. Well: MW-1

2. Date of fluid level measurement: 6/24/96

3. Total Depth 15.22 ft. Well Diameter 4 in.

   Depth to Hydrocarbon — ft. Gallons/ft. ~~8.7~~ 0.67 gal.

   Depth to Water 2.15 ft. Gallons/ Casing Volume 8.7 gal.

   Water Column 13.07 ft. Total Purge Volume 26.3 gal.

4. Date and time of sample collection: 6/25/96

5. Comments regarding physical character of ground water:

   Clear during development pH: 7.9 SC = 1,700

   Bailed dry after approx 12 [illegible]

   Very clear [illegible]

6. Field Parameters:

   Temperature: _____ pH 7.16 SC Field 1,670 SC @25 c _____

7. Water phase, number of containers: 6

   Hydrocarbon phase, number of containers: —

8. Other comments affecting monitoring:

9. Field Personnel: CD + KR

Project # 32-08

FIELD RECORD
GROUND-WATER SAMPLING

1. Well: MW-2

2. Date of fluid level measurement: 6/24/96

3. Total Depth 15.29 ft. Well Diameter 4 in.

   Depth to Hydrocarbon — ft. Gallons/ft. 0.67 gal.

   Depth to Water 3.14 ft. Gallons/ Casing Volume 8.1 gal.

   Water Column 12.15 ft. Total Purge Volume 24.4 gal.

4. Date and time of sample collection: 6/25/96

5. Comments regarding physical character of ground water:

   [illegible] 6.88 [illegible] = 2.22

   [illegible] 2 [illegible]

6. Field Parameters:

   Temperature: _____ pH 6.75 SC Field 2.21 SC @25 c _____

7. Water phase, number of containers: 6

   Hydrocarbon phase, number of containers: —

8. Other comments affecting monitoring:

9. Field Personnel: CD+KR

Project # 32-08

FIELD RECORD
GROUND-WATER SAMPLING

1. Well: MW-4

2. Date of fluid level measurement: 6/25/96

3. Total Depth 15.11 ft. Well Diameter 4 in.

   Depth to Hydrocarbon – ft. Gallons/ft. 0.67 gal.

   Depth to Water 2.06 ft. Gallons/ Casing Volume 8.7 gal.

   Water Column 13.05 ft. Total Purge Volume 26.2 gal.

4. Date and time of sample collection: 6/25/96

5. Comments regarding physical character of ground water:

   Clear During Development [illegible] SC=1,770

   Becomes [illegible] surging. Bailed [illegible] after 12 gallons

6. Field Parameters:

   Temperature: _____ pH 7.11 SC Field 1,506 SC @25 c _____

7. Water phase, number of containers: 6

   Hydrocarbon phase, number of containers: –

8. Other comments affecting monitoring:

9. Field Personnel: CD+KR

Project # 32-08

FIELD RECORD
GROUND-WATER SAMPLING

1. Well: MW-5

2. Date of fluid level measurement: 6/25/96

3. Total Depth 18.28 ft. Well Diameter 4 in.

   Depth to Hydrocarbon — ft. Gallons/ft. 0.67 gal.

   Depth to Water 6.39 ft. Gallons/ Casing Volume 8.0 gal.

   Water Column 11.89 ft. Total Purge Volume 24.0 gal.

4. Date and time of sample collection: 6/25/96

5. Comments regarding physical character of ground water:

   [illegible] pH = 8.33 SC = 96

   [illegible] becomes very turbid - Very Brown

   [illegible] ~12 gal [illegible]; 10 [illegible] 6/25. [illegible]

6. Field Parameters:

   Temperature: _____ pH 7.42/7.35 SC Field 1,310 SC @25 c _____

7. Water phase, number of containers: 6

   Hydrocarbon phase, number of containers: —

8. Other comments affecting monitoring:

9. Field Personnel: CD+KR

Project # 32-08

FIELD RECORD
GROUND-WATER SAMPLING

1. Well: MW-6

2. Date of fluid level measurement: 6/24/96

3. Total Depth 15.23 ft. Well Diameter 4 in.

   Depth to Hydrocarbon — ft. Gallons/ft. ~~7.46~~ 0.67 gal.

   Depth to Water 4.09 ft. Gallons/ Casing Volume 7.46 gal.

   Water Column 11.14 ft. Total Purge Volume 22.4 gal.

4. Date and time of sample collection: _____

5. Comments regarding physical character of ground water:

   Clear upon initial development, with surging [illegible]

   pH 7.32 [illegible] after 12 gallons SC 1.157

6. Field Parameters:

   Temperature: — pH 7.11 SC Field 1,330 SC @25 c —

7. Water phase, number of containers: 6

   Hydrocarbon phase, number of containers: —

8. Other comments affecting monitoring:

9. Field Personnel: CD+KR

Project # 32-08

FIELD RECORD
GROUND-WATER SAMPLING

1. Well: MW-7

2. Date of fluid level measurement: 6/24/96

3. Total Depth 16.05 ft. Well Diameter 4" in.

   Depth to Hydrocarbon – ft. Gallons/ft. 0.67 gal.

   Depth to Water 3.16 ft. Gallons/ Casing Volume 8.6 gal.

   Water Column 12.89 ft. Total Purge Volume 25.9 gal.

4. Date and time of sample collection: 6/25/96

5. Comments regarding physical character of ground water:

   Mod [illegible] pH: 7.33 SC= 992

6. Field Parameters:

   Temperature: _____ pH 7.13 SC Field 6219 SC @25 c _____

7. Water phase, number of containers: 6

   Hydrocarbon phase, number of containers: –

8. Other comments affecting monitoring:

   DUPE-1

9. Field Personnel: CD+KR

Project # 32-08

FIELD RECORD
GROUND-WATER SAMPLING

1. Well: MW-8 Truck Bay

2. Date of fluid level measurement: 6/24/96

3. Total Depth 13.54 ft. Well Diameter 4 in.

   Depth to Hydrocarbon – ft. Gallons/ft. 0.67 gal.

   Depth to Water 2.18 ft. Gallons/ Casing Volume 7.6 gal.

   Water Column 11.36 ft. Total Purge Volume 22.8 gal.

4. Date and time of sample collection: 6/25/96

5. Comments regarding physical character of ground water:

   Clear. Upon swaging becomes only slightly [illegible]

   pH = 6.97 [illegible]

   Bailed dry after ~ 12 gallons

6. Field Parameters:

   Temperature: _____ pH 6.74 SC Field ~~1,980~~ 2,020 SC @25 c _____

7. Water phase, number of containers: 6

   Hydrocarbon phase, number of containers: –

8. Other comments affecting monitoring:

9. Field Personnel: CD+KR

Project # 32-08

FIELD RECORD
GROUND-WATER SAMPLING

1. Well: MW-9

2. Date of fluid level measurement: 6/24/96

3. Total Depth 15.10 ft. Well Diameter 4 in.

   Depth to Hydrocarbon NO [illegible] ft. Gallons/ft. 0.67 gal.

   Depth to Water 2.21 ft. Gallons/ Casing Volume 8.6 gal.

   Water Column 12.89 ft. Total Purge Volume 25.9 gal.

4. Date and time of sample collection: 6/25/96

5. Comments regarding physical character of ground water:

   Clear but [illegible] green [illegible] odor pH = 770 SC = 731

   [illegible] 10 gallons

6. Field Parameters:

   Temperature: _____ pH 7.75 SC Field 759 SC @25 c _____

7. Water phase, number of containers: 6

   Hydrocarbon phase, number of containers: –

8. Other comments affecting monitoring:

   DUPE-2

9. Field Personnel: CD

Project # 32-08

FIELD RECORD
GROUND-WATER SAMPLING

1. Well: MW-12 [illegible]

2. Date of fluid level measurement: 6/24/96

3. Total Depth 15.30 ft. Well Diameter 4 in.

   Depth to Hydrocarbon – ft. Gallons/ft. 0.67 gal.

   Depth to Water 4.29 ft. Gallons/ Casing Volume 7.4 gal.

   Water Column 11.01 ft. Total Purge Volume 22.1 gal.

4. Date and time of sample collection: 6/25/96

5. Comments regarding physical character of ground water:

   Clear [illegible] pH = 6.76 SC ~~3,2~~ 3,580

   Becomes [illegible] [illegible] 10 gal [illegible]

   [illegible]

6. Field Parameters:

   Temperature: _____ pH 6.83 SC Field ~~3380~~ 3,410 SC @25 c _____

7. Water phase, number of containers: 6

   Hydrocarbon phase, number of containers: –

8. Other comments affecting monitoring:

9. Field Personnel: CD + KR

Project # 32-08

FIELD RECORD
GROUND-WATER SAMPLING

1. Well: MW-7TD

2. Date of fluid level measurement: 6/24/96

3. Total Depth 26.21 ft. Well Diameter 2" in.

Depth to Hydrocarbon — ft. Gallons/ft. 0.17 gal.

Depth to Water 25.59 ft. Gallons/ Casing Volume 0.10 gal.

Water Column 0.62 ft. Total Purge Volume 0.30 gal.

4. Date and time of sample collection: 6/25/96

5. Comments regarding physical character of ground water:

[illegible] 0.3 gallon Turbidity

SC=55

6. Field Parameters:

Temperature: — pH 7.81 SC Field 995 SC @25 c —

7. Water phase, number of containers: 3 VOCs only

Hydrocarbon phase, number of containers: —

8. Other comments affecting monitoring:

9. Field Personnel: CD+KR

Project # 32-08

FIELD RECORD
GROUND-WATER SAMPLING

1. Well: SK-7

2. Date of fluid level measurement: 6/24/96

3. Total Depth 11.99 ft. Well Diameter 2 in.

Depth to Hydrocarbon — ft. Gallons/ft. 0.17 gal.

Depth to Water 5.10 ft. Gallons/ Casing Volume 1.17 gal.

Water Column 6.89 ft. Total Purge Volume 3.5 gal.

4. Date and time of sample collection: 6/25/96

5. Comments regarding physical character of ground water:

Above ground tank [illegible]

[illegible]

[illegible]

6. Field Parameters:

Temperature: ____ pH 6.89 SC Field 2.13 SC @25 c ____

7. Water phase, number of containers: 6

Hydrocarbon phase, number of containers: —

8. Other comments affecting monitoring:

9. Field Personnel: CD+KR

Project # 32-08

FIELD RECORD
GROUND-WATER SAMPLING

1. Well: SK-8

2. Date of fluid level measurement: 6/24/96

3. Total Depth 11.71 ft. Well Diameter 2" in.

   Depth to Hydrocarbon — ft. Gallons/ft. 0.17 gal.

   Depth to Water 4.76 ft. Gallons/ Casing Volume 1.2 gal.

   Water Column 6.95 ft. Total Purge Volume 3.5 gal.

4. Date and time of sample collection: _____

5. Comments regarding physical character of ground water:

   Clear @ start of development / purge pH=7.17 SC:

   Pulled 3 gallons before [illegible]. Not much [illegible]

   Sample: Water Clear

6. Field Parameters:

   Temperature: _____ pH 6.90 SC Field 2,230 SC @25 c _____

7. Water phase, number of containers: 6

   Hydrocarbon phase, number of containers: —

8. Other comments affecting monitoring:

   _____

   _____

9. Field Personnel: CD + KR

Project # 32-08

FIELD RECORD
GROUND-WATER SAMPLING

1. Well: SK-11 B-

2. Date of fluid level measurement: 6/24/96

3. Total Depth 11.33 ft. Well Diameter 2 in.

Depth to Hydrocarbon — ft. Gallons/ft. 0.17 gal.

Depth to Water 4.67 ft. Gallons/ Casing Volume 1.13 gal.

Water Column 6.66 ft. Total Purge Volume 3.39 gal.

4. Date and time of sample collection: 6/25/96

5. Comments regarding physical character of ground water:

Sample w/ per. pump. Not weighted. Purged ~5 gallons.

6. Field Parameters:

Temperature: — pH 7.13 SC Field 558 SC @25 c

7. Water phase, number of containers: 6

Hydrocarbon phase, number of containers: —

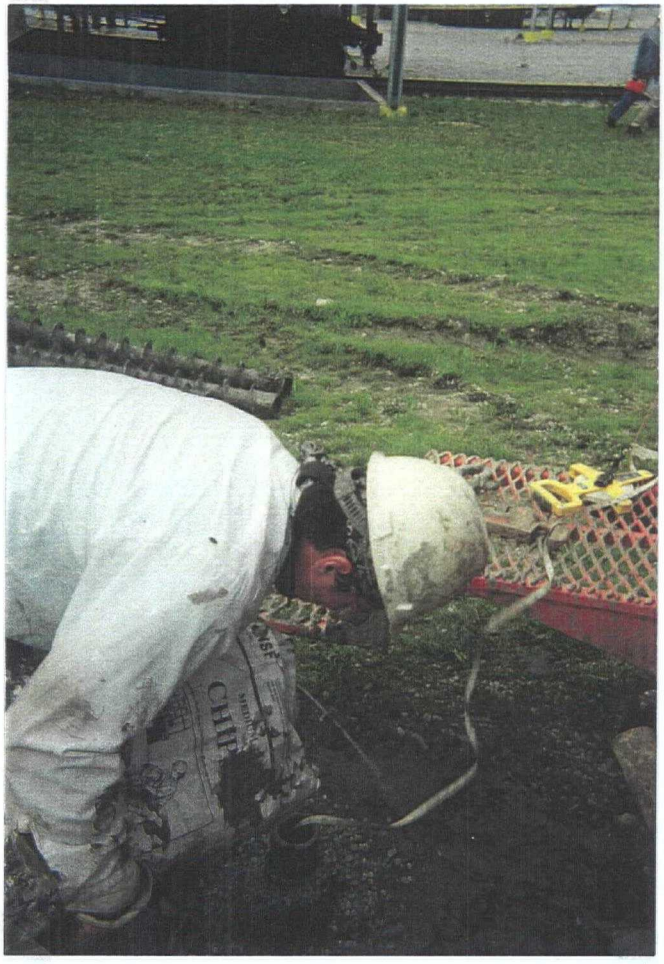
8. Other comments affecting monitoring:

9. Field Personnel: CD + KR

APPENDIX G

PHOTODOCUMENTATION

PHASE II/III RCRA FACILITY INVESTIGATION
SAFETY-KLEEN CORP. RECYCLE CENTER
DOLTON, ILLINOIS



1

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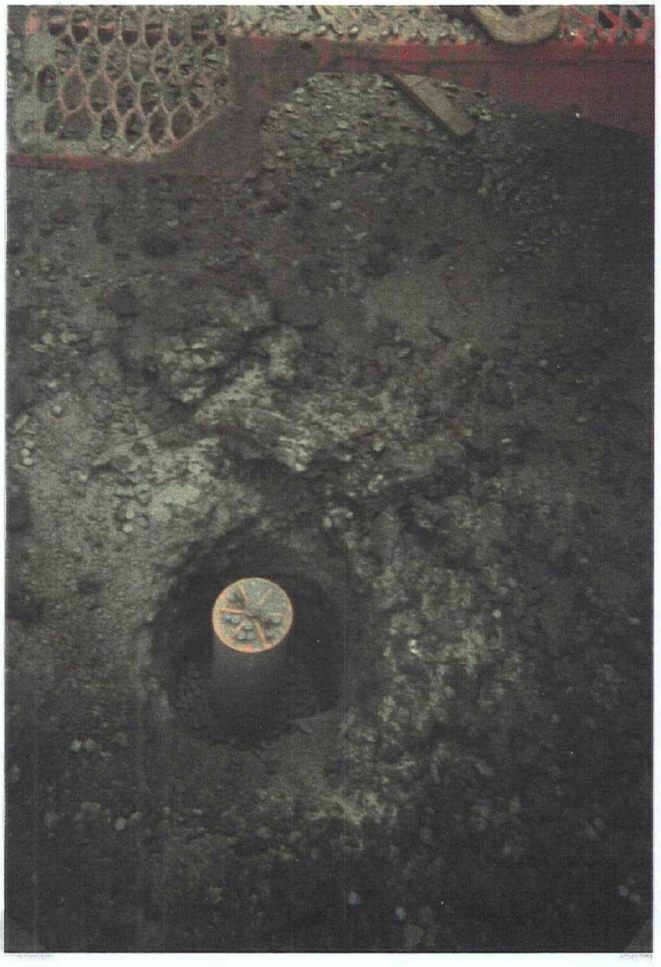

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APPENDIX H

FIELD DOCUMENTATION FORMS

PHASE II/III RCRA FACILITY INVESTIGATION
SAFETY-KLEEN CORP. RECYCLE CENTER
DOLTON, ILLINOIS

DAILY FIELD MEMORANDUM

Date: 5/30/96

Field Personnel: Charlie DeWolf THC, Mike Stege R+S
Brian Colnan THC
Dusty Jackson R+S

Forms Completed as Attachments to this Memorandum*:

* Note: Ensure all forms are signed by field personnel

Activity Log:

Time	Activity	Location
0800	Arrive @ Site	
0800 - 0900	H+S Contractor Training	
0900 - 1000	Permits, Drums Etc...	
1000 - 1130	Commence Drilling VB-2	
1130 - 1345	Drill + Sample LE-2	
1400 - 1480	LUNCH	
1430 - 1745	Drill LE-1/MW-1 + Complete	
1900	Leave Site	

Signatures:

Field Personnel

Project Manager

Form 01

DAILY INSTRUMENT CALIBRATION/MAINTENANCE LOG

Date 5-30-96

Field Instrument and Number	Standard and Concentration	Calibration Reading	Accuracy Reading	Accuracy (+/- from Standard)	Calibrators Initials
Thermo Environ Inst. 580B	Isobutylene 100ppm	100ppm	100.00	0	BC
Determinator	Isobutylene	100ppm	101.2	±1.2	BC

Field Instrument and Number	Maintenance Personnel	Maintenance Performed

SOIL SAMPLING
HEALTH AND SAFETY WORKSHEET

Date: 5/30/96

Job #: 32-08

Sampling Location: Dolton

Page: ____ of ____

Onsite Personnel:

Name	Affiliation	PPE (include modifications and times)
Charlie DeWolf	THC	Modified Level D Hardhats, boots, long sleeved shirt, safety glasses
Brian Colman	THC	
Dusty Jackson	RSDC	
Mike Stege	RSDC	

Health and Safety Data:

Time of Measurement	Collection Area	TOV (ppm)	% LEL	pH	Air Temperature	Other (Specify)
1050	VB-2	0	0	--	50	-
1330	LF-2	0	0	--	70	-
1500	LF-1	0	0	--	75	-

Site Safety Officer

SOIL SAMPLING
SITE CONDITION WORKSHEET

Date: 5/30/96

Job #: 32-08

Sampling Location: East Field, Dalton.

Page: _____ of _____

Arrival Time: 0800

Sampling Team Members	Affiliation
Charlie DeWolf	THC
Brian Colman	THC
Dusty Jackson	RSDC
Mike Stage	RSDC

Others Present:

Sampling site condition upon arrival (concrete cover, standing water, erosion, etc.):

VB-2 - Asphalt.

LE-2 - Grass at side of road. wet - moist with standing water nearby

LE-1

General: 5 inches of rain recently. Little Calumet River @ flood stage. Standing water in low areas

Weather conditions (include significant condition changes and times): Sunny Dry + Clear T = 70°

Miscellaneous site notes:

Time of Sampling Commencement: _____

Observer

Form 03

DAILY FIELD MEMORANDUM

Date: 5-31-96

Field Personnel: Charlie DeWolf THC — Mike Stage RSK
Brian Culnan THC
Dusty Jackson RSK

Forms Completed as Attachments to this Memorandum*:

* Note: Ensure all forms are signed by field personnel

Activity Log:

Time	Activity	Location
8:00	arrival @ site	
8:15	prep for boring @ LE-3	LE-3
9:00	Begin boring LE-3	LE-3
10:00	Complete boring LE-3	
10:30	decon equipment	
10:45	set up @ LE-5	
11:00	Soil boring @ LE-5	
12:00	Complete boring - decon	
12:15 - 12:45	lunch	
13:00	boring @ LE-4	
14:30	complete boring	
15:00	finish decon	

Signatures:

Field Personnel

Project Manager

DAILY INSTRUMENT CALIBRATION/MAINTENANCE LOG

Date 5-31-96

Field Instrument and Number	Standard and Concentration	Calibration Reading	Accuracy Reading	Accuracy (+/- from Standard)	Calibrators Initials
Thermo Environ Inst	Isobutylene	100ppm	99.9	-0.1	BC
Determinator	Isobutylene 100ppm	100ppm	101.2	+1.2	BC
MSA Gascope	Pentane 50%	56% LEL		6%	BS

Field Instrument and Number	Maintenance Personnel	Maintenance Performed

SOIL SAMPLING
HEALTH AND SAFETY WORKSHEET

Date: 5-31-96
Job #: 3208
Sampling Location: Dalton
Page: 1 of

Onsite Personnel:

Name	Affiliation	PPE (include modifications and times)
Charlie DeWolf	THC	Level D
Brian Culmer	THC	
Dusty Jackson	RSI	
Mike Stoic	RSI	

Health and Safety Data:

Time of Measurement	Collection Area	TOV (ppm)	% LEL	pH	Air Temperature	Other (Specify)
0915	LE-3	0-5.5 (background)	0	NM	~65	
1115	LE-5	0-11	0	NM	~70	
1330	LE-4	0	0	NM	~75	

Site Safety Officer

Form 04

SOIL SAMPLING
SITE CONDITION WORKSHEET

Date: 5-31-96
Job #: 32-08
Sampling Location: Dalton
Page: 1 of

Arrival Time: 8:30

Sampling Team Members	Affiliation
Charlie Dewolf	THC
Brian Culnan	THC
Dusty Jackson	RSDC
Mike Stoge	RSDC

Others Present:

Sampling site condition upon arrival (concrete cover, standing water, erosion, etc.):
LE-3 located S/W concrete pad & secondary containment in gravel
LE-5 south end of facility in grass
LE-4 boring completed in gravel parking lot

Weather conditions (include significant condition changes and times): Sunny, warm, slight breeze.

Miscellaneous site notes:

Time of Sampling Commencement: 9:00 AM

Observer

Form 03

DAILY FIELD MEMORANDUM

Date: 6/3/96

Field Personnel: Brian Culman THC — Mike Stegl RSDC
Charlie DeWolf THC
Dusty Jackson RSDC

Forms Completed as Attachments to this Memorandum*:

* Note: Ensure all forms are signed by field personnel

Activity Log:

Time	Activity	Location
0745	Arrive @ Site, obtain permits	
0800	Begin drill + complete MW-12	
1000	Begin drill + complete MW-4	
1000	Surveyors Arrive for Barker Site	
1280	Complete MW-4, Surveyors Complete	
1230-100	LUNCH	
100-400	MW-7	
400-530	LE-6 Clean up, Leave site (Drillers)	
530-630	Stockpile Sampling	

Signatures:

Field Personnel

Project Manager

DAILY INSTRUMENT CALIBRATION/MAINTENANCE LOG

Date 6/3/96

Field Instrument and Number	Standard and Concentration	Calibration Reading	Accuracy Reading	Accuracy (+/- from Standard)	Calibrators Initials
TEI 580B 11.8	Isobutylene 100		99.9	± 0.1	BC
Determinator 10.6	Isobutylene 100		99.8	± 0.2	BC
MSA 61 CG1	~~Pentane~~ 50		58	± 16%	BC

Field Instrument and Number	Maintenance Personnel	Maintenance Performed

SOIL SAMPLING
SITE CONDITION WORKSHEET

Date: 6/3/96

Job #: 32-08

Sampling Location: Dalton Recycle Center

Page: _____ of _____

Arrival Time: 0845

Sampling Team Members	Affiliation
Brian Culnan	THC
Charlie DeWolf	THC
Dusty Jackson	RSDC
Mike Stege	RSDC

Others Present:

Sampling site condition upon arrival (concrete cover, standing water, erosion, etc.):

MW-12 - Standing water on concrete adjacent to boring. Boring up on grass above curb - no standing water. Ground slightly soft

MW-4 - No standing water. Dry - somewhat soft.

VB-3 - Soft in vicinity, standing water 40 ft to the SE

LE-6 - Fill, roadbase gravel. Dry

Weather conditions (include significant condition changes and times): A.M. Partly cloudy - cool. Dry. Heavy rains over weekend have left some standing water

Miscellaneous site notes:

Time of Sampling Commencement:

Observer

Form 03

SOIL SAMPLING
HEALTH AND SAFETY WORKSHEET

Date: 6/3/96

Job #: 32-08

Sampling Location: DOCTON RECYCLE CENTER

Page: ____ of ____

Onsite Personnel:

Name	Affiliation
Brian Culnan	TriHydro
Charlie DeWolf	TriHydro
Dusty Jackson	RSIC
Mike Stegz	RSIC

PPE (include modifications and times)

MODIFIED LEVEL D

Health and Safety Data:

Time of Measurement	Collection Area	TOV (ppm)	% LEL	pH	Air Temperature	Other (Specify)
0900	MW-2	0.0	0	—	60	
1115	MW-4	0.0	0	—	70	
1400	VB-3	10.0	0	—	70	
1530	VB-3	0	0	—	70	
1700	LE-6	0	0	—	70	

Site Safety Officer

DAILY FIELD MEMORANDUM

Date: 6-4-96

Field Personnel: Charlie DeWolf, Mike Stage, Brian Cuhan, Dusty Jackson

Forms Completed as Attachments to this Memorandum*:

* Note: Ensure all forms are signed by field personnel

Activity Log:

Time	Activity	Location
8~~00~~ 8:45	Decon from yesterday. Set concrete pad	VB-3/MW-7
	Set up @ VB-4/mw-8	VB-4/MW-8
0845-12:00	Shipment to Lab, Drill + Complete MW-8	
→ 12:30	Decon	
→ 13:00	lunch	
→ 13:30	Set up rig @ VB-6	
→ 14:45	bore & Sample @ VB-6	
→ 15:15	decon	
→ 17:15	set up drill & sample @ VB-9	
18:20	leave site	

Signatures:

Field Personnel

Project Manager

DAILY INSTRUMENT CALIBRATION/MAINTENANCE LOG

Date 6-4-96

Field Instrument and Number	Standard and Concentration	Calibration Reading	Accuracy Reading	Accuracy (+/- from Standard)	Calibrators Initials
Determinator 10.6	Isobutylene 100ppm	100ppm	101.2	+ 1.2	BC
Thermo. Environ 11.8	" "	"	97.2	- 2.8	BC
MSA Combustable Gas	Pentane 5%	60%	60%	+ 10%	BC

Field Instrument and Number	Maintenance Personnel	Maintenance Performed

SOIL SAMPLING
HEALTH AND SAFETY WORKSHEET

Date: 6-11-96
Job #: 32008
Sampling Location: Dalton
Page: 1 of 1

Onsite Personnel:

Name	Affiliation	PPE (include modifications and times)
Charlie Dowdy	THC	Level D
Brian Culpepper	THC	
Dusty Jackson	RSOC	
Mike Stags	RSOC	

Health and Safety Data:

Time of Measurement	Collection Area	TOV (ppm)	% LEL	pH	Air Temperature	Other (Specify)
0900	VB-3	0	0	—	60	
1000	VB-4	0	0	—	65	
1100	VB-4	0	0	—	65	
1400	VB-6	0	0	NA	50	rain
1615	VB-9	0	0	NA	50	

Site Safety Officer

SOIL SAMPLING
HEALTH AND SAFETY WORKSHEET

Date: 6/5/96
Job #: 32-08
Sampling Location: DOLTON RECYCLE CENTER
Page: ____ of ____

Onsite Personnel:

Name	Affiliation	PPE (include modifications and times)
Charlie DeWolf	THC	MODIFIED LEVEL D
Brian Colnan	THC	
Dusty Jackson	RSDC	
Mike Stege	RSDC	

Health and Safety Data:

Time of Measurement	Collection Area	TOV (ppm)	% LEL	pH	Air Temperature	Other (Specify)
0900	MW-5	0	0	=	70	
1150	MW-6	0	0	=	75	
1500	MW-9	0	0	=	75	

Site Safety Officer

Form 04

DAILY FIELD MEMORANDUM

Date: 6/5/96

Field Personnel: Charlie DeWolf, Mike Stage, Brian Culnan, Dusty Jackson

Forms Completed as Attachments to this Memorandum*:

* Note: Ensure all forms are signed by field personnel

Activity Log:

Time	Activity	Location
0730	Arrive @ Site Obtain Permits	
0800	Set up @ LE-7/MW-5	
0830	Commence boring LE-7	
0930	Complete boring/wc	
1030	Complete monitoring well MW-5	
1100	Decon - Set up @ MW-6	
1200	Commence w/ boring for mw-6	
1300	complete borings	
1400	Complete MW-6 well installation	
1400 to 1430	lunch	
1515	Commence boring VB-8/MW-9	
1600	complete boring	
1630	leave Site	

Signatures:

Field Personnel

Project Manager

DAILY INSTRUMENT CALIBRATION/MAINTENANCE LOG

Date 6-5-96

Field Instrument and Number	Standard and Concentration	Calibration Reading	Accuracy Reading	Accuracy (+/- from Standard)	Calibrators Initials
Thermo. Envir. 580B	11.8 Isobut. 100ppm	100ppm	106	+ 6 ppm	BC
580B	10.6	100ppm	99.7	- 0.03	BC
MSA Gas meter	Pentane 50%		60%	+ 10%	BC

Field Instrument and Number	Maintenance Personnel	Maintenance Performed

SOIL SAMPLING
HEALTH AND SAFETY WORKSHEET

Date 6-5-96
Job # 32-08
Location Dalton

Onsite Personnel

Name	Affiliation	PPE (including modifications and times)
Cherie DeWolf	THC	Level D
Brian Culnan	THC	
Dusty Jackson	RSDC	
Mike Stege	RSDC	

Health and Safety Data

Time of Measurement	Collection Area	TOV	% LEL	pH	Air Temp	Other
8:40	LE-7	0	0	—	70	
12:15	MW-6	0	0	—	75	
15:00	VB-8	0	0	—	75	

DAILY FIELD MEMORANDUM

Date: 6-6-96

Field Personnel: Charlie DeWolf, Mike Stege, Brian Culnan, Dusty Jackson

Forms Completed as Attachments to this Memorandum*:

* Note: Ensure all forms are signed by field personnel

Activity Log:

Time	Activity	Location
7:40	Arrive @ site get permits etc	
8:30	Set up @ office for MW-2	
9:30	Commence boring	
11:15	Complete well MW-2	
12:30	Set up @ VB-9/MW-13	
1-1:30	lunch	
2:00	Commence borings	
3:00	Complete borings - did not install well	
3:30	Decon & set up @ VB-7	
4:30	Complete borings	
5:30	leave Site	

Signatures:

Field Personnel

Project Manager

DAILY INSTRUMENT CALIBRATION/MAINTENANCE LOG

Date 6-6-96

Field Instrument and Number	Standard and Concentration	Calibration Reading	Accuracy Reading	Accuracy (+/- from Standard)	Calibrators Initials
10.6	Isobut. 100ppm	100.0	104.5	+ 4.5	BC
11.8	Isobut. 100ppm	100.0	99.9	- 0.01	BC
MSA Combustable Gas portable		50%	58%	+8%	BC

Field Instrument and Number	Maintenance Personnel	Maintenance Performed

SOIL SAMPLING
HEALTH AND SAFETY WORKSHEET

Date 6-6-96
Job # 32-08
Location Dalton

Onsite Personnel

Name	Affiliation
Charlie DeWolf	THC
Brian Culnan	THC
Dusty Jackson	RSDC
Mike Stec	RSDC

PPE (including modifications and times)
Level D

Health and Safety Data

Time of Measurement	Collection Area	TOV	% LEL	pH	Air Temp	Other
9:45	VB-1	0	0	—	65	
13:45	VB-9	0	0		70	
15:30	VB-7	0	0		70	

DAILY FIELD MEMORANDUM

Date: 6-7-96

Field Personnel: Charlie DeWolf, Mike Stys, Brian Culnen, Dusty Jackson

Forms Completed as Attachments to this Memorandum*:

* Note: Ensure all forms are signed by field personnel

Activity Log:

Time	Activity	Location
7:35	arrive @ site, get permits etc.	
8:45	commence drilling for temp wall	adjacent to VB-3
9:30	complete temp wall installation	
10:00	Decon - move to LE-8	
10:35	commence boring LE-8	
11:30	complete boring	
12:00	commence boring VB-5	
13:30	Complete boring	
14:00 - 14:30	lunch	
15:00	Commence boring @ LE-9	
16:00	complete boring LE-9	
16:45	complete decon	
17:30	Drillers leave site	
18:15	THC leaves site	

Signatures:

Field Personnel

Project Manager

DAILY INSTRUMENT CALIBRATION/MAINTENANCE LOG

Date 6-7-96

Field Instrument and Number	Standard and Concentration	Calibration Reading	Accuracy Reading	Accuracy (+/- from Standard)	Calibrators Initials
11.8 PID	Isobut. 100 ppm	100	96.9	- 3.1	BK
10.6 PID	Isobut. 100 ppm	99	101.3	+1.3	BK
MSA Comb. 90%	Methane 50%		58%	+8%	BK

Field Instrument and Number	Maintenance Personnel	Maintenance Performed

6-7-96

SOIL SAMPLING
HEALTH AND SAFETY WORKSHEET

JOB # 32-01

Dalton

Onsite Personnel

Name	Affiliation	PPE (including modifications and times)
Charlie DeWolf	THC	Level D
Brian Culnan	THC	
Dusty Jackson	RSDC	
Mike Stage	RSDC	

Health and Safety Data

Time of Measurement	Collection Area	TOV	%LEL	pH	Air Temp	Other
1040	LE-8	0	0	—	55	
850	Top well	0	0	—	50	
12:15	VB-5	10	0	—	55	
15:10	LE-9	0	0	—	55	

DAILY FIELD MEMORANDUM

Date: 6/9/96

Field Personnel: Charlie DeWolf

Forms Completed as Attachments to this Memorandum*:

* Note: Ensure all forms are signed by field personnel

Activity Log:

Time	Activity	Location
0600-0700	Pick Geotech samples / C-O-C	Red Roof Inn
0700-0730	Mobe to Site	
0730-1630	Develop Wells, Clean & Secure Wells, Fluid level measurements	Recycle Center
2100-2200	Paperwork, Development parameters	Red Roof Inn

Signatures:

Field Personnel

Project Manager

DAILY INSTRUMENT CALIBRATION/MAINTENANCE LOG

Date 6/9/96

Field Instrument and Number	Standard and Concentration	Calibration Reading	Accuracy Reading	Accuracy (+/- from Standard)	Calibrators Initials
Beckman pH	pH=4; pH=10		4.32; 10.02		CD
YSI 33	TAP WATER	0.200	0.200		CD

Field Instrument and Number	Maintenance Personnel	Maintenance Performed

RECORD OF CALIBRATION
PH METER

Date: 6/24/96 Personnel: KR, CD

Time: 0910

Instrument Brand/ID#: _____

Known pH for Standard 1: 7.00

Known pH of Standard 2: 10.01

Pre-Calibration Instrument Readings:

Standard 1: 7.00, Standard 2: 10.01

Post-Calibration Instrument Readings:

Standard 1: 7.01, Standard 2: 10.01

Temperature: _____ °C

Accuracy:

Standard 1: _____ (±%), Standard 2: _____ (±%)

Comments regarding instrument maintenance, cleanliness, condition, quickness in stabilizing, etc.:

clean and working

FORM 06

RECORD OF CALIBRATION
PH METER

Date: 6/25/96 Personnel: KR, CD

Time: 0740

Instrument Brand/ID#: _____

Known pH for Standard 1: 7.00

Known pH of Standard 2: 10.01

Pre-Calibration Instrument Readings:

Standard 1: 7.00, Standard 2: 10.01

Post-Calibration Instrument Readings:

Standard 1: 7.01, Standard 2: 10.03

Temperature: _____ °C

Accuracy:

Standard 1: _____ (±%), Standard 2: _____ (±%)

Comments regarding instrument maintenance, cleanliness, condition, quickness in stabilizing, etc.:

clean and working

FORM 06

APPENDIX I

GEOTECHNICAL RESULTS

PHASE II/III RCRA FACILITY INVESTIGATION
SAFETY-KLEEN CORP. RECYCLE CENTER
DOLTON, ILLINOIS

32-08
DATA

midwest engineering services, inc.

geotechnical • environmental • materials engineers

15327 S. 70th Court
Orland Park, IL 60462
708-429-7805
FAX 708-429-7824

August 14, 1996

Mr. Charlie DeWolf
TriHydro Corporation
920 Sheridan
Laramie, Wyoming 82070

Subject: Geotechnical Laboratory Testing
Dolton, Illinois
TriHydro Job No. 32-08
MES Project No. 2-63072

Dear Mr. DeWolf:

Enclosed please find the geotechnical laboratory test results for the above-referenced project.

We appreciate the opportunity to be of continued service to TriHydro Corporation. If you have any questions or if we may be of further assistance please do not hesitate to contact us at your convenience.

Very truly yours

MIDWEST ENGINEERING SERVICES, INC.

Kenneth K. Rippy, P.E.
Chicago Branch Manager

Encl.

Report of Laboratory Testing

Client: TriHydro Corporation
920 Sheridan
Laramie, WY 82070

Project: Geotechnical/Analytical Services
TriHydro Corporation
Project No. 32-08

Date: 7-2-1996

Project No.: 2-63072

Laboratory No.:	M96153	
Sample Location:	LE-8 (8-10')	LE-9 (10-12')
Sample Description:	Gray Lean Clay	Dark Gray Lean Clay

Moisture Content Determination (ASTM D2216)

Moisture Content, %:	21.9	21.9

Dry Bulk Density (ASTM D2937)

Dry Bulk Density, pcf:	110.0	109.7

Porosity

Porosity, %:	33.5	33.7

*Assumed specific gravity of 2.65 for porosity determination

Atterberg Limits (ASTM D4318)

Liquid Limit:	30	38
Plastic Limit:	18	19
Plasticity Index:	12	19

Organic Content (ASTM D2974)

Organic Content, %:	2.93	4.18

Hydraulic Conductivity (ASTM D5084)

Hydraulic Conductivity, cm/sec.:	7.3×10^{-5}	1.3×10^{-8}

Grain Size Analysis (ASTM D422)

Gravel, %:	0.0	0.9
Sand, %	0.4	9.5
Silt, %:	53.9	31.1
Clay, %:	45.7	58.5

Report of Laboratory Testing

Client: TriHydro Corporation
920 Sheridan
Laramie, WY 82070

Project: Geotechnical/Analytical Services
TriHydro Corporation
Project No. 32-08

Date: 7-2-1996

Project No.: 2-63072

Laboratory No.: M96153

Sample Location:	VB-5 (22-24')	VB-5 (26-28')
Sample Description:	Gray Lean Clay	Dark Gray Lean Clay with Sand

Moisture Content Determination (ASTM D2216)

Moisture Content, %:	—	14.9

Dry Bulk Density (ASTM D2937)

Dry Bulk Density, pcf:	—	120.4

Porosity

Porosity, %:	—	27.2*

*Assumed specific gravity of 2.65 for porosity determination

Atterberg Limits (ASTM D4318)

Liquid Limit:	—	30
Plastic Limit:	—	19
Plasticity Index:	—	11

Organic Content (ASTM D2974)

Organic Content, %:	—	4.01

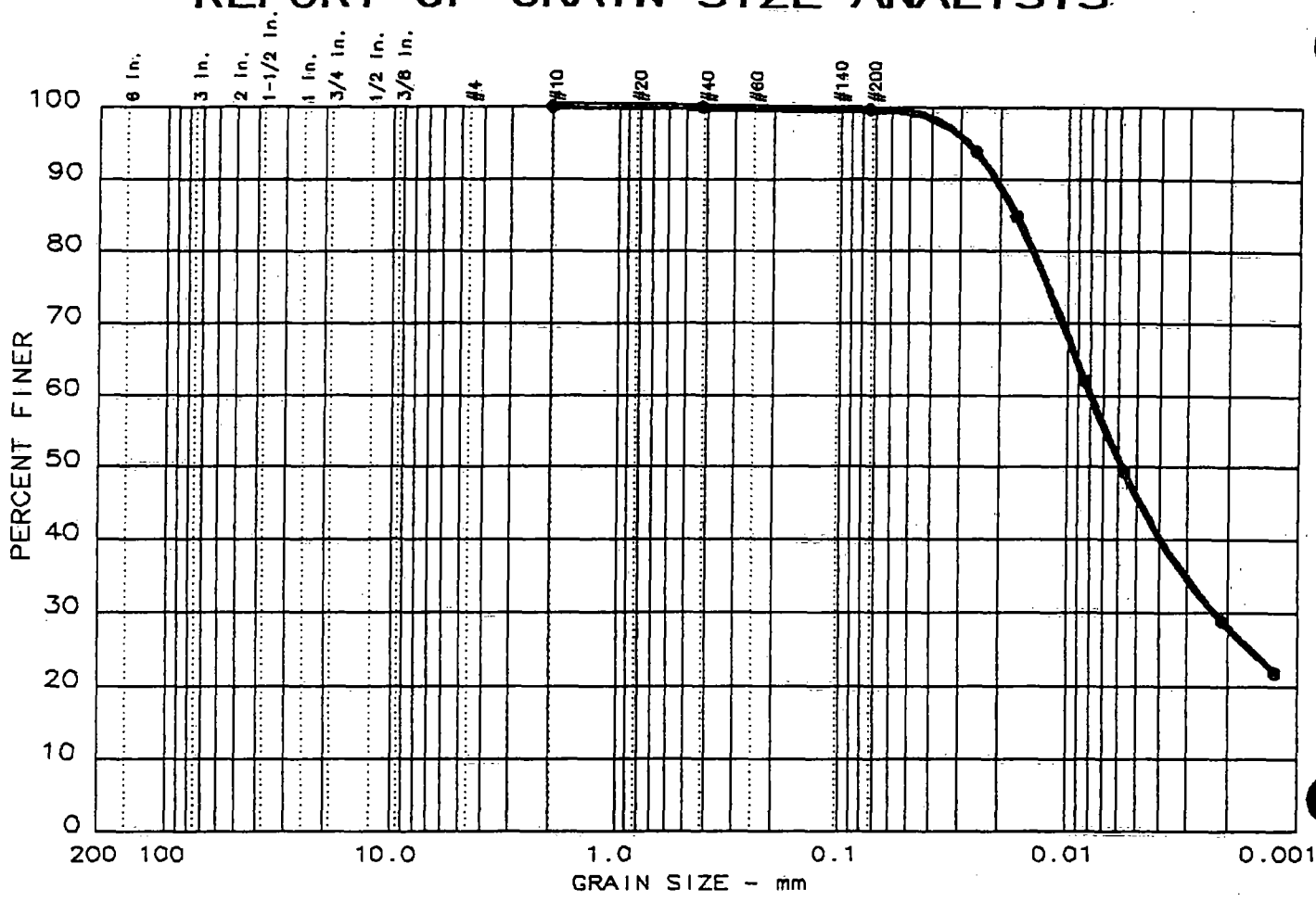
Hydraulic Conductivity (ASTM D5084)

Hydraulic Conductivity, cm/sec.:	9.4×10^{-9}	1.8×10^{-8}

Grain Size Analysis (ASTM D422)

Gravel, %:	2.4	5.1
Sand, %	10.9	17.8
Silt, %:	48.6	39.6
Clay, %:	38.1	37.5

REPORT OF GRAIN SIZE ANALYSIS



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	3	0.0	0.0	0.4	53.9	45.7

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	30	12	0.02	0.01	0.01	0.002				

MATERIAL DESCRIPTION	USCS	AASHTO
● Gray Lean Clay	CL	

Project No.: 2-63072
Project: Geotechnical/Analytical Services
● Location: TriHydro Corporation

Date: 6-14-96

Remarks:
Sample LE-8 (8-10')

REPORT OF GRAIN SIZE ANALYSIS

MIDWEST ENGINEERING SERVICES

Figure No. _____

Report Of Falling Head Hydraulic Conductivity Test

Client: TriHydro Corporation
920 Sheridan
Laramie, WY 82070

Project: Geotechnical/Analytical Services
TriHydro Corporation
Project No. 32-08

Date: 6/26/96

Project No.: 2-63072

Laboratory No.: M96153
Sample Location: LE-8 (8-10')
Sample Description: Gray Lean Clay

Material Properties

Natural Moisture:	21.9	Percent Finer No. 200:	99.6
Bulk Dry Density, pcf:	110.0	Percent Finer .005 mm:	45.7
Bulk Porosity, %:	33.5	Liquid Limit:	30
Organic Content, %:	2.93	Plasiticity Index:	12

Sample Characteristics

Height,cm:	5.08
Diameter,cm:	7.11
Wet Weight,gm:	434.6
Moisture, %:	21.4
Dry Density,pcf:	110.6
Compaction, %:	—

Test Parameters

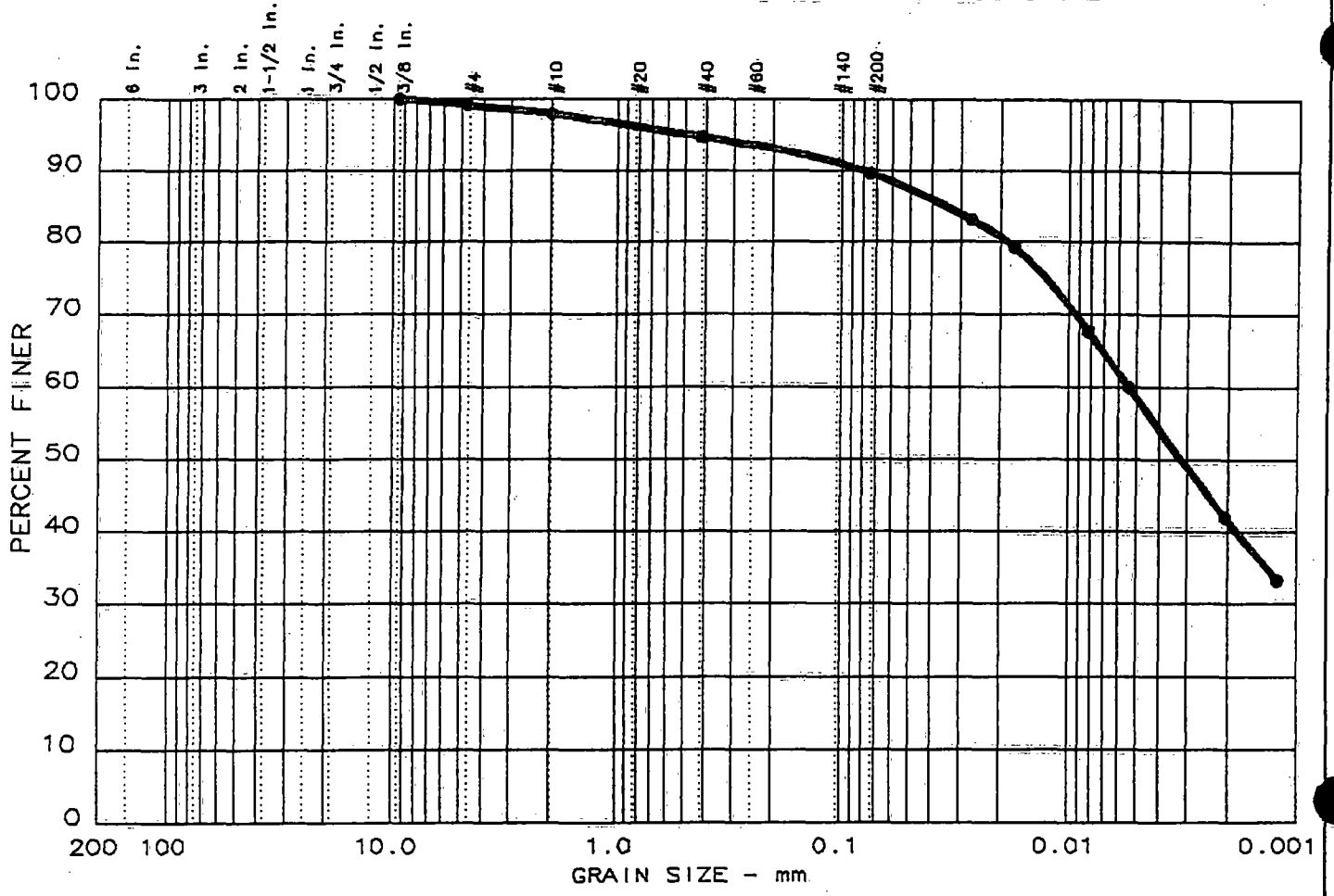
Permeameter:	Flexible Wall
Permeant Fluid:	Deaired Water
Cell Pressure:	28
Back Pressure:	25
Test Pressure:	25
Differential Head:	0

(Hydraulic Conductivity,ASTM D5084,method C)

Run No.	Time t (sec)	Head Loss, cm ho	Head Loss, cm hi	Inflow/ Outflow	Coeff. of Permeability, cm/sec k=aL/2At[ln(ho/hi)]
1	60	10.30	9.65	1.17	6.9E-05
2	120	10.70	9.20	1.14	8.0E-05
3	60	9.20	8.60	1.00	7.2E-05
4	120	8.60	7.50	0.83	7.3E-05
5	120	7.50	6.60	1.25	6.8E-05
AVERAGE STEADY HYDRAULIC CONDUCTIVITY				*K=	7.3E-05 cm/sec

*Sample had vertical sand seam

REPORT OF GRAIN SIZE ANALYSIS



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	1	0.0	0.9	9.5	31.1	58.5

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	38	19	0.04	0.01	0.00					

	MATERIAL DESCRIPTION	USCS	AASHTO
●	Dark Gray Lean Clay	CL	

Project No.: 2-63072
Project: Geotechnical/Analytical Services
● Location: TriHydro Corporation

Date: 6-14-96

Remarks:
Sample LE-9 (10-12')

REPORT OF GRAIN SIZE ANALYSIS
MIDWEST ENGINEERING SERVICES

Figure No. _____

Report Of Falling Head Hydraulic Conductivity Test

Client: TriHydro Corporation
920 Sheridan
Laramie, WY 82070

Project: Geotechnical/Analytical Services
TriHydro Corporation
Project No. 32-08

Date: 7/1/96

Project No.: 2-63072

Laboratory No.: M96153
Sample Location: LE-9 (10-12')
Sample Description: Dark Gray Lean Clay

Material Properties

Natural Moisture:	21.9	Percent Finer No. 200:	89.6
Bulk Dry Density, pcf:	109.7	Percent Finer .005 mm:	58.5
Bulk Porosity, %:	33.7	Liquid Limit:	38
Organic Content, %:	4.18	Plasiticity Index:	19

Sample Characteristics

Height,cm:	5.08
Diameter,cm:	7.21
Wet Weight,gm:	426.3
Moisture, %:	21.3
Dry Density,pcf:	105.6
Compaction, %:	----

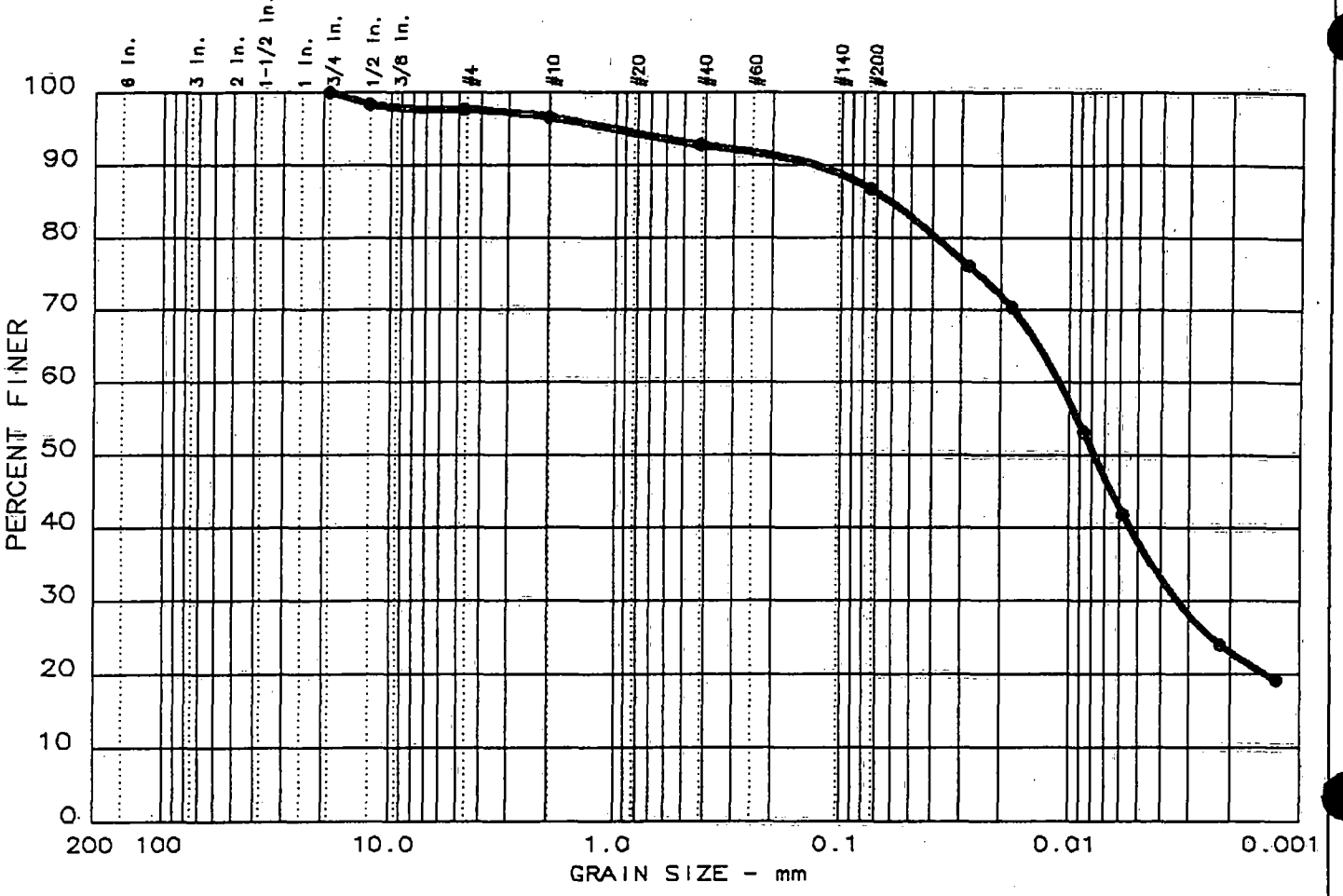
Test Parameters

Permeameter:	Flexible Wall
Permeant Fluid:	Deaired Water
Cell Pressure:	29
Back Pressure:	25
Test Pressure:	27
Differential Head:	2

(Hydraulic Conductivity,ASTM D5084,method C)

Run No.	Time t (sec)	Head Loss, cm ho	Head Loss, cm hi	Inflow/ Outflow	Coeff. of Permeability, cm/sec k=aL/2At[ln(ho/hi)]
1	20700	150.90	150.30	1.00	1.2E-08
2	55800	150.30	148.45	1.06	1.4E-08
3	12660	148.45	148.10	0.75	1.2E-08
4	18720	148.10	147.45	0.86	1.5E-08
5	55140	147.45	145.70	0.94	1.3E-08
AVERAGE STEADY HYDRAULIC CONDUCTIVITY				K=	1.3E-08 cm/sec

REPORT OF GRAIN SIZE ANALYSIS



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	2	0.0	2.4	10.9	48.6	38.1

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			0.06	0.01	0.01	0.003				

MATERIAL DESCRIPTION	USCS	AASHTO
● Gray Lean Clay (visual description)		

Project No.: 2-63072
Project: Geotechnical/Analytical Services
● Location: TriHydro Corporation

Date: 6-14-96

Remarks:
Sample VB-5 (22-24')

REPORT OF GRAIN SIZE ANALYSIS

MIDWEST ENGINEERING SERVICES

Figure No. _____

Report Of Falling Head Hydraulic Conductivity Test

Client: TriHydro Corporation
920 Sheridan
Laramie, WY 82070

Project: Geotechnical/Analytical Services
TriHydro Corporation
Project No. 32-08

Date: 7/2/96

Project No.: 2-63072

Laboratory No.: M96153
Sample Location: VB-5 (22-24')
Sample Description: Gray Lean Clay

Material Properties

Natural Moisture:	----	Percent Finer No. 200:	86.7
Bulk Dry Density, pcf:	----	Percent Finer .005 mm:	38.1
Bulk Porosity, %:	----	Liquid Limit:	----
Organic Content, %:	----	Plasiticity Index:	----

Sample Characteristics

Height,cm:	3.56
Diameter,cm:	3.51
Wet Weight,gm:	72.2
Moisture, %:	18.7
Dry Density,pcf:	110.5
Compaction, %:	----

Test Parameters

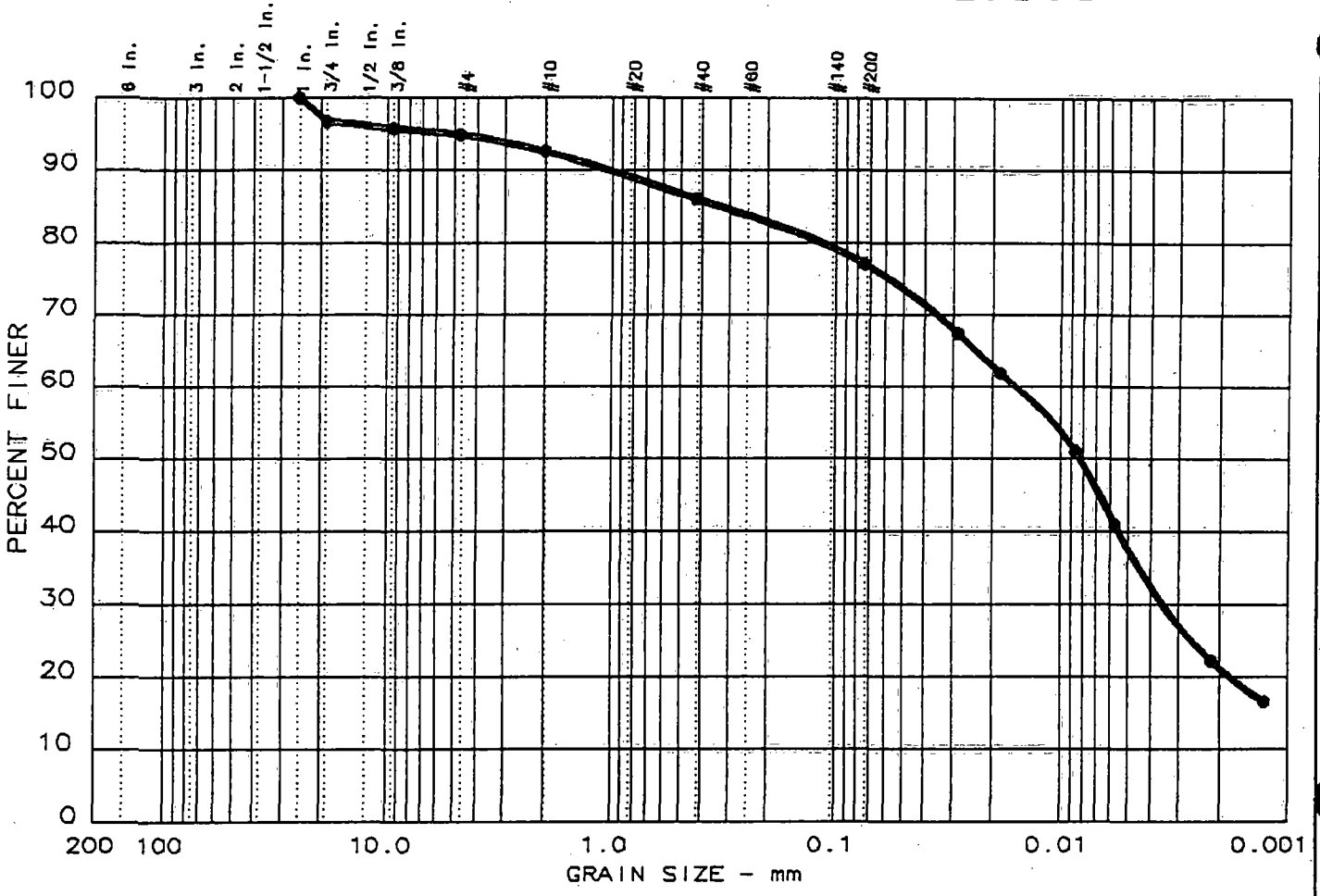
Permeameter:	Flexible Wall
Permeant Fluid:	Deaired Water
Cell Pressure:	18.5
Back Pressure:	15
Test Pressure:	16.5
Differential Head:	1.5

(Hydraulic Conductivity,ASTM D5084,method C)

Run No.	Time t (sec)	Head Loss, cm ho	Head Loss, cm hi	Inflow/ Outflow	Coeff. of Permeability, cm/sec k=aL/2At[ln(ho/hi)]
1	54780	120.30	119.90	1.00	1.1E-08
2	86100	119.90	119.45	0.80	8.0E-09
3	31380	119.45	119.25	1.00	9.8E-09
4	20640	118.85	118.75	1.00	7.5E-09
5	163140	118.45	117.35	1.20	1.1E-08
AVERAGE STEADY HYDRAULIC CONDUCTIVITY				*K=	9.4E-09 cm/sec

* Sample was disturbed

REPORT OF GRAIN SIZE ANALYSIS



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	4	0.0	5.1	17.8	39.6	37.5

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	30	11	0.33	0.02	0.01	0.004				

MATERIAL DESCRIPTION	USCS	AASHTO
● Dark Gray Lean Clay with Sand	CL	

Project No.: 2-63072
Project: Geotechnical/Analytical Services
● Location: TriHydro Corporation

Date: 6-14-96

Remarks:
Sample VB-5 (26-28')

REPORT OF GRAIN SIZE ANALYSIS

MIDWEST ENGINEERING SERVICES

Figure No. _____

Report Of Falling Head Hydraulic Conductivity Test

Client: TriHydro Corporation
920 Sheridan
Laramie, WY 82070

Project: Geotechnical/Analytical Services
TriHydro Corporation
Project No. 32-08

Date: 7/1/96

Project No.: 2-63072

Laboratory No.: M96153
Sample Location: VB-5 (26-28')
Sample Description: Dark Gray Lean Clay with Sand

Material Properties

Natural Moisture:	14.9	Percent Finer No. 200:	77.1
Bulk Dry Density, pcf:	120.4	Percent Finer .005 mm:	37.5
Bulk Porosity, %:	27.2	Liquid Limit:	30
Organic Content, %:	4.01	Plasiticity Index:	11

Sample Characteristics

Height,cm:	5.08
Diameter,cm:	7.24
Wet Weight,gm:	461.7
Moisture, %:	14.1
Dry Density,pcf:	120.8
Compaction, %:	----

Test Parameters

Permeameter:	Flexible Wall
Permeant Fluid:	Deaired Water
Cell Pressure:	29.5
Back Pressure:	25
Test Pressure:	27
Differential Head:	2

(Hydraulic Conductivity,ASTM D5084,method C)

Run No.	Time t (sec)	Head Loss, cm ho	Head Loss, cm hi	Inflow/ Outflow	Coeff. of Permeability, cm/sec k=aL/2At[ln(ho/hi)]
1	24360	152.20	151.10	1.00	1.8E-08
2	55800	151.10	148.65	1.04	1.8E-08
3	12660	148.65	148.15	1.00	1.6E-08
4	18720	148.15	147.35	0.78	1.8E-08
5	55140	147.35	145.00	1.04	1.8E-08
AVERAGE STEADY HYDRAULIC CONDUCTIVITY				K=	1.8E-08 cm/sec

CHAIN-OF-CUSTODY RECORD Page 1 of 2

Project No.:	Today's Date:	Date Results Requested:
32-08	6/9/96	STANDARD T-A-T (3-4 WKS)

Sampler's Name:	Phone No.:	Fax No.:
Charlie DeWolf/ Brian Cohen	307-745-7474	307-745-7729

Company Name and Address:
TriHydro Corporation
920 Sheridan
Laramie, WY 82070

Company Contact: Charlie DeWolf/ Brian Cohen

Collector's Sample No.	Sample Matrix	Date Sampled/ Time Sampled	No. of Containers	Falling Head Permeability	Grain Size *	Atterberg Limits	Bulk Density	Bulk Porosity	Moisture Content	Total Organic Carbon	Analyses Requested
LE-9 (10-12)	SOIL	6/7/96	1 Shelby	X	X	X	X	X	X	X	
VB-5 (22-24)	SOIL	6/7/96	1 Shelby (6" or so)	X	(X)	—	—	—	—	—	If enough sample
VB-5 (26-28)	SOIL	6/7/96	1 Shelby	X	X	X	X	X	X	X	
LE-8 (8-10)	SOIL	6/7/96	1 Shelby	X	X	X	X	X	X	X	
VB-8 (9-11)	SOIL	6/7/96	1 JAR		X						
VB-9 (22-24)/MW-6 (20-22)		6/7/96	2 JARS(?)		X		X	X			
VB-1 (22-24)/(24-26)/LE-10 (22-24)			1 JAR 2 RINGS		X		X	X	X		
VB-3 (22-24)	SOIL	6/7/96	1 RING		X				X		

Remarks: * Including hydrometer. Samples to be composited are: 2 plus Bagged together

Relinquished by:	Affiliation:	Date/Time:	Received by:	Affiliation:	Date/Time:
Relinquished by:	Affiliation:	Date/Time:	Received by:	Affiliation:	Date/Time:
Relinquished by:	Affiliation:	Date/Time:	Received by:	Affiliation:	Date/Time:

Were samples received in good condition?	Remarks:

CHAIN-OF-CUSTODY RECORD

Page 2 of 2

Project No.:	Today's Date:	Date Results Requested:
32-09	6/9/96	STANDARD TAT 5 WORKS

Sampler's Name:	Phone No.:	Fax No.:
C. DeWolf / B. Colman	307-745-7474	307-745-7729

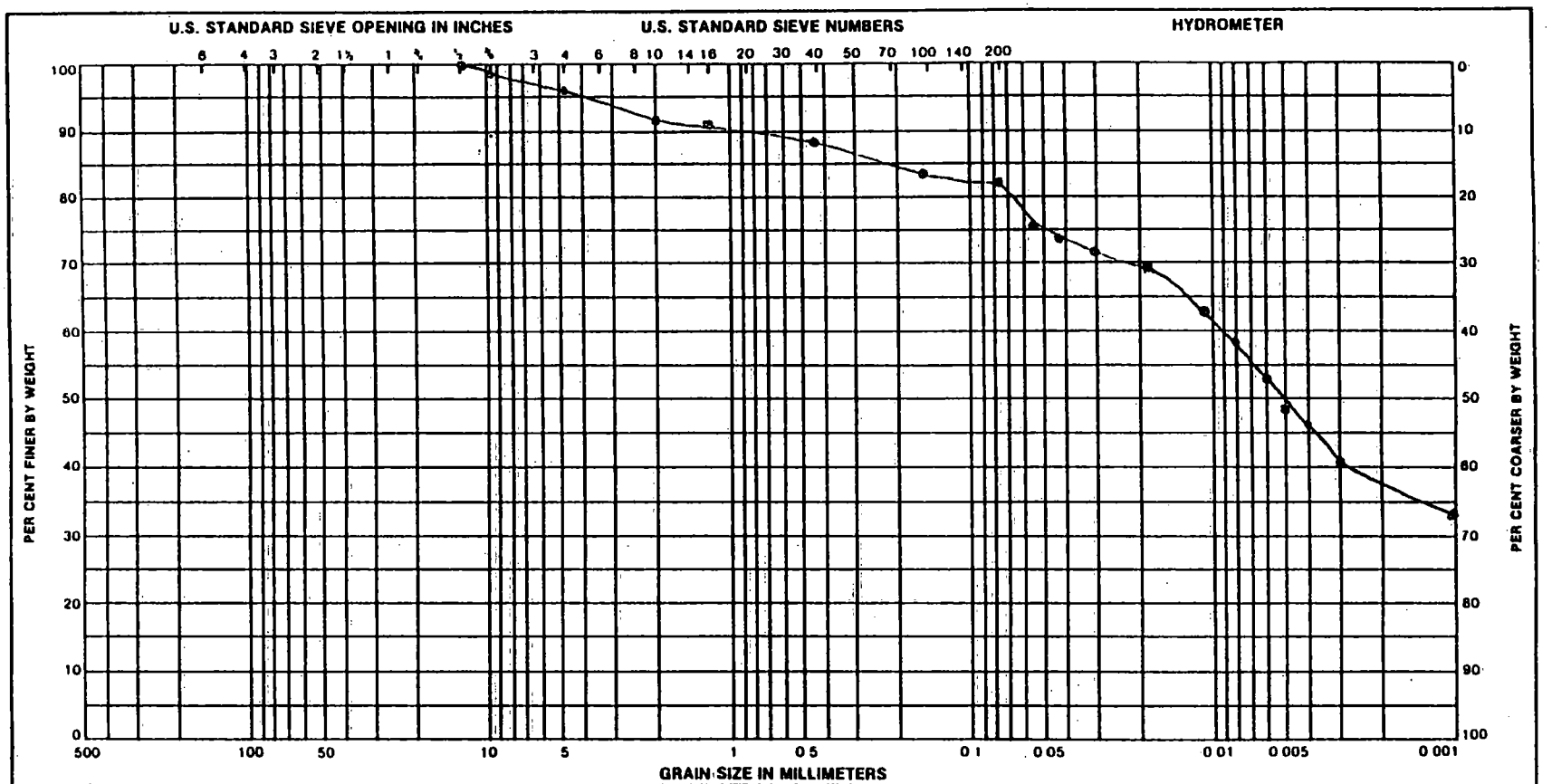
Company Name and Address:	Company Contact:
TriHydro Corporation 920 Sheridan Laramie, WY 82070	C. DeWolf / B. Colman

Collector's Sample No.	Sample Matrix	Date Sampled/ Time Sampled	No. of Containers	Analyses Requested: Falling Head Permeability	Grain Size	Atterberg Limits	Bulk Density	Bulk Porosity	Moisture Content	Total Organic Carbon														
VB-4(22-24)	Soil	6/7/96	2 RINGS		X																			
VB-3(30-32)/VB-3(24-26)	Soil	6/7/96	2 RINGS		X		X	X	X	X														
LE-10(20-22)	Soil	6/7/96	2 RINGS		X																			
VB-5(24-26)/VB-8(28-30)		6/7/96	2 RINGS	X								HOLD												

Remarks:

Relinquished by:	Affiliation:	Date/Time:	Received by:	Affiliation:	Date/Time:
Relinquished by:	Affiliation:	Date/Time:	Received by:	Affiliation:	Date/Time:
Relinquished by:	Affiliation:	Date/Time:	Received by:	Affiliation:	Date/Time:

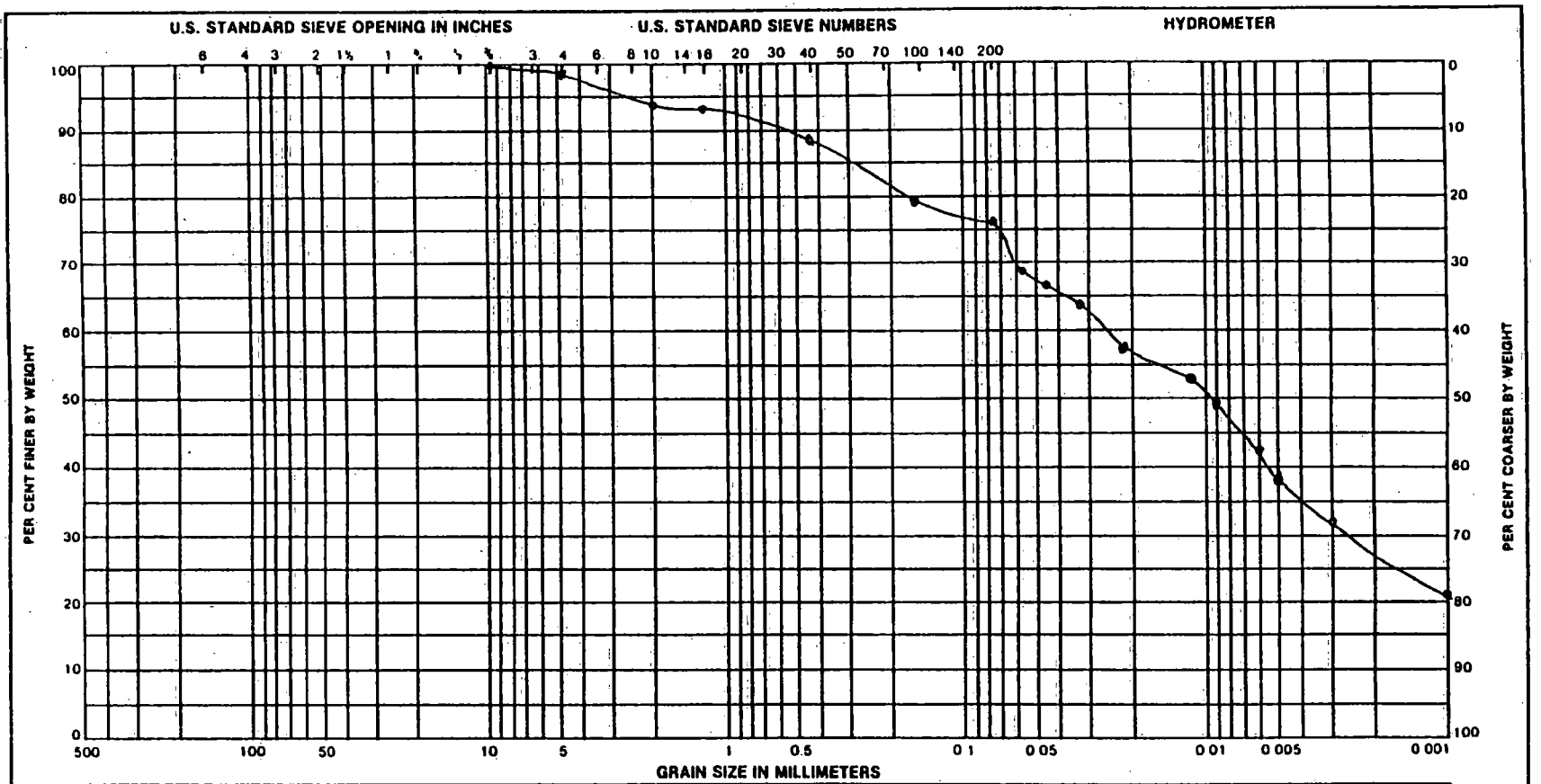
Were samples received in good condition?	Remarks:



Boring No.	Sample No.	Elev. or Depth	Classification	Nat w %	LL	PL	PI	Project
VB-3	- -	22-24	Grey SILTY CLAY with some SAND	22.7	-	-	-	TRIHYDRO CORPORATION
			AND GRAVEL (CL)					PROJECT No. 32-08

REPORT OF SOIL ANALYSIS

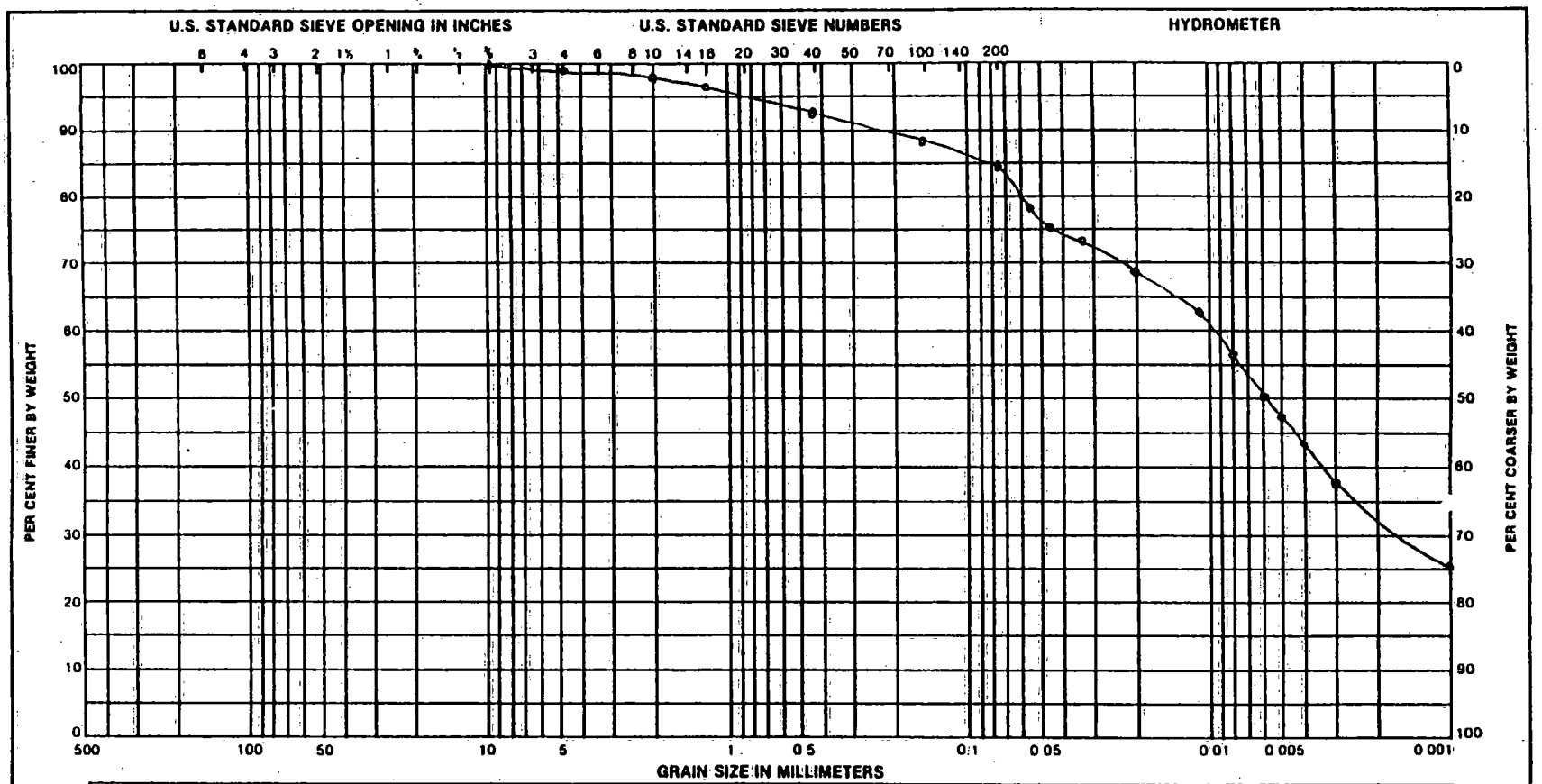
File No. 2-63072



Boring No.	Sample No.	Elev. or Depth	Classification	Nat w %	LL	PL	PI	Project
LE10	--	20-22'	Grey SILTY CLAY with some SAND	15.4	-	-	-	TRIHYDRO CORPORATION
			and trace GRAVEL (CL)					PROJECT No. 32-08

REPORT OF SOIL ANALYSIS

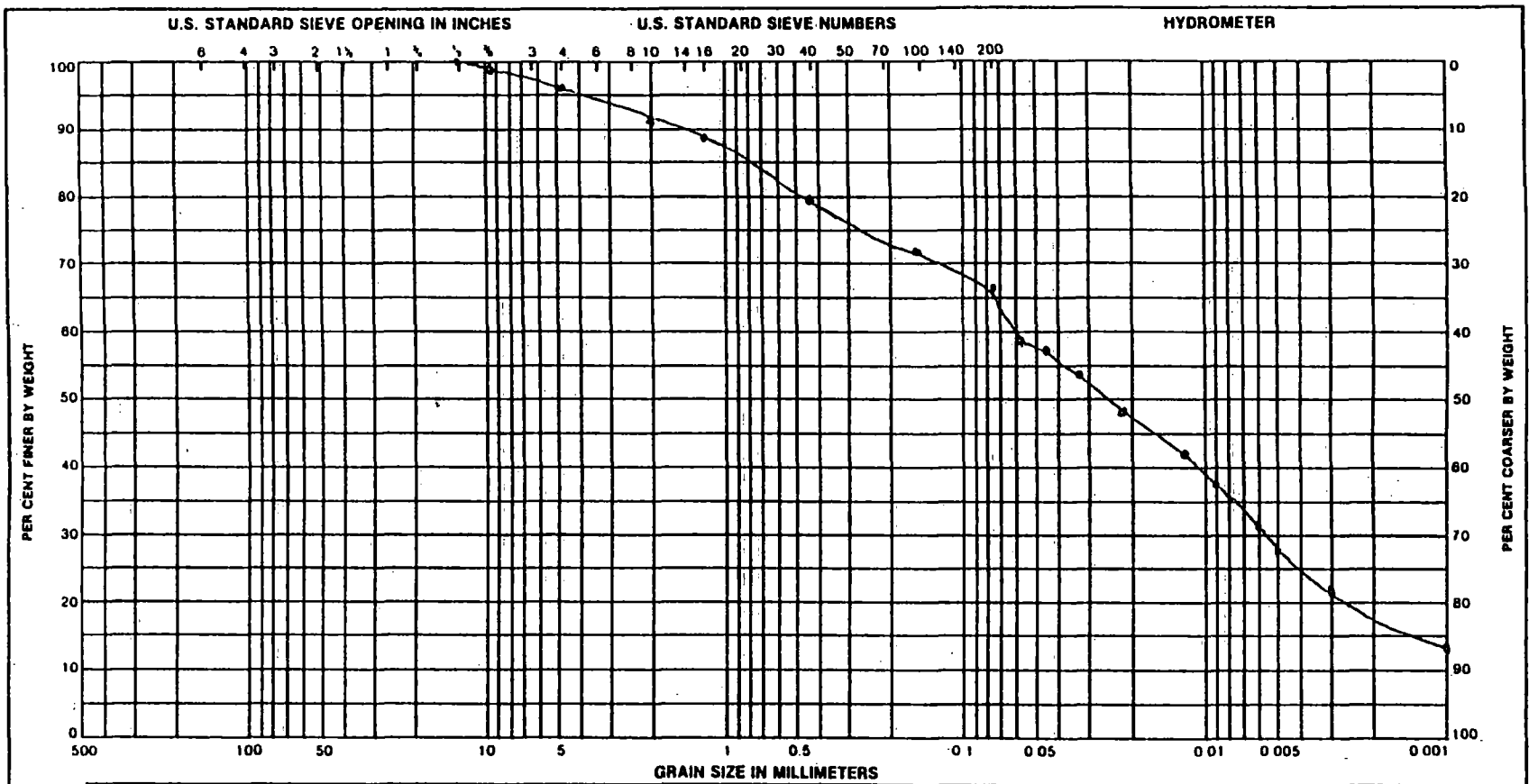
File No. 2-63072



Boring No.	Sample No.	Elev. or Depth	Classification	Nat w %	LL	PL	PI	Project
VB-7	- -	22-24-4	Grey SILTY CLAY with some SAND	17.3	-	-	-	TRIHYDRO CORPORATION
			and trace GRAVEL (CL)					PROJECT No. 32-08

REPORT OF SOIL ANALYSIS

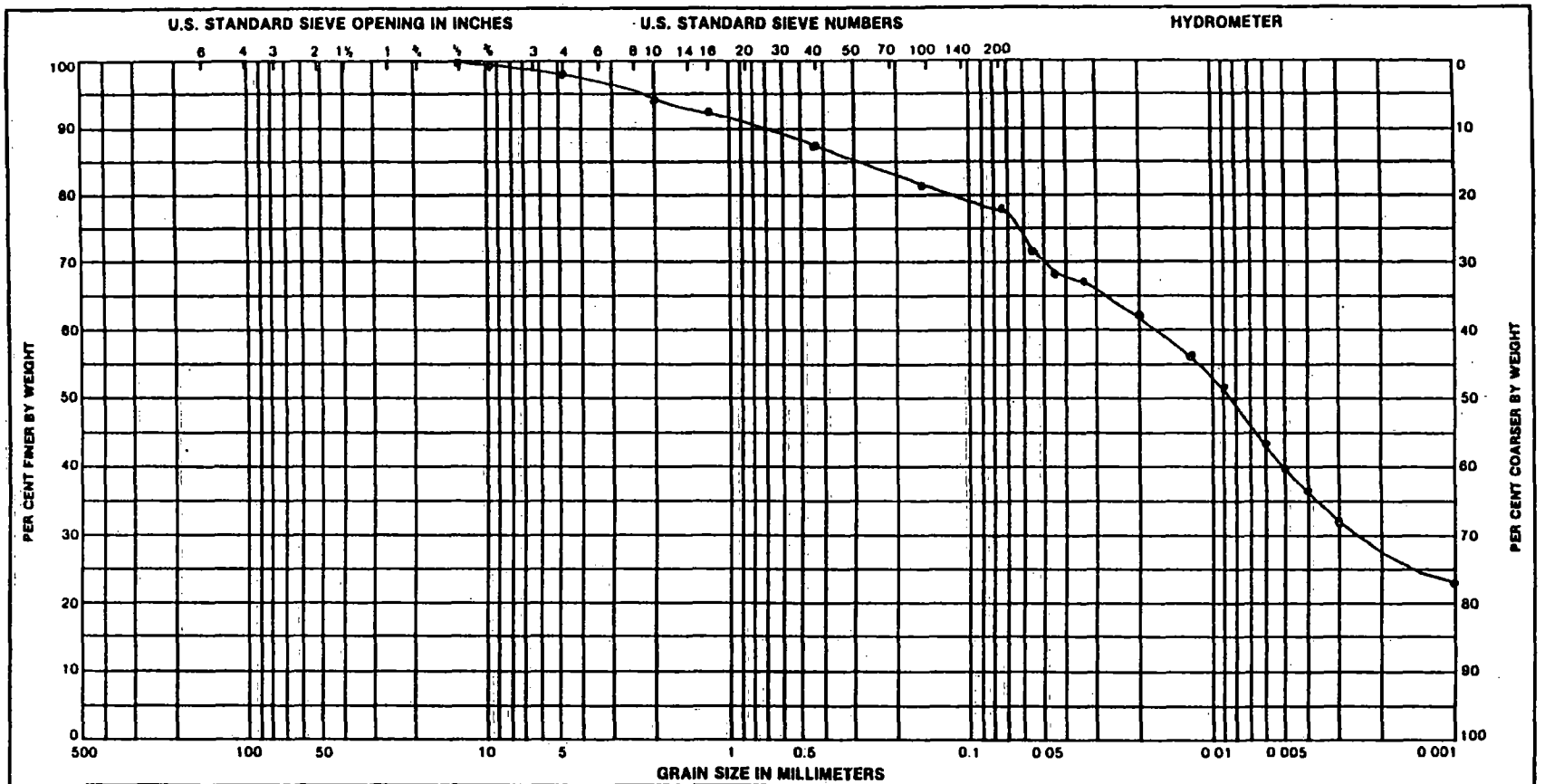
File No. 2-63072



Boring No.	Sample No.	Elev. or Depth	Classification	Nat w %	LL	PL	PI	Project
WB-8	- -	9- 11	Grey SANDY CLAY with trace GRAVEL (CL)	15,9	-	-	-	TRIHYDRO CORPORATION
								PROJECT No. 32-08

REPORT OF SOIL ANALYSIS

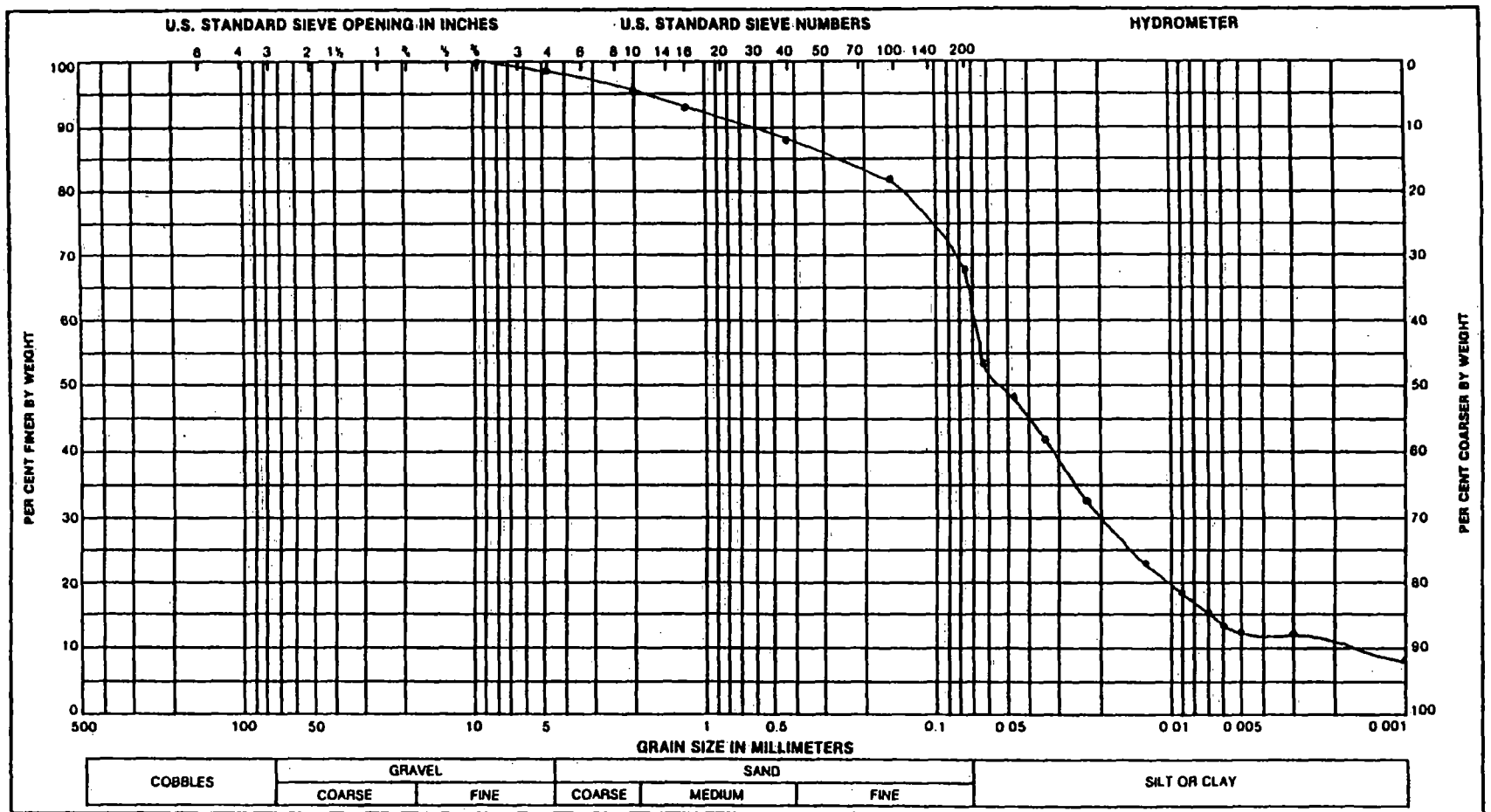
File No. 2-63072



Boring No.	Sample No.	Elev. or Depth	Classification	Nat w %	LL	PL	PI	Project
VVB-A	- -	24-26.	Grey SILTY CLAY with some SAND	17.4	-	-	-	TRIHYDRO CORPORATION
		28-30"	and GRAVEL (CL)					PROJECT No. 32-08

REPORT OF SOIL ANALYSIS

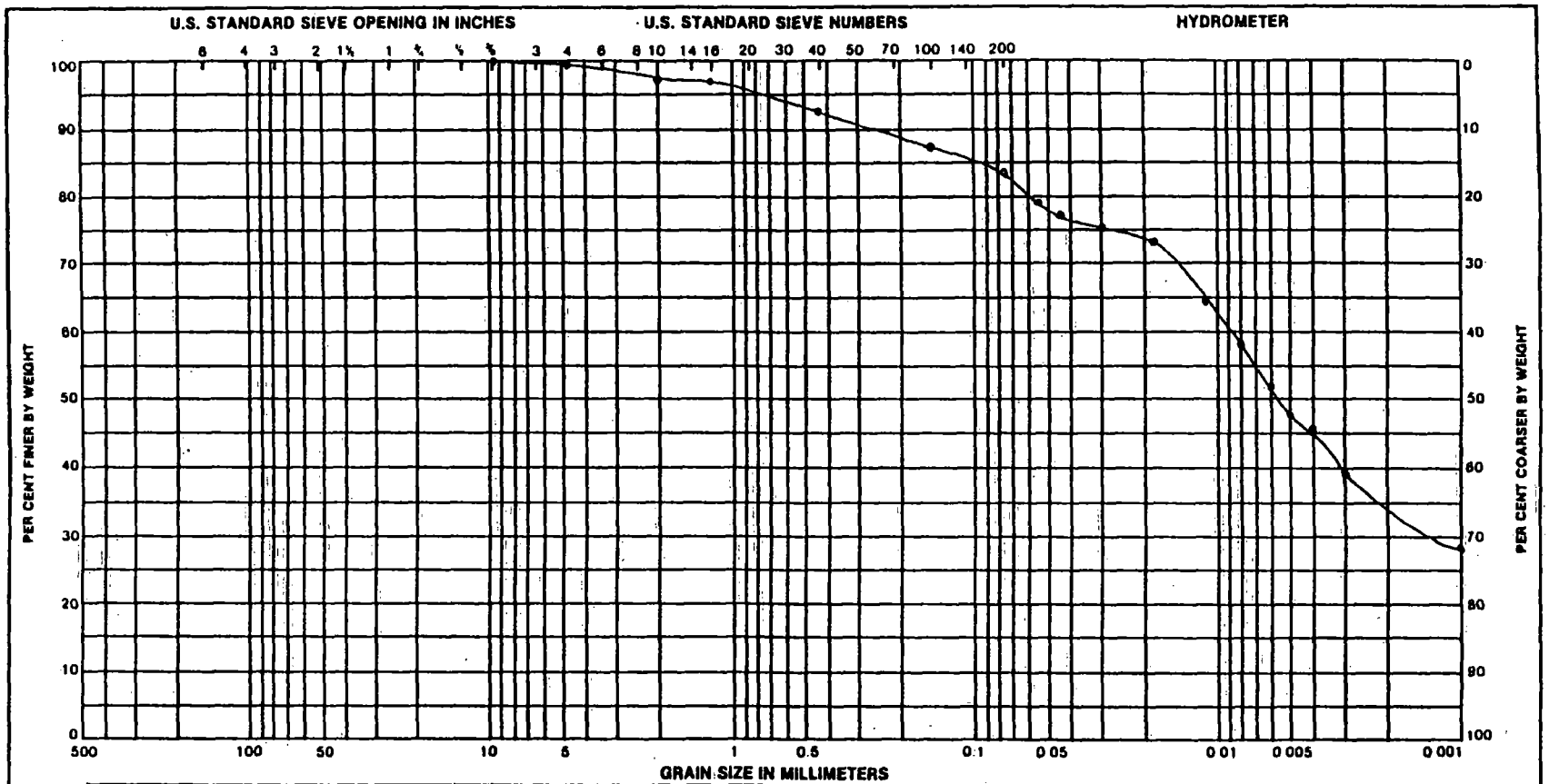
File No. 2-63072



Boring No.	Sample No.	Elev. or Depth	Classification	Nat w %	γ_d pcf	PL	PI	Project
VB-9	- -	22-24	Grey SANDY CLAY with trace	16.5	98.6	-	-	TRIHYDRO COPRORATION
MW-6	- -	20-22	GRAVEL (CL)	14.4	89.4*	-	-	PROJECT No. 32-08

REPORT OF SOIL ANALYSIS * sample was disturbed.

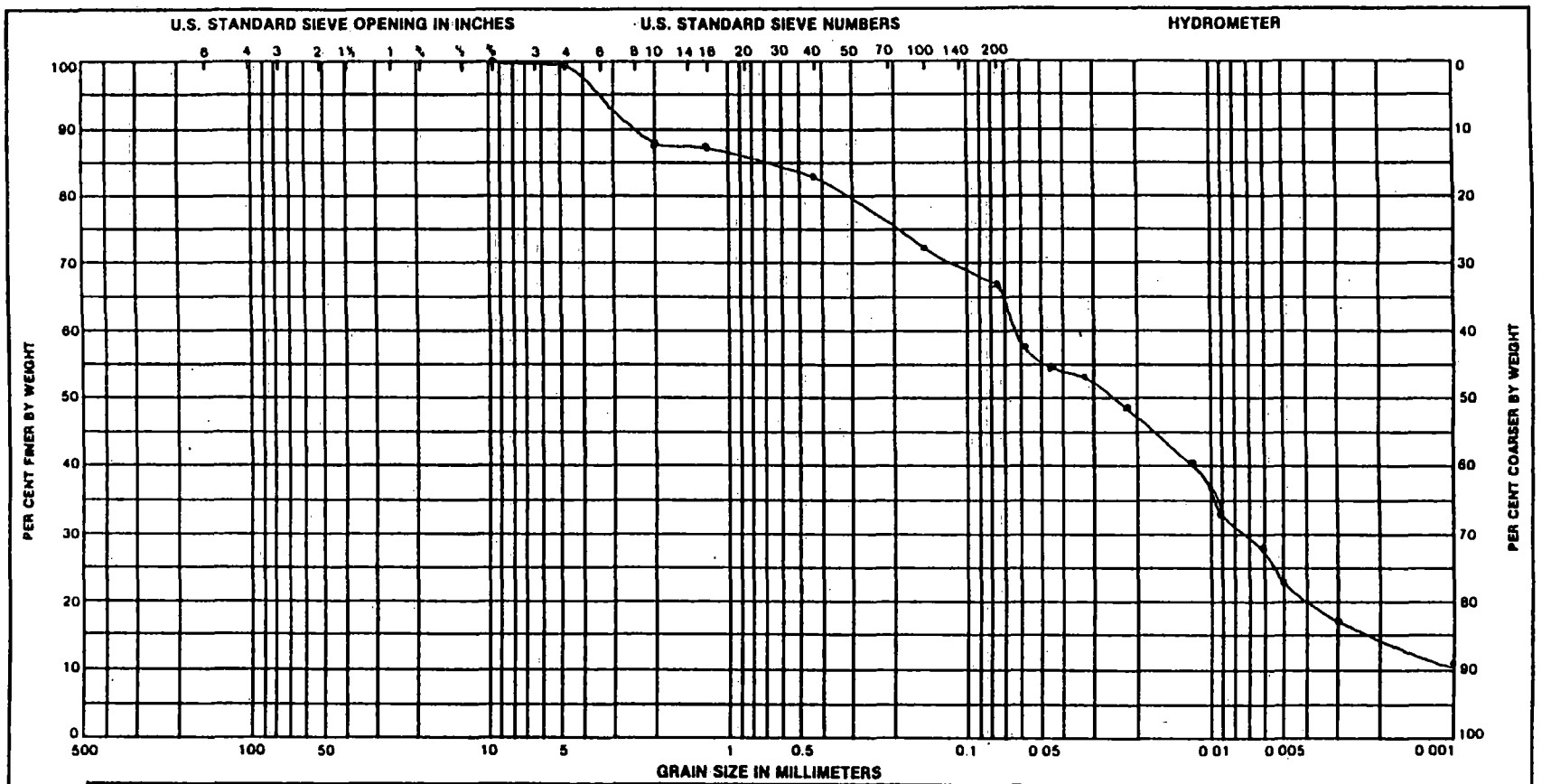
File No. 2-63072



Boring No.	Sample No.	Elev. or Depth	Classification	Nat w %	LOI,%	γ_d,pcf	PI	Project
VB-3	- -	24'-26'	Grey SILTY CLAY with some SAND	21.8	2.1	118.2	-	TRIHYDRO CORPORATION
		30-32'	(CL)	18.6	6.9	117.8	-	PROJECT No. 32-08

REPORT OF SOIL ANALYSIS

File No. 2-63072



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Boring No.	Sample No.	Elev. or Depth	Classification	Nat w %	γ_d, pcf	PL	PI	Project
VB-1	- -	22-24	Grey SANDY CLAY (CL)	19.7	114.2	-	-	TRIHYDRO CORPORATION
VB-1	- -	24-26		11.0	-	-	-	PROJECT No. 32-08
LE10	- -	22-24		18.2	130.9	-	-	

REPORT OF SOIL ANALYSIS

File No. 2-63072

APPENDIX J

SOIL QUALITY ANALYTICAL REPORTS

PHASE II/III RCRA FACILITY INVESTIGATION
SAFETY-KLEEN CORP. RECYCLE CENTER
DOLTON, ILLINOIS

safety-kleen

June 17, 1996

Mr. Jack Bedessem
TriHydro Corporation
920 Sheridan

Laramie, WY 82070

Re: SK Lab Project #96-136
Project ID Name: Dolton, IL

Dear Jack:

Enclosed please find the analytical results for the sample received by SK Environmental Laboratory on 5/31/96.

A formal Quality Control/Quality Assurance program is maintained by Safety-Kleen, which is designed to meet or exceed the EPA requirements. This information is available upon request.

If you have any questions concerning this analysis, or if we can be of further assistance, please contact Rick Cook at 312-825-7351.

Sincerely,

K Hood for MA Hartwig

Mark A. Hartwig
Environmental Lab Manager

MAH:

Allan A. Manteuffel Technical Center

P.O. Box 92050
Elk Grove Village, IL
60009-2050

12555 W. Old Higgins Rd.
Elk Grove Village, IL 60007
Telephone: 312/694-2700
Fax: 312/825-7850

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 6/17/96

ANALYTICAL RESULTS

TCLP Metals

	Work Order #	01	02	03	04	05	06
	Collector's Sample #	LE-2 (4-6)	LE-2 (18-20)	VB-2 (20-22)	VB-2 (25-27)	LE-1 (2-4)	LE-1 (18-20)
	Date Sampled	5/30/96	5/30/96	5/30/96	5/30/96	5/30/96	5/30/96
	Date Leached	6/5/96	6/5/96	6/5/96	6/5/96	6/5/96	6/5/96
	Date Analyzed (EPA Method 6010)	6/11/96	6/11/96	6/11/96	6/11/96	6/11/96	6/11/96
	Date Analyzed (EPA Method 7470)	6/11/96	6/11/96	6/11/96	6/11/96	6/11/96	6/11/96
Analyte	EPA Method	Reporting Limit mg/L	Concentration mg/L					
Barium	6010	0.05	0.6275	0.5385	0.6700	0.361	0.379	0.8065
Cadmium	6010	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Lead	6010	0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Mercury	7470	0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008

	Work Order #	07	08	09	10	11
	Collector's Sample #	LE-3 (20-22)	LE-5 (18-20)	LE-5 (2-4)	LE-4 (4-6)	LE-4 (18-20)
	Date Sampled	5/31/96	5/31/96	5/31/96	5/31/96	5/31/96
	Date Leached	6/5/96	6/5/96	6/5/96	6/5/96	6/5/96
	Date Analyzed (EPA Method 6010)	6/11/96	6/11/96	6/11/96	6/11/96	6/11/96
	Date Analyzed (EPA Method 7470)	6/11/96	6/11/96	6/11/96	6/11/96	6/11/96
Analyte	EPA Method	Reporting Limit mg/L	Concentration mg/L				
Barium	6010	0.05	0.7980	0.7690	0.5695	0.485	0.8145
Cadmium	6010	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Lead	6010	0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Mercury	7470	0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008

Analytical Review / Date: 6/17/96

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 6/17/96

ANALYTICAL RESULTS

Semi-Volatile Organics in Soil

EPA Method 8270

	Work Order #	01	02	03	04	05	06
	Collector's Sample #	LE-2 (4-6)	LE-2 (18-20)	VB-2 (20-22)	VB-2 (25-27)	LE-1 (2-4)	LE-1 (18-20)
	Date Sampled	5/30/96	5/30/96	5/30/96	5/30/96	5/30/96	5/30/96
	Date Extracted	6/7/96	6/7/96	6/5/96	6/5/96	6/5/96	6/5/96
	Date Analyzed	6/13/96	6/13/96	6/7/96	6/7/96	6/7/96	6/7/96
	Dilution Factor	1	1	1	1	1	1
Analyte	Reporting Limit µg/Kg	Concentration µg/Kg					
Acenaphthene	660	<660	<660	<660	<660	<660	<660
Acenaphthylene	660	<660	<660	<660	<660	<660	<660
Anthracene	660	<660	<660	<660	<660	<660	<660
Benz(a)anthracene	660	<660	<660	<660	<660	<660	<660
B[illegible](b)fluoranthene	660	<660	<660	<660	<660	<660	<660
Benzo(k)fluoranthene	660	<660	<660	<660	<660	<660	<660
Benzoic Acid	3300	<3300	<3300	<3300	<3300	<3300	<3300
Benzo(g,h,i)perylene	660	<660	<660	<660	<660	<660	<660
Benzo(a)pyrene	660	<660	<660	<660	<660	<660	<660
Benzyl Alcohol	1300	<1300	<1300	<1300	<1300	<1300	<1300
bis(2-Chloroethoxy)Methane	660	<660	<660	<660	<660	<660	<660
bis(2-Chloroethyl)Ether	1850	<1850	<1850	<1850	<1850	<1850	<1850
bis(2-Chloroisopropyl)Ether	1600	<1600	<1600	<1600	<1600	<1600	<1600
4-Bromophenyl-phenylether	660	<660	<660	<660	<660	<660	<660
Butylbenzylphthalate	660	<660	2060	<660	<660	<660	<660
4-Chloroaniline	1300	<1300	<1300	<1300	<1300	<1300	<1300
4-Chloro-3-Methylphenol	1300	<1300	<1300	<1300	<1300	<1300	<1300
2-Chloronaphthalene	1100	<1100	<1100	<1100	<1100	<1100	<1100
2-Chlorophenol	660	<660	<660	<660	<660	<660	<660
4-[illegible]lorophenyl-phenylether	660	<660	<660	<660	<660	<660	<660
Chrysene	660	<660	<660	<660	<660	<660	<660
Dibenz(a,h)anthracene	660	<660	<660	<660	<660	<660	<660

ANALYTICAL RESULTS

Semi-Volatile Organics in Soil

EPA Method 8270

Work Order #	01	02	03	04	05	06
Collector's Sample #	LE-2 (4-6)	LE-2 (18-20)	VB-2 (20-22)	VB-2 (25-27)	LE-1 (2-4)	LE-1 (18-20)
Date Sampled	5/30/96	5/30/96	5/30/96	5/30/96	5/30/96	5/30/96
Date Extracted	6/7/96	6/7/96	6/5/96	6/5/96	6/5/96	6/5/96
Date Analyzed	6/13/96	6/13/96	6/7/96	6/7/96	6/7/96	6/7/96
Dilution Factor	1	1	1	1	1	1
Analyte	Reporting Limit µg/Kg	Concentration µg/Kg					
Dibenzofuran	660	<660	<660	<660	<660	<660	<660
1,2-Dichlorobenzene	660	<660	<660	<660	<660	<660	<660
1,3-Dichlorobenzene	660	<660	<660	<660	<660	<660	<660
1,4-Dichlorobenzene	660	<660	<660	<660	<660	<660	<660
3,3-Dichlorobenzidine	1300	<1300	<1300	<1300	<1300	<1300	<1300
2,4-Dichlorophenol	660	<660	<660	<660	<660	<660	<660
Diethylphthalate	660	<660	<660	<660	<660	<660	<660
2,4-Dimethylphenol	660	<660	<660	<660	<660	<660	<660
Dimethylphthalate	660	<660	<660	<660	<660	<660	<660
4,6-Dinitro-2-Methylphenol	3300	<3300	<3300	<3300	<3300	<3300	<3300
2,4-Dinitrophenol	3300	<3300	<3300	<3300	<3300	<3300	<3300
2,4-Dinitrotoluene	660	<660	<660	<660	<660	<660	<660
2,6-Dinitrotoluene	850	<850	<850	<850	<850	<850	<850
Di-n-octyl phthalate	660	<660	<660	<660	<660	<660	<660
bis(2-ethylhexyl)phthalate	11200	<11200	<11200	<11200	<11200	<11200	<11200
Fluoranthene	660	<660	<660	<660	<660	<660	<660
Fluorene	660	<660	<660	<660	<660	<660	<660
Hexachlorobenzene	660	<660	<660	<660	<660	<660	<660
Hexachlorobutadiene	660	<660	<660	<660	<660	<660	<660
Hexachlorocyclopentadiene	660	<660	<660	<660	<660	<660	<660
Hexachloroethane	660	<660	<660	<660	<660	<660	<660
Indeno(1,2,3-cd)pyrene	660	<660	<660	<660	<660	<660	<660

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 6/17/96

ANALYTICAL RESULTS

Semi-Volatile Organics in Soil

EPA Method 8270

Work Order #	01	02	03	04	05	06
Collector's Sample #	LE-2 (4-6)	LE-2 (18-20)	VB-2 (20-22)	VB-2 (25-27)	LE-1 (2-4)	LE-1 (18-20)
Date Sampled	5/30/96	5/30/96	5/30/96	5/30/96	5/30/96	5/30/96
Date Extracted	6/7/96	6/7/96	6/5/96	6/5/96	6/5/96	6/5/96
Date Analyzed	6/13/96	6/13/96	6/7/96	6/7/96	6/7/96	6/7/96
Dilution Factor	1	1	1	1	1	1
Analyte	Reporting Limit µg/Kg	Concentration µg/Kg					
Isophorone	660	<660	<660	<660	<660	<660	<660
2-Methylnaphthalene	660	<660	<660	<660	<660	<660	<660
2-Methylphenol	660	<660	<660	<660	<660	<660	<660
4-Methylphenol	660	<660	<660	<660	<660	<660	<660
[illegible]thalene	660	<660	<660	<660	<660	<660	<660
2-Nitroaniline	3300	<3300	<3300	<3300	<3300	<3300	<3300
3-Nitroaniline	3300	<3300	<3300	<3300	<3300	<3300	<3300
Nitrobenzene	660	<660	<660	<660	<660	<660	<660
2-Nitrophenol	1350	<1350	<1350	<1350	<1350	<1350	<1350
4-Nitrophenol	3300	<3300	<3300	<3300	<3300	<3300	<3300
N-Nitrosodiphenylamine	660	<660	<660	<660	<660	<660	<660
N-Nitroso-di-n-propylamine	900	<900	<900	<900	<900	<900	<900
Pentachlorophenol	3300	<3300	<3300	<3300	<3300	<3300	<3300
Phenanthrene	660	<660	<660	<660	<660	<660	<660
Phenol	660	<660	<660	<660	<660	<660	<660
Pyrene	660	<660	<660	<660	<660	<660	<660
Pyridine	2050	<2050	<2050	<2050	<2050	<2050	<2050
1,2,4-Trichlorobenzene	660	<660	<660	<660	<660	<660	<660
2,4,5-Trichlorophenol	660	<660	<660	<660	<660	<660	<660
[illegible]6-Trichlorophenol	660	<660	<660	<660	<660	<660	<660

Analytical Review / Date: [signature] 6/17/96

ANALYTICAL RESULTS

Semi-Volatile Organics in Soil

EPA Method 8270

Work Order #	07	08	09	10	11
Collector's Sample #	LE-3 (20-22)	LE-5 (18-20)	LE-5 (2-4)	LE-4 (4-6)	LE-4 (18-20)
Date Sampled	5/31/96	5/31/96	5/31/96	5/31/96	5/31/96
Date Extracted	6/5/96	6/5/96	6/5/96	6/5/96	6/5/96
Date Analyzed	6/7/96	6/7/96	6/7/96	6/7/96	6/7/96
Dilution Factor	1	1	1	1	1
Analyte	Reporting Limit µg/Kg	Concentration µg/Kg				
Acenaphthene	660	<660	<660	<660	<660	<660
Acenaphthylene	660	<660	<660	<660	<660	<660
Anthracene	660	<660	<660	<660	<660	<660
Benz(a)anthracene	660	<660	<660	<660	<660	<660
B[redacted](b)fluoranthene	660	<660	<660	<660	<660	<660
Benzo(k)fluoranthene	660	<660	<660	<660	<660	<660
Benzoic Acid	3300	<3300	<3300	<3300	<3300	<3300
Benzo(g,h,i)perylene	660	<660	<660	<660	<660	<660
Benzo(a)pyrene	660	<660	<660	<660	<660	<660
Benzyl Alcohol	1300	<1300	<1300	<1300	<1300	<1300
bis(2-Chloroethoxy)Methane	660	<660	<660	<660	<660	<660
bis(2-Chloroethyl)Ether	1850	<1850	<1850	<1850	<1850	<1850
bis(2-Chloroisopropyl)Ether	1600	<1600	<1600	<1600	<1600	<1600
4-Bromophenyl-phenylether	660	<660	<660	<660	<660	<660
Butylbenzylphthalate	660	<660	<660	<660	<660	<660
4-Chloroaniline	1300	<1300	<1300	<1300	<1300	<1300
4-Chloro-3-Methylphenol	1300	<1300	<1300	<1300	<1300	<1300
2-Chloronaphthalene	1100	<1100	<1100	<1100	<1100	<1100
2-Chlorophenol	660	<660	<660	<660	<660	<660
4[redacted]orophenyl-phenylether	660	<660	<660	<660	<660	<660
Chrysene	660	<660	<660	<660	<660	<660
Dibenz(a,h)anthracene	660	<660	<660	<660	<660	<660

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 6/17/96

ANALYTICAL RESULTS

Semi-Volatile Organics in Soil

EPA Method 8270

Work Order #	07	08	09	10	11
Collector's Sample #	LE-3 (20-22)	LE-5 (18-20)	LE-5 (2-4)	LE-4 (4-6)	LE-4 (18-20)
Date Sampled	5/31/96	5/31/96	5/31/96	5/31/96	5/31/96
Date Extracted	6/5/96	6/5/96	6/5/96	6/5/96	6/5/96
Date Analyzed	6/7/96	6/7/96	6/7/96	6/7/96	6/7/96
Dilution Factor	1	1	1	1	1
Analyte	Reporting Limit µg/Kg	Concentration µg/Kg			
Dibenzofuran	660	<660	<660	<660	<660	<660
1,2-Dichlorobenzene	660	<660	<660	<660	<660	<660
1,3-Dichlorobenzene	660	<660	<660	<660	<660	<660
1,4-Dichlorobenzene	660	<660	<660	<660	<660	<660
3,[redacted]ichlorobenzidine	1300	<1300	<1300	<1300	<1300	<1300
2,4-Dichlorophenol	660	<660	<660	<660	<660	<660
Diethylphthalate	660	<660	<660	<660	<660	<660
2,4-Dimethylphenol	660	<660	<660	<660	<660	<660
Dimethylphthalate	660	<660	<660	<660	<660	<660
4,6-Dinitro-2-Methylphenol	3300	<3300	<3300	<3300	<3300	<3300
2,4-Dinitrophenol	3300	<3300	<3300	<3300	<3300	<3300
2,4-Dinitrotoluene	660	<660	<660	<660	<660	<660
2,6-Dinitrotoluene	850	<850	<850	<850	<850	<850
Di-n-octyl phthalate	660	<660	<660	<660	<660	<660
bis(2-ethylhexyl)phthalate	11200	<11200	<11200	<11200	<11200	<11200
Fluoranthene	660	<660	<660	<660	<660	<660
Fluorene	660	<660	<660	<660	<660	<660
Hexachlorobenzene	660	<660	<660	<660	<660	<660
Hexachlorobutadiene	660	<660	<660	<660	<660	<660
H[redacted]chlorocyclopentadiene	660	<660	<660	<660	<660	<660
Hexachloroethane	660	<660	<660	<660	<660	<660
Indeno(1,2,3-cd)pyrene	660	<660	<660	<660	<660	<660

ANALYTICAL RESULTS

Semi-Volatile Organics in Soil

EPA Method 8270

Work Order #		07	08	09	10	11
Collector's Sample #		LE-3 (20-22)	LE-5 (18-20)	LE-5 (2-4)	LE-4 (4-6)	LE-4 (18-20)
Date Sampled		5/31/96	5/31/96	5/31/96	5/31/96	5/31/96
Date Extracted		6/5/96	6/5/96	6/5/96	6/5/96	6/5/96
Date Analyzed		6/7/96	6/7/96	6/7/96	6/7/96	6/7/96
Dilution Factor		1	1	1	1	1
Analyte	Reporting Limit µg/Kg	Concentration µg/Kg				
Isophorone	660	<660	<660	<660	<660	<660
2-Methylnaphthalene	660	<660	<660	<660	<660	<660
2-Methylphenol	660	<660	<660	<660	<660	<660
4-Methylphenol	660	<660	<660	<660	<660	<660
Naphthalene	660	<660	<660	<660	<660	<660
2-Nitroaniline	3300	<3300	<3300	<3300	<3300	<3300
3-Nitroaniline	3300	<3300	<3300	<3300	<3300	<3300
Nitrobenzene	660	<660	<660	<660	<660	<660
2-Nitrophenol	1350	<1350	<1350	<1350	<1350	<1350
4-Nitrophenol	3300	<3300	<3300	<3300	<3300	<3300
N-Nitrosodiphenylamine	660	<660	<660	<660	<660	<660
N-Nitroso-di-n-propylamine	900	<900	<900	<900	<900	<900
Pentachlorophenol	3300	<3300	<3300	<3300	<3300	<3300
Phenanthrene	660	<660	<660	<660	<660	<660
Phenol	660	<660	<660	<660	<660	<660
Pyrene	660	<660	<660	<660	<660	<660
Pyridine	2050	<2050	<2050	<2050	<2050	<2050
1,2,4-Trichlorobenzene	660	<660	<660	<660	<660	<660
2,4,5-Trichlorophenol	660	<660	<660	<660	<660	<660
2,4,6-Trichlorophenol	660	<660	<660	<660	<660	<660

Analytical Review / Date: 6/17/96

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 6/17/96

ANALYTICAL RESULTS

Volatile Organics in Soil

EPA Method 8240

	Work Order #	01	02	03	04	05	06
	Collector's Sample #	LE-2 (4-6)	LE-2 (18-20)	VB-2 (20-22)	VB-2 (25-27)	LE-1 (2-4)	LE-1 (18-20)
	Date Sampled	5/30/96	5/30/96	5/30/96	5/30/96	5/30/96	5/30/96
	Date Analyzed	6/7/96	6/7/96	6/7/96	6/7/96	6/6/96	6/7/96
	Dilution Factor	10	10	10	50	1	10
Analyte	Report Limit µg/Kg	Concentration µg/Kg					
Acetone	100	<100	<100	<100	<1000	<100	<100
Acetonitrile	100	<500	<500	<500	<2500	<100	<500
Allyl Chloride	5	<50	<50	<50	<250	<5	<50
Benzene	5	<50	<50	<50	<250	<5	<50
Benzyl Chloride	100	<100	<100	<100	<1000	<100	<100
Bromodichloromethane	5	<50	<50	<50	<250	<5	<50
Bromoform	5	<50	<50	<50	<250	<5	<50
Bromomethane	10	<50	<50	<50	<250	<10	<50
2-Butanone	100	<100	<100	<100	<1000	<100	<100
Carbon Disulfide	100	<100	<100	<100	<1000	<100	<100
Carbon Tetrachloride	5	<50	<50	<50	<250	<5	<50
Chlorobenzene	5	<50	<50	<50	<250	<5	<50
Chlorodibromomethane	5	<50	<50	<50	<250	<5	<50
Chloroethane	10	<50	<50	<50	<250	<10	<50
2-Chloroethyl vinyl ether	10	<50	<50	<50	<250	<10	<50
Chloroform	5	<50	<50	<50	<250	<5	<50
Chloromethane	10	<50	<50	<50	<250	<10	<50
1,2-Dibromo-3-chloropropane	100	<100	<100	<100	<1000	<100	<100
1,2-Dibromoethane	5	<50	<50	<50	<250	<5	<50
Dibromomethane	5	<50	<50	<50	<250	<5	<50
1,4-Dichloro-2-butene	100	<100	<100	<100	<1000	<100	<100
1,2-Dichlorobenzene	5	<50	<50	<50	<250	<5	<50

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 6/17/96

ANALYTICAL RESULTS

Volatile Organics in Soil

EPA Method 8240

	Work Order #	01	02	03	04	05	06
	Collector's Sample #	LE-2 (4-6)	LE-2 (18-20)	VB-2 (20-22)	VB-2 (25-27)	LE-1 (2-4)	LE-1 (18-20)
	Date Sampled	5/30/96	5/30/96	5/30/96	5/30/96	5/30/96	5/30/96
	Date Analyzed	6/7/96	6/7/96	6/7/96	6/7/96	6/6/96	6/7/96
	Dilution Factor	10	10	10	50	1	10
Analyte	Report Limit µg/Kg	Concentration µg/Kg					
1,3-Dichlorobenzene	5	<50	<50	<50	<250	<5	<50
1,4-Dichlorobenzene	5	<50	<50	<50	<250	<5	<50
Dichlorodifluoromethane	5	<50	<50	<50	<250	<5	<50
1,1-Dichloroethane	5	<50	<50	<50	<250	<5	<50
1,[redacted]chloroethane	5	<50	<50	<50	<250	<5	<50
1,1-Dichloroethene	5	<50	<50	<50	<250	<5	<50
cis-1,2-Dichloroethene	5	<50	<50	<50	<250	<5	<50
trans-1,2-Dichloroethene	5	<50	<50	<50	<250	<5	<50
1,2-Dichloropropane	5	<50	<50	<50	<250	<5	<50
cis-1,3-Dichloropropene	5	<50	<50	<50	<250	<5	<50
trans-1,3-Dichloropropene	5	<50	<50	<50	<250	<5	<50
Ethylbenzene	5	<50	<50	<50	<250	<5	<50
Ethyl methacrylate	5	<50	<50	<50	<250	<5	<50
2-Hexanone	50	<100	<100	<100	<500	<50	<100
Isobutyl Alcohol	1000	<10000	<10000	<10000	<50000	<1000	<10000
Methacrylonitrile	100	<100	<100	<100	<1000	<100	<100
Methylene Chloride	5	<50	<50	<50	<250	13	<50
Methyl Iodide	5	<50	<50	<50	<250	<5	<50
Methyl methacrylate	50	<50	<50	<50	<250	<50	<50
4-[redacted]hyl-2-pentanone	50	<50	<50	<50	<500	<50	<50
Pentachloroethane	10	<50	<50	<50	<250	<10	<50
Styrene	5	<50	<50	<50	<250	<5	<50

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 6/17/96

ANALYTICAL RESULTS

Volatile Organics in Soil

EPA Method 8240

Work Order #		01	02	03	04	05	06
Collector's Sample #		LE-2 (4-6)	LE-2 (18-20)	VB-2 (20-22)	VB-2 (25-27)	LE-1 (2-4)	LE-1 (18-20)
Date Sampled		5/30/96	5/30/96	5/30/96	5/30/96	5/30/96	5/30/96
Date Analyzed		6/7/96	6/7/96	6/7/96	6/7/96	6/6/96	6/7/96
Dilution Factor		10	10	10	50	1	10
Analyte	Report Limit µg/Kg	Concentration µg/Kg					
1,1,1,2-Tetrachloroethane	5	<50	<50	<50	<250	<5	<50
1,1,2,2-Tetrachloroethane	5	<50	<50	<50	<250	<5	<50
Tetrachloroethene	5	<50	<50	<50	<250	<5	<50
Toluene	5	<50	<50	<50	<250	<5	<50
1,1,1-Trichloroethane	5	<50	<50	<50	<250	<5	<50
1,1,2-Trichloroethane	5	<50	<50	<50	<250	<5	<50
Trichloroethene	5	<50	<50	<50	<250	<5	<50
1,2,3-Trichloropropane	5	<50	<50	<50	<250	<5	<50
Vinyl Acetate	50	<100	<100	<100	<500	<50	<100
Vinyl Chloride	10	<50	<50	<50	<250	<10	<50
Xylene (Total)	5	<50	<50	<50	<250	<5	<50

Analytical Review / Date: 6/17/96

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 6/17/96

ANALYTICAL RESULTS

Volatile Organics in Soil

EPA Method 8240

	Work Order #	07	08	09	10	11
	Collector's Sample #	LE-3 (20-22)	LE-5 (18-20)	LE-5 (2-4)	LE-4 (4-6)	LE-4 (18-20)
	Date Sampled	5/31/96	5/31/96	5/31/96	5/31/96	5/31/96
	Date Analyzed	6/7/96	6/11/96	6/7/96	6/7/96	6/11/96
	Dilution Factor	1	10	10	1	10
Analyte	Report Limit µg/Kg	Concentration µg/Kg				
Acetone	100	<100	<100	101	<100	<100
Acetonitrile	100	<100	<500	<500	<100	<500
Allyl Chloride	5	<5	<50	<50	<5	<50
Benzene	5	<5	<50	<50	<5	<50
Bromide Chloride	100	<100	<100	<100	<100	<100
Bromodichloromethane	5	<5	<50	<50	<5	<50
Bromoform	5	<5	<50	<50	<5	<50
Bromomethane	10	<10	<50	<50	<10	<50
2-Butanone	100	<100	<100	<100	<100	<100
Carbon Disulfide	100	<100	<100	<100	<100	<100
Carbon Tetrachloride	5	<5	<50	<50	<5	<50
Chlorobenzene	5	<5	<50	<50	<5	<50
Chlorodibromomethane	5	<5	<50	<50	<5	<50
Chloroethane	10	<10	<50	<50	<10	<50
2-Chloroethyl vinyl ether	10	<10	<50	<50	<10	<50
Chloroform	5	<5	<50	<50	<5	<50
Chloromethane	10	<10	<50	<50	<10	<50
1,2-Dibromo-3-chloropropane	100	<100	<100	<100	<100	<100
1,2-Dibromoethane	5	<5	<50	<50	<5	<50
Dibromomethane	5	<5	<50	<50	<5	<50
1,4-Dichloro-2-butene	100	<100	<100	<100	<100	<100
1,2-Dichlorobenzene	5	<5	<50	<50	<5	<50

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 6/17/96

ANALYTICAL RESULTS

Volatile Organics in Soil

EPA Method 8240

Work Order #		07	08	09	10	11
Collector's Sample #		LE-3 (20-22)	LE-5 (18-20)	LE-5 (2-4)	LE-4 (4-6)	LE-4 (18-20)
Date Sampled		5/31/96	5/31/96	5/31/96	5/31/96	5/31/96
Date Analyzed		6/7/96	6/11/96	6/7/96	6/7/96	6/11/96
Dilution Factor		1	10	10	1	10
Analyte	Report Limit µg/Kg	Concentration µg/Kg				
1,3-Dichlorobenzene	5	<5	<50	<50	<5	<50
1,4-Dichlorobenzene	5	<5	<50	<50	<5	<50
Dichlorodifluoromethane	5	<5	<50	<50	<5	<50
1,1-Dichloroethane	5	<5	<50	<50	<5	<50
1,2-Dichloroethane	5	<5	<50	<50	<5	<50
1,1-Dichloroethene	5	<5	<50	<50	<5	<50
cis-1,2-Dichloroethene	5	<5	<50	<50	<5	<50
trans-1,2-Dichloroethene	5	<5	<50	<50	<5	<50
1,2-Dichloropropane	5	<5	<50	<50	<5	<50
cis-1,3-Dichloropropene	5	<5	<50	<50	<5	<50
trans-1,3-Dichloropropene	5	<5	<50	<50	<5	<50
Ethylbenzene	5	<5	<50	<50	<5	<50
Ethyl methacrylate	5	<5	<50	<50	<5	<50
2-Hexanone	50	<50	<100	<100	<50	<100
Isobutyl Alcohol	1000	<1000	<10000	<10000	<1000	<10000
Methacrylonitrile	100	<100	<100	<100	<100	<100
Methylene Chloride	5	<5	<50	<50	<5	<50
Methyl Iodide	5	<5	<50	<50	<5	<50
Methyl methacrylate	50	<50	<50	<50	<50	<50
4-Methyl-2-pentanone	50	<50	<50	<50	<50	<50
Pentachloroethane	10	<10	<50	<50	<10	<50
Styrene	5	<5	<50	<50	<5	<50

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 6/17/96

ANALYTICAL RESULTS

Volatile Organics in Soil

EPA Method 8240

Work Order #	07	08	09	10	11
Collector's Sample #	LE-3 (20-22)	LE-5 (18-20)	LE-5 (2-4)	LE-4 (4-6)	LE-4 (18-20)
Date Sampled	5/31/96	5/31/96	5/31/96	5/31/96	5/31/96
Date Analyzed	6/7/96	6/11/96	6/7/96	6/7/96	6/11/96
Dilution Factor	1	10	10	1	10
Analyte	Report Limit ug/Kg	Concentration µg/Kg			
1,1,1,2-Tetrachloroethane	5	<5	<50	<50	<5	<50
1,1,2,2-Tetrachloroethane	5	<5	<50	<50	<5	<50
Tetrachloroethene	5	<5	<50	<50	<5	<50
Toluene	5	<5	<50	<50	<5	<50
1,[redacted]Trichloroethane	5	<5	<50	<50	<5	<50
1,1,2-Trichloroethane	5	<5	<50	<50	<5	<50
Trichloroethene	5	<5	<50	<50	<5	<50
1,2,3-Trichloropropane	5	<5	<50	<50	<5	<50
Vinyl Acetate	50	<50	<100	<100	<50	<100
Vinyl Chloride	10	<10	<50	<50	<10	<50
Xylene (Total)	5	<5	<50	<50	<5	<50

Analytical Review / Date: [signature] 6/17/96

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 6/17/96

ANALYTICAL RESULTS

Polychlorinated Biphenyls

EPA Method 8080

Reporting Limit: 1.0

Work Order #	Collector's Sample #	Date Sampled	Date Analyzed	Concentration mg/Kg
01	LE-2 (4-6)	5/30/96	6/10/96	<1.0
02	LE-2 (18-20)	5/30/96	6/10/96	<1.0
03	VB-2 (20-22)	5/30/96	6/10/96	<1.0
04	VB-2 (25-27)	5/30/96	6/10/96	<1.0
05	LE-1 (2-4)	5/30/96	6/10/96	<1.0
06	LE-1 (18-20)	5/30/96	6/10/96	<1.0

Analytical Review / Date: 6/17/96

safety-kleen®

June 19, 1996

Mr. Jack Bedessem
TriHydro Corporation
920 Sheridan

Laramie, WY 82070

Re: SK Lab Project #96-136
Project ID Name: Dolton, IL

Dear Jack:

Enclosed please find the analytical results for the sample received by SK Environmental Laboratory on 6/04/96.

A formal Quality Control/Quality Assurance program is maintained by Safety-Kleen, which is designed to meet or exceed the EPA requirements. This information is available upon request.

If you have any questions concerning this analysis, or if we can be of further assistance, please contact Rick Cook at 312-825-7351.

Sincerely,

Mark A. Hartwig
Environmental Lab Manager

MAH:

Allan A. Manteuffel Technical Center

P.O. Box 92050
Elk Grove Village, IL
60009-2050

12555 W. Old Higgins Rd.
Elk Grove Village, IL 60007
Telephone: 312/694-2700
Fax: 312/825-7850

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 6/18/96

ANALYTICAL RESULTS

TCLP Metals

		Work Order #	12	13	14	16
		Collector's Sample #	LE-6 (4-6)	LE-6 (18-20)	VB-3 (32-34)	VB-3 (36-38)
		Date Sampled	6/3/96	6/3/96	6/3/96	6/3/96
		Date Leached	6/4/96	6/4/96	6/4/96	6/4/96
		Date Analyzed (EPA Method 6010)	6/7/96	6/7/96	6/7/96	6/7/96
		Date Analyzed (EPA Method 7470)	6/11/96	6/11/96	6/11/96	6/11/96
Analyte	**EPA Method**	**Reporting Limit mg/L**	**Concentration mg/L**			
Barium	6010	0.05	**0.651**	**0.945**	**0.923**	**1.028**
Cadmium	6010	0.05	<0.05	<0.05	<0.05	<0.05
Lead	6010	0.4	<0.40	<0.40	<0.40	<0.40
Mercury	7470	0.0008	<0.0008	<0.0008	<0.0008	<0.0008

Analytical Review / Date: [signature] 6/19/96

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 6/18/96

ANALYTICAL RESULTS

Semi-Volatile Organics in Soil

EPA Method 8270

	Work Order #	12	13	14	15	16
	Collector's Sample #	LE-6 (4-6)	LE-6 (18-20)	VB-3 (32-34)	VB-3 (34-36)	VB-3 (36-38)
	Date Sampled	6/3/96	6/3/96	6/3/96	6/3/96	6/3/96
	Date Extracted	6/7/96	6/7/96	6/7/96	6/7/96	6/7/96
	Date Analyzed	6/13/96	6/13/96	6/13/96	6/13/96	6/11/96
	Dilution Factor	1	1	1	1	1
Analyte	Reporting Limit µg/Kg	Concentration µg/Kg				
Acenaphthene	660	<660	<660	<660	<660	<660
Acenaphthylene	660	<660	<660	<660	<660	<660
Anthracene	660	<660	<660	<660	<660	<660
Benz(a)anthracene	660	<660	<660	<660	<660	<660
Benzo(b)fluoranthene	660	<660	<660	<660	<660	<660
Benzo(k)fluoranthene	660	<660	<660	<660	<660	<660
Benzoic Acid	3300	<3300	<3300	<3300	<3300	<3300
Benzo(g,h,i)perylene	660	<660	<660	<660	<660	<660
Benzo(a)pyrene	660	<660	<660	<660	<660	<660
Benzyl Alcohol	1300	<1300	<1300	<1300	<1300	<1300
bis(2-Chloroethoxy)Methane	660	<660	<660	<660	<660	<660
bis(2-Chloroethyl)Ether	1850	<1850	<1850	<1850	<1850	<1850
bis(2-Chloroisopropyl)Ether	1600	<1600	<1600	<1600	<1600	<1600
4-Bromophenyl-phenylether	660	<660	<660	<660	<660	<660
Butylbenzylphthalate	660	<660	<660	1130	<660	<660
4-Chloroaniline	1300	<1300	<1300	<1300	<1300	<1300
4-Chloro-3-Methylphenol	1300	<1300	<1300	<1300	<1300	<1300
2-Chloronaphthalene	1100	<1100	<1100	<1100	<1100	<1100
2-Chlorophenol	660	<660	<660	<660	<660	<660
4-Chlorophenyl-phenylether	660	<660	<660	<660	<660	<660
Chrysene	660	<660	<660	<660	<660	<660
Dibenz(a,h)anthracene	660	<660	<660	<660	<660	<660

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 6/18/96

ANALYTICAL RESULTS

Semi-Volatile Organics in Soil

EPA Method 8270

	Work Order #	12	13	14	15	16
	Collector's Sample #	LE-6 (4-6)	LE-6 (18-20)	VB-3 (32-34)	VB-3 (34-36)	VB-3 (36-38)
	Date Sampled	6/3/96	6/3/96	6/3/96	6/3/96	6/3/96
	Date Extracted	6/7/96	6/7/96	6/7/96	6/7/96	6/7/96
	Date Analyzed	6/13/96	6/13/96	6/13/96	6/13/96	6/11/96
	Dilution Factor	1	1	1	1	1
Analyte	Reporting Limit µg/Kg	Concentration µg/Kg				
Dibenzofuran	660	<660	<660	<660	<660	<660
1,2-Dichlorobenzene	660	<660	<660	<660	<660	<660
1,3-Dichlorobenzene	660	<660	<660	<660	<660	<660
1,4-Dichlorobenzene	660	<660	<660	<660	<660	<660
[illegible]-Dichlorobenzidine	1300	<1300	<1300	<1300	<1300	<1300
2,4-Dichlorophenol	660	<660	<660	<660	<660	<660
Diethylphthalate	660	<660	<660	<660	<660	<660
2,4-Dimethylphenol	660	<660	<660	<660	<660	<660
Dimethylphthalate	660	<660	<660	<660	<660	<660
4,6-Dinitro-2-Methylphenol	3300	<3300	<3300	<3300	<3300	<3300
2,4-Dinitrophenol	3300	<3300	<3300	<3300	<3300	<3300
2,4-Dinitrotoluene	660	<660	<660	<660	<660	<660
2,6-Dinitrotoluene	850	<850	<850	<850	<850	<850
Di-n-octyl phthalate	660	<660	<660	<660	<660	<660
bis(2-ethylhexyl)phthalate	11200	<11200	<11200	<11200	<11200	<11200
Fluoranthene	660	<660	<660	<660	<660	<660
Fluorene	660	<660	<660	<660	<660	<660
Hexachlorobenzene	660	<660	<660	<660	<660	<660
Hexachlorobutadiene	660	<660	<660	<660	<660	<660
[illegible]achlorocyclopentadiene	660	<660	<660	<660	<660	<660
Hexachloroethane	660	<660	<660	<660	<660	<660
Indeno(1,2,3-cd)pyrene	660	<660	<660	<660	<660	<660

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 6/18/96

ANALYTICAL RESULTS

Semi-Volatile Organics in Soil

EPA Method 8270

	Work Order #	12	13	14	15	16
	Collector's Sample #	LE-6 (4-6)	LE-6 (18-20)	VB-3 (32-34)	VB-3 (34-36)	VB-3 (36-38)
	Date Sampled	6/3/96	6/3/96	6/3/96	6/3/96	6/3/96
	Date Extracted	6/7/96	6/7/96	6/7/96	6/7/96	6/7/96
	Date Analyzed	6/13/96	6/13/96	6/13/96	6/13/96	6/11/96
	Dilution Factor	1	1	1	1	1
Analyte	Reporting Limit µg/Kg	Concentration µg/Kg				
Isophorone	660	<660	<660	<660	<660	<660
2-Methylnaphthalene	660	<660	<660	<660	<660	<660
2-Methylphenol	660	<660	<660	<660	<660	<660
4-Methylphenol	660	<660	<660	<660	<660	<660
hthalene	660	<660	<660	<660	<660	<660
2-Nitroaniline	3300	<3300	<3300	<3300	<3300	<3300
3-Nitroaniline	3300	<3300	<3300	<3300	<3300	<3300
Nitrobenzene	660	<660	<660	<660	<660	<660
2-Nitrophenol	1350	<1350	<1350	<1350	<1350	<1350
4-Nitrophenol	3300	<3300	<3300	<3300	<3300	<3300
N-Nitrosodiphenylamine	660	<660	<660	<660	<660	<660
N-Nitroso-di-n-propylamine	900	<900	<900	<900	<900	<900
Pentachlorophenol	3300	<3300	<3300	<3300	<3300	<3300
Phenanthrene	660	<660	<660	<660	<660	<660
Phenol	660	<660	<660	<660	<660	<660
Pyrene	660	<660	<660	<660	<660	<660
Pyridine	2050	<2050	<2050	<2050	<2050	<2050
1,2,4-Trichlorobenzene	660	<660	<660	<660	<660	<660
2,4,5-Trichlorophenol	660	<660	<660	<660	<660	<660
6-Trichlorophenol	660	<660	<660	<660	<660	<660

Analytical Review / Date: 6/19/96

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 6/18/96

ANALYTICAL RESULTS

Volatile Organics in Soil

EPA Method 8240

Work Order #		12	13	14	15	16
Collector's Sample #		LE-6 (4-6)	LE-6 (18-20)	VB-3 (32-34)	VB-3 (34-36)	VB-3 (36-38)
Date Sampled		6/3/96	6/3/96	6/3/96	6/3/96	6/3/96
Date Analyzed		6/6/96	6/6/96	6/6/96	6/6/96	6/5/96
Dilution Factor		1	1	10	10	1
Analyte	Report Limit µg/Kg	Concentration µg/Kg				
Acetone	100	<100	<100	<100	<100	260
Acetonitrile	100	<100	<100	<500	<500	<100
Allyl Chloride	5	<5	<5	<50	<50	<5
Benzene	5	<5	<5	<50	<50	<5
Benzyl Chloride	100	<100	<100	<100	<100	<100
Bromodichloromethane	5	<5	<5	<50	<50	<5
Bromoform	5	<5	<5	<50	<50	<5
Bromomethane	10	<10	<10	<50	<50	<10
2-Butanone	100	<100	<100	<100	<100	<100
Carbon Disulfide	100	<100	<100	<100	<100	<100
Carbon Tetrachloride	5	<5	<5	<50	<50	<5
Chlorobenzene	5	<5	<5	<50	<50	<5
Chlorodibromomethane	5	<5	<5	<50	<50	<5
Chloroethane	10	<10	<10	<50	<50	<10
2-Chloroethyl vinyl ether	10	<10	<10	<50	<50	<10
Chloroform	5	<5	<5	<50	<50	<5
Chloromethane	10	<10	<10	<50	<50	<10
1,2-Dibromo-3-chloropropane	100	<100	<100	<100	<100	<100
1,2-Dibromoethane	5	<5	<5	<50	<50	<5
Dibromomethane	5	<5	<5	<50	<50	<5
1,4-Dichloro-2-butene	100	<100	<100	<100	<100	<100
1,2-Dichlorobenzene	5	<5	<5	<50	<50	<5

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 6/18/96

ANALYTICAL RESULTS

Volatile Organics in Soil

EPA Method 8240

Work Order #		12	13	14	15	16
Collector's Sample #		LE-6 (4-6)	LE-6 (18-20)	VB-3 (32-34)	VB-3 (34-36)	VB-3 (36-38)
Date Sampled		6/3/96	6/3/96	6/3/96	6/3/96	6/3/96
Date Analyzed		6/6/96	6/6/96	6/6/96	6/6/96	6/5/96
Dilution Factor		1	1	10	10	1
Analyte	Report Limit µg/Kg	Concentration µg/Kg				
1,3-Dichlorobenzene	5	<5	<5	<50	<50	<5
1,4-Dichlorobenzene	5	<5	<5	<50	<50	<5
Dichlorodifluoromethane	5	<5	<5	<50	<50	<5
1,1-Dichloroethane	5	<5	<5	<50	<50	<5
1,2-Dichloroethane	5	<5	<5	<50	<50	<5
1,1-Dichloroethene	5	<5	<5	<50	<50	<5
cis-1,2-Dichloroethene	5	<5	<5	<50	<50	<5
trans-1,2-Dichloroethene	5	<5	<5	<50	<50	<5
1,2-Dichloropropane	5	<5	<5	<50	<50	<5
cis-1,3-Dichloropropene	5	<5	<5	<50	<50	<5
trans-1,3-Dichloropropene	5	<5	<5	<50	<50	<5
Ethylbenzene	5	<5	<5	<50	<50	<5
Ethyl methacrylate	5	<5	<5	<50	<50	<5
2-Hexanone	50	<50	<50	<100	<100	<50
Isobutyl Alcohol	1000	<1000	<1000	<10000	<10000	<1000
Methacrylonitrile	100	<100	<100	<100	<100	<100
Methylene Chloride	5	<5	<5	<50	<50	<5
Methyl Iodide	5	<5	<5	<50	<50	<5
Methyl methacrylate	50	<50	<50	<50	<50	<50
4-Methyl-2-pentanone	50	<50	<50	66	<50	<50
Pentachloroethane	10	<10	<10	<50	<50	<10
Styrene	5	<5	<5	<50	<50	<5

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 6/18/96

ANALYTICAL RESULTS

Volatile Organics in Soil

EPA Method 8240

Work Order #		12	13	14	15	16
Collector's Sample #		LE-6 (4-6)	LE-6 (18-20)	VB-3 (32-34)	VB-3 (34-36)	VB-3 (36-38)
Date Sampled		6/3/96	6/3/96	6/3/96	6/3/96	6/3/96
Date Analyzed		6/6/96	6/6/96	6/6/96	6/6/96	6/5/96
Dilution Factor		1	1	10	10	1
Analyte	Report Limit µg/Kg	Concentration µg/Kg				
1,1,1,2-Tetrachloroethane	5	<5	<5	<50	<50	<5
1,1,2,2-Tetrachloroethane	5	<5	<5	<50	<50	<5
Tetrachloroethene	5	<5	<5	<50	<50	<5
Toluene	5	<5	<5	102	<50	28
1,1,1-Trichloroethane	5	<5	<5	<50	<50	<5
1,1,2-Trichloroethane	5	<5	<5	<50	<50	<5
Trichloroethene	5	<5	<5	<50	<50	<5
1,2,3-Trichloropropane	5	<5	<5	<50	<50	<5
Vinyl Acetate	50	<50	<50	<100	<100	<50
Vinyl Chloride	10	<10	<10	<50	<50	<10
Xylene (Total)	5	<5	<5	<50	<50	<5

Analytical Review / Date:

safety-kleen®

June 24, 1996

Mr. Jack Bedessem
TriHydro Corporation
920 Sheridan

Laramie,WY 82070

Re: SK Lab Project #96-136c
Project ID Name: Dolton, IL

Dear Jack:

Enclosed please find the analytical results for the sample received by SK Environmental Laboratory on 6/6/96.

A formal Quality Control/Quality Assurance program is maintained by Safety-Kleen, which is designed to meet or exceed the EPA requirements. This information is available upon request.

If you have any questions concerning this analysis, or if we can be of further assistance, please contact Rick Cook at 312-825-7351.

Sincerely,

Mark A. Hartwig
Environmental Lab Manager

MAH:

Allan A. Manteuffel Technical Center

P.O. Box 92050
Elk Grove Village, IL
60009-2050

12555 W. Old Higgins Rd.
Elk Grove Village, IL 60007
Telephone: 312/694-2700
Fax: 312/825-7850

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 6/24/96

ANALYTICAL RESULTS

TCLP Metals

	Work Order #	17	18	19	20	21	22
	Collector's Sample #	VB-9(22-24)	VB-9(26-28)	VB-6(20-22)	VB-6(24-26)	VB-4(22-24)	VB-4(26-28)
	Date Sampled	6/4/96	6/4/96	6/4/96	6/4/96	6/4/96	6/4/96
	Date Leached	6/10/96	6/10/96	6/10/96	6/10/96	6/10/96	6/10/96
	Date Analyzed (EPA Method 6010)	6/14/96	6/14/96	6/14/96	6/14/96	6/14/96	6/14/96
	Date Analyzed (EPA Method 7470)	6/14/96	6/14/96	6/14/96	6/14/96	6/14/96	6/14/96
Analyte	EPA Method	Reporting Limit mg/L	Concentration mg/L				
Barium	6010	0.05	**0.947**	**0.760**	**0.319**	**0.832**	**0.820**	**0.542**
Cadmium	6010	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Lead	6010	0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Mercury	7470	0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008

	Work Order #	23	24	25	26	27
	Collector's Sample #	LE-7(4-6)	LE-7(18-20)	MW-6(4-6)	MW-6(20-22)	VB-8(30-32)
	Date Sampled	6/5/96	6/5/96	6/5/96	6/5/96	6/5/96
	Date Leached	6/10/96	6/10/96	6/10/96	6/10/96	6/10/96
	Date Analyzed (EPA Method 6010)	6/14/96	6/14/96	6/14/96	6/14/96	6/14/96
	Date Analyzed (EPA Method 7470)	6/14/96	6/14/96	6/14/96	6/14/96	6/14/96
Analyte	EPA Method	Reporting Limit mg/L	Concentration mg/L			
Barium	6010	0.05	**1.133**	**0.817**	**0.540**	**0.717**	**0.751**
Cadmium	6010	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Lead	6010	0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Mercury	7470	0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008

lytical Review / Date: 6/24/96

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 6/24/96

ANALYTICAL RESULTS

TCLP Metals

		Work Order #	28	29	30	31	32
		Collector's Sample #	VB-8(34-36)	XX-1	XX-2	XX-3	XX-4
		Date Sampled	6/5/96	6/5/96	6/5/96	6/5/96	6/5/96
		Date Leached	6/10/96	6/10/96	6/10/96	6/10/96	6/10/96
		Date Analyzed (EPA Method 6010)	6/14/96	6/14/96	6/14/96	6/14/96	6/14/96
		Date Analyzed (EPA Method 7470)	6/14/96	6/14/96	6/14/96	6/14/96	6/14/96
Analyte	**EPA Method**	**Reporting Limit mg/L**	**Concentration mg/L**				
Barium	6010	0.05	**0.682**	**0.719**	**0.760**	**0.810**	**0.383**
Cadmium	6010	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Lead	6010	0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Mercury	7470	0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008

Analytical Review / Date: 6/24/96

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 6/24/96

ANALYTICAL RESULTS

Semi-Volatile Organics in Soil

EPA Method 8270

Work Order #	17	18	19	20	21	22
Collector's Sample #	VB-9(22-24)	VB-9(26-28)	VB-6(20-22)	VB-6(24-26)	VB-4(22-24)	VB-4(26-28)
Date Sampled	6/4/96	6/4/96	6/4/96	6/4/96	6/4/96	6/4/96
Date Extracted	6/13/96	6/13/96	6/15/96	6/15/96	6/15/96	6/15/96
Date Analyzed	6/17/96	6/18/96	6/19/96	6/17/96	6/18/96	6/17/96
Dilution Factor	1	1	1	1	1	1
Analyte	Reporting Limit µg/Kg	Concentration µg/Kg					
Acenaphthene	660	<660	<660	<660	<660	<660	<660
Acenaphthylene	660	<660	<660	<660	<660	<660	<660
Anthracene	660	<660	<660	<660	<660	<660	<660
Benz(a)anthracene	660	<660	<660	<660	<660	<660	<660
Benzo(b)fluoranthene	660	<660	<660	<660	<660	<660	<660
Benzo(k)fluoranthene	660	<660	<660	<660	<660	<660	<660
Benzoic Acid	3300	<3300	<3300	<3300	<3300	<3300	<3300
Benzo(g,h,i)perylene	660	<660	<660	<660	<660	<660	<660
Benzo(a)pyrene	660	<660	<660	<660	<660	<660	<660
Benzyl Alcohol	1300	<1300	<1300	<1300	<1300	<1300	<1300
bis(2-Chloroethoxy)Methane	660	<660	<660	<660	<660	<660	<660
bis(2-Chloroethyl)Ether	1850	<1850	<1850	<1850	<1850	<1850	<1850
bis(2-Chloroisopropyl)Ether	1600	<1600	<1600	<1600	<1600	<1600	<1600
4-Bromophenyl-phenylether	660	<660	<660	<660	<660	<660	<660
Butylbenzylphthalate	660	<660	<660	<660	<660	<660	<660
4-Chloroaniline	1300	<1300	<1300	<1300	<1300	<1300	<1300
4-Chloro-3-Methylphenol	1300	<1300	<1300	<1300	<1300	<1300	<1300
2-Chloronaphthalene	1100	<1100	<1100	<1100	<1100	<1100	<1100
2-Chlorophenol	660	<660	<660	<660	<660	<660	<660
4-Chlorophenyl-phenylether	660	<660	<660	<660	<660	<660	<660
Chrysene	660	<660	<660	<660	<660	<660	<660
Dibenz(a,h)anthracene	660	<660	<660	<660	<660	<660	<660

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 6/24/96

ANALYTICAL RESULTS

Semi-Volatile Organics in Soil

EPA Method 8270

	Work Order #	17	18	19	20	21	22
	Collector's Sample #	VB-9(22-24)	VB-9(26-28)	VB-6(20-22)	VB-6(24-26)	VB-4(22-24)	VB-4(26-28)
	Date Sampled	6/4/96	6/4/96	6/4/96	6/4/96	6/4/96	6/4/96
	Date Extracted	6/13/96	6/13/96	6/15/96	6/15/96	6/15/96	6/15/96
	Date Analyzed	6/17/96	6/18/96	6/19/96	6/17/96	6/18/96	6/17/96
	Dilution Factor	1	1	1	1	1	1
Analyte	Reporting Limit µg/Kg	Concentration µg/Kg					
Dibenzofuran	660	<660	<660	<660	<660	<660	<660
1,2-Dichlorobenzene	660	<660	<660	<660	<660	<660	<660
1,3-Dichlorobenzene	660	<660	<660	<660	<660	<660	<660
1,4-Dichlorobenzene	660	<660	<660	<660	<660	<660	<660
3,3'-Dichlorobenzidine	1300	<1300	<1300	<1300	<1300	<1300	<1300
2,4-Dichlorophenol	660	<660	<660	<660	<660	<660	<660
Diethylphthalate	660	<660	<660	<660	<660	<660	<660
2,4-Dimethylphenol	660	<660	<660	<660	<660	<660	<660
Dimethylphthalate	660	<660	<660	<660	<660	<660	<660
4,6-Dinitro-2-Methylphenol	3300	<3300	<3300	<3300	<3300	<3300	<3300
2,4-Dinitrophenol	3300	<3300	<3300	<3300	<3300	<3300	<3300
2,4-Dinitrotoluene	660	<660	<660	<660	<660	<660	<660
2,6-Dinitrotoluene	850	<850	<850	<850	<850	<850	<850
Di-n-octyl phthalate	660	<660	<660	<660	<660	<660	<660
bis(2-ethylhexyl)phthalate	11200	<11200	<11200	<11200	<11200	<11200	<11200
Fluoranthene	660	<660	<660	<660	<660	<660	<660
Fluorene	660	<660	<660	<660	<660	<660	<660
Hexachlorobenzene	660	<660	<660	<660	<660	<660	<660
Hexachlorobutadiene	660	<660	<660	<660	<660	<660	<660
Hexachlorocyclopentadiene	660	<660	<660	<660	<660	<660	<660
Hexachloroethane	660	<660	<660	<660	<660	<660	<660
Indeno(1,2,3-cd)pyrene	660	<660	<660	<660	<660	<660	<660

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 6/24/96

ANALYTICAL RESULTS

Semi-Volatile Organics in Soil

EPA Method 8270

	Work Order #	17	18	19	20	21	22
	Collector's Sample #	VB-9(22-24)	VB-9(26-28)	VB-6(20-22)	VB-6(24-26)	VB-4(22-24)	VB-4(26-28)
	Date Sampled	6/4/96	6/4/96	6/4/96	6/4/96	6/4/96	6/4/96
	Date Extracted	6/13/96	6/13/96	6/15/96	6/15/96	6/15/96	6/15/96
	Date Analyzed	6/17/96	6/18/96	6/19/96	6/17/96	6/18/96	6/17/96
	Dilution Factor	1	1	1	1	1	1
Analyte	Reporting Limit µg/Kg	Concentration µg/Kg					
Isophorone	660	<660	<660	<660	<660	<660	<660
2-Methylnaphthalene	660	<660	<660	<660	<660	<660	<660
2-Methylphenol	660	<660	<660	<660	<660	<660	<660
4-Methylphenol	660	<660	<660	<660	<660	<660	<660
Naphthalene	660	<660	<660	<660	<660	<660	<660
2-Nitroaniline	3300	<3300	<3300	<3300	<3300	<3300	<3300
3-Nitroaniline	3300	<3300	<3300	<3300	<3300	<3300	<3300
Nitrobenzene	660	<660	<660	<660	<660	<660	<660
2-Nitrophenol	1350	<1350	<1350	<1350	<1350	<1350	<1350
4-Nitrophenol	3300	<3300	<3300	<3300	<3300	<3300	<3300
N-Nitrosodiphenylamine	660	<660	<660	<660	<660	<660	<660
N-Nitroso-di-n-propylamine	900	<900	<900	<900	<900	<900	<900
Pentachlorophenol	3300	<3300	<3300	<3300	<3300	<3300	<3300
Phenanthrene	660	<660	<660	<660	<660	<660	<660
Phenol	660	<660	<660	<660	<660	<660	<660
Pyrene	660	<660	<660	<660	<660	<660	<660
Pyridine	2050	<2050	<2050	<2050	<2050	<2050	<2050
1,2,4-Trichlorobenzene	660	<660	<660	<660	<660	<660	<660
2,4,5-Trichlorophenol	660	<660	<660	<660	<660	<660	<660
2,4,6-Trichlorophenol	660	<660	<660	<660	<660	<660	<660

Analytical Review / Date: 6/24/96

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 6/24/96

ANALYTICAL RESULTS

Semi-Volatile Organics in Soil

EPA Method 8270

	Work Order #	23	24	25	26	27	28
	Collector's Sample #	LE-7(4-6)	LE-7(18-20)	MW-6(4-6)	MW-6(20-22)	VB-8(30-32)	VB-8(34-36)
	Date Sampled	6/5/96	6/5/96	6/5/96	6/5/96	6/5/96	6/5/96
	Date Extracted	6/15/96	6/15/96	6/15/96	6/15/96	6/15/96	6/15/96
	Date Analyzed	6/17/96	6/17/96	6/17/96	6/17/96	6/17/96	6/17/96
	Dilution Factor	1	1	1	1	1	1
Analyte	Reporting Limit µg/Kg	Concentration µg/Kg					
Acenaphthene	660	<660	<660	<660	<660	<660	<660
Acenaphthylene	660	<660	<660	<660	<660	<660	<660
Anthracene	660	<660	<660	<660	<660	<660	<660
Benz(a)anthracene	660	<660	<660	<660	<660	<660	<660
Benzo(b)fluoranthene	660	<660	<660	<660	<660	<660	<660
Benzo(k)fluoranthene	660	<660	<660	<660	<660	<660	<660
Benzoic Acid	3300	<3300	<3300	<3300	<3300	<3300	<3300
Benzo(g,h,i)perylene	660	<660	<660	<660	<660	<660	<660
Benzo(a)pyrene	660	<660	<660	<660	<660	<660	<660
Benzyl Alcohol	1300	<1300	<1300	<1300	<1300	<1300	<1300
bis(2-Chloroethoxy)Methane	660	<660	<660	<660	<660	<660	<660
bis(2-Chloroethyl)Ether	1850	<1850	<1850	<1850	<1850	<1850	<1850
bis(2-Chloroisopropyl)Ether	1600	<1600	<1600	<1600	<1600	<1600	<1600
4-Bromophenyl-phenylether	660	<660	<660	<660	<660	<660	<660
Butylbenzylphthalate	660	<660	<660	<660	<660	<660	<660
4-Chloroaniline	1300	<1300	<1300	<1300	<1300	<1300	<1300
4-Chloro-3-Methylphenol	1300	<1300	<1300	<1300	<1300	<1300	<1300
2-Chloronaphthalene	1100	<1100	<1100	<1100	<1100	<1100	<1100
2-Chlorophenol	660	<660	<660	<660	<660	<660	<660
4-Chlorophenyl-phenylether	660	<660	<660	<660	<660	<660	<660
Chrysene	660	<660	<660	<660	<660	<660	<660
Dibenz(a,h)anthracene	660	<660	<660	<660	<660	<660	<660

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 6/24/96

ANALYTICAL RESULTS

Semi-Volatile Organics in Soil

EPA Method 8270

Work Order #		23	24	25	26	27	28
Collector's Sample #		LE-7(4-6)	LE-7(18-20)	MW-6(4-6)	MW-6(20-22)	VB-8(30-32)	VB-8(34-36)
Date Sampled		6/5/96	6/5/96	6/5/96	6/5/96	6/5/96	6/5/96
Date Extracted		6/15/96	6/15/96	6/15/96	6/15/96	6/15/96	6/15/96
Date Analyzed		6/17/96	6/17/96	6/17/96	6/17/96	6/17/96	6/17/96
Dilution Factor		1	1	1	1	1	1
Analyte	Reporting Limit µg/Kg	Concentration µg/Kg					
Dibenzofuran	660	<660	<660	<660	<660	<660	<660
1,2-Dichlorobenzene	660	<660	<660	<660	<660	<660	<660
1,3-Dichlorobenzene	660	<660	<660	<660	<660	<660	<660
1,4-Dichlorobenzene	660	<660	<660	<660	<660	<660	<660
3,3'-Dichlorobenzidine	1300	<1300	<1300	<1300	<1300	<1300	<1300
2,4-Dichlorophenol	660	<660	<660	<660	<660	<660	<660
Diethylphthalate	660	<660	<660	<660	<660	<660	<660
2,4-Dimethylphenol	660	<660	<660	<660	<660	<660	<660
Dimethylphthalate	660	<660	<660	<660	<660	<660	<660
4,6-Dinitro-2-Methylphenol	3300	<3300	<3300	<3300	<3300	<3300	<3300
2,4-Dinitrophenol	3300	<3300	<3300	<3300	<3300	<3300	<3300
2,4-Dinitrotoluene	660	<660	<660	<660	<660	<660	<660
2,6-Dinitrotoluene	850	<850	<850	<850	<850	<850	<850
Di-n-octyl phthalate	660	<660	<660	<660	<660	<660	<660
bis(2-ethylhexyl)phthalate	11200	<11200	<11200	<11200	<11200	<11200	<11200
Fluoranthene	660	<660	<660	<660	<660	<660	<660
Fluorene	660	<660	<660	<660	<660	<660	<660
Hexachlorobenzene	660	<660	<660	<660	<660	<660	<660
Hexachlorobutadiene	660	<660	<660	<660	<660	<660	<660
Hexachlorocyclopentadiene	660	<660	<660	<660	<660	<660	<660
Hexachloroethane	660	<660	<660	<660	<660	<660	<660
Indeno(1,2,3-cd)pyrene	660	<660	<660	<660	<660	<660	<660

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 6/24/96

ANALYTICAL RESULTS

Semi-Volatile Organics in Soil

EPA Method 8270

Work Order #	23	24	25	26	27	28
Collector's Sample #	LE-7(4-6)	LE-7(18-20)	MW-6(4-6)	MW-6(20-22)	VB-8(30-32)	VB-8(34-36)
Date Sampled	6/5/96	6/5/96	6/5/96	6/5/96	6/5/96	6/5/96
Date Extracted	6/15/96	6/15/96	6/15/96	6/15/96	6/15/96	6/15/96
Date Analyzed	6/17/96	6/17/96	6/17/96	6/17/96	6/17/96	6/17/96
Dilution Factor	1	1	1	1	1	1
Analyte	Reporting Limit µg/Kg	Concentration µg/Kg				
Isophorone	660	<660	<660	<660	<660	<660	<660
2-Methylnaphthalene	660	<660	<660	<660	<660	<660	<660
2-Methylphenol	660	<660	<660	<660	<660	<660	<660
4-Methylphenol	660	<660	<660	<660	<660	<660	<660
Naphthalene	660	<660	<660	<660	<660	<660	<660
2-Nitroaniline	3300	<3300	<3300	<3300	<3300	<3300	<3300
3-Nitroaniline	3300	<3300	<3300	<3300	<3300	<3300	<3300
Nitrobenzene	660	<660	<660	<660	<660	<660	<660
2-Nitrophenol	1350	<1350	<1350	<1350	<1350	<1350	<1350
4-Nitrophenol	3300	<3300	<3300	<3300	<3300	<3300	<3300
N-Nitrosodiphenylamine	660	<660	<660	<660	<660	<660	<660
N-Nitroso-di-n-propylamine	900	<900	<900	<900	<900	<900	<900
Pentachlorophenol	3300	<3300	<3300	<3300	<3300	<3300	<3300
Phenanthrene	660	<660	<660	<660	<660	<660	<660
Phenol	660	<660	<660	<660	<660	<660	<660
Pyrene	660	<660	<660	<660	<660	<660	<660
Pyridine	2050	<2050	<2050	<2050	<2050	<2050	<2050
1,2,4-Trichlorobenzene	660	<660	<660	<660	<660	<660	<660
2,4,5-Trichlorophenol	660	<660	<660	<660	<660	<660	<660
2,4,6-Trichlorophenol	660	<660	<660	<660	<660	<660	<660

Analytical Review / Date: 6/24/96

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 6/24/96

ANALYTICAL RESULTS

Semi-Volatile Organics in Soil

EPA Method 8270

	Work Order #	29	30	31	32
	Collector's Sample #	XX-1	XX-2	XX-3	XX-4
	Date Sampled	6/5/96	6/5/96	6/5/96	6/5/96
	Date Extracted	6/15/96	6/15/96	6/15/96	6/15/96
	Date Analyzed	6/17/96	6/17/96	6/17/96	6/17/96
	Dilution Factor	1	1	1	1
Analyte	Reporting Limit µg/Kg	Concentration µg/Kg			
Acenaphthene	660	<660	<660	<660	<660
Acenaphthylene	660	<660	<660	<660	<660
Anthracene	660	<660	<660	<660	<660
Benz(a)anthracene	660	<660	<660	<660	<660
Benzo(b)fluoranthene	660	<660	<660	<660	<660
Benzo(k)fluoranthene	660	<660	<660	<660	<660
Benzoic Acid	3300	<3300	<3300	<3300	<3300
Benzo(g,h,i)perylene	660	<660	<660	<660	<660
Benzo(a)pyrene	660	<660	<660	<660	<660
Benzyl Alcohol	1300	<1300	<1300	<1300	<1300
bis(2-Chloroethoxy)Methane	660	<660	<660	<660	<660
bis(2-Chloroethyl)Ether	1850	<1850	<1850	<1850	<1850
bis(2-Chloroisopropyl)Ether	1600	<1600	<1600	<1600	<1600
4-Bromophenyl-phenylether	660	<660	<660	<660	<660
Butylbenzylphthalate	660	<660	<660	<660	<660
4-Chloroaniline	1300	<1300	<1300	<1300	<1300
4-Chloro-3-Methylphenol	1300	<1300	<1300	<1300	<1300
2-Chloronaphthalene	1100	<1100	<1100	<1100	<1100
2-Chlorophenol	660	<660	<660	<660	<660
4-Chlorophenyl-phenylether	660	<660	<660	<660	<660
Chrysene	660	<660	<660	<660	<660
Dibenz(a,h)anthracene	660	<660	<660	<660	<660

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 6/24/96

ANALYTICAL RESULTS

Semi-Volatile Organics in Soil

EPA Method 8270

	Work Order #	29	30	31	32
	Collector's Sample #	XX-1	XX-2	XX-3	XX-4
	Date Sampled	6/5/96	6/5/96	6/5/96	6/5/96
	Date Extracted	6/15/96	6/15/96	6/15/96	6/15/96
	Date Analyzed	6/17/96	6/17/96	6/17/96	6/17/96
	Dilution Factor	1	1	1	1
Analyte	Reporting Limit µg/Kg	Concentration µg/Kg			
Dibenzofuran	660	<660	<660	<660	<660
1,2-Dichlorobenzene	660	<660	<660	<660	<660
1,3-Dichlorobenzene	660	<660	<660	<660	<660
1,4-Dichlorobenzene	660	<660	<660	<660	<660
3,3'-Dichlorobenzidine	1300	<1300	<1300	<1300	<1300
2,4-Dichlorophenol	660	<660	<660	<660	<660
Diethylphthalate	660	<660	<660	<660	<660
2,4-Dimethylphenol	660	<660	<660	<660	<660
Dimethylphthalate	660	<660	<660	<660	<660
4,6-Dinitro-2-Methylphenol	3300	<3300	<3300	<3300	<3300
2,4-Dinitrophenol	3300	<3300	<3300	<3300	<3300
2,4-Dinitrotoluene	660	<660	<660	<660	<660
2,6-Dinitrotoluene	850	<850	<850	<850	<850
Di-n-octyl phthalate	660	<660	<660	<660	<660
bis(2-ethylhexyl)phthalate	11200	<11200	<11200	<11200	<11200
Fluoranthene	660	<660	<660	<660	<660
Fluorene	660	<660	<660	<660	<660
Hexachlorobenzene	660	<660	<660	<660	<660
Hexachlorobutadiene	660	<660	<660	<660	<660
Hexachlorocyclopentadiene	660	<660	<660	<660	<660
Hexachloroethane	660	<660	<660	<660	<660
Indeno(1,2,3-cd)pyrene	660	<660	<660	<660	<660

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 6/24/96

ANALYTICAL RESULTS

Semi-Volatile Organics in Soil

EPA Method 8270

	Work Order #	29	30	31	32
	Collector's Sample #	XX-1	XX-2	XX-3	XX-4
	Date Sampled	6/5/96	6/5/96	6/5/96	6/5/96
	Date Extracted	6/15/96	6/15/96	6/15/96	6/15/96
	Date Analyzed	6/17/96	6/17/96	6/17/96	6/17/96
	Dilution Factor	1	1	1	1
Analyte	Reporting Limit µg/Kg	Concentration µg/Kg			
Isophorone	660	<660	<660	<660	<660
2-Methylnaphthalene	660	<660	<660	<660	<660
2-Methylphenol	660	<660	<660	<660	<660
4-Methylphenol	660	<660	<660	<660	<660
Naphthalene	660	<660	<660	<660	<660
2-Nitroaniline	3300	<3300	<3300	<3300	<3300
3-Nitroaniline	3300	<3300	<3300	<3300	<3300
Nitrobenzene	660	<660	<660	<660	<660
2-Nitrophenol	1350	<1350	<1350	<1350	<1350
4-Nitrophenol	3300	<3300	<3300	<3300	<3300
N-Nitrosodiphenylamine	660	<660	<660	<660	<660
N-Nitroso-di-n-propylamine	900	<900	<900	<900	<900
Pentachlorophenol	3300	<3300	<3300	<3300	<3300
Phenanthrene	660	<660	<660	<660	<660
Phenol	660	<660	<660	<660	<660
Pyrene	660	<660	<660	<660	<660
Pyridine	2050	<2050	<2050	<2050	<2050
1,2,4-Trichlorobenzene	660	<660	<660	<660	<660
2,4,5-Trichlorophenol	660	<660	<660	<660	<660
2,4,6-Trichlorophenol	660	<660	<660	<660	<660

Analytical Review / Date: [signature] 6/29/96

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 6/24/96

ANALYTICAL RESULTS

Volatile Organics in Soil

EPA Method 8240

Work Order #		17	18	19	20	21	22
Collector's Sample #		VB-9(22-24)	VB-9(26-28)	VB-6(20-22)	VB-6(24-26)	VB-4(22-24)	VB-4(26-28)
Date Sampled		6/4/96	6/4/96	6/4/96	6/4/96	6/4/96	6/4/96
Date Analyzed		6/13/96	6/14/96	6/14/96	6/13/96	6/13/96	6/14/96
Dilution Factor		10	50	50	10	10	50
Analyte	Report Limit µg/Kg	Concentration µg/Kg					
Acetone	100	<100	<1000	<1000	<100	<100	<1000
Acetonitrile	100	<500	<2500	<2500	<500	<500	<2500
Allyl Chloride	5	<50	<250	<250	<50	<50	<250
Benzene	5	<50	<250	<250	<50	<50	<250
Benzyl Chloride	100	<100	<1000	<1000	<100	<100	<1000
Bromodichloromethane	5	<50	<250	<250	<50	<50	<250
Bromoform	5	<50	<250	<250	<50	<50	<250
Bromomethane	10	<50	<250	<250	<50	<50	<250
2-Butanone	100	<100	<1000	<1000	<100	<100	<1000
Carbon Disulfide	100	<100	<1000	<1000	<100	<100	<1000
Carbon Tetrachloride	5	<50	<250	<250	<50	<50	<250
Chlorobenzene	5	<50	<250	<250	<50	<50	<250
Chlorodibromomethane	5	<50	<250	<250	<50	<50	<250
Chloroethane	10	<50	<250	<250	<50	<50	<250
2-Chloroethyl vinyl ether	10	<50	<250	<250	<50	<50	<250
Chloroform	5	<50	<250	<250	<50	<50	<250
Chloromethane	10	<50	<250	<250	<50	<50	<250
1,2-Dibromo-3-chloropropane	100	<100	<1000	<1000	<100	<100	<1000
1,2-Dibromoethane	5	<50	<250	<250	<50	<50	<250
Dibromomethane	5	<50	<250	<250	<50	<50	<250
[illegible]-Dichloro-2-butene	100	<100	<1000	<1000	<100	<100	<1000
1,2-Dichlorobenzene	5	<50	<250	<250	<50	<50	<250

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 6/24/96

ANALYTICAL RESULTS

Volatile Organics in Soil

EPA Method 8240

Work Order #		17	18	19	20	21	22
Collector's Sample #		VB-9(22-24)	VB-9(26-28)	VB-6(20-22)	VB-6(24-26)	VB-4(22-24)	VB-4(26-28)
Date Sampled		6/4/96	6/4/96	6/4/96	6/4/96	6/4/96	6/4/96
Date Analyzed		6/13/96	6/14/96	6/14/96	6/13/96	6/13/96	6/14/96
Dilution Factor		10	50	50	10	10	50
Analyte	Report Limit µg/Kg	Concentration µg/Kg					
1,3-Dichlorobenzene	5	<50	<250	<250	<50	<50	<250
1,4-Dichlorobenzene	5	<50	<250	<250	<50	<50	<250
Dichlorodifluoromethane	5	<50	<250	<250	<50	<50	<250
1,1-Dichloroethane	5	<50	<250	<250	<50	<50	<250
[illegible]-Dichloroethane	5	<50	<250	<250	<50	<50	<250
1,1-Dichloroethene	5	<50	<250	<250	<50	<50	<250
cis-1,2-Dichloroethene	5	<50	<250	<250	<50	<50	<250
trans-1,2-Dichloroethene	5	<50	<250	<250	<50	<50	<250
1,2-Dichloropropane	5	<50	<250	<250	<50	<50	<250
cis-1,3-Dichloropropene	5	<50	<250	<250	<50	<50	<250
trans-1,3-Dichloropropene	5	<50	<250	<250	<50	<50	<250
Ethylbenzene	5	<50	<250	<250	<50	<50	<250
Ethyl methacrylate	5	<50	<250	<250	<50	<50	<250
2-Hexanone	50	<100	<500	<500	<100	<100	<500
Isobutyl Alcohol	1000	<10000	<50000	<50000	<10000	<10000	<50000
Methacrylonitrile	100	<100	<1000	<1000	<100	<100	<1000
Methylene Chloride	5	<50	<250	<250	<50	<50	<250
Methyl Iodide	5	<50	<250	<250	<50	<50	<250
Methyl methacrylate	50	<50	<250	<250	<50	<50	<250
[illegible]Methyl-2-pentanone	50	<50	<500	<500	<50	<50	<500
Pentachloroethane	10	<50	<250	<250	<50	<50	<250
Styrene	5	<50	<250	<250	<50	<50	<250

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 6/24/96

ANALYTICAL RESULTS

Volatile Organics in Soil

EPA Method 8240

Work Order #	17	18	19	20	21	22
Collector's Sample #	VB-9(22-24)	VB-9(26-28)	VB-6(20-22)	VB-6(24-26)	VB-4(22-24)	VB-4(26-28)
Date Sampled	6/4/96	6/4/96	6/4/96	6/4/96	6/4/96	6/4/96
Date Analyzed	6/13/96	6/14/96	6/14/96	6/13/96	6/13/96	6/14/96
Dilution Factor	10	50	50	10	10	50
Analyte	Report Limit µg/Kg	Concentration µg/Kg					
1,1,1,2-Tetrachloroethane	5	<50	<250	<250	<50	<50	<250
1,1,2,2-Tetrachloroethane	5	<50	<250	<250	<50	<50	<250
Tetrachloroethene	5	<50	<250	<250	<50	<50	<250
Toluene	5	<50	<250	<250	<50	<50	<250
1-Trichloroethane	5	<50	<250	<250	<50	<50	<250
1,1,2-Trichloroethane	5	<50	<250	<250	<50	<50	<250
Trichloroethene	5	<50	<250	<250	<50	<50	<250
1,2,3-Trichloropropane	5	<50	<250	<250	<50	<50	<250
Vinyl Acetate	50	<100	<500	<500	<100	<100	<500
Vinyl Chloride	10	<50	<250	<250	<50	<50	<250
Xylene (Total)	5	<50	<250	<250	<50	<50	<250

Analytical Review / Date: 6/24/96

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 6/24/96

ANALYTICAL RESULTS

Volatile Organics in Soil

EPA Method 8240

Work Order #		23	24	25	26	27	28
Collector's Sample #		LE-7(4-6)	LE-7(18-20)	MW-6(4-6)	MW-6(20-22)	VB-8(30-32)	VB-8(34-36)
Date Sampled		6/5/96	6/5/96	6/5/96	6/5/96	6/5/96	6/5/96
Date Analyzed		6/14/96	6/14/96	6/13/96	6/14/96	6/14/96	6/13/96
Dilution Factor		5	10	10	10	10	10
Analyte	Report Limit µg/Kg	Concentration µg/Kg					
Acetone	100	<100	<100	<100	<100	<100	<100
Acetonitrile	100	<250	<500	<500	<500	<500	<500
Allyl Chloride	5	<25	<50	<50	<50	<50	<50
Benzene	5	<25	<50	<50	<50	<50	<50
[illegible]zyl Chloride	100	<100	<100	<100	<100	<100	<100
Bromodichloromethane	5	<25	<50	<50	<50	<50	<50
Bromoform	5	<25	<50	<50	<50	<50	<50
Bromomethane	10	<25	<50	<50	<50	<50	<50
2-Butanone	100	<100	<100	<100	<100	<100	<100
Carbon Disulfide	100	<100	<100	<100	<100	<100	<100
Carbon Tetrachloride	5	<25	<50	<50	<50	<50	<50
Chlorobenzene	5	<25	<50	<50	<50	<50	<50
Chlorodibromomethane	5	<25	<50	<50	<50	<50	<50
Chloroethane	10	<25	<50	<50	<50	<50	<50
2-Chloroethyl vinyl ether	10	<25	<50	<50	<50	<50	<50
Chloroform	5	<25	<50	<50	<50	<50	<50
Chloromethane	10	<25	<50	<50	<50	<50	<50
1,2-Dibromo-3-chloropropane	100	<100	<100	<100	<100	<100	<100
1,2-Dibromoethane	5	<25	<50	<50	<50	<50	<50
[illegible]romomethane	5	<25	<50	<50	<50	<50	<50
1,4-Dichloro-2-butene	100	<100	<100	<100	<100	<100	<100
1,2-Dichlorobenzene	5	<25	<50	<50	<50	<50	<50

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 6/24/96

ANALYTICAL RESULTS

Volatile Organics in Soil

EPA Method 8240

Work Order #		23	24	25	26	27	28
Collector's Sample #		LE-7(4-6)	LE-7(18-20)	MW-6(4-6)	MW-6(20-22)	VB-8(30-32)	VB-8(34-36)
Date Sampled		6/5/96	6/5/96	6/5/96	6/5/96	6/5/96	6/5/96
Date Analyzed		6/14/96	6/14/96	6/13/96	6/14/96	6/14/96	6/13/96
Dilution Factor		5	10	10	10	10	10
Analyte	Report Limit µg/Kg	Concentration µg/Kg					
1,3-Dichlorobenzene	5	<25	<50	<50	<50	<50	<50
1,4-Dichlorobenzene	5	<25	<50	<50	<50	<50	<50
Dichlorodifluoromethane	5	<25	<50	<50	<50	<50	<50
1,1-Dichloroethane	5	<25	<50	<50	<50	<50	<50
1,2-Dichloroethane	5	<25	<50	<50	<50	<50	<50
1,1-Dichloroethene	5	<25	<50	<50	<50	<50	<50
cis-1,2-Dichloroethene	5	<25	<50	<50	<50	<50	<50
trans-1,2-Dichloroethene	5	<25	<50	<50	<50	<50	<50
1,2-Dichloropropane	5	<25	<50	<50	<50	<50	<50
cis-1,3-Dichloropropene	5	<25	<50	<50	<50	<50	<50
trans-1,3-Dichloropropene	5	<25	<50	<50	<50	<50	<50
Ethylbenzene	5	<25	<50	<50	<50	<50	<50
Ethyl methacrylate	5	<25	<50	<50	<50	<50	<50
2-Hexanone	50	<50	<100	<100	<100	<100	<100
Isobutyl Alcohol	1000	<5000	<10000	<10000	<10000	<10000	<10000
Methacrylonitrile	100	<100	<100	<100	<100	<100	<100
Methylene Chloride	5	<25	<50	<50	<50	<50	<50
Methyl Iodide	5	<25	<50	<50	<50	<50	<50
Methyl methacrylate	50	<25	<50	<50	<50	<50	<50
4-Methyl-2-pentanone	50	<50	<50	<50	<50	<50	<50
Pentachloroethane	10	<25	<50	<50	<50	<50	<50
Styrene	5	<25	<50	<50	<50	<50	<50

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 6/24/96

ANALYTICAL RESULTS

Volatile Organics in Soil

EPA Method 8240

Work Order #	23	24	25	26	27	28
Collector's Sample #	LE-7(4-6)	LE-7(18-20)	MW-6(4-6)	MW-6(20-22)	VB-8(30-32)	VB-8(34-36)
Date Sampled	6/5/96	6/5/96	6/5/96	6/5/96	6/5/96	6/5/96
Date Analyzed	6/14/96	6/14/96	6/13/96	6/14/96	6/14/96	6/13/96
Dilution Factor	5	10	10	10	10	10
Analyte	Report Limit µg/Kg	Concentration µg/Kg					
1,1,1,2-Tetrachloroethane	5	<25	<50	<50	<50	<50	<50
1,1,2,2-Tetrachloroethane	5	<25	<50	<50	<50	<50	<50
Tetrachloroethene	5	<25	<50	<50	<50	<50	<50
Toluene	5	<25	<50	<50	<50	**118**	<50
1,1,1-Trichloroethane	5	<25	<50	<50	<50	<50	<50
1,1,2-Trichloroethane	5	<25	<50	<50	<50	<50	<50
Trichloroethene	5	<25	<50	<50	<50	<50	<50
1,2,3-Trichloropropane	5	<25	<50	<50	<50	<50	<50
Vinyl Acetate	50	<50	<100	<100	<100	<100	<100
Vinyl Chloride	10	<25	<50	<50	<50	<50	<50
Xylene (Total)	5	<25	<50	<50	<50	<50	<50

Analytical Review / Date: 6/24/96

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 6/24/96

ANALYTICAL RESULTS

Volatile Organics in Soil

EPA Method 8240

Work Order #	29	30	31	32	33	34
Collector's Sample #	XX-1	XX-2	XX-3	XX-4	Trip Blank A	Trip Blank B
Date Sampled	6/5/96	6/5/96	6/5/96	6/5/96	6/4/96	6/4/96
Date Analyzed	6/14/96	6/15/96	6/15/96	6/15/96	6/14/96	6/14/96
Dilution Factor	10	10	10	10	1	1
Analyte	Report Limit µg/Kg	Concentration µg/Kg					
Acetone	100	<100	<100	<100	<100	<100	<100
Acetonitrile	100	<500	<500	<500	<500	<100	<100
Allyl Chloride	5	<50	<50	<50	<50	<5	<5
Benzene	5	<50	<50	<50	<50	<5	<5
Benzyl Chloride	100	<100	<100	<100	<100	<100	<100
Bromodichloromethane	5	<50	<50	<50	<50	<5	<5
Bromoform	5	<50	<50	<50	<50	<5	<5
Bromomethane	10	<50	<50	<50	<50	<10	<10
2-Butanone	100	<100	<100	<100	<100	<100	<100
Carbon Disulfide	100	<100	<100	<100	<100	<100	<100
Carbon Tetrachloride	5	<50	<50	<50	<50	<5	<5
Chlorobenzene	5	<50	<50	<50	<50	<5	<5
Chlorodibromomethane	5	<50	<50	<50	<50	<5	<5
Chloroethane	10	<50	<50	<50	<50	<10	<10
2-Chloroethyl vinyl ether	10	<50	<50	<50	<50	<10	<10
Chloroform	5	<50	<50	<50	<50	<5	<5
Chloromethane	10	<50	<50	<50	<50	<10	<10
1,2-Dibromo-3-chloropropane	100	<100	<100	<100	<100	<100	<100
1,2-Dibromoethane	5	<50	<50	<50	<50	<5	<5
Dibromomethane	5	<50	<50	<50	<50	<5	<5
1,4-Dichloro-2-butene	100	<100	<100	<100	<100	<100	<100
1,2-Dichlorobenzene	5	<50	<50	<50	<50	<5	<5

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 6/24/96

ANALYTICAL RESULTS

Volatile Organics in Soil

EPA Method 8240

Work Order #		29	30	31	32	33	34
Collector's Sample #		XX-1	XX-2	XX-3	XX-4	Trip Blank A	Trip Blank B
Date Sampled		6/5/96	6/5/96	6/5/96	6/5/96	6/4/96	6/4/96
Date Analyzed		6/14/96	6/15/96	6/15/96	6/15/96	6/14/96	6/14/96
Dilution Factor		10	10	10	10	1	1
Analyte	Report Limit µg/Kg	Concentration µg/Kg					
1,3-Dichlorobenzene	5	<50	<50	<50	<50	<5	<5
1,4-Dichlorobenzene	5	<50	<50	<50	<50	<5	<5
Dichlorodifluoromethane	5	<50	<50	<50	<50	<5	<5
1,1-Dichloroethane	5	<50	<50	<50	<50	<5	<5
1,2-Dichloroethane	5	<50	<50	<50	<50	<5	<5
1,1-Dichloroethene	5	<50	<50	<50	<50	<5	<5
cis-1,2-Dichloroethene	5	<50	<50	<50	<50	<5	<5
trans-1,2-Dichloroethene	5	<50	<50	<50	<50	<5	<5
1,2-Dichloropropane	5	<50	<50	<50	<50	<5	<5
cis-1,3-Dichloropropene	5	<50	<50	<50	<50	<5	<5
trans-1,3-Dichloropropene	5	<50	<50	<50	<50	<5	<5
Ethylbenzene	5	<50	<50	<50	<50	<5	<5
Ethyl methacrylate	5	<50	<50	<50	<50	<5	<5
2-Hexanone	50	<100	<100	<100	<100	<50	<50
Isobutyl Alcohol	1000	<10000	<10000	<10000	<10000	<1000	<1000
Methacrylonitrile	100	<100	<100	<100	<100	<100	<100
Methylene Chloride	5	<50	<50	<50	<50	<5	<5
Methyl Iodide	5	<50	<50	<50	<50	<5	<5
Methyl methacrylate	50	<50	<50	<50	<50	<50	<50
4-Methyl-2-pentanone	50	<50	<50	<50	<50	<50	<50
Pentachloroethane	10	<50	<50	<50	<50	<10	<10
Styrene	5	<50	<50	<50	<50	<5	<5

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 6/24/96

ANALYTICAL RESULTS

Volatile Organics in Soil

EPA Method 8240

Work Order #	29	30	31	32	33	34
Collector's Sample #	XX-1	XX-2	XX-3	XX-4	Trip Blank A	Trip Blank B
Date Sampled	6/5/96	6/5/96	6/5/96	6/5/96	6/4/96	6/4/96
Date Analyzed	6/14/96	6/15/96	6/15/96	6/15/96	6/14/96	6/14/96
Dilution Factor	10	10	10	10	1	1
Analyte	Report Limit µg/Kg	Concentration µg/Kg					
1,1,1,2-Tetrachloroethane	5	<50	<50	<50	<50	<5	<5
1,1,2,2-Tetrachloroethane	5	<50	<50	<50	<50	<5	<5
Tetrachloroethene	5	<50	<50	<50	<50	<5	<5
Toluene	5	<50	<50	<50	<50	<5	<5
1-Trichloroethane	5	<50	<50	<50	<50	<5	<5
1,1,2-Trichloroethane	5	<50	<50	<50	<50	<5	<5
Trichloroethene	5	<50	<50	<50	<50	<5	<5
1,2,3-Trichloropropane	5	<50	<50	<50	<50	<5	<5
Vinyl Acetate	50	<100	<100	<100	<100	<50	<50
Vinyl Chloride	10	<50	<50	<50	<50	<10	<10
Xylene (Total)	5	<50	<50	<50	<50	<5	<5

Analytical Review / Date: 6/24/96

safety-kleen®

June 26, 1996

Mr. Jack Bedessem
TriHydro Corporation
920 Sheridan

Laramie,WY 82070

Re: SK Lab Project #96-136
Project ID Name: Dolton, IL

Dear Jack:

Enclosed please find the analytical results for the sample received by SK Environmental Laboratory on 6/08/96.

A formal Quality Control/Quality Assurance program is maintained by Safety-Kleen, which is designed to meet or exceed the EPA requirements. This information is available upon request.

If you have any questions concerning this analysis, or if we can be of further assistance, please contact Rick Cook at 312-825-7351.

Sincerely,

Mark A. Hartwig

Mark A. Hartwig
Environmental Lab Manager

MAH:

Allan A. Manteuffel Technical Center

P.O. Box 92050
Elk Grove Village, IL
60009-2050

12555 W. Old Higgins Rd.
Elk Grove Village, IL 60007
Telephone: 312/694-2700
Fax: 312/825-7850

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 6/26/96

ANALYTICAL RESULTS

TCLP Metals

	Work Order #	39	40	41	42	43	44
	Collector's Sample #	VB-1 (20-22)	VB-1 (24-26)	LE-10 (4-6)	LE-10 (18-20)	LE-10 (24-26)	VB-7 (20-22)
	Date Sampled	6/6/96	6/6/96	6/6/96	6/6/96	6/6/96	6/6/96
	Date Leached	6/12/96	6/12/96	6/12/96	6/12/96	6/12/96	6/12/96
	Date Analyzed (EPA Method 6010)	6/17/96	6/17/96	6/17/96	6/17/96	6/17/96	6/17/96
	Date Analyzed (EPA Method 7470)	6/18/96	6/18/96	6/18/96	6/18/96	6/18/96	6/18/96
Analyte	EPA Method	Reporting Limit mg/L	Concentration mg/L				
Barium	6010	0.05	**0.857**	**0.417**	**0.701**	**0.629**	**0.380**	**0.639**
Cadmium	6010	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Lead	6010	0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Mercury	7470	0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008

	Work Order #	45	46	47	48	49	50
	Collector's Sample #	VB-7 (24-26)	VB-5 (20-22)	VB-5 (24-26)	LE-8 (4-6)	LE-8 (18-20)	LE-9 (2-4)
	Date Sampled	6/6/96	6/7/96	6/7/96	6/7/96	6/7/96	6/7/96
	Date Leached	6/12/96	6/12/96	6/12/96	6/12/96	6/12/96	6/12/96
	Date Analyzed (EPA Method 6010)	6/17/96	6/17/96	6/17/96	6/17/96	6/17/96	6/17/96
	Date Analyzed (EPA Method 7470)	6/18/96	6/18/96	6/18/96	6/18/96	6/18/96	6/18/96
Analyte	EPA Method	Reporting Limit mg/L	Concentration mg/L				
Barium	6010	0.05	**0.582**	**0.675**	**0.882**	**0.320**	**0.689**	**0.354**
Cadmium	6010	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Lead	6010	0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Mercury	7470	0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008

Analytical Review / Date: 6/26/96

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 6/26/96

ANALYTICAL RESULTS

TCLP Metals

	Work Order #	51	52	53	54	55
	Collector's Sample #	XX-5	LE-9 (18-20)	LE-9 (22-24)	VB-3 (22-24)	VB-8 (24-26)
	Date Sampled	6/7/96	6/7/96	6/7/96	6/3/96	6/5/96
	Date Leached	6/13/96	6/13/96	6/13/96	6/13/96	6/13/96
	Date Analyzed (EPA Method 6010)	6/17/96	6/17/96	6/17/96	6/17/96	6/17/96
	Date Analyzed (EPA Method 7470)	6/18/96	6/18/96	6/18/96	6/18/96	6/18/96
Analyte	EPA Method	Reporting Limit mg/L	Concentration mg/L				
Barium	6010	0.05	**0.719**	**0.331**	**0.710**	**0.604**	**0.733**
Cadmium	6010	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Lead	6010	0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Mercury	7470	0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008

Analytical Review / Date: 6/20/96

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 6/26/96

ANALYTICAL RESULTS

Semi-Volatile Organics in Soil

EPA Method 8270

	Work Order #	39	40	41	42	43	44
	Collector's Sample #	VB-1 (20-22)	VB-1 (24-26)	LE-10 (4-6)	LE-10 (18-20)	LE-10 (24-26)	VB-7 (20-22)
	Date Sampled	6/6/96	6/6/96	6/6/96	6/6/96	6/6/96	6/6/96
	Date Extracted	6/13/96	6/11/96	6/13/96	6/13/96	6/13/96	6/11/96
	Date Analyzed	6/15/96	6/12/96	6/15/96	6/15/96	6/14/96	6/12/96
	Dilution Factor	1	1	1	1	1	1
Analyte	Reporting Limit µg/Kg	Concentration µg/Kg					
Acenaphthene	660	<660	<660	<660	<660	<660	<660
Acenaphthylene	660	<660	<660	<660	<660	<660	<660
Anthracene	660	<660	<660	<660	<660	<660	<660
Benz(a)anthracene	660	<660	<660	<660	<660	<660	<660
Benzo(b)fluoranthene	660	<660	<660	<660	<660	<660	<660
Benzo(k)fluoranthene	660	<660	<660	<660	<660	<660	<660
Benzoic Acid	3300	<3300	<3300	<3300	<3300	<3300	<3300
Benzo(g,h,i)perylene	660	<660	<660	<660	<660	<660	<660
Benzo(a)pyrene	660	<660	<660	<660	<660	<660	<660
Benzyl Alcohol	1300	<1300	<1300	<1300	<1300	<1300	<1300
bis(2-Chloroethoxy)Methane	660	<660	<660	<660	<660	<660	<660
bis(2-Chloroethyl)Ether	1850	<1850	<1850	<1850	<1850	<1850	<1850
bis(2-Chloroisopropyl)Ether	1600	<1600	<1600	<1600	<1600	<1600	<1600
4-Bromophenyl-phenylether	660	<660	<660	<660	<660	<660	<660
Butylbenzylphthalate	660	<660	<660	<660	<660	<660	<660
4-Chloroaniline	1300	<1300	<1300	<1300	<1300	<1300	<1300
4-Chloro-3-Methylphenol	1300	<1300	<1300	<1300	<1300	<1300	<1300
2-Chloronaphthalene	1100	<1100	<1100	<1100	<1100	<1100	<1100
2-Chlorophenol	660	<660	<660	<660	<660	<660	<660
4-Chlorophenyl-phenylether	660	<660	<660	<660	<660	<660	<660
Chrysene	660	<660	<660	<660	<660	<660	<660
Dibenz(a,h)anthracene	660	<660	<660	<660	<660	<660	<660

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 6/26/96

ANALYTICAL RESULTS

Semi-Volatile Organics in Soil

EPA Method 8270

	Work Order #	39	40	41	42	43	44
	Collector's Sample #	VB-1 (20-22)	VB-1 (24-26)	LE-10 (4-6)	LE-10 (18-20)	LE-10 (24-26)	VB-7 (20-22)
	Date Sampled	6/6/96	6/6/96	6/6/96	6/6/96	6/6/96	6/6/96
	Date Extracted	6/13/96	6/11/96	6/13/96	6/13/96	6/13/96	6/11/96
	Date Analyzed	6/15/96	6/12/96	6/15/96	6/15/96	6/14/96	6/12/96
	Dilution Factor	1	1	1	1	1	1
Analyte	Reporting Limit µg/Kg	Concentration µg/Kg					
Dibenzofuran	660	<660	<660	<660	<660	<660	<660
1,2-Dichlorobenzene	660	<660	<660	<660	<660	<660	<660
1,3-Dichlorobenzene	660	<660	<660	<660	<660	<660	<660
1,4-Dichlorobenzene	660	<660	<660	<660	<660	<660	<660
3,3'-Dichlorobenzidine	1300	<1300	<1300	<1300	<1300	<1300	<1300
2,4-Dichlorophenol	660	<660	<660	<660	<660	<660	<660
Diethylphthalate	660	<660	<660	<660	<660	<660	<660
2,4-Dimethylphenol	660	<660	<660	<660	<660	<660	<660
Dimethylphthalate	660	<660	<660	<660	<660	<660	<660
4,6-Dinitro-2-Methylphenol	3300	<3300	<3300	<3300	<3300	<3300	<3300
2,4-Dinitrophenol	3300	<3300	<3300	<3300	<3300	<3300	<3300
2,4-Dinitrotoluene	660	<660	<660	<660	<660	<660	<660
2,6-Dinitrotoluene	850	<850	<850	<850	<850	<850	<850
Di-n-octyl phthalate	660	<660	<660	<660	<660	<660	<660
bis(2-ethylhexyl)phthalate	11200	<11200	<11200	<11200	<11200	<11200	<11200
Fluoranthene	660	<660	<660	<660	<660	<660	<660
Fluorene	660	<660	<660	<660	<660	<660	<660
Hexachlorobenzene	660	<660	<660	<660	<660	<660	<660
Hexachlorobutadiene	660	<660	<660	<660	<660	<660	<660
Hexachlorocyclopentadiene	660	<660	<660	<660	<660	<660	<660
Hexachloroethane	660	<660	<660	<660	<660	<660	<660
Indeno(1,2,3-cd)pyrene	660	<660	<660	<660	<660	<660	<660

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 6/26/96

ANALYTICAL RESULTS

Semi-Volatile Organics in Soil

EPA Method 8270

Work Order #		39	40	41	42	43	44
Collector's Sample #		VB-1 (20-22)	VB-1 (24-26)	LE-10 (4-6)	LE-10 (18-20)	LE-10 (24-26)	VB-7 (20-22)
Date Sampled		6/6/96	6/6/96	6/6/96	6/6/96	6/6/96	6/6/96
Date Extracted		6/13/96	6/11/96	6/13/96	6/13/96	6/13/96	6/11/96
Date Analyzed		6/15/96	6/12/96	6/15/96	6/15/96	6/14/96	6/12/96
Dilution Factor		1	1	1	1	1	1
Analyte	Reporting Limit µg/Kg	Concentration µg/Kg					
Isophorone	660	<660	<660	<660	<660	<660	<660
2-Methylnaphthalene	660	<660	660	<660	<660	<660	<660
2-Methylphenol	660	<660	<660	<660	<660	<660	<660
4-Methylphenol	660	<660	<660	<660	<660	<660	<660
Naphthalene	660	<660	<660	990	<660	<660	<660
2-Nitroaniline	3300	<3300	<3300	<3300	<3300	<3300	<3300
3-Nitroaniline	3300	<3300	<3300	<3300	<3300	<3300	<3300
Nitrobenzene	660	<660	<660	<660	<660	<660	<660
2-Nitrophenol	1350	<1350	<1350	<1350	<1350	<1350	<1350
4-Nitrophenol	3300	<3300	<3300	<3300	<3300	<3300	<3300
N-Nitrosodiphenylamine	660	<660	<660	<660	<660	<660	<660
N-Nitroso-di-n-propylamine	900	<900	<900	<900	<900	<900	<900
Pentachlorophenol	3300	<3300	<3300	<3300	<3300	<3300	<3300
Phenanthrene	660	<660	<660	<660	<660	<660	<660
Phenol	660	<660	<660	<660	<660	<660	<660
Pyrene	660	<660	<660	<660	<660	<660	<660
Pyridine	2050	<2050	<2050	<2050	<2050	<2050	<2050
1,2,4-Trichlorobenzene	660	<660	<660	<660	<660	<660	<660
2,4,5-Trichlorophenol	660	<660	<660	<660	<660	<660	<660
2,4,6-Trichlorophenol	660	<660	<660	<660	<660	<660	<660

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Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 6/26/96

ANALYTICAL RESULTS

Semi-Volatile Organics in Soil

EPA Method 8270

	Work Order #	45	46	47	48	49	50
	Collector's Sample #	VB-7(24-26)	VB-5(20-22)	VB-5(24-26)	LE-8 (4-6)	LE-8 (18-20)	LE-9 (2-4)
	Date Sampled	6/6/96	6/7/96	6/7/96	6/7/96	6/7/96	6/7/96
	Date Extracted	6/11/96	6/13/96	6/13/96	6/13/96	6/13/96	6/13/96
	Date Analyzed	6/12/96	6/19/96	6/15/96	6/18/96	6/15/96	6/15/96
	Dilution Factor	1	1	1	1	1	1
Analyte	Reporting Limit µg/Kg	Concentration µg/Kg					
Acenaphthene	660	<660	<660	<660	<660	<660	<660
Acenaphthylene	660	<660	<660	<660	<660	<660	<660
Anthracene	660	<660	<660	<660	<660	<660	<660
Benz(a)anthracene	660	<660	<660	<660	<660	<660	<660
Benzo(b)fluoranthene	660	<660	<660	<660	<660	<660	<660
Benzo(k)fluoranthene	660	<660	<660	<660	<660	<660	<660
Benzoic Acid	3300	<3300	<3300	<3300	<3300	<3300	<3300
Benzo(g,h,i)perylene	660	<660	<660	<660	<660	<660	<660
Benzo(a)pyrene	660	<660	<660	<660	<660	<660	<660
Benzyl Alcohol	1300	<1300	<1300	<1300	<1300	<1300	<1300
bis(2-Chloroethoxy)Methane	660	<660	<660	<660	<660	<660	<660
bis(2-Chloroethyl)Ether	1850	<1850	<1850	<1850	<1850	<1850	<1850
bis(2-Chloroisopropyl)Ether	1600	<1600	<1600	<1600	<1600	<1600	<1600
4-Bromophenyl-phenylether	660	<660	<660	<660	<660	<660	<660
Butylbenzylphthalate	660	<660	<660	<660	<660	<660	<660
4-Chloroaniline	1300	<1300	<1300	<1300	<1300	<1300	<1300
4-Chloro-3-Methylphenol	1300	<1300	<1300	<1300	<1300	<1300	<1300
2-Chloronaphthalene	1100	<1100	<1100	<1100	<1100	<1100	<1100
2-Chlorophenol	660	<660	<660	<660	<660	<660	<660
4-Chlorophenyl-phenylether	660	<660	<660	<660	<660	<660	<660
Chrysene	660	<660	<660	<660	<660	<660	<660
Dibenz(a,h)anthracene	660	<660	<660	<660	<660	<660	<660

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 6/26/96

ANALYTICAL RESULTS

Semi-Volatile Organics in Soil

EPA Method 8270

Work Order #		45	46	47	48	49	50
Collector's Sample #		VB-7(24-26)	VB-5(20-22)	VB-5(24-26)	LE-8 (4-6)	LE-8 (18-20)	LE-9 (2-4)
Date Sampled		6/6/96	6/7/96	6/7/96	6/7/96	6/7/96	6/7/96
Date Extracted		6/11/96	6/13/96	6/13/96	6/13/96	6/13/96	6/13/96
Date Analyzed		6/12/96	6/19/96	6/15/96	6/18/96	6/15/96	6/15/96
Dilution Factor		1	1	1	1	1	1
Analyte	Reporting Limit µg/Kg	Concentration µg/Kg					
Dibenzofuran	660	<660	<660	<660	<660	<660	<660
1,2-Dichlorobenzene	660	<660	<660	<660	<660	<660	<660
1,3-Dichlorobenzene	660	<660	<660	<660	**1690**	<660	<660
1,4-Dichlorobenzene	660	<660	<660	<660	**6570**	<660	<660
3,3'-Dichlorobenzidine	1300	<1300	<1300	<1300	<1300	<1300	<1300
2,4-Dichlorophenol	660	<660	<660	<660	<660	<660	<660
Diethylphthalate	660	<660	<660	<660	<660	<660	<660
2,4-Dimethylphenol	660	<660	<660	<660	<660	<660	<660
Dimethylphthalate	660	<660	<660	<660	<660	<660	<660
4,6-Dinitro-2-Methylphenol	3300	<3300	<3300	<3300	<3300	<3300	<3300
2,4-Dinitrophenol	3300	<3300	<3300	<3300	<3300	<3300	<3300
2,4-Dinitrotoluene	660	<660	<660	<660	<660	<660	<660
2,6-Dinitrotoluene	850	<850	<850	<850	<850	<850	<850
Di-n-octyl phthalate	660	<660	<660	<660	**29880 ***	<660	<660
bis(2-ethylhexyl)phthalate	11200	<11200	<11200	<11200	<11200	<11200	<11200
Fluoranthene	660	<660	<660	<660	<660	<660	<660
Fluorene	660	<660	<660	<660	<660	<660	<660
Hexachlorobenzene	660	<660	<660	<660	<660	<660	<660
Hexachlorobutadiene	660	<660	<660	<660	<660	<660	<660
Hexachlorocyclopentadiene	660	<660	<660	<660	<660	<660	<660
Hexachloroethane	660	<660	<660	<660	<660	<660	<660
Indeno(1,2,3-cd)pyrene	660	<660	<660	<660	<660	<660	<660

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 6/26/96

ANALYTICAL RESULTS

Semi-Volatile Organics in Soil

EPA Method 8270

Work Order #		45	46	47	48	49	50
Collector's Sample #		VB-7(24-26)	VB-5(20-22)	VB-5(24-26)	LE-8 (4-6)	LE-8 (18-20)	LE-9 (2-4)
Date Sampled		6/6/96	6/7/96	6/7/96	6/7/96	6/7/96	6/7/96
Date Extracted		6/11/96	6/13/96	6/13/96	6/13/96	6/13/96	6/13/96
Date Analyzed		6/12/96	6/19/96	6/15/96	6/18/96	6/15/96	6/15/96
Dilution Factor		1	1	1	1	1	1
Analyte	Reporting Limit µg/Kg	Concentration µg/Kg					
Isophorone	660	<660	<660	<660	<660	<660	<660
2-Methylnaphthalene	660	<660	<660	<660	<660	<660	<660
2-Methylphenol	660	<660	<660	<660	<660	<660	<660
4-Methylphenol	660	<660	<660	<660	<660	<660	<660
[redacted]nthalene	660	<660	<660	<660	<660	<660	<660
2-Nitroaniline	3300	<3300	<3300	<3300	<3300	<3300	<3300
3-Nitroaniline	3300	<3300	<3300	<3300	<3300	<3300	<3300
Nitrobenzene	660	<660	<660	<660	<660	<660	<660
2-Nitrophenol	1350	<1350	<1350	<1350	<1350	<1350	<1350
4-Nitrophenol	3300	<3300	<3300	<3300	<3300	<3300	<3300
N-Nitrosodiphenylamine	900	<900	<900	<900	<900	<900	<900
N-Nitroso-di-n-propylamine	660	<660	<660	<660	<660	<660	<660
Pentachlorophenol	3300	<3300	<3300	<3300	<3300	<3300	<3300
Phenanthrene	660	<660	<660	<660	<660	<660	<660
Phenol	660	<660	<660	<660	7330	<660	<660
Pyrene	660	<660	<660	<660	<660	<660	<660
Pyridine	2050	<2050	<2050	<2050	<2050	<2050	<2050
1,2,4-Trichlorobenzene	660	<660	<660	<660	7450	<660	<660
2,4,5-Trichlorophenol	660	<660	<660	<660	<660	<660	<660
[redacted]6-Trichlorophenol	660	<660	<660	<660	<660	<660	<660

* 1:20 Dilution

Analytical Review / Date: [signature] 6/26/96

Project ID #: 32-08
Project ID Name: Dolton, IL
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ANALYTICAL RESULTS

Semi-Volatile Organics in Soil

EPA Method 8270

	Work Order #	51	52	53	54	55
	Collector's Sample #	XX-5	LE-9 (18-20)	LE-9 (22-24)	VB-3(22-24)	VB-8(24-26)
	Date Sampled	6/7/96	6/7/96	6/7/96	6/3/96	6/5/96
	Date Extracted	6/13/96	6/13/96	6/18/96	6/13/96	6/13/96
	Date Analyzed	6/17/96	6/15/96	6/21/96	6/15/96	6/17/96
	Dilution Factor	1	1	1	1	1
Analyte	Reporting Limit µg/Kg	Concentration µg/Kg				
Acenaphthene	660	<660	<660	<660	<660	<660
Acenaphthylene	660	<660	<660	<660	<660	<660
Anthracene	660	<660	<660	<660	<660	<660
Benz(a)anthracene	660	<660	<660	<660	<660	<660
Benzo(b)fluoranthene	660	<660	<660	<660	<660	<660
Benzo(k)fluoranthene	660	<660	<660	<660	<660	<660
Benzoic Acid	3300	<3300	<3300	<3300	<3300	<3300
Benzo(g,h,i)perylene	660	<660	<660	<660	<660	<660
Benzo(a)pyrene	660	<660	<660	<660	<660	<660
Benzyl Alcohol	1300	<1300	<1300	<1300	<1300	<1300
bis(2-Chloroethoxy)Methane	660	<660	<660	<660	<660	<660
bis(2-Chloroethyl)Ether	1850	<1850	<1850	<1850	<1850	<1850
bis(2-Chloroisopropyl)Ether	1600	<1600	<1600	<1600	<1600	<1600
4-Bromophenyl-phenylether	660	<660	<660	<660	<660	<660
Butylbenzylphthalate	660	<660	<660	<660	<660	<660
4-Chloroaniline	1300	<1300	<1300	<1300	<1300	<1300
4-Chloro-3-Methylphenol	1300	<1300	<1300	<1300	<1300	<1300
2-Chloronaphthalene	1100	<1100	<1100	<1100	<1100	<1100
2-Chlorophenol	660	<660	<660	<660	<660	<660
4-Chlorophenyl-phenylether	660	<660	<660	<660	<660	<660
Chrysene	660	<660	<660	<660	<660	<660
Dibenz(a,h)anthracene	660	<660	<660	<660	<660	<660

Project ID #: 32-08
Project ID Name: Dolton, IL
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Date Reported: 6/26/96

ANALYTICAL RESULTS

Semi-Volatile Organics in Soil

EPA Method 8270

	Work Order #	51	52	53	54	55
	Collector's Sample #	XX-5	LE-9 (18-20)	LE-9 (22-24)	VB-3(22-24)	VB-8(24-26)
	Date Sampled	6/7/96	6/7/96	6/7/96	6/3/96	6/5/96
	Date Extracted	6/13/96	6/13/96	6/18/96	6/13/96	6/13/96
	Date Analyzed	6/17/96	6/15/96	6/21/96	6/15/96	6/17/96
	Dilution Factor	1	1	1	1	1
Analyte	Reporting Limit µg/Kg	Concentration µg/Kg				
Dibenzofuran	660	<660	<660	<660	<660	<660
1,2-Dichlorobenzene	660	<660	<660	<660	<660	<660
1,3-Dichlorobenzene	660	<660	<660	<660	<660	<660
1,4-Dichlorobenzene	660	<660	<660	<660	<660	<660
3,3'-Dichlorobenzidine	1300	<1300	<1300	<1300	<1300	<1300
[illegible]ichlorophenol	660	<660	<660	<660	<660	<660
Diethylphthalate	660	<660	<660	<660	<660	<660
2,4-Dimethylphenol	660	<660	<660	<660	<660	<660
Dimethylphthalate	660	<660	<660	<660	<660	<660
4,6-Dinitro-2-Methylphenol	3300	<3300	<3300	<3300	<3300	<3300
2,4-Dinitrophenol	3300	<3300	<3300	<3300	<3300	<3300
2,4-Dinitrotoluene	660	<660	<660	<660	<660	<660
2,6-Dinitrotoluene	850	<850	<850	<850	<850	<850
Di-n-octyl phthalate	660	<660	<660	<660	<660	<660
bis(2-ethylhexyl)phthalate	11200	<11200	<11200	<11200	<11200	<11200
Fluoranthene	660	<660	<660	<660	<660	<660
Fluorene	660	<660	<660	<660	<660	<660
Hexachlorobenzene	660	<660	<660	<660	<660	<660
Hexachlorobutadiene	660	<660	<660	<660	<660	<660
Hexachlorocyclopentadiene	660	<660	<660	<660	<660	<660
Hexachloroethane	660	<660	<660	<660	<660	<660
[illegible]ene(1,2,3-cd)pyrene	660	<660	<660	<660	<660	<660

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 6/26/96

ANALYTICAL RESULTS

Semi-Volatile Organics in Soil

EPA Method 8270

	Work Order #	51	52	53	54	55
	Collector's Sample #	XX-5	LE-9 (18-20)	LE-9 (22-24)	VB-3(22-24)	VB-8(24-26)
	Date Sampled	6/7/96	6/7/96	6/7/96	6/3/96	6/5/96
	Date Extracted	6/13/96	6/13/96	6/18/96	6/13/96	6/13/96
	Date Analyzed	6/17/96	6/15/96	6/21/96	6/15/96	6/17/96
	Dilution Factor	1	1	1	1	1
Analyte	Reporting Limit µg/Kg	Concentration µg/Kg				
Isophorone	660	<660	<660	<660	<660	<660
2-Methylnaphthalene	660	<660	<660	<660	<660	<660
2-Methylphenol	660	<660	<660	<660	<660	<660
4-Methylphenol	660	<660	<660	<660	<660	<660
Naphthalene	660	<660	<660	<660	<660	<660
2-Nitroaniline	3300	<3300	<3300	<3300	<3300	<3300
3-Nitroaniline	3300	<3300	<3300	<3300	<3300	<3300
Nitrobenzene	660	<660	<660	<660	<660	<660
2-Nitrophenol	1350	<1350	<1350	<1350	<1350	<1350
4-Nitrophenol	3300	<3300	<3300	<3300	<3300	<3300
N-Nitrosodiphenylamine	900	<900	<900	<900	<900	<900
N-Nitroso-di-n-propylamine	660	<660	<660	<660	<660	<660
Pentachlorophenol	3300	<3300	<3300	<3300	<3300	<3300
Phenanthrene	660	<660	<660	<660	<660	<660
Phenol	660	<660	<660	<660	<660	<660
Pyrene	660	<660	<660	<660	<660	<660
Pyridine	2050	<2050	<2050	<2050	<2050	<2050
1,2,4-Trichlorobenzene	660	<660	<660	<660	<660	<660
2,4,5-Trichlorophenol	660	<660	<660	<660	<660	<660
2,4,6-Trichlorophenol	660	<660	<660	<660	<660	<660

Analytical Review / Date: 6/26/96

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 6/26/96

ANALYTICAL RESULTS

Volatile Organics in Soil

EPA Method 8240

Work Order #		39	40	41	42	43	44
Collector's Sample #		VB-1 (20-22)	VB-1 (24-26)	LE-10 (4-6)	LE-10 (18-20)	LE-10 (24-26)	VB-7 (20-22)
Date Sampled		6/6/96	6/6/96	6/6/96	6/6/96	6/6/96	6/6/96
Date Analyzed		6/18/96	6/17/96	6/17/96	6/17/96	6/18/96	6/17/96
Dilution Factor		50	50	10	10	50	10
Analyte	Report Limit µg/Kg	Concentration µg/Kg					
Acetone	100	723	747	467	212	<500	<100
Acetonitrile	100	<2500	<2500	<500	<500	<2500	<500
Allyl Chloride	5	<250	<250	<50	<50	<250	<50
Benzene	5	<250	<250	<50	<50	<250	<50
Benzyl Chloride	100	<500	<500	<100	<100	<500	<100
Bromodichloromethane	5	<250	<250	<50	<50	<250	<50
Bromoform	5	<250	<250	<50	<50	<250	<50
Bromomethane	10	<250	<250	<50	<50	<250	<50
2-Butanone	100	<500	<500	<100	<100	<500	<100
Carbon Disulfide	100	<500	<500	<100	<100	<500	<100
Carbon Tetrachloride	5	<250	<250	<50	<50	<250	<50
Chlorobenzene	5	<250	<250	<50	<50	<250	<50
Chlorodibromomethane	5	<250	<250	<50	<50	<250	<50
Chloroethane	10	<250	<250	<50	<50	<250	<50
2-Chloroethyl vinyl ether	10	<250	<250	<50	<50	<250	<50
Chloroform	5	<250	<250	<50	<50	<250	<50
Chloromethane	10	<250	<250	<50	<50	<250	<50
1,2-Dibromo-3-chloropropane	100	<500	<500	<100	<100	<500	<100
1,2-Dibromoethane	5	<250	<250	<50	<50	<250	<50
Dibromomethane	5	<250	<250	<50	<50	<250	<50
Dichloro-2-butene	100	<500	<500	<100	<100	<500	<100
1,2-Dichlorobenzene	5	<250	<250	<50	<50	<250	<50

ANALYTICAL RESULTS

Volatile Organics in Soil

EPA Method 8240

Work Order #		39	40	41	04	43	44
Collector's Sample #		VB-1 (20-22)	VB-1 (24-26)	LE-10 (4-6)	LE-10 (18-20)	LE-10 (24-26)	VB-7 (20-22)
Date Sampled		6/6/96	6/6/96	6/6/96	6/6/96	6/6/96	6/6/96
Date Analyzed		6/18/96	6/17/96	6/17/96	6/17/96	6/18/96	6/17/96
Dilution Factor		50	50	10	10	50	10
Analyte	Report Limit µg/Kg	Concentration µg/Kg					
1,3-Dichlorobenzene	5	<250	<250	<50	<50	<250	<50
1,4-Dichlorobenzene	5	<250	<250	<50	<50	<250	<50
Dichlorodifluoromethane	5	<250	<250	<50	<50	<250	<50
1,1-Dichloroethane	5	<250	<250	<50	<50	<250	<50
1,2-Dichloroethane	5	<250	<250	<50	<50	<250	<50
1,1-Dichloroethene	5	<250	<250	<50	<50	<250	<50
cis-1,2-Dichloroethene	5	<250	<250	<50	<50	<250	<50
trans-1,2-Dichloroethene	5	<250	<250	<50	<50	<250	<50
1,2-Dichloropropane	5	<250	<250	<50	<50	<250	<50
cis-1,3-Dichloropropene	5	<250	<250	<50	<50	<250	<50
trans-1,3-Dichloropropene	5	<250	<250	<50	<50	<250	<50
Ethylbenzene	5	<250	<250	<50	<50	<250	<50
Ethyl methacrylate	5	<250	<250	<50	<50	<250	<50
2-Hexanone	50	<500	<500	<100	<100	<500	<100
Isobutyl Alcohol	1000	<50000	<50000	<10000	<10000	<50000	<10000
Methacrylonitrile	100	<500	<500	<100	<100	<500	<100
Methylene Chloride	5	<250	<250	<50	<50	<250	<50
Methyl Iodide	5	<250	<250	<50	<50	<250	<50
Methyl methacrylate	50	<250	<250	<50	<50	<250	<50
4-Methyl-2-pentanone	50	<500	<500	<50	80	<500	<50
Pentachloroethane	10	<250	<250	<50	<50	<250	<50
Styrene	5	<250	<250	<50	<50	<250	<50

Project ID #: 32-08
Project ID Name: Dolton, IL
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ANALYTICAL RESULTS

Volatile Organics in Soil

EPA Method 8240

Work Order #	39	40	41	04	43	44
Collector's Sample #	VB-1 (20-22)	VB-1 (24-26)	LE-10 (4-6)	LE-10 (18-20)	LE-10 (24-26)	VB-7 (20-22)
Date Sampled	6/6/96	6/6/96	6/6/96	6/6/96	6/6/96	6/6/96
Date Analyzed	6/18/96	6/17/96	6/17/96	6/17/96	6/18/96	6/17/96
Dilution Factor	50	50	10	10	50	10
Analyte	Report Limit µg/Kg	Concentration µg/Kg				
1,1,1,2-Tetrachloroethane	5	<250	<250	<50	<50	<250	<50
1,1,2,2-Tetrachloroethane	5	<250	<250	<50	<50	<250	<50
Tetrachloroethene	5	<250	<250	<50	<50	<250	<50
Toluene	5	<250	<250	<50	<50	<250	<50
1,1,1-Trichloroethane	5	<250	<250	<50	<50	<250	<50
1,1,2-Trichloroethane	5	<250	<250	<50	<50	<250	<50
Trichloroethene	5	<250	<250	<50	<50	<250	<50
1,2,3-Trichloropropane	5	<250	<250	<50	<50	<250	<50
Vinyl Acetate	50	<500	<500	<100	<100	<500	<100
Vinyl Chloride	10	<250	<250	<50	<50	<250	<50
Xylene (Total)	5	<250	<250	<50	<50	<250	<50

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ANALYTICAL RESULTS

Volatile Organics in Soil

EPA Method 8240

Work Order #		45	46	47	48	49	50
Collector's Sample #		VB-7 (24-26)	VB-5 (20-22)	VB-5 (24-26)	LE-8 (4-6)	LE-8 (18-20)	LE-9 (2-4)
Date Sampled		6/6/96	6/7/96	6/7/96	6/7/96	6/7/96	6/7/96
Date Analyzed		6/18/96	6/18/96	6/18/96	6/18/96	6/20/96	6/18/96
Dilution Factor		50	10	50	10	50	1
Analyte	Report Limit µg/Kg	Concentration µg/Kg					
Acetone	100	<500	158	<500	183	<500	<100
Acetonitrile	100	<2500	<500	<2500	<500	<2500	<100
Allyl Chloride	5	<250	<50	<250	<50	<250	<5
Benzene	5	<250	<50	<250	<50	<250	<5
Benzyl Chloride	100	<500	<100	<500	<100	<500	<100
Bromodichloromethane	5	<250	<50	<250	<50	<250	<5
Bromoform	5	<250	<50	<250	<50	<250	<5
Bromomethane	10	<250	<50	<250	<50	<250	<10
2-Butanone	100	<500	<100	<500	<100	<500	<100
Carbon Disulfide	100	<500	<100	<500	<100	<500	<100
Carbon Tetrachloride	5	<250	<50	<250	<50	<250	<5
Chlorobenzene	5	<250	<50	<250	88	<250	<5
Chlorodibromomethane	5	<250	<50	<250	<50	<250	<5
Chloroethane	10	<250	<50	<250	<50	<250	<10
2-Chloroethyl vinyl ether	10	<250	<50	<250	<50	<250	<10
Chloroform	5	<250	<50	<250	<50	<250	<5
Chloromethane	10	<250	<50	<250	<50	<250	<10
1,2-Dibromo-3-chloropropane	100	<500	<100	<500	<100	<500	<100
1,2-Dibromoethane	5	<250	<50	<250	<50	<250	<5
Dibromomethane	5	<250	<50	<250	<50	<250	<5
1,4-Dichloro-2-butene	100	<500	<100	<500	<100	<500	<100
1,2-Dichlorobenzene	5	<250	<50	<250	143	<250	<5

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 6/26/96

ANALYTICAL RESULTS

Volatile Organics in Soil

EPA Method 8240

	Work Order #	45	46	47	48	49	50
	Collector's Sample #	VB-7 (24-26)	VB-5 (20-22)	VB-5 (24-26)	LE-8 (4-6)	LE-8 (18-20)	LE-9 (2-4)
	Date Sampled	6/6/96	6/7/96	6/7/96	6/7/96	6/7/96	6/7/96
	Date Analyzed	6/18/96	6/18/96	6/18/96	6/18/96	6/20/96	6/18/96
	Dilution Factor	50	10	50	10	50	1
Analyte	Report Limit µg/Kg	Concentration µg/Kg					
1,3-Dichlorobenzene	5	<250	<50	<250	**311**	<250	<5
1,4-Dichlorobenzene	5	<250	<50	<250	**1210**	<250	<5
Dichlorodifluoromethane	5	<250	<50	<250	<50	<250	<5
1,1-Dichloroethane	5	<250	<50	<250	<50	<250	<5
1,2-Dichloroethane	5	<250	<50	<250	<50	<250	<5
1,1-Dichloroethene	5	<250	<50	<250	<50	<250	<5
cis-1,2-Dichloroethene	5	<250	<50	<250	<50	<250	<5
trans-1,2-Dichloroethene	5	<250	<50	<250	<50	<250	<5
1,2-Dichloropropane	5	<250	<50	<250	<50	<250	<5
cis-1,3-Dichloropropene	5	<250	<50	<250	<50	<250	<5
trans-1,3-Dichloropropene	5	<250	<50	<250	<50	<250	<5
Ethylbenzene	5	<250	<50	<250	<50	<250	<5
Ethyl methacrylate	5	<250	<50	<250	<50	<250	<5
2-Hexanone	50	<500	<100	<500	<100	<500	<50
Isobutyl Alcohol	1000	<50000	<10000	<50000	<10000	<50000	<1000
Methacrylonitrile	100	<500	<100	<500	<100	<500	<100
Methylene Chloride	5	<250	<50	<250	<50	<250	<5
Methyl Iodide	5	<250	<50	<250	<50	<250	<5
Methyl methacrylate	50	<250	<50	<250	<50	<250	<50
4-Methyl-2-pentanone	50	<500	<50	<500	<50	<500	<50
Pentachloroethane	10	<250	<50	<250	<50	<250	<10
Styrene	5	<250	<50	<250	<50	<250	<5

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 6/26/96

ANALYTICAL RESULTS

Volatile Organics in Soil

EPA Method 8240

Work Order #		45	46	47	48	49	50
Collector's Sample #		VB-7 (24-26)	VB-5 (20-22)	VB-5 (24-26)	LE-8 (4-6)	LE-8 (18-20)	LE-9 (2-4)
Date Sampled		6/6/96	6/7/96	6/7/96	6/7/96	6/7/96	6/7/96
Date Analyzed		6/18/96	6/18/96	6/18/96	6/18/96	6/20/96	6/18/96
Dilution Factor		50	10	50	10	50	1
Analyte	Report Limit µg/Kg	Concentration µg/Kg					
1,1,1,2-Tetrachloroethane	5	<250	<50	<250	<50	<250	<5
1,1,2,2-Tetrachloroethane	5	<250	<50	<250	<50	<250	<5
Tetrachloroethene	5	<250	<50	<250	<50	<250	<5
Toluene	5	<250	<50	<250	<50	<250	<5
1,1,1-Trichloroethane	5	<250	<50	<250	<50	<250	<5
1,1,2-Trichloroethane	5	<250	<50	<250	<50	<250	<5
Trichloroethene	5	<250	<50	<250	<50	<250	<5
1,2,3-Trichloropropane	5	<250	<50	<250	<50	<250	<5
Vinyl Acetate	50	<500	<100	<500	<100	<500	<50
Vinyl Chloride	10	<250	<50	<250	<50	<250	<10
Xylene (Total)	5	<250	<50	<250	<50	<250	<5

Analytical Review / Date: 6/26/96

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 6/26/96

ANALYTICAL RESULTS

Volatile Organics in Soil

EPA Method 8240

Work Order #		51	52	53	54	55
Collector's Sample #		XX-5	LE-9 (18-20)	LE-9 (22-24)	VB-3 (22-24)	VB-8 (24-26)
Date Sampled		6/7/96	6/7/96	6/7/96	6/3/96	6/5/96
Date Analyzed		6/18/96	6/18/96	6/18/96	6/11/96	6/17/96
Dilution Factor		10	10	50	1	10
Analyte	Report Limit µg/Kg	Concentration µg/Kg				
Acetone	100	**115**	**200**	<500	<100	**124**
Acetonitrile	100	<500	<500	<2500	<100	<500
Allyl Chloride	5	<50	<50	<250	<5	<50
Benzene	5	<50	<50	<250	<5	<50
Benzyl Chloride	100	<100	<100	<500	<100	<100
Bromodichloromethane	5	<50	<50	<250	<5	<50
Bromoform	5	<50	<50	<250	<5	<50
Bromomethane	10	<50	<50	<250	<10	<50
2-Butanone	100	<100	<100	<500	<100	<100
Carbon Disulfide	100	<100	<100	<500	<100	<100
Carbon Tetrachloride	5	<50	<50	<250	<5	<50
Chlorobenzene	5	<50	<50	<250	<5	<50
Chlorodibromomethane	5	<50	<50	<250	<5	<50
Chloroethane	10	<50	<50	<250	<10	<50
2-Chloroethyl vinyl ether	10	<50	<50	<250	<10	<50
Chloroform	5	<50	<50	<250	<5	<50
Chloromethane	10	<50	<50	<250	<10	<50
1,2-Dibromo-3-chloropropane	100	<100	<100	<500	<100	<100
1,2-Dibromoethane	5	<50	<50	<250	<5	<50
Dibromomethane	5	<50	<50	<250	<5	<50
1,4-Dichloro-2-butene	100	<100	<100	<500	<100	<100
1,2-Dichlorobenzene	5	<50	<50	<250	<5	<50

ANALYTICAL RESULTS

Volatile Organics in Soil

EPA Method 8240

Work Order #		51	52	53	54	55
Collector's Sample #		XX-5	LE-9 (18-20)	LE-9 (22-24)	VB-3 (22-24)	VB-8 (24-26)
Date Sampled		6/7/96	6/7/96	6/7/96	6/3/96	6/5/96
Date Analyzed		6/18/96	6/18/96	6/18/96	6/11/96	6/17/96
Dilution Factor		10	10	50	1	10
Analyte	Report Limit µg/Kg	Concentration µg/Kg				
1,3-Dichlorobenzene	5	<50	<50	<250	<5	<50
1,4-Dichlorobenzene	5	<50	<50	<250	<5	<50
Dichlorodifluoromethane	5	<50	<50	<250	<5	<50
1,1-Dichloroethane	5	<50	<50	<250	<5	<50
1,2-Dichloroethane	5	<50	<50	<250	<5	<50
1,1-Dichloroethene	5	<50	<50	<250	<5	<50
cis-1,2-Dichloroethene	5	<50	<50	<250	<5	<50
trans-1,2-Dichloroethene	5	<50	<50	<250	<5	<50
1,2-Dichloropropane	5	<50	<50	<250	<5	<50
cis-1,3-Dichloropropene	5	<50	<50	<250	<5	<50
trans-1,3-Dichloropropene	5	<50	<50	<250	<5	<50
Ethylbenzene	5	<50	<50	<250	<5	<50
Ethyl methacrylate	5	<50	<50	<250	<5	<50
2-Hexanone	50	<100	<100	<500	<50	<100
Isobutyl Alcohol	1000	<10000	<10000	<50000	<1000	<10000
Methacrylonitrile	100	<100	<100	<500	<100	<100
Methylene Chloride	5	<50	<50	<250	<5	<50
Methyl Iodide	5	<50	<50	<250	<5	<50
Methyl methacrylate	50	<50	<50	<250	<50	<50
4-Methyl-2-pentanone	50	<50	<50	<500	<50	<50
Pentachloroethane	10	<50	<50	<250	<10	<50
Styrene	5	<50	<50	<250	<5	<50

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 6/26/96

ANALYTICAL RESULTS

Volatile Organics in Soil

EPA Method 8240

	Work Order #	51	52	53	54	55
	Collector's Sample #	XX-5	LE-9 (18-20)	LE-9 (22-24)	VB-3 (22-24)	VB-8 (24-26)
	Date Sampled	6/7/96	6/7/96	6/7/96	6/3/96	6/5/96
	Date Analyzed	6/18/96	6/18/96	6/18/96	6/11/96	6/17/96
	Dilution Factor	10	10	50	1	10
Analyte	Report Limit µg/Kg	Concentration µg/Kg				
1,1,1,2-Tetrachloroethane	5	<50	<50	<250	<5	<50
1,1,2,2-Tetrachloroethane	5	<50	<50	<250	<5	<50
Tetrachloroethene	5	<50	<50	<250	<5	<50
Toluene	5	<50	<50	<250	<5	55
1,1,1-Trichloroethane	5	<50	<50	<250	<5	<50
1,1,2-Trichloroethane	5	<50	<50	<250	<5	<50
Trichloroethene	5	<50	<50	<250	<5	<50
1,2,3-Trichloropropane	5	<50	<50	<250	<5	<50
Vinyl Acetate	50	<100	<100	<500	<50	<100
Vinyl Chloride	10	<50	<50	<250	<10	<50
Xylene (Total)	5	<50	<50	<250	<5	<50

Analytical Review / Date: 6/26/96

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 6/26/96

ANALYTICAL RESULTS

Volatile Organics in Water

EPA Method 8240

Work Order #	56
Collector's Sample #	Trip Blank
Date Sampled	NA
Date Analyzed	6/19/96
Dilution Factor	1

Analyte	Report Limit µg/L	Concentration µg/L
Acetone	100	<100
Acetonitrile	100	<100
Allyl Chloride	5	<5
Benzene	5	<5
Benzyl Chloride	100	<100
Bromodichloromethane	5	<5
Bromoform	5	<5
Bromomethane	10	<10
2-Butanone	100	<100
Carbon Disulfide	100	<100
Carbon Tetrachloride	5	<5
Chlorobenzene	5	<5
Chlorodibromomethane	5	<5
Chloroethane	10	<10
2-Chloroethyl vinyl ether	10	<10
Chloroform	5	<5
Chloromethane	10	<10
1,2-Dibromo-3-chloropropane	100	<100
1,2-Dibromoethane	5	<5
Dibromomethane	5	<5
1,4-Dichloro-2-butene	100	<100
1,2-Dichlorobenzene	5	<5

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 6/26/96

ANALYTICAL RESULTS

Volatile Organics in Water

EPA Method 8240

Work Order #	56
Collector's Sample #	Trip Blank
Date Sampled	NA
Date Analyzed	6/19/96
Dilution Factor	1

Analyte	Report Limit µg/L	Concentration µg/L
1,3-Dichlorobenzene	5	<5
1,4-Dichlorobenzene	5	<5
Dichlorodifluoromethane	5	<5
1,1-Dichloroethane	5	<5
1,2-Dichloroethane	5	<5
1,1-Dichloroethene	5	<5
cis-1,2-Dichloroethene	5	<5
trans-1,2-Dichloroethene	5	<5
1,2-Dichloropropane	5	<5
cis-1,3-Dichloropropene	5	<5
trans-1,3-Dichloropropene	5	<5
Ethylbenzene	5	<5
Ethyl methacrylate	5	<5
2-Hexanone	50	<50
Isobutyl Alcohol	1000	<1000
Methacrylonitrile	100	<100
Methylene Chloride	5	<5
Methyl Iodide	5	<5
Methyl methacrylate	50	<50
4-Methyl-2-pentanone	50	<50
Tetrachloroethane	10	<10
Styrene	5	<5

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 6/26/96

ANALYTICAL RESULTS

Volatile Organics in Water

EPA Method 8240

Work Order #	56
Collector's Sample #	Trip Blank
Date Sampled	NA
Date Analyzed	6/19/96
Dilution Factor	1

Analyte	Report Limit µg/L	Concentration µg/L
1,1,1,2-Tetrachloroethane	5	<5
1,1,2,2-Tetrachloroethane	5	<5
Tetrachloroethene	5	<5
Toluene	5	<5
1,1,1-Trichloroethane	5	<5
1,1,2-Trichloroethane	5	<5
Trichloroethene	5	<5
1,2,3-Trichloropropane	5	<5
Vinyl Acetate	50	<50
Vinyl Chloride	10	<10
Xylene (Total)	5	<5

NA = Not Applicable

Analytical Review / Date: 6/26/96

ANALYTICAL RESULTS

TCLP Metals

			Work Order #	35	36	37	38
			Collector's Sample #	RFI COMP B	RFI COMP C	RFI COMP D	RFI COMP E
			Date Sampled	6/7/96	6/7/96	6/7/96	6/7/96
			Date Leached	6/11/96	6/11/96	6/11/96	6/11/96
			Date Analyzed (EPA Method 6010)	6/14/96	6/14/96	6/14/96	6/14/96
			Date Analyzed (EPA Method 7470)	6/18/96	6/18/96	6/18/96	6/18/96
Analyte	EPA Method	Reg Limit mg/L	PQL mg/L	Concentration mg/L			
Arsenic	6010	5	0.50	<0.50	<0.50	<0.50	<0.50
Barium	6010	100	0.05	0.729	0.66	0.430	0.690
Cadmium	6010	1	0.05	<0.05	<0.05	<0.05	<0.05
Chromium	6010	5	0.05	<0.05	<0.05	<0.05	<0.05
Lead	6010	5	0.40	<0.40	<0.40	<0.40	<0.40
Mercury	7470	0.2	0.0008	<0.0008	<0.0008	<0.0008	<0.0008
Selenium	6010	1	0.60	<0.60	<0.60	<0.60	<0.60
Silver	6010	5	0.05	<0.05	<0.05	<0.05	<0.05

Analytical Review / Date: 6/26/96

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 6/26/96

ANALYTICAL RESULTS

Polychlorinated Biphenyls

EPA Method 8080

Reporting Limit: 1.0

Work Order #	Collector's Sample #	Date Sampled	Date Analyzed	Concentration mg/Kg
39	VB-1 (20-22)	6/6/96	6/17/96	<1.0
40	VB-1 (24-26)	6/6/96	6/17/96	<1.0
41	LE-10 (4-6)	6/6/96	6/17/96	<1.0
42	LE-10 (18-20)	6/6/96	6/17/96	<1.0

Analytical Review / Date: 6/24/96

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 6/26/96

TCLP Volatiles

Matrix:Soil

ANALYTICAL RESULTS

TCLP Volatile Organics

EPA Method 8240

			Work Order #	35	36	37	38
			Collector's Sample #	RFI COMP B	RFI COMP C	RFI COMP D	RFI COMP E
			Date Sampled	6/7/96	6/7/96	6/7/96	6/7/96
			Date Analyzed	6/14/96	6/14/96	6/14/96	6/14/96
			Dilution Factor	1	1	1	1
Analyte	Reg Limit mg/L	PQL mg/L		Concentration mg/L			
Benzene	0.5	0.1		<0.1	<0.1	<0.1	<0.1
Carbon Tetrachloride	0.5	0.1		<0.1	<0.1	<0.1	<0.1
Chlorobenzene	100	0.1		<0.1	<0.1	<0.1	<0.1
Chloroform	6	0.1		<0.1	<0.1	<0.1	<0.1
[illegible]-Dichlorobenzene	7.5	0.1		<0.1	<0.1	<0.1	<0.1
1,2-Dichloroethane	0.5	0.1		<0.1	<0.1	<0.1	<0.1
1,1-Dichloroethylene	0.7	0.1		<0.1	<0.1	<0.1	<0.1
Methyl Ethyl Ketone	200	0.5		<0.5	3.9	<0.5	<0.5
Tetrachloroethylene	0.7	0.1		<0.1	<0.1	<0.1	<0.1
Trichloroethylene	0.5	0.1		<0.1	<0.1	<0.1	<0.1
Vinyl Chloride	0.2	0.14		<0.14	<0.14	<0.14	<0.14

Analytical Review / Date: [signature] 6/26/96

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 6/26/96

TCLP Semi-Volatiles

Matrix:Soil

ANALYTICAL RESULTS

TCLP Base/Neutral/Acids

EPA Method 8270

	Work Order #	35	36	37	38
	Collector's Sample #	RFI COMP B	RFI COMP C	RFI COMP D	RFI COMP E
	Date Sampled	6/7/96	6/7/96	6/7/96	6/7/96
	Date Extracted	6/13/96	6/13/96	6/13/96	6/13/96
	Date Analyzed	6/18/96	6/18/96	6/18/96	6/18/96
	Dilution Factor	1	1	1	1
Analyte	Reg Limit mg/L	PQL mg/L	Concentration mg/L			
2-Methylphenol	200	0.04	<0.04	<0.04	<0.04	<0.04
4-Methylphenol	200	0.04	<0.04	<0.04	<0.04	<0.04
2,4-Dinitrotoluene	0.13	0.04	<0.04	<0.04	<0.04	<0.04
Hexachlorobenzene	0.13	0.04	<0.04	<0.04	<0.04	<0.04
Hexachlorobutadiene	0.5	0.04	<0.04	<0.04	<0.04	<0.04
Hexachloroethane	3	0.09	<0.09	<0.09	<0.09	<0.09
Nitrobenzene	2	0.04	<0.04	<0.04	<0.04	<0.04
Pentachlorophenol	100	0.04	<0.04	<0.04	<0.04	<0.04
Pyridine	5	0.04	<0.04	<0.04	<0.04	<0.04
2,4,5-Trichlorophenol	400	0.04	<0.04	<0.04	<0.04	<0.04
2,4,6-Trichlorophenol	2	0.04	<0.04	<0.04	<0.04	<0.04

Analytical Review / Date: 6/26/96

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 6/26/96

Misc.

Matrix:Soil

ANALYTICAL RESULTS

Miscellaneous

	Work Order #	35	36	37	38
	Collector's Sample #	RFI COMP B	RFI COMP C	RFI COMP D	RFI COMP E
	Date Sampled	6/7/96	6/7/96	6/7/96	6/7/96
Analyte	Method	Date Analyzed	Result			
Ignitability	1020	6/14/96	>142 F	>142 F	>142 F	>142 F
pH	9045	6/11/96	7.85	7.81	7.84	7.84
Cyanide	D5049-90	6/11/96	ND	ND	ND	<5 mg/kg
Sulfide	9030A	6/13/96	88 mg/kg	ND	ND	44 mg/kg
TPH as Mineral Spirits *	8015	6/18/96	17.29 mg/kg	13.39 mg/kg	21.57 mg/kg	<10.72 mg/kg
Paint Filter Test	SK 9905	6/11/96	pass	pass	pass	pass

TPH Extraction date: 6/12/96

ND = None Detected

Analytical Review / Date: 6/26/96

safety-kleen ®
Allan A. Manteuffel Technical Center

October 25, 1996

Mr. Jack Bedessem
TriHydro Corporation
920 Sheridan
Laramie, WY 82070

Re: SK Lab Project #96-136
Project ID Name: Dolton, IL

Dear Jack:

Enclosed please find the QA/QC results for the sample received by SK Environmental Laboratory on 6/96.

Also included in the packet are the 5 gram sample data for the VOA compounds and the matrix spike data.

If you have any questions concerning this analysis, or if we can be of further assistance, please contact Rick Cook at 312-825-7351.

Sincerely,

Mark A. Hartwig
Environmental Lab Manager

P.O. Box 92050
Elk Grove Village, IL
60009-2050

12555 W. Old Higgins Road
Elk Grove Village, IL 60007
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Project ID Name: Dolton
SK Lab Project #: 96-136A
Date Reported: 11/13/96

INITIAL CALIBRATION VERIFICATION CHECK SAMPLE REPORT

Metals in TCLP Leachate

Analyte	Date Analyzed	Expected Result mg/L	Observed Result mg/L	% Recovery	% Acceptability Limits
Barium	6/11/96	5	4.934	98.68	90 - 110
Cadmium	6/11/96	0.5	0.4787	95.74	90 - 110
Lead	6/11/96	5	4.765	95.3	90 - 110
Mercury	6/11/96	0.0025	0.0025	100	90 - 110

METHOD BLANK SUMMARY

Metals in TCLP Leachate

Lab Blank #:	607DBD3010	RBLANK1
Date Digested:	6/7/96	6/11/96
Date Analyzed:	6/11/96	6/11/96
Analyte	**Concentration mg/L**	
Barium	<0.010	N/A
Cadmium	<0.010	N/A
Lead	<0.08	N/A
Mercury	N/A	<0.0002

Review / Date: [signature] 11/13/96

INITIAL CALIBRATION VERIFICATION CHECK SAMPLE REPORT

Metals in TCLP Leachate

Analyte	Date Analyzed	Expected Result mg/L	Observed Result mg/L	% Recovery	% Acceptability Limits
Barium	6/7/96	5	5.032	100.64	90 - 110
Cadmium	6/7/96	0.5	0.4923	98.46	90 - 110
Lead	6/7/96	5	4.956	99.12	90 - 110
Mercury	6/11/96	0.0025	0.0025	100	90 - 110

METHOD BLANK SUMMARY

Metals in TCLP Leachate

Lab Blank #:	606DBD3010	RBLANK1
Date Digested:	6/6/96	6/11/96
Date Analyzed:	6/7/96	6/11/96
Analyte	**Concentration mg/L**	
Barium	<0.010	N/A
Cadmium	<0.010	N/A
Lead	<0.08	N/A
Mercury	N/A	<0.0002

Review / Date: 11/13/96

INITIAL CALIBRATION VERIFICATION CHECK SAMPLE REPORT

Metals in TCLP Leachate

Analyte	Date Analyzed	Expected Result mg/L	Observed Result mg/L	% Recovery	% Acceptability Limits
Barium	6/14/96	5	4.909	98.18	90 - 110
Cadmium	6/14/96	0.5	0.5017	100.34	90 - 110
Lead	6/14/96	5	5.016	100.32	90 - 110
Mercury	6/14/96	0.0025	0.00263	105.2	90 - 110

METHOD BLANK SUMMARY

Metals in TCLP Leachate

Lab Blank #:	613ADB3010	RBLANK1
Date Digested:	6/13/96	6/14/96
Date Analyzed:	6/14/96	6/14/96
Analyte	**Concentration mg/L**	
Barium	<0.010	N/A
Cadmium	<0.010	N/A
Lead	<0.08	N/A
Mercury	N/A	<0.0002

Review / Date: [signature] 11/13/96

INITIAL CALIBRATION VERIFICATION CHECK SAMPLE REPORT

Metals in TCLP Leachate

Analyte	Date Analyzed	Expected Result mg/L	Observed Result mg/L	% Recovery	% Acceptability Limits
Barium	6/14/96	5	4.909	98.18	90 - 110
Cadmium	6/14/96	0.5	0.5017	100.34	90 - 110
Lead	6/14/96	5	5.016	100.32	90 - 110
Mercury	6/18/96	0.0025	0.00269	107.6	90 - 110

METHOD BLANK SUMMARY

Metals in TCLP Leachate

Lab Blank #:	613ADB3010	RBLANK1
Date Digested:	6/13/96	6/18/96
Date Analyzed:	6/14/96	6/18/96
Analyte	**Concentration mg/L**	
Barium	<0.010	N/A
Cadmium	<0.010	N/A
Lead	<0.08	N/A
Mercury	N/A	<0.0002

Review / Date: 11/13/96

INITIAL CALIBRATION VERIFICATION CHECK SAMPLE REPORT

Metals in TCLP Leachate

Analyte	Date Analyzed	Expected Result mg/L	Observed Result mg/L	% Recovery	% Acceptability Limits
Barium	6/17/96	5	4.976	99.52	90 - 110
Cadmium	6/17/96	0.5	0.5003	100.06	90 - 110
Lead	6/17/96	5	4.93	98.6	90 - 110
Mercury	6/18/96	0.0025	0.00269	107.6	90 - 110

METHOD BLANK SUMMARY

Metals in TCLP Leachate

Lab Blank #:	614ADB3010	RBLANK1
Date Digested:	6/14/96	6/18/96
Date Analyzed:	6/17/96	6/18/96
Analyte	**Concentration mg/L**	
Barium	<0.010	N/A
Cadmium	<0.010	N/A
Lead	<0.08	N/A
Mercury	N/A	<0.0002

Review / Date: 11/13/96

LABORATORY CONTROL SAMPLE RESULTS

Metals in TCLP Leachate

% Acceptability Limits: 80 - 120

Lab Control Sample ID LCSE611

Analyte	Date Prepared	Date Analyzed	Expected Result mg/L	Observed Result mg/L	% Recovery
Barium	6/11/96	6/11/96	1	0.9429	94.29
Cadmium	6/11/96	6/11/96	1	0.8439	84.39
Lead	6/11/96	6/11/96	1	0.9069	90.69

Review / Date: 11/13/96

LABORATORY CONTROL SAMPLE RESULTS

Metals in TCLP Leachate

% Acceptability Limits: 80 - 120

Lab Control Sample ID LCSE607

Analyte	Date Prepared	Date Analyzed	Expected Result mg/L	Observed Result mg/L	% Recovery
Barium	6/7/96	6/7/96	1	0.9846	98.46
Cadmium	6/7/96	6/7/96	1	0.8916	89.16
Lead	6/7/96	6/7/96	1	0.9581	95.81

Review / Date: 11/13/96

LABORATORY CONTROL SAMPLE RESULTS

Metals in TCLP Leachate

% Acceptability Limits: 80 - 120

Lab Control Sample ID LCSE614

Analyte	Date Prepared	Date Analyzed	Expected Result mg/L	Observed Result mg/L	% Recovery
Barium	6/14/96	6/14/96	1	0.9598	95.98
Cadmium	6/14/96	6/14/96	1	0.8859	88.59
Lead	6/14/96	6/14/96	1	0.9812	98.12

Review / Date: 11/13/96

LABORATORY CONTROL SAMPLE RESULTS

Metals in TCLP Leachate

% Acceptability Limits: 80 - 120

Lab Control Sample ID LCSE614

Analyte	Date Prepared	Date Analyzed	Expected Result mg/L	Observed Result mg/L	% Recovery
Barium	6/14/96	6/14/96	1	0.9598	95.98
Cadmium	6/14/96	6/14/96	1	0.8859	88.59
Lead	6/14/96	6/14/96	1	0.9812	98.12

Review / Date: [signature] 11/13/96

LABORATORY CONTROL SAMPLE RESULTS

Metals in TCLP Leachate

% Acceptability Limits: 80 - 120

Lab Control Sample ID LCSE614

Analyte	Date Prepared	Date Analyzed	Expected Result mg/L	Observed Result mg/L	% Recovery
Barium	6/17/96	6/17/96	1	0.9344	93.44
Cadmium	6/17/96	6/17/96	1	0.8616	86.16
Lead	6/17/96	6/17/96	1	0.9301	93.01

Review / Date: 11/13/96

Project ID #: 32-08
Project ID Name: Dolton
SK Lab Project #: 96-136A
Date Reported: 11/13/96

MATRIX SPIKE (MS) & MATRIX SPIKE DUPLICATE (MSD) SUMMARY

PERCENT RECOVERY & RELATIVE PERCENT DIFFERENCE (RPD)

Metals in TCLP Leachate

Acceptability Limits %

Work Order #: 9603756 RPD: 20

Collector's Sample #: N/A % Recovery: 80 - 120

Analyte	Spike Added mg/L	Sample Conc. mg/L	MS Conc. mg/L	MSD Conc. mg/L	MS % Recovery	MSD % Recovery
Barium	5.000	0.5335	5.12	5.09	92	91
Cadmium	5.000	<0.050	4.254	4.23	85	85
Lead	5.000	<0.40	4.476	4.445	90	89
Mercury	0.010	<0.0008	0.0098	0.00996	98	100

Review / Date: 11/13/96

Project ID Name: Dolton
SK Lab Project #: 96-136B
Date Reported: 11/13/96

MATRIX SPIKE (MS) & MATRIX SPIKE DUPLICATE (MSD) SUMMARY

PERCENT RECOVERY & RELATIVE PERCENT DIFFERENCE (RPD)

Metals in TCLP Leachate

Acceptability Limits %

Work Order #: 9603702 RPD: 20

Collector's Sample #: N/A % Recovery: 80 - 120

Analyte	Spike Added mg/L	Sample Conc. mg/L	MS Conc. mg/L	MSD Conc. mg/L	MS % Recovery	MSD % Recovery
Barium	5.000	1.028	5.78	5.79	95	95
Cadmium	5.000	<0.050	4.372	4.382	85	85
Lead	5.000	<0.40	4.671	4.676	90	89

Acceptability Limits %

Work Order #: 9603756 RPD: 20

Collector's Sample #: N/A % Recovery: 80 - 120

Analyte	Spike Added mg/L	Sample Conc. mg/L	MS Conc. mg/L	MSD Conc. mg/L	MS % Recovery	MSD % Recovery
Mercury	0.010	<0.0008	0.0098	0.00996	98	100

Review / Date: [signature] 11/13/96

Project ID #: 32-08
Project ID Name: Dolton
SK Lab Project #: 96-136C
Date Reported: 11/13/96

MATRIX SPIKE (MS) & MATRIX SPIKE DUPLICATE (MSD) SUMMARY

PERCENT RECOVERY & RELATIVE PERCENT DIFFERENCE (RPD)

Metals in TCLP Leachate

Acceptability Limits %

Work Order #: 9603852 RPD: 20

Collector's Sample #: N/A % Recovery: 80 - 120

Analyte	Spike Added mg/L	Sample Conc. mg/L	MS Conc. mg/L	MSD Conc. mg/L	MS % Recovery	MSD % Recovery
Barium	5.000	0.661	5.34	5.37	94	94
Cadmium	5.000	<0.050	4.387	4.408	88	88
Lead	5.000	<0.40	4.793	4.767	96	96

Acceptability Limits %

Work Order #: 9603815 RPD: 20

Collector's Sample #: N/A % Recovery: 80 - 120

Analyte	Spike Added mg/L	Sample Conc. mg/L	MS Conc. mg/L	MSD Conc. mg/L	MS % Recovery	MSD % Recovery
Mercury	0.010	<0.00250	0.0107	0.0107	107	107

Review / Date: 11/13/96

MATRIX SPIKE (MS) & MATRIX SPIKE DUPLICATE (MSD) SUMMARY

PERCENT RECOVERY & RELATIVE PERCENT DIFFERENCE (RPD)

Metals in TCLP Leachate

Acceptability Limits %

Work Order #: 9603852 RPD: 20

Collector's Sample #: N/A % Recovery: 80 - 120

Analyte	Spike Added mg/L	Sample Conc. mg/L	MS Conc. mg/L	MSD Conc. mg/L	MS % Recovery	MSD % Recovery
Barium	5.000	0.661	5.34	5.37	94	94
Cadmium	5.000	<0.050	4.387	4.408	88	88
Lead	5.000	<0.40	4.793	4.767	96	96

Acceptability Limits %

Work Order #: 9603815 RPD: 20

Collector's Sample #: N/A % Recovery: 80 - 120

Analyte	Spike Added mg/L	Sample Conc. mg/L	MS Conc. mg/L	MSD Conc. mg/L	MS % Recovery	MSD % Recovery
Mercury	0.010	<0.00250	0.0107	0.0107	107	107

Review / Date: 11/13/96

MATRIX SPIKE (MS) & MATRIX SPIKE DUPLICATE (MSD) SUMMARY

PERCENT RECOVERY & RELATIVE PERCENT DIFFERENCE (RPD)

Metals in TCLP Leachate

Acceptability Limits %

Work Order #: 9603871 RPD: 20

Collector's Sample #: N/A % Recovery: 80 - 120

Analyte	Spike Added mg/L	Sample Conc. mg/L	MS Conc. mg/L	MSD Conc. mg/L	MS % Recovery	MSD % Recovery
Barium	5.000	0.733	5.285	5.41	91	94
Cadmium	5.000	<0.050	4.183	4.301	84	86
Lead	5.000	<0.40	4.793	4.664	92	93

Acceptability Limits %

Work Order #: 9603871 RPD: 20

Collector's Sample #: N/A % Recovery: 80 - 120

Analyte	Spike Added mg/L	Sample Conc. mg/L	MS Conc. mg/L	MSD Conc. mg/L	MS % Recovery	MSD % Recovery
Mercury	0.010	<0.00250	0.0111	0.0111	111	111

Review / Date: [signature] 11/13/96

Project ID Name: Dolton

SK Lab Project #: 96-136E

Date Reported: 11/13/96

MATRIX SPIKE (MS) & MATRIX SPIKE DUPLICATE (MSD) SUMMARY

PERCENT RECOVERY & RELATIVE PERCENT DIFFERENCE (RPD)

Metals in TCLP Leachate

Acceptability Limits %

Work Order #: 9604248 RPD: 20

Collector's Sample #: N/A % Recovery: 80 - 120

Analyte	Spike Added mg/L	Sample Conc. mg/L	MS Conc. mg/L	MSD Conc. mg/L	MS % Recovery	MSD % Recovery
Barium	1.000	<0.01	0.8547	0.862	85	86
Cadmium	0.005	<0.005	0.005	0.00508	100	102
Lead	0.050	<0.050	0.0523	0.0513	95	93

Acceptability Limits %

Work Order #: 9603871 RPD: 20

Collector's Sample #: N/A % Recovery: 80 - 120

Analyte	Spike Added mg/L	Sample Conc. mg/L	MS Conc. mg/L	MSD Conc. mg/L	MS % Recovery	MSD % Recovery
Mercury	0.003	<0.00250	0.00248	0.00255	99	102

Review / Date: 11/13/96

SURROGATE RECOVERY SUMMARY

Volatile Organics in Soil

EPA Method 8240

Work Order #	Collector's Sample #	Percent Recovery			
		S1 (TOL)	S2 (BFB)	S3 (DCE)	TOTAL OUT
01	LE-2 (4-6)	100	99	116	0
02	LE-2 (18-20)	101	98	109	0
03	VB-2 (20-22)	103	98	108	0
04	VB-2 (25-27)	113	83	121	0
05	LE-1 (2-4)	107	94	107	0
06	LE-1 (18-20)	101	98	110	0
07	LE-3 (20-22)	109	92	112	0
08	LE-5 (18-20)	102	98	97	0
09	LE-5 (2-4)	110	87	123	1
10	LE-4 (4-6)	107	90	127	1
11	LE-4 (18-20)	103	96	99	0

	Surrogates		Recovery Limits
S1	TOL	Toluene-d8	81 - 117
S2	BFB	Bromofluorobenzene	74 - 121
S3	DCE	1,2-Dichloroethane-d4	70 - 121

Review / Date: 10/25/96

METHOD BLANK SUMMARY

Volatile Organics in Soil

EPA Method 8240

Lab Blank #	BL060696	BL060796	BL061196
Date Analyzed	6/6/96	6/7/96	6/11/96
Analyte	Concentration µg/Kg		
Acetone	<100	<100	<100
Acetonitrile	<100	<100	<100
Allyl Chloride	<5	<5	<5
Benzene	<5	<5	<5
Benzyl Chloride	<100	<100	<100
Bromodichloromethane	<5	<5	<5
Bromoform	<5	<5	<5
Bromomethane	<10	<10	<10
2-Butanone	<100	<100	<100
Carbon Disulfide	<100	<100	<100
Carbon Tetrachloride	<5	<5	<5
Chlorobenzene	<5	<5	<5
Chlorodibromomethane	<5	<5	<5
Chloroethane	<10	<10	<10
2-Chloroethyl vinyl ether	<10	<10	<10
Chloroform	<5	<5	<5
Chloromethane	<10	<10	<10
1,2-Dibromo-3-chloropro	<100	<100	<100
1,2-Dibromoethane	<5	<5	<5
Dibromomethane	<5	<5	<5
1,4-Dichloro-2-butene	<100	<100	<100
1,2-Dichlorobenzene	<5	<5	<5
1,3-Dichlorobenzene	<5	<5	<5
1,4-Dichlorobenzene	<5	<5	<5

Project ID #: 32-08
Project ID Name: Dolton
SK Lab Project #: 96-136A
Date Reported: 10/25/96

METHOD BLANK SUMMARY

Volatile Organics in Soil

EPA Method 8240

Lab Blank #	BL060696	BL060796	BL061196
Date Analyzed	6/6/96	6/7/96	6/11/96
Analyte	Concentration µg/Kg		
Dichlorodifluoromethane	<5	<5	<5
1,1-Dichloroethane	<5	<5	<5
1,2-Dichloroethane	<5	<5	<5
1,1-Dichloroethene	<5	<5	<5
cis-1,2-Dichloroethene	<5	<5	<5
trans-1,2-Dichloroethene	<5	<5	<5
1,2-Dichloropropane	<5	<5	<5
cis-1,3-Dichloropropene	<5	<5	<5
trans-1,3-Dichloropropen	<5	<5	<5
Ethylbenzene	<5	<5	<5
Ethyl methacrylate	<5	<5	<5
2-Hexanone	<50	<50	<50
Isobutyl Alcohol	<1000	<1000	<1000
Methacrylonitrile	<100	<100	<100
Methylene Chloride	<5	<5	<5
Methyl Iodide	<5	<5	<5
Methyl methacrylate	<50	<50	<50
4-Methyl-2-pentanone	<50	<50	<50
Pentachloroethane	<10	<10	<10
Styrene	<5	<5	<5
1,1,1,2-Tetrachloroethane	<5	<5	<5
1,1,2,2-Tetrachloroethane	<5	<5	<5
Tetrachloroethene	<5	<5	<5
Toluene	<5	<5	<5
1,1,1-Trichloroethane	<5	<5	<5

Project ID #: 32-08
Project ID Name: Dolton
SK Lab Project #: 96-136
Date Reported: 10/25/96

ANALYTICAL RESULTS

Volatile Organics in Soil

EPA Method 8240

Work Order #		19	20	21	22	23	24
Collector's Sample #		VB-6 (20-22)	VB-6 (24-26)	VB-4 (22-24)	VB-4 (26-28)	LE-7 (4-6)	LE-7 (18-20)
Date Sampled		6/4/96	6/4/96	6/4/96	6/4/96	6/5/96	6/5/96
Date Analyzed		6/11/96	6/11/96	6/11/96	6/11/96	6/11/96	6/11/96
Dilution Factor		1	1	1	1	1	1
Analyte	Report Limit ug/kg	Concentration µg/kg					
Methyl Ethyl Ketone	100	<100	<100	<100	<100	<100	<100
Methylene Chloride	5	<5	<5	<5	<5	<5	<5
Tetrachloroethene	5	<5	<5	<5	<5	<5	<5
1,1,2-Trichloroethane	5	<5	<5	<5	<5	<5	<5
Trichloroethene	5	<5	<5	<5	<5	<5	<5
Benzene	5	<5	<5	<5	<5	<5	<5
1,1-Dichloroethene	5	<5	<5	<5	<5	<5	<5
1,2-Dichloropropane	5	<5	<5	<5	<5	<5	<5
1,2-Dichloroethane	5	<5	<5	<5	<5	<5	<5
trans-1,3-Dichloropropene	5	<5	<5	<5	<5	<5	<5
Vinyl Chloride	5	<5	<5	<5	<5	<5	<5

Analytical Review / Date:

Project ID #: 32-08
Project ID Name: Dolton
SK Lab Project #: 96-136
Date Reported: 10/25/96

ANALYTICAL RESULTS

Volatile Organics in Soil

EPA Method 8240

Work Order #		49	51	52	53	55
Collector's Sample #		LE-8 (18-20)	XX-5	LE-9 (18-20)	LE-9 (22-24)	VB-8 (24-26)
Date Sampled		6/7/96	6/7/96	6/7/96	6/7/96	6/5/96
Date Analyzed		6/18/96	6/17/96	6/18/96	6/18/96	6/15/96
Dilution Factor		1	1	1	1	1
Analyte	Report Limit µg/kg	Concentration µg/kg				
Methyl Ethyl Ketone	100	<100	<100	<100	<100	<100
Methylene Chloride	5	<5	<5	<5	<5	<5
Tetrachloroethene	5	<5	<5	<5	<5	<5
1,1,2-Trichloroethane	5	<5	<5	<5	<5	<5
Trichloroethene	5	<5	<5	<5	<5	<5
Benzene	5	<5	<5	<5	<5	<5
1,1-Dichloroethene	5	<5	<5	<5	<5	<5
1,2-Dichloropropane	5	<5	<5	<5	<5	<5
1,2-Dichloroethane	5	<5	<5	<5	<5	<5
trans-1,3-Dichloropropene	5	<5	<5	<5	<5	<5
Vinyl Chloride	5	<5	<5	<5	<5	<5

METHOD BLANK SUMMARY

Volatile Organics in Soil

EPA Method 8240

Lab Blank #	BL060696	BL060796	BL061196
Date Analyzed	6/6/96	6/7/96	6/11/96
Analyte	Concentration µg/Kg		
1,1,2-Trichloroethane	<5	<5	<5
Trichloroethene	<5	<5	<5
1,2,3-Trichloropropane	<5	<5	<5
Vinyl Acetate	<50	<50	<50
Vinyl Chloride	<10	<10	<10
ene (Total)	<5	<5	<5

Review / Date: 10/25/96

MATRIX SPIKE (MS) & MATRIX SPIKE DUPLICATE (MSD) SUMMARY

PERCENT RECOVERY & RELATIVE PERCENT DIFFERENCE (RPD)

Volatile Organics in Soil

EPA Method 8240

Work Order #: 96-136-04

Collector's Sample #: VB-2 (25-27)

Analyte	Spike Added ug/Kg	Sample Conc. ug/Kg	MS Conc. ug/Kg	MSD Conc. ug/Kg	MS % Recover	MSD % Recovery	RPD %	Acceptability Limits % RPD	Acceptability Limits % % Recovery
Benzene	50	<5	49.9	49.2	100	98	1	20	76 - 127
Chlorobenzene	50	<5	48.9	47	98	94	4	20	75 - 110
1,1-Dichloroethylene	50	<5	57.9	53.7	116	107	8	20	61 - 145
Toluene	50	<5	51.3	51.6	103	103	0	20	76 - 125
Trichloroethylene	50	<5	47.8	44.4	96	89	7	20	71 - 120

Work Order #: 96-136-08

Collector's Sample #: LE-5 (18-20)

Analyte	Spike Added mg/Kg	Sample Conc. mg/Kg	MS Conc. mg/Kg	MSD Conc. mg/Kg	MS % Recover	MSD % Recovery	RPD %	Acceptability Limits % RPD	Acceptability Limits % % Recovery
Benzene	50	<5	52	52.3	104	105	1	20	76 - 127
Chlorobenzene	50	<5	51.4	52.9	103	106	3	20	75 - 110
1,1-Dichloroethylene	50	<5	48.6	48.8	97	98	0	20	61 - 145
Toluene	50	<5	52.6	53.9	105	108	2	20	76 - 125
Trichloroethylene	50	<5	52.4	50.8	105	102	3	20	71 - 120

Review / Date: 10/25/96

MATRIX SPIKE (MS) & MATRIX SPIKE DUPLICATE (MSD) SUMMARY

PERCENT RECOVERY & RELATIVE PERCENT DIFFERENCE (RPD)

Volatile Organics in Soil

EPA Method 8240

Work Order #: 9603700

Collector's Sample #: N/A

Analyte	Spike Added ug/Kg	Sample Conc. ug/Kg	MS Conc. ug/Kg	MSD Conc. ug/Kg	MS % Recovery	MSD % Recovery	RPD %	Acceptability Limits % RPD	Acceptability Limits % % Recovery
Benzene	50	<5	51.9	49.9	104	100	4	20	76 - 127
Chlorobenzene	50	<5	53.4	49.5	107	99	8	20	75 - 110
1,1-Dichloroethylene	50	<5	47.8	49.8	96	100	4	20	61 - 145
Toluene	50	<5	65.6	56.6	131	113	15	20	76 - 125
Trichloroethylene	50	<5	50.3	50.6	101	101	0	20	71 - 120

Review / Date: 10/25/96

Project ID Name: Dolton
SK Lab Project #: 96-136C
Date Reported: 11/11/96

SURROGATE RECOVERY SUMMARY

Volatile Organics in Soil

EPA Method 8240

Work Order #	Collector's Sample #	Percent Recovery			
		S1 (TOL)	S2 (BFB)	S3 (DCE)	TOTAL OUT
17	VB-9 (22-24)	92	91	137	1
18	VB-9 (26-28)	99	88	116	0
19	VB-6 (20-22)	102	83	110	0
20	VB-6 (24-26)	91	94	118	0
21	VB-4 (22-24)	92	82	114	0
22	VB-4 (26-28)	97	81	116	0
23	LE-7 (4-6)	106	83	127	1
24	LE-7 (18-20)	102	87	108	0
25	MW-6 (4-6)	89	83	109	0
26	MW-6 (20-22)	101	86	106	0
27	VB-8 (30-32)	105	80	125	1
28	VB-8 (34-36)	92	90	111	0
29	XX-1	106	79	90	0
30	XX-2	108	69	118	1
31	XX-3	102	76	106	0
32	XX-4	111	72	115	1
33*	Trip Blank A	98	100	102	0
34*	Trip Blank B	98	99	102	0

	Surrogates		Recovery Limits
S1	TOL	Toluene-d8	81 - 117
S2	BFB	Bromofluorobenzene	74 - 121
S3	DCE	1,2-Dichloroethane-d4	70 - 121

* Aqueous Samples

Review / Date: 11/13/96

METHOD BLANK SUMMARY

Volatile Organics in Soil

EPA Method 8240

Lab Blank #	2MBL61396	2MBL61496	2MBL61596	5MBL61496
Date Analyzed	6/13/96	6/14/96	6/15/96	6/14/96
Analyte	Concentration µg/Kg			
Acetone	<100	<100	<100	<100
Acetonitrile	<100	<100	<100	<100
Allyl Chloride	<5	<5	<5	<5
Benzene	<5	<5	<5	<5
Benzyl Chloride	<100	<100	<100	<100
modichloromethane	<5	<5	<5	<5
Bromoform	<5	<5	<5	<5
Bromomethane	<10	<10	<10	<10
2-Butanone	<100	<100	<100	<100
Carbon Disulfide	<100	<100	<100	<100
Carbon Tetrachloride	<5	<5	<5	<5
Chlorobenzene	<5	<5	<5	<5
Chlorodibromomethane	<5	<5	<5	<5
Chloroethane	<10	<10	<10	<10
2-Chloroethyl vinyl ether	<10	<10	<10	<10
Chloroform	<5	<5	<5	<5
Chloromethane	<10	<10	<10	<10
1,2-Dibromo-3-chloropro	<100	<100	<100	<100
1,2-Dibromoethane	<5	<5	<5	<5
Dibromomethane	<5	<5	<5	<5
1,4-Dichloro-2-butene	<100	<100	<100	<100
1,2-Dichlorobenzene	<5	<5	<5	<5
1,3-Dichlorobenzene	<5	<5	<5	<5
1,4-Dichlorobenzene	<5	<5	<5	<5
Dichlorodifluoromethane	<5	<5	<5	<5

METHOD BLANK SUMMARY

Volatile Organics in Soil

EPA Method 8240

Lab Blank #	2MBL61396	2MBL61496	2MBL61596	5MBL61496
Date Analyzed	6/13/96	6/14/96	6/15/96	6/14/96
Analyte	Concentration µg/Kg			
1,1-Dichloroethane	<5	<5	<5	<5
1,2-Dichloroethane	<5	<5	<5	<5
1,1-Dichloroethene	<5	<5	<5	<5
cis-1,2-Dichloroethene	<5	<5	<5	<5
trans-1,2-Dichloroethene	<5	<5	<5	<5
1,2-Dichloropropane	<5	<5	<5	<5
cis-1,3-Dichloropropene	<5	<5	<5	<5
trans-1,3-Dichloropropen	<5	<5	<5	<5
Ethylbenzene	<5	<5	<5	<5
Ethyl methacrylate	<5	<5	<5	<5
2-Hexanone	<50	<50	<50	<50
Isobutyl Alcohol	<1000	<1000	<1000	<1000
Methacrylonitrile	<100	<100	<100	<100
Methylene Chloride	<5	<5	<5	<5
Methyl Iodide	<5	<5	<5	<5
Methyl methacrylate	<5	<5	<5	<5
4-Methyl-2-pentanone	<50	<50	<50	<50
Pentachloroethane	<10	<10	<10	<10
Styrene	<5	<5	<5	<5
1,1,1,2-Tetrachloroethane	<5	<5	<5	<5
1,1,2,2-Tetrachloroethane	<5	<5	<5	<5
Tetrachloroethene	<5	<5	<5	<5
Toluene	<5	<5	<5	<5

METHOD BLANK SUMMARY

Volatile Organics in Soil

EPA Method 8240

Lab Blank #	2MBL61396	2MBL61496	2MBL61596	5MBL61496
Date Analyzed	6/13/96	6/14/96	6/15/96	6/14/96
Analyte	Concentration µg/Kg			
1,1,1-Trichloroethane	<5	<5	<5	<5
1,1,2-Trichloroethane	<5	<5	<5	<5
Trichloroethene	<5	<5	<5	<5
1,2,3-Trichloropropane	<5	<5	<5	<5
Vinyl Acetate	<50	<50	<50	<50
yl Chloride	<10	<10	<10	<10
Xylene (Total)	<5	<5	<5	<5

MATRIX SPIKE (MS) & MATRIX SPIKE DUPLICATE (MSD) SUMMARY

PERCENT RECOVERY & RELATIVE PERCENT DIFFERENCE (RPD)

Volatile Organics in Soil

EPA Method 8240

Work Order #: 96-136-28

Collector's Sample #: VB-8 (34-36)

Analyte	Spike Added ug/Kg	Sample Conc. ug/Kg	MS Conc. ug/Kg	MSD Conc. ug/Kg	MS % Recover	MSD % Recovery	RPD %	Acceptability Limits % RPD	Acceptability Limits % Recovery
Benzene	50	<5	49	49.6	98	99	1	20	76 - 127
Chlorobenzene	50	<5	46.4	47	93	94	1	20	75 - 110
1,1-Dichloroethylene	50	<5	41.6	43.5	83	87	4	20	61 - 145
Toluene	50	<5	47.7	47.4	95	95	1	20	76 - 125
Trichloroethylene	50	<5	51.9	56.5	104	113	8	20	71 - 120

Work Order #: 96-136-26

Collector's Sample #: MW-6 (20-22)

Analyte	Spike Added ug/Kg	Sample Conc. ug/Kg	MS Conc. ug/Kg	MSD Conc. ug/Kg	MS % Recover	MSD % Recovery	RPD %	Acceptability Limits % RPD	Acceptability Limits % Recovery
Benzene	50	<5	53.2	53.1	106	106	0	20	76 - 127
Chlorobenzene	50	<5	49.6	48.3	99	97	3	20	75 - 110
1,1-Dichloroethylene	50	<5	55.2	61.2	110	122	10	20	61 - 145
Toluene	50	<5	60.5	53	121	106	13	20	76 - 125
Trichloroethylene	50	<5	46.4	47	93	94	1	20	71 - 120

Review / Date: _____

MATRIX SPIKE (MS) & MATRIX SPIKE DUPLICATE (MSD) SUMMARY

PERCENT RECOVERY & RELATIVE PERCENT DIFFERENCE (RPD)

Volatile Organics in Soil

EPA Method 8240

Work Order #: 96-136-32

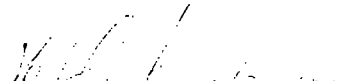
Collector's Sample #: XX-4

Analyte	Spike Added ug/Kg	Sample Conc. ug/Kg	MS Conc. ug/Kg	MSD Conc. ug/Kg	MS % Recover	MSD % Recovery	RPD %	Acceptability Limits % RPD	Acceptability Limits % % Recovery
Benzene	50	<5	53.4	52.1	107	104	2	20	76 - 127
Chlorobenzene	50	<5	47	48.4	94	97	3	20	75 - 110
1,1-Dichloroethylene	50	<5	46.9	51.5	94	103	9	20	61 - 145
Toluene	50	<5	52.2	54.4	104	109	4	20	76 - 125
Trichloroethylene	50	<5	47.9	49.8	96	100	4	20	71 - 120

Work Order #: 9603824

Collector's Sample #: N/A

Analyte	Spike Added ug/Kg	Sample Conc. ug/Kg	MS Conc. ug/Kg	MSD Conc. ug/Kg	MS % Recover	MSD % Recovery	RPD %	Acceptability Limits % RPD	Acceptability Limits % % Recovery
Benzene	50	<5	50.1	50.2	100	100	0	20	76 - 127
Chlorobenzene	50	<5	50.3	48.1	101	96	4	20	75 - 110
1,1-Dichloroethylene	50	<5	52.4	53.8	105	108	3	20	61 - 145
Toluene	50	<5	50.3	48	101	96	5	20	76 - 125
Trichloroethylene	50	<5	50.2	50.2	100	100	0	20	71 - 120

Review / Date: 

SURROGATE RECOVERY SUMMARY

Volatile Organics in Soil

EPA Method 8240

Work Order #	Collector's Sample #	Percent Recovery			
		S1 (TOL)	S2 (BFB)	S3 (DCE)	TOTAL OUT
39	VB-1 (20-22)	113	89	112	0
40	VB-1 (24-26)	110	84	103	0
41	LE-10 (4-6)	111	91	126	1
42	LE-10 (18-20)	108	89	116	0
43	LE-10 (24-26)	101	74	112	0
44	VB-7 (20-22)	108	91	112	0
45	VB-7 (24-26)	95	71	114	1
46	VB-5 (20-22)	119	82	117	0
47	VB-5 (24-26)	91	80	126	1
48	LE-8 (4-6)	115	85	123	1
49	LE-8 (18-20)	92	91	99	0
50	LE-9 (2-4)	117	85	113	0
51	XX-5	107	94	98	0
52	LE-9 (18-20)	117	84	120	0
53	LE-9 (22-24)	88	81	140	1
54	VB-3 (22-24)	107	88	124	1
55	VB-8 (24-26)	105	94	104	0
56*	Trip Blank	103	94	91	0

* Aqueous Sample

Surrogate Limits	Recovery Limits
Toluene-d8	81 - 117
Bromofluorobenzene	74 - 121
1,2-Dichloroethane-d4	70 - 121

Review / Date: 11/13/96

Project ID #: 32-08
Project ID Name: Dolton
SK Lab Project #: 96-136D
Date Reported: 10/25/96

METHOD BLANK SUMMARY

Volatile Organics in Soil

EPA Method 8240

Lab Blank #	2MBL61896	2MBL62096	5MBL61196	5MBL61796	5MBL61896	5MBL61996
Date Analyzed	6/18/96	6/20/96	6/11/96	6/17/96	6/18/96	6/19/96
Analyte	Concentration µg/Kg					
Acetone	<100	<100	<100	<100	<100	<100
Acetonitrile	<100	<100	<100	<100	<100	<100
Allyl Chloride	<5	<5	<5	<5	<5	<5
Benzene	<5	<5	<5	<5	<5	<5
Benzyl Chloride	<100	<100	<100	<100	<100	<100
Bromodichloromethane	<5	<5	<5	<5	<5	<5
Bromoform	<5	<5	<5	<5	<5	<5
Bromomethane	<10	<10	<10	<10	<10	<10
2-Butanone	<100	<100	<100	<100	<100	<100
Carbon Disulfide	<100	<100	<100	<100	<100	<100
Carbon Tetrachloride	<5	<5	<5	<5	<5	<5
Chlorobenzene	<5	<5	<5	<5	<5	<5
Chlorodibromomethane	<5	<5	<5	<5	<5	<5
Chloroethane	<10	<10	<10	<10	<10	<10
2-Chloroethyl vinyl ether	<10	<10	<10	<10	<10	<10
Chloroform	<5	<5	<5	<5	<5	<5
Chloromethane	<10	<10	<10	<10	<10	<10
1,2-Dibromo-3-chloropropan	<100	<100	<100	<100	<100	<100
1,2-Dibromoethane	<5	<5	<5	<5	<5	<5
Dibromomethane	<5	<5	<5	<5	<5	<5
1,4-Dichloro-2-butene	<100	<100	<100	<100	<100	<100
1,2-Dichlorobenzene	<5	<5	<5	<5	<5	<5
1,3-Dichlorobenzene	<5	<5	<5	<5	<5	<5
1,4-Dichlorobenzene	<5	<5	<5	<5	<5	<5
Dichlorodifluoromethane	<5	<5	<5	<5	<5	<5

METHOD BLANK SUMMARY

Volatile Organics in Soil

EPA Method 8240

Lab Blank #	2MBL61896	2MBL62096	5MBL61196	5MBL61796	5MBL61896	5MBL61996
Date Analyzed	6/18/96	6/20/96	6/11/96	6/17/96	6/18/96	6/19/96
Analyte	Concentration µg/Kg					
1,1-Dichloroethane	<5	<5	<5	<5	<5	<5
1,2-Dichloroethane	<5	<5	<5	<5	<5	<5
1,1-Dichloroethene	<5	<5	<5	<5	<5	<5
cis-1,2-Dichloroethene	<5	<5	<5	<5	<5	<5
trans-1,2-Dichloroethene	<5	<5	<5	<5	<5	<5
1,2-Dichloropropane	<5	<5	<5	<5	<5	<5
cis-1,3-Dichloropropene	<5	<5	<5	<5	<5	<5
trans-1,3-Dichloropropene	<5	<5	<5	<5	<5	<5
Ethylbenzene	<5	<5	<5	<5	<5	<5
Ethyl methacrylate	<5	<5	<5	<5	<5	<5
2-Hexanone	<50	<50	<50	<50	<50	<50
Isobutyl Alcohol	<1000	<1000	<1000	<1000	<1000	<1000
Methacrylonitrile	<100	<100	<100	<100	<100	<100
Methylene Chloride	<5	<5	<5	<5	<5	<5
Methyl Iodide	<5	<5	<5	<5	<5	<5
Methyl methacrylate	<5	<5	<5	<5	<5	<5
4-Methyl-2-pentanone	<50	<50	<50	<50	<50	<50
Pentachloroethane	<10	<10	<10	<10	<10	<10
Styrene	<5	<5	<5	<5	<5	<5
1,1,1,2-Tetrachloroethane	<5	<5	<5	<5	<5	<5
1,1,2,2-Tetrachloroethane	<5	<5	<5	<5	<5	<5
Tetrachloroethene	<5	<5	<5	<5	<5	<5
Toluene	<5	<5	<5	<5	<5	<5

METHOD BLANK SUMMARY

Volatile Organics in Soil

EPA Method 8240

Lab Blank #	2MBL61896	2MBL62096	5MBL61196	5MBL61796	5MBL61896	5MBL61996
Date Analyzed	6/18/96	6/20/96	6/11/96	6/17/96	6/18/96	6/19/96
Analyte	Concentration µg/Kg					
1,1,1-Trichloroethane	<5	<5	<5	<5	<5	<5
1,1,2-Trichloroethane	<5	<5	<5	<5	<5	<5
Trichloroethene	<5	<5	<5	<5	<5	<5
1,2,3-Trichloropropane	<5	<5	<5	<5	<5	<5
Vinyl Acetate	<50	<50	<50	<50	<50	<50
Vinyl Chloride	<10	<10	<10	<10	<10	<10
Xylene (Total)	<5	<5	<5	<5	<5	<5

MATRIX SPIKE (MS) & MATRIX SPIKE DUPLICATE (MSD) SUMMARY

PERCENT RECOVERY & RELATIVE PERCENT DIFFERENCE (RPD)

Volatile Organics in Soil

EPA Method 8240

Work Order #: 96-136-43

Collector's Sample #: LE-10 (24-26)

Analyte	Spike Added ug/Kg	Sample Conc. ug/Kg	MS Conc. ug/Kg	MSD Conc. ug/Kg	MS % Recover	MSD % Recovery	RPD %	Acceptability Limits % RPD	Acceptability Limits % Recovery
Benzene	50	<5	48	48.9	96	98	2	20	76 - 127
Chlorobenzene	50	<5	46.1	42.8	92	86	7	20	75 - 110
1,1-Dichloroethylene	50	<5	46.8	47.3	94	95	1	20	61 - 145
Toluene	50	<5	47	42.7	94	85	10	20	76 - 125
Trichloroethylene	50	<5	47.8	48	96	96	0	20	71 - 120

Work Order #: 96-136-49

Collector's Sample #: LE-8 (18-20)

Analyte	Spike Added ug/Kg	Sample Conc. ug/Kg	MS Conc. ug/Kg	MSD Conc. ug/Kg	MS % Recover	MSD % Recovery	RPD %	Acceptability Limits % RPD	Acceptability Limits % Recovery
Benzene	50	<5	48	50.3	96	101	5	20	76 - 127
Chlorobenzene	50	<5	45.5	46.6	91	93	2	20	75 - 110
1,1-Dichloroethylene	50	<5	40.6	47.1	81	94	15	20	61 - 145
Toluene	50	<5	44.4	44.1	89	88	1	20	76 - 125
Trichloroethylene	50	<5	49.2	52	98	104	6	20	71 - 120

Review / Date:

MATRIX SPIKE (MS) & MATRIX SPIKE DUPLICATE (MSD) SUMMARY

PERCENT RECOVERY & RELATIVE PERCENT DIFFERENCE (RPD)

Volatile Organics in Soil

EPA Method 8240

Work Order #: 9603677

Collector's Sample #: N/A

Analyte	Spike Added ug/Kg	Sample Conc. ug/Kg	MS Conc. ug/Kg	MSD Conc. ug/Kg	MS % Recover	MSD % Recovery	RPD %	Acceptability Limits % RPD	Acceptability Limits % % Recovery
Benzene	50	<5	52	52.3	104	105	1	20	76 - 127
Chlorobenzene	50	<5	51.4	52.9	103	106	3	20	75 - 110
1,1-Dichloroethylene	50	<5	48.6	48.8	97	98	0	20	61 - 145
Toluene	50	<5	52.6	53.9	105	108	2	20	76 - 125
Trichloroethylene	50	<5	52.4	50.8	105	102	3	20	71 - 120

Work Order #: 96-136-40

Collector's Sample #: VB-1 (24-26)

Analyte	Spike Added ug/Kg	Sample Conc. ug/Kg	MS Conc. ug/Kg	MSD Conc. ug/Kg	MS % Recover	MSD % Recovery	RPD %	Acceptability Limits % RPD	Acceptability Limits % % Recovery
Benzene	50	<5	55.4	52.8	111	106	5	20	76 - 127
Chlorobenzene	50	<5	53.4	48.3	107	97	10	20	75 - 110
1,1-Dichloroethylene	50	<5	53	58.4	106	117	10	20	61 - 145
Toluene	50	<5	62.3	51.9	125	104	18	20	76 - 125
Trichloroethylene	50	<5	47.7	46.2	95	92	3	20	71 - 120

Review / Date: _____

MATRIX SPIKE (MS) & MATRIX SPIKE DUPLICATE (MSD) SUMMARY

PERCENT RECOVERY & RELATIVE PERCENT DIFFERENCE (RPD)

Volatile Organics in Soil

EPA Method 8240

Work Order #: 96-136-39

Collector's Sample #: VB-1 (20-22)

Analyte	Spike Added ug/Kg	Sample Conc. ug/Kg	MS Conc. ug/Kg	MSD Conc. ug/Kg	MS % Recover.	MSD % Recovery	RPD %	Acceptability Limits % RPD	Acceptability Limits % % Recovery
Benzene	50	<5	54.8	57.3	110	115	4	20	76 - 127
Chlorobenzene	50	<5	50.3	50.5	101	101	0	20	75 - 110
1,1-Dichloroethylene	50	<5	48.1	47.9	96	96	0	20	61 - 145
Toluene	50	<5	53.5	56.6	107	113	6	20	76 - 125
Trichloroethylene	50	<5	48.3	46	97	92	5	20	71 - 120

Work Order #: 9603896

Collector's Sample #: NA

Analyte	Spike Added ug/Kg	Sample Conc. ug/Kg	MS Conc. ug/Kg	MSD Conc. ug/Kg	MS % Recover.	MSD % Recovery	RPD %	Acceptability Limits % RPD	Acceptability Limits % % Recovery
Benzene	50	<5	51.2	53.9	102	108	5	20	76 - 127
Chlorobenzene	50	<5	45.4	46.7	91	93	3	20	75 - 110
1,1-Dichloroethylene	50	<5	55.7	66.2	111	132	17	20	61 - 145
Toluene	50	<5	46.8	48.4	94	97	3	20	76 - 125
Trichloroethylene	50	<5	*	*	*	*	*	20	71 - 120

* Sample Interference.

Review / Date:

Project ID #: 32-08
Project ID Name: Dolton
SK Lab Project #: 96-136
Date Reported: 10/25/96

ANALYTICAL RESULTS

Volatile Organics in Soil

EPA Method 8240

Work Order #		01	02	03	04	06	08
Collector's Sample #		LE-2 (4-6)	LE-2 (18-20)	VB-2 (20-22)	VB-2 (25-27)	LE-1 (18-20)	LE-5 (18-20)
Date Sampled		5/30/96	5/30/96	5/30/96	5/30/96	5/30/96	5/31/96
Date Analyzed		6/6/96	6/6/96	6/6/96	6/6/96	6/6/96	6/7/96
Dilution Factor		1	1	1	1	1	1
Analyte	Report Limit µg/kg	Concentration µg/kg					
Methyl Ethyl Ketone	100	<100	<100	<100	<100	<100	<100
Methylene Chloride	5	<5	<5	<5	<5	<5	<5
Tetrachloroethene	5	<5	<5	<5	<5	<5	<5
1,1,2-Trichloroethane	5	<5	<5	<5	<5	<5	<5
Trichloroethene	5	<5	<5	<5	<5	<5	<5
Benzene	5	<5	<5	<5	<5	<5	<5
1,1-Dichloroethene	5	<5	<5	<5	<5	<5	<5
1,2-Dichloropropane	5	<5	<5	<5	<5	<5	<5
1,2-Dichloroethane	5	<5	<5	<5	<5	<5	<5
trans-1,3-Dichloropropene	5	<5	<5	<5	<5	<5	<5
Vinyl Chloride	5	<5	<5	<5	<5	<5	<5

Project ID #: 32-08
Project ID Name: Dolton
SK Lab Project #: 96-136
Date Reported: 10/25/96

ANALYTICAL RESULTS

Volatile Organics in Soil

EPA Method 8240

Work Order #		09	11	14	15	17	18
Collector's Sample #		LE-5 (2-4)	LE-4 (18-20)	VB-3 (32-34)	VB-3 (34-36)	VB-9 (22-24)	VB-9 (26-28)
Date Sampled		5/31/96	5/31/96	6/3/96	6/3/96	6/4/96	6/4/96
Date Analyzed		6/7/96	6/7/96	6/5/96	6/5/96	6/11/96	6/11/96
Dilution Factor		1	1	1	1	1	1
Analyte	Report Limit ug/kg	Concentration µg/kg					
Methyl Ethyl Ketone	100	**107**	<100	<100	<100	<100	<100
Methylene Chloride	5	<5	<5	<5	<5	<5	<5
Tetrachloroethene	5	<5	<5	<5	<5	<5	<5
1,1,2-Trichloroethane	5	<5	<5	<5	<5	<5	<5
Trichloroethene	5	<5	<5	<5	<5	<5	<5
Benzene	5	<5	<5	<5	<5	<5	<5
1,1-Dichloroethene	5	<5	<5	<5	<5	<5	<5
1,2-Dichloropropane	5	<5	<5	<5	<5	<5	<5
1,2-Dichloroethane	5	<5	<5	<5	<5	<5	<5
trans-1,3-Dichloropropene	5	<5	<5	<5	<5	<5	<5
Vinyl Chloride	5	<5	<5	<5	<5	<5	<5

Project ID #: 32-08
Project ID Name: Dolton
SK Lab Project #: 96-136
Date Reported: 10/25/96

ANALYTICAL RESULTS

Volatile Organics in Soil

EPA Method 8240

Work Order #		31	32	39	40	41	42
Collector's Sample #		XX-3	XX-4	VB-1 (20-22)	VB-1 (24-26)	LE-10 (4-6)	LE-10 (18-20)
Date Sampled		6/5/96	6/5/96	6/6/96	6/6/96	6/6/96	6/6/96
Date Analyzed		6/14/96	6/14/96	6/15/96	6/17/96	6/15/96	6/15/96
Dilution Factor		1	1	1	1	1	1
Analyte	Report Limit µg/kg	Concentration µg/kg					
Methyl Ethyl Ketone	100	<100	<100	<100	<100	<100	<100
Methylene Chloride	5	<5	<5	<5	<5	<5	<5
Tetrachloroethene	5	<5	<5	<5	**32.2**	<5	<5
1,1,2-Trichloroethane	5	<5	<5	<5	<5	<5	<5
Trichloroethene	5	<5	<5	<5	<5	<5	<5
Benzene	5	<5	<5	<5	<5	**20.8**	<5
1,1-Dichloroethene	5	<5	<5	<5	<5	<5	<5
1,2-Dichloropropane	5	<5	<5	<5	<5	<5	<5
1,2-Dichloroethane	5	<5	<5	<5	<5	<5	<5
trans-1,3-Dichloropropene	5	<5	<5	<5	<5	<5	<5
Vinyl Chloride	5	<5	<5	<5	<5	<5	<5

Project ID #: 32-08
Project ID Name: Dolton
SK Lab Project #: 96-136
Date Reported: 10/25/96

ANALYTICAL RESULTS

Volatile Organics in Soil

EPA Method 8240

Work Order #	43	44	45	46	47	48
Collector's Sample #	LE-10 (24-26	VB-7 (20-22	VB-7 (24-26)	VB-5 (20-22)	VB-5 (24-26)	LE-8 (4-6)
Date Sampled	6/6/96	6/6/96	6/6/96	6/7/96	6/7/96	6/7/96
Date Analyzed	6/15/96	6/15/96	6/15/96	6/18/96	6/15/96	6/18/96
Dilution Factor	1	1	1	1	1	1
Analyte	Report Limit ug/kg	Concentration µg/kg					
Methyl Ethyl Ketone	100	<100	<100	<100	<100	<100	<100
Methylene Chloride	5	<5	<5	<5	<5	**17**	<5
Tetrachloroethene	5	<5	<5	<5	<5	<5	<5
1,1,2-Trichloroethane	5	<5	<5	<5	<5	<5	<5
Trichloroethene	5	<5	<5	<5	<5	<5	<5
Benzene	5	<5	<5	<5	<5	**9.8**	<5
1,1-Dichloroethene	5	<5	<5	<5	<5	<5	<5
1,2-Dichloropropane	5	<5	<5	<5	<5	<5	<5
1,2-Dichloroethane	5	<5	<5	<5	<5	<5	<5
trans-1,3-Dichloropropene	5	<5	<5	<5	<5	<5	<5
Vinyl Chloride	5	<5	<5	<5	<5	<5	<5

Analytical Review / Date: 10/25/96

Project ID #: 32-08
Project ID Name: Dolton
SK Lab Project #: 96-136A
Date Reported: 11/13/96

MATRIX SPIKE (MS) & MATRIX SPIKE DUPLICATE (MSD) SUMMARY

PERCENT RECOVERY & RELATIVE PERCENT DIFFERENCE (RPD)

Volatile Organics in Soil

EPA Method 8240

Work Order #: 96-136-43

Collector's Sample #: LE-10 (24-26)

Analyte	Spike Added mg/Kg	Sample Conc.	MS Conc. mg/Kg	MS % Recovery	Acceptability Limits % % Recovery
Methyl Ethyl Ketone	5	<5	ND	ND	76 - 127
Methylene Chloride	5	<5	30	600	75 - 110
Tetrachloroethene	5	<5	12	240	61 - 145
1,1,2-Trichloroethane	5	<5	9	180	76 - 125
Trichloroethene	5	<5	3.9	78	71 - 120
Benzene	5	<5	8.3	166	71 - 120
1,1-Dichloroethene	5	<5	10	200	71 - 120
1,2-Dichloropropane	5	<5	8.7	174	71 - 120
1,2-Dichloroethane	5	<5	7.7	154	71 - 120
trans-1,3-Dichloropropene	5	<5	5.1	102	71 - 120
Vinyl Chloride	5	<5	9.5	190	71 - 120

Review / Date: [signature] 11/13/96

MATRIX SPIKE (MS) & MATRIX SPIKE DUPLICATE (MSD) SUMMARY

PERCENT RECOVERY & RELATIVE PERCENT DIFFERENCE (RPD)

Volatile Organics in Soil

EPA Method 8240

Work Order #: 96-136-52

Collector's Sample #: LE-9 (18-20)

Analyte	Spike Added mg/Kg	Sample Conc.	MS Conc. mg/Kg	MS % Recovery	Acceptability Limits % % Recovery
Methyl Ethyl Ketone	5	<5	ND	ND	76 - 127
Methylene Chloride	5	<5	19.3	386	75 - 110
Tetrachloroethene	5	<5	8.99	180	61 - 145
1,1,2-Trichloroethane	5	<5	4.42	88	76 - 125
Trichloroethene	5	<5	4.17	83	71 - 120
Benzene	5	<5	8.08	162	71 - 120
1,1-Dichloroethene	5	<5	8.63	173	71 - 120
1,2-Dichloropropane	5	<5	5.99	120	71 - 120
1,2-Dichloroethane	5	<5	8.02	160	71 - 120
trans-1,3-Dichloropropene	5	<5	3.28	66	71 - 120
Vinyl Chloride	5	<5	10.2	204	71 - 120

Project ID #: 32-08
Project ID Name: Dolton
SK Lab Project #: 96-136A
Date Reported: 11/13/96

MATRIX SPIKE (MS) & MATRIX SPIKE DUPLICATE (MSD) SUMMARY

PERCENT RECOVERY & RELATIVE PERCENT DIFFERENCE (RPD)

Volatile Organics in Soil

EPA Method 8240

Work Order #: 96-136-39

Collector's Sample #: VB-1 (20-22)

Analyte	Spike Added mg/Kg	Sample Conc.	MS Conc. mg/Kg	MS % Recovery	Acceptability Limits % % Recovery
Methyl Ethyl Ketone	50	<5	50	100	76 - 127
Methylene Chloride	50	<5	ND	ND	75 - 110
Tetrachloroethene	50	<5	48.9	98	61 - 145
1,1,2-Trichloroethane	50	<5	50.3	101	76 - 125
Trichloroethene	50	<5	48.3	97	71 - 120
Benzene	50	<5	54.8	110	71 - 120
1,1-Dichloroethene	50	<5	48.1	96	71 - 120
1,2-Dichloropropane	50	<5	51.4	103	71 - 120
1,2-Dichloroethane	50	<5	51.7	103	71 - 120
trans-1,3-Dichloropropene	50	<5	48.3	97	71 - 120
Vinyl Chloride	50	<5	49	98	71 - 120

Review / Date: 11/13/96

Project ID #: 32-08
Project ID Name: Dolton
SK Lab Project #: 96-136A
Date Reported: 10/25/96

METHOD BLANK SUMMARY

Semi-Volatile Organics in Soil

EPA Method 8240

Lab Blank #	8SBL0605	8SBL0607
Date Extracted	6/5/96	6/7/96
Date Analyzed	6/6/96	6/13/96
Analyte	Concentration µg/Kg	
Acenaphthene	<660	<660
Acenaphthylene	<660	<660
Anthracene	<660	<660
Benz(a)anthracene	<660	<660
Benzo(b)fluoranthene	<660	<660
Benzo(k)fluoranthene	<660	<660
Benzoic Acid	<3300	<3300
Benzo(g,h,i)perylene	<660	<660
Benzo(a)pyrene	<660	<660
Benzyl Alcohol	<1300	<1300
bis(2-Chloroethoxy)Methan	<660	<660
bis(2-Chloroethyl)Ether	<1850	<1850
bis(2-Chloroisopropyl)Ether	<1600	<1600
4-Bromophenyl-phenylether	<660	<660
Butylbenzylphthalate	<660	<660
4-Chloroaniline	<1300	<1300
4-Chloro-3-Methylphenol	<1300	<1300
2-Chloronaphthalene	<1100	<1100
2-Chlorophenol	<660	<660
4-Chlorophenyl-phenylether	<660	<660
Chrysene	<660	<660
Dibenz(a,h)anthracene	<660	<660
Dibenzofuran	<660	<660

METHOD BLANK SUMMARY

Semi-Volatile Organics in Soil

EPA Method 8240

Lab Blank #	8SBL0605	8SBL0607
Date Extracted	6/5/96	6/7/96
Date Analyzed	6/6/96	6/13/96
Analyte	Concentration µg/Kg	
1,2-Dichlorobenzene	<660	<660
1,3-Dichlorobenzene	<660	<660
1,4-Dichlorobenzene	<660	<660
3,3'-Dichlorobenzidine	<1300	<1300
Dichlorophenol	<660	<660
Diethylphthalate	<660	<660
2,4-Dimethylphenol	<660	<660
Dimethylphthalate	<660	<660
4,6-Dinitro-2-Methylphenol	<3300	<3300
2,4-Dinitrophenol	<3300	<3300
2,4-Dinitrotoluene	<660	<660
2,6-Dinitrotoluene	<850	<850
Di-n-octyl phthalate	<660	<660
bis(2-ethylhexyl)phthalate	<11200	<11200
Fluoranthene	<660	<660
Fluorene	<660	<660
Hexachlorobenzene	<660	<660
Hexachlorobutadiene	<660	<660
Hexachlorocyclopentadien	<660	<660
Hexachloroethane	<660	<660
Indeno(1,2,3-cd)pyrene	<660	<660

METHOD BLANK SUMMARY

Semi-Volatile Organics in Soil

EPA Method 8240

Lab Blank #	8SBL0605	8SBL0607
Date Extracted	6/5/96	6/7/96
Date Analyzed	6/6/96	6/13/96
Analyte	Concentration µg/Kg	
Isophorone	<660	<660
2-Methylnaphthalene	<660	<660
2-Methylphenol	<660	<660
4-Methylphenol	<660	<660
Naphthalene	<660	<660
2-Nitroaniline	<3300	<3300
3-Nitroaniline	<3300	<3300
Nitrobenzene	<660	<660
2-Nitrophenol	<1350	<1350
4-Nitrophenol	<3300	<3300
N-Nitrosodiphenylamine	<660	<660
N-Nitroso-di-n-propylamine	<900	<900
Pentachlorophenol	<3300	<3300
Phenanthrene	<660	<660
Phenol	<660	<660
Pyrene	<660	<660
Pyridine	<2050	<2050
1,2,4-Trichlorobenzene	<660	<660
2,4,5-Trichlorophenol	<660	<660
2,4,6-Trichlorophenol	<660	<660

Review / Date: 10/25/96

SURROGATE RECOVERY SUMMARY

Semi-Volatile Organics in Soil

EPA Method 8270

Work Order #	Collector's Sample #	Percent Recovery					
		S1 (2FP)	S2 (PHL)	S3 (NB)	S4 (2FBP)	S5 (246TBP)	TOTAL OUT
01	LE-2 (4-6)	51	66	53	64	96	0
02	LE-2 (18-20)	56	69	56	70	96	0
03	VB-2 (20-22)	62	81	54	68	77	0
04	VB-2 (25-27)	56	81	62	76	28	1
05	LE-1 (2-4)	49	57	49	59	72	0
06	LE-1 (18-20)	63	79	63	72	78	0
07	LE-3 (20-22)	53	70	56	66	76	0
08	LE-5 (18-20)	53	65	50	64	75	0
09	LE-5 (2-4)	51	67	47	61	86	0
10	LE-4 (4-6)	72	88	63	73	96	0
11	LE-4 (18-20)	58	72	62	70	82	0

Surrogates			Recovery Limits
S1	2FP	2-Fluorophenol	16-108
S2	PHL	Phenol-d6	13-121
S3	NB	Nitrobenzene-d5	27-112
S4	2FBP	2-Fluorobiphenyl	34-118
S5	246TBP	2,4,6-Tribromophenol	32-123

Review / Date: 11/13/96

Project ID Name: Dolton
SK Lab Project #: 96-136A
Date Reported: 11/11/96

METHOD BLANK SUMMARY

Semi-Volatile Organics in Soil

EPA Method 8270

Lab Blank #	8SBL0605	8SBL0607
Date Extracted	6/5/96	6/7/96
Date Analyzed	6/6/96	6/13/96
Analyte	Concentration µg/Kg	
Acenaphthene	<660	<660
Acenaphthylene	<660	<660
Anthracene	<660	<660
Benz(a)anthracene	<660	<660
Benzo(b)fluoranthene	<660	<660
Benzo(k)fluoranthene	<660	<660
Benzoic Acid	<3300	<3300
Benzo(g,h,i)perylene	<660	<660
Benzo(a)pyrene	<660	<660
Benzyl Alcohol	<1300	<1300
bis(2-Chloroethoxy)Methan	<660	<660
bis(2-Chloroethyl)Ether	<1850	<1850
bis(2-Chloroisopropyl)Ether	<1600	<1600
4-Bromophenyl-phenylether	<660	<660
Butylbenzylphthalate	<660	<660
4-Chloroaniline	<1300	<1300
4-Chloro-3-Methylphenol	<1300	<1300
2-Chloronaphthalene	<1100	<1100
2-Chlorophenol	<660	<660
4-Chlorophenyl-phenylether	<660	<660
Chrysene	<660	<660
Dibenz(a,h)anthracene	<660	<660
Dibenzofuran	<660	<660

Project ID #: 32-08
Project ID Name: Dolton
SK Lab Project #: 96-136A
Date Reported: 11/11/96

METHOD BLANK SUMMARY

Semi-Volatile Organics in Soil

EPA Method 8270

Lab Blank #	8SBL0605	8SBL0607
Date Extracted	6/5/96	6/7/96
Date Analyzed	6/6/96	6/13/96
Analyte	Concentration µg/Kg	
1,2-Dichlorobenzene	<660	<660
1,3-Dichlorobenzene	<660	<660
1,4-Dichlorobenzene	<660	<660
3,3'-Dichlorobenzidine	<1300	<1300
2,4-Dichlorophenol	<660	<660
Diethylphthalate	<660	<660
2,4-Dimethylphenol	<660	<660
Dimethylphthalate	<660	<660
4,6-Dinitro-2-Methylphenol	<3300	<3300
2,4-Dinitrophenol	<3300	<3300
2,4-Dinitrotoluene	<660	<660
2,6-Dinitrotoluene	<850	<850
Di-n-octyl phthalate	<660	<660
bis(2-ethylhexyl)phthalate	<11200	<11200
Fluoranthene	<660	<660
Fluorene	<660	<660
Hexachlorobenzene	<660	<660
Hexachlorobutadiene	<660	<660
Hexachlorocyclopentadien	<660	<660
Hexachloroethane	<660	<660
eno(1,2,3-cd)pyrene	<660	<660

Project ID #: 32-08
Project ID Name: Dolton
SK Lab Project #: 96-136A
Date Reported: 11/11/96

METHOD BLANK SUMMARY

Semi-Volatile Organics in Soil

EPA Method 8270

Lab Blank #	8SBL0605	8SBL0607
Date Extracted	6/5/96	6/7/96
Date Analyzed	6/6/96	6/13/96
Analyte	Concentration µg/Kg	
Isophorone	<660	<660
2-Methylnaphthalene	<660	<660
2-Methylphenol	<660	<660
4-Methylphenol	<660	<660
Naphthalene	<660	<660
2-Nitroaniline	<3300	<3300
3-Nitroaniline	<3300	<3300
Nitrobenzene	<660	<660
2-Nitrophenol	<1350	<1350
4-Nitrophenol	<3300	<3300
N-Nitrosodiphenylamine	<660	<660
N-Nitroso-di-n-propylamine	<900	<900
Pentachlorophenol	<3300	<3300
Phenanthrene	<660	<660
Phenol	<660	<660
Pyrene	<660	<660
Pyridine	<2050	<2050
1,2,4-Trichlorobenzene	<660	<660
2,4,5-Trichlorophenol	<660	<660
2,4,6-Trichlorophenol	<660	<660

Review / Date: 11/13/96

SURROGATE RECOVERY SUMMARY

Semi-Volatile Organics in Soil

EPA Method 8270

Work Order #	Collector's Sample #	Percent Recovery					
		S1 (2FP)	S2 (PHL)	S3 (NB)	S4 (2FBP)	S5 (246TBP)	TOTAL OUT
12	LE-6 (4-6)	66	78	67	74	92	0
13	LE-6 (18-20)	60	69	64	73	90	0
14	VB-3 (32-34)	42	55	44	60	80	0
15	VB-3 (34-36)	70	81	69	76	87	0
16	VB-3 (36-38)	47	67	68	69	90	0

Surrogates			Recovery Limits
S1	2FP	2-Fluorophenol	16-108
S2	PHL	Phenol-d6	13-121
S3	NB	Nitrobenzene-d5	27-112
S4	2FBP	2-Fluorobiphenyl	34-118
S5	246TBP	2,4,6-Tribromophenol	32-123

Review / Date: 10/25/96

METHOD BLANK SUMMARY

Semi-Volatile Organics in Soil

EPA Method 8270

Lab Blank #	8SBL0607
Date Analyzed	6/13/96
Analyte	Concentration µg/Kg
Acenaphthene	<660
Acenaphthylene	<660
Anthracene	<660
Benz(a)anthracene	<660
Benzo(b)fluoranthene	<660
Benzo(k)fluoranthene	<660
Benzoic Acid	<3300
Benzo(g,h,i)perylene	<660
Benzo(a)pyrene	<660
Benzyl Alcohol	<1300
bis(2-Chloroethoxy)Methane	<660
bis(2-Chloroethyl)Ether	<1850
bis(2-Chloroisopropyl)Ether	<1600
4-Bromophenyl-phenylether	<660
Butylbenzylphthalate	<660
4-Chloroaniline	<1300
4-Chloro-3-Methylphenol	<1300
2-Chloronaphthalene	<1100
2-Chlorophenol	<660
4-Chlorophenyl-phenylether	<660
Chrysene	<660
Dibenz(a,h)anthracene	<660
Dibenzofuran	<660
1,2-Dichlorobenzene	<660

METHOD BLANK SUMMARY

Semi-Volatile Organics in Soil

EPA Method 8270

Lab Blank #	8SBL0607
Date Analyzed	6/13/96
Analyte	Concentration µg/Kg
1,3-Dichlorobenzene	<660
1,4-Dichlorobenzene	<660
3,3'-Dichlorobenzidine	<1300
2,4-Dichlorophenol	<660
Diethylphthalate	<660
2,4-Dimethylphenol	<660
Dimethylphthalate	<660
4,6-Dinitro-2-Methylphenol	<3300
2,4-Dinitrophenol	<3300
2,4-Dinitrotoluene	<660
2,6-Dinitrotoluene	<850
Di-n-octyl phthalate	<660
bis(2-ethylhexyl)phthalate	<11200
Fluoranthene	<660
Fluorene	<660
Hexachlorobenzene	<660
Hexachlorobutadiene	<660
Hexachlorocyclopentadiene	<660
Hexachloroethane	<660
Indeno(1,2,3-cd)pyrene	<660
Isophorone	<660
2-Methylnaphthalene	<660
2-Methylphenol	<660
4-Methylphenol	<660

METHOD BLANK SUMMARY

Semi-Volatile Organics in Soil

EPA Method 8270

Lab Blank #	8SBL0607
Date Analyzed	6/13/96
Analyte	Concentration µg/Kg
Naphthalene	<660
2-Nitroaniline	<3300
3-Nitroaniline	<3300
Nitrobenzene	<660
2-Nitrophenol	<1350
4-Nitrophenol	<3300
N-Nitrosodiphenylamine	<660
N-Nitroso-di-n-propylamine	<900
Pentachlorophenol	<3300
Phenanthrene	<660
Phenol	<660
Pyrene	<660
Pyridine	<2050
1,2,4-Trichlorobenzene	<660
2,4,5-Trichlorophenol	<660
2,4,6-Trichlorophenol	<660

SURROGATE RECOVERY SUMMARY

Volatile Organics in Soil

EPA Method 8240

Work Order #	Collector's Sample #	Percent Recovery			
		S1 (TOL)	S2 (BFB)	S3 (DCE)	TOTAL OUT
12	LE-6 (4-6)	109	90	115	0
13	LE-6 (18-20)	106	93	105	0
14	VB-3 (32-34)	119	84	107	0
15	VB-3 (34-36)	112	92	102	0
16	VB-3 (36-38)	109	80	101	0

	Surrogates		Recovery Limits
S1	TOL	Toluene-d8	81 - 117
S2	BFB	Bromofluorobenzene	74 - 121
S3	DCE	1,2-Dichloroethane-d4	70 - 121

Review / Date: _____

METHOD BLANK SUMMARY

Volatile Organics in Soil

EPA Method 8240

Lab Blank #	BL60596	2BL60696	BL60696
Date Analyzed	6/5/96	6/6/96	6/6/96
Analyte	Concentration µg/Kg		
Acetone	<100	<100	<100
Acetonitrile	<100	<100	<100
Allyl Chloride	<5	<5	<5
Benzene	<5	<5	<5
Benzyl Chloride	<100	<100	<100
Bromodichloromethane	<5	<5	<5
Bromoform	<5	<5	<5
Bromomethane	<10	<10	<10
2-Butanone	<100	<100	<100
Carbon Disulfide	<100	<100	<100
Carbon Tetrachloride	<5	<5	<5
Chlorobenzene	<5	<5	<5
Chlorodibromomethane	<5	<5	<5
Chloroethane	<10	<10	<10
2-Chloroethyl vinyl ether	<10	<10	<10
Chloroform	<5	<5	<5
Chloromethane	<10	<10	<10
1,2-Dibromo-3-chloropropan	<100	<100	<100
1,2-Dibromoethane	<5	<5	<5
Dibromomethane	<5	<5	<5
1,4-Dichloro-2-butene	<100	<100	<100
1,2-Dichlorobenzene	<5	<5	<5
1,3-Dichlorobenzene	<5	<5	<5
1,4-Dichlorobenzene	<5	<5	<5

Project ID #: 32-08
Project ID Name: Dolton
SK Lab Project #: 96-136B
Date Reported: 10/25/96

METHOD BLANK SUMMARY

Volatile Organics in Soil

EPA Method 8240

Lab Blank #	BL60596	2BL60696	BL60696
Date Analyzed	6/5/96	6/6/96	6/6/96
Analyte	Concentration ug/Kg		
Dichlorodifluoromethane	<5	<5	<5
1,1-Dichloroethane	<5	<5	<5
1,2-Dichloroethane	<5	<5	<5
1,1-Dichloroethene	<5	<5	<5
cis-1,2-Dichloroethene	<5	<5	<5
trans-1,2-Dichloroethene	<5	<5	<5
1,2-Dichloropropane	<5	<5	<5
cis-1,3-Dichloropropene	<5	<5	<5
trans-1,3-Dichloropropene	<5	<5	<5
Ethylbenzene	<5	<5	<5
Ethyl methacrylate	<5	<5	<5
2-Hexanone	<50	<50	<50
Isobutyl Alcohol	<1000	<1000	<1000
Methacrylonitrile	<100	<100	<100
Methylene Chloride	<5	<5	<5
Methyl Iodide	<5	<5	<5
Methyl methacrylate	<50	<50	<50
4-Methyl-2-pentanone	<50	<50	<50
Pentachloroethane	<10	<10	<10
Styrene	<5	<5	<5
1,1,1,2-Tetrachloroethane	<5	<5	<5
1,1,2,2-Tetrachloroethane	<5	<5	<5
Tetrachloroethene	<5	<5	<5

METHOD BLANK SUMMARY

Volatile Organics in Soil

EPA Method 8240

Lab Blank #	BL60596	2BL60696	BL60696
Date Analyzed	6/5/96	6/6/96	6/6/96
Analyte	Concentration µg/Kg		
Toluene	<5	<5	<5
1,1,1-Trichloroethane	<5	<5	<5
1,1,2-Trichloroethane	<5	<5	<5
Trichloroethene	<5	<5	<5
1,2,3-Trichloropropane	<5	<5	<5
Vinyl Acetate	<50	<50	<50
Vinyl Chloride	<10	<10	<10
Xylene (Total)	<5	<5	<5

Review / Date: 10/25/96

roject ID Name: Dolton

SK Lab Project #: 96-136C

te Reported: 10/25/96

SURROGATE RECOVERY SUMMARY

Semi-Volatile Organics in Soil

EPA Method 8270

Work Order #	Collector's Sample #	Percent Recovery					
		S1 (2FP)	S2 (PHL)	S3 (NB)	S4 (2FBP)	S5 (246TBP)	TOTAL OUT
17	VB-9 (22-24)	66	80	67	73	68	0
18	VB-9 (26-28)	79	87	76	87	66	0
19	VB-6 (20-22)	58	65	74	85	77	0
20	VB-6 (24-26)	63	77	63	74	63	0
21	VB-4 (22-24)	62	74	63	71	71	0
22	VB-4 (26-28)	59	72	70	79	60	0
23	LE-7 (4-6)	67	81	68	87	84	0
24	LE-7 (18-20)	54	66	62	77	74	0
25	MW-6 (4-6)	55	69	57	76	83	0
26	MW-6 (20-22)	65	82	81	88	55	0
27	VB-8 (30-32)	64	78	71	81	64	0
28	VB-8 (34-36)	66	80	72	77	73	0
29	XX-1	58	76	63	77	60	0
30	XX-2	58	73	65	85	51	0
31	XX-3	46	62	48	69	61	0
32	XX-4	52	70	61	84	53	0

Surrogates			Recovery Limits
S1	2FP	2-Fluorophenol	16-108
S2	PHL	Phenol-d6	13-121
S3	NB	Nitrobenzene-d5	27-112
S4	2FBP	2-Fluorobiphenyl	34-118
S5	246TBP	2,4,6-Tribromophenol	32-123

Review / Date: [signature] 10/25/96

METHOD BLANK SUMMARY

Semi-Volatile Organics in Soil

EPA Method 8270

Lab Blank #	8SBL0613	8SBL0615	8SBL0620
Date Extracted	6/13/15	6/15/96	6/20/96
Date Analyzed	6/15/96	6/17/96	6/21/96
Analyte	Concentration µg/Kg		
Acenaphthene	<660	<660	<660
Acenaphthylene	<660	<660	<660
Anthracene	<660	<660	<660
Benz(a)anthracene	<660	<660	<660
Benzo(b)fluoranthene	<660	<660	<660
Benzo(k)fluoranthene	<660	<660	<660
Benzoic Acid	<3300	<3300	<3300
Benzo(g,h,i)perylene	<660	<660	<660
Benzo(a)pyrene	<660	<660	<660
Benzyl Alcohol	<1300	<1300	<1300
bis(2-Chloroethoxy)Methane	<660	<660	<660
bis(2-Chloroethyl)Ether	<1850	<1850	<1850
bis(2-Chloroisopropyl)Ether	<1600	<1600	<1600
4-Bromophenyl-phenylether	<660	<660	<660
Butylbenzylphthalate	<660	<660	<660
4-Chloroaniline	<1300	<1300	<1300
4-Chloro-3-Methylphenol	<1300	<1300	<1300
2-Chloronaphthalene	<1100	<1100	<1100
2-Chlorophenol	<660	<660	<660
4-Chlorophenyl-phenylether	<660	<660	<660
Chrysene	<660	<660	<660
Dibenz(a,h)anthracene	<660	<660	<660
Dibenzofuran	<660	<660	<660

METHOD BLANK SUMMARY

Semi-Volatile Organics in Soil

EPA Method 8270

Lab Blank #	8SBL0613	8SBL0615	8SBL0620
Date Extracted	6/13/15	6/15/96	6/20/96
Date Analyzed	6/15/96	6/17/96	6/21/96
Analyte	Concentration µg/Kg		
1,2-Dichlorobenzene	<660	<660	<660
1,3-Dichlorobenzene	<660	<660	<660
1,4-Dichlorobenzene	<660	<660	<660
3,3'-Dichlorobenzidine	<1300	<1300	<1300
[redacted]Dichlorophenol	<660	<660	<660
Diethylphthalate	<660	<660	<660
2,4-Dimethylphenol	<660	<660	<660
Dimethylphthalate	<660	<660	<660
4,6-Dinitro-2-Methylphenol	<3300	<3300	<3300
2,4-Dinitrophenol	<3300	<3300	<3300
2,4-Dinitrotoluene	<660	<660	<660
2,6-Dinitrotoluene	<850	<850	<850
Di-n-octyl phthalate	<660	<660	<660
bis(2-ethylhexyl)phthalate	<11200	<11200	<11200
Fluoranthene	<660	<660	<660
Fluorene	<660	<660	<660
Hexachlorobenzene	<660	<660	<660
Hexachlorobutadiene	<660	<660	<660
Hexachlorocyclopentadiene	<660	<660	<660
Hexachloroethane	<660	<660	<660
[redacted]eno(1,2,3-cd)pyrene	<660	<660	<660

Project ID #: 32-08
Project ID Name: Dolton
SK Lab Project #: 96-136C
Date Reported: 10/25/96

METHOD BLANK SUMMARY

Semi-Volatile Organics in Soil

EPA Method 8270

Lab Blank #	8SBL0613	8SBL0615	8SBL0620
Date Extracted	6/13/15	6/15/96	6/20/96
Date Analyzed	6/15/96	6/17/96	6/21/96
Analyte	Concentration µg/Kg		
Isophorone	<660	<660	<660
2-Methylnaphthalene	<660	<660	<660
2-Methylphenol	<660	<660	<660
4-Methylphenol	<660	<660	<660
Naphthalene	<660	<660	<660
2-Nitroaniline	<3300	<3300	<3300
3-Nitroaniline	<3300	<3300	<3300
Nitrobenzene	<660	<660	<660
2-Nitrophenol	<1350	<1350	<1350
4-Nitrophenol	<3300	<3300	<3300
N-Nitrosodiphenylamine	<660	<660	<660
N-Nitroso-di-n-propylamine	<900	<900	<900
Pentachlorophenol	<3300	<3300	<3300
Phenanthrene	<660	<660	<660
Phenol	<660	<660	<660
Pyrene	<660	<660	<660
Pyridine	<2050	<2050	<2050
1,2,4-Trichlorobenzene	<660	<660	<660
2,4,5-Trichlorophenol	<660	<660	<660
2,4,6-Trichlorophenol	<660	<660	<660

Review / Date:

SURROGATE RECOVERY SUMMARY

Semi-Volatile Organics in Soil

EPA Method 8270

Work Order #	Collector's Sample #	Percent Recovery					
		S1 (2FP)	S2 (PHL)	S3 (NB)	S4 (2FBP)	S5 (246TBP)	TOTAL OUT
39	VB-1 (20-22)	56	66	58	65	59	0
40	VB-1 (24-26)	54	72	38	90	36	0
41	LE-10 (4-6)	58	72	56	66	86	0
42	LE-10 (18-20)	67	80	54	60	69	0
43	LE-10 (24-26)	65	84	68	79	37	0
44	VB-7 (20-22)	53	65	65	81	69	0
45	VB-7 (24-26)	55	76	71	90	36	0
46	VB-5 (20-22)	56	68	72	80	55	0
47	VB-5 (24-26)	57	69	57	71	62	0
48	LE-8 (4-6)	56	73	68	90	89	0
49	LE-8 (18-20)	65	77	59	65	66	0
50	LE-9 (2-4)	63	76	64	71	82	0
51	XX-5	59	77	71	81	43	0
52	LE-9 (18-20)	58	72	62	68	47	0
53	LE-9 (22-24)	47	51	49	70	72	0
54	VB-3 (22-24)	58	73	60	69	65	0
55	VB-8 (24-26)	70	87	81	89	46	0

Surrogates			Recovery Limits
S1	2FP	2-Fluorophenol	16-108
S2	PHL	Phenol-d6	13-121
S3	NB	Nitrobenzene-d5	27-112
S4	2FBP	2-Fluorobiphenyl	34-118
S5	246TBP	2,4,6-Tribromophenol	32-123

Review / Date:

METHOD BLANK SUMMARY

Semi-Volatile Organics in Soil

EPA Method 8270

Lab Blank #	8SBL0611	8SBL0613	8SBL0620
Date Extracted	6/11/96	6/13/96	6/20/96
Date Analyzed	6/13/96	6/15/96	6/21/96
Analyte	Concentration ug/Kg		
Acenaphthene	<660	<660	<660
Acenaphthylene	<660	<660	<660
Anthracene	<660	<660	<660
Benz(a)anthracene	<660	<660	<660
Benzo(b)fluoranthene	<660	<660	<660
Benzo(k)fluoranthene	<660	<660	<660
Benzoic Acid	<3300	<3300	<3300
Benzo(g,h,i)perylene	<660	<660	<660
Benzo(a)pyrene	<660	<660	<660
Benzyl Alcohol	<1300	<1300	<1300
bis(2-Chloroethoxy)Methan	<660	<660	<660
bis(2-Chloroethyl)Ether	<1850	<1850	<1850
bis(2-Chloroisopropyl)Ether	<1600	<1600	<1600
4-Bromophenyl-phenylethe	<660	<660	<660
Butylbenzylphthalate	<660	<660	<660
4-Chloroaniline	<1300	<1300	<1300
4-Chloro-3-Methylphenol	<1300	<1300	<1300
2-Chloronaphthalene	<1100	<1100	<1100
2-Chlorophenol	<660	<660	<660
4-Chlorophenyl-phenylethe	<660	<660	<660
Chrysene	<660	<660	<660
Dibenz(a,h)anthracene	<660	<660	<660
Dibenzofuran	<660	<660	<660

Project ID #: 32-08
Project ID Name: Dolton
SK Lab Project #: 96-136D
Date Reported: 10/25/96

METHOD BLANK SUMMARY

Semi-Volatile Organics in Soil

EPA Method 8270

Lab Blank #	8SBL0611	8SBL0613	8SBL0620
Date Extracted	6/11/96	6/13/96	6/20/96
Date Analyzed	6/13/96	6/15/96	6/21/96
Analyte	Concentration µg/Kg		
1,2-Dichlorobenzene	<660	<660	<660
1,3-Dichlorobenzene	<660	<660	<660
1,4-Dichlorobenzene	<660	<660	<660
3,3'-Dichlorobenzidine	<1300	<1300	<1300
Dichlorophenol	<660	<660	<660
Diethylphthalate	<660	<660	<660
2,4-Dimethylphenol	<660	<660	<660
Dimethylphthalate	<660	<660	<660
4,6-Dinitro-2-Methylphenol	<3300	<3300	<3300
2,4-Dinitrophenol	<3300	<3300	<3300
2,4-Dinitrotoluene	<660	<660	<660
2,6-Dinitrotoluene	<850	<850	<850
Di-n-octyl phthalate	<660	<660	<660
bis(2-ethylhexyl)phthalate	<11200	<11200	<11200
Fluoranthene	<660	<660	<660
Fluorene	<660	<660	<660
Hexachlorobenzene	<660	<660	<660
Hexachlorobutadiene	<660	<660	<660
Hexachlorocyclopentadien	<660	<660	<660
Hexachloroethane	<660	<660	<660
eno(1,2,3-cd)pyrene	<660	<660	<660

Project ID #: 32-08
Project ID Name: Dolton
SK Lab Project #: 96-136D
Date Reported: 10/25/96

METHOD BLANK SUMMARY

Semi-Volatile Organics in Soil

EPA Method 8270

Lab Blank #	8SBL0611	8SBL0613	8SBL0620
Date Extracted	6/11/96	6/13/96	6/20/96
Date Analyzed	6/13/96	6/15/96	6/21/96
Analyte	Concentration µg/Kg		
Isophorone	<660	<660	<660
2-Methylnaphthalene	<660	<660	<660
2-Methylphenol	<660	<660	<660
4-Methylphenol	<660	<660	<660
Naphthalene	<660	<660	<660
2-Nitroaniline	<3300	<3300	<3300
3-Nitroaniline	<3300	<3300	<3300
Nitrobenzene	<660	<660	<660
2-Nitrophenol	<1350	<1350	<1350
4-Nitrophenol	<3300	<3300	<3300
N-Nitrosodiphenylamine	<660	<660	<660
N-Nitroso-di-n-propylamine	<900	<900	<900
Pentachlorophenol	<3300	<3300	<3300
Phenanthrene	<660	<660	<660
Phenol	<660	<660	<660
Pyrene	<660	<660	<660
Pyridine	<2050	<2050	<2050
1,2,4-Trichlorobenzene	<660	<660	<660
2,4,5-Trichlorophenol	<660	<660	<660
2,4,6-Trichlorophenol	<660	<660	<660

Review / Date:

MATRIX SPIKE (MS) & MATRIX SPIKE DUPLICATE (MSD) SUMMARY

PERCENT RECOVERY & RELATIVE PERCENT DIFFERENCE (RPD)

Semi-Volatile Organics in Soil

EPA Method 8270

Work Order #: 96-136-53

Collector's Sample # LE-9 (22-24)

Analyte	Spike Added mg/Kg	Sample Conc. mg/Kg	MS Conc. mg/Kg	MSD Conc. mg/Kg	MS % Recovery	MSD % Recovery	RPD %	Acceptability Limits %	
								RPD	% Recovery
1,2,4-Trichlorobenzene	8	<0.660	3.85	3.02	48	38	23	40	34-107
Acenaphthene	8	<0.660	5.08	3.85	64	48	29	40	44-120
2,4-Dinitrotoluene	8	<0.660	4.86	3.66	61	46	28	40	39-123
Pyrene	8	<0.660	5.9	4.1	74	51	37	40	33-119
1,4-Dichlorobenzene	8	<0.660	3.19	2.42	40	30	29	40	33-110
Phenol	8	<0.660	4.12	3.14	51	39	27	40	32-115
2-Chlorophenol	8	<0.660	3.95	2.85	49	36	31	40	34-118
4-Chloro-3-Methylphenol	8	<1.300	4.95	3.68	62	46	30	40	46-132
Pentachlorophenol	8	<3.300	3.56	2.52	44	31	35	40	19-151
N-Nitrosodi-N-propylamin	8	<0.900	3.73	3.16	47	39	19	40	47-124
4-Nitrophenol	8	<3.300	5.32	3.67	66	46	36	40	13-111

Review / Date: W.L. Cook 11/13/96

MATRIX SPIKE (MS) & MATRIX SPIKE DUPLICATE (MSD) SUMMARY

PERCENT RECOVERY & RELATIVE PERCENT DIFFERENCE (RPD)

Semi-Volatile Organics in Soil

EPA Method 8270

Work Order #: 96-136-53

Collector's Sample # LE-9 (22-24)

Analyte	Spike Added mg/Kg	Sample Conc. mg/Kg	MS Conc. mg/Kg	MSD Conc. mg/Kg	MS % Recovery	MSD % Recovery	RPD %	Acceptability Limits %	
								RPD	% Recovery
1,2,4-Trichlorobenzene	8	<0.660	4.71	3.16	59	40	38	40	34-107
Acenaphthene	8	<0.660	5.54	4.17	69	52	28	40	44-120
2,4-Dinitrotoluene	8	<0.660	5.18	4.21	65	53	20	40	39-123
Pyrene	8	<0.660	6.35	4.92	79	62	24	40	33-119
1,4-Dichlorobenzene	8	<0.660	4.12	3.09	52	39	29	40	33-110
Phenol	8	<0.660	4.9	3.64	61	46	28	40	32-115
2-Chlorophenol	8	<0.660	5.13	3.3	64	41	44	40	34-118
4-Chloro-3-Methylphenol	8	<1.300	5.79	4.03	72	50	36	40	46-132
Pentachlorophenol	8	<3.300	1.78	1.62	22	20	10	40	19-151
N-Nitrosodi-N-propylamin	8	<0.900	5.35	3.81	67	48	33	40	47-124
4-Nitrophenol	8	<3.300	3.58	2.77	45	35	25	40	13-111

Review / Date: [signature] 11/13/96

MATRIX SPIKE (MS) & MATRIX SPIKE DUPLICATE (MSD) SUMMARY

PERCENT RECOVERY & RELATIVE PERCENT DIFFERENCE (RPD)

Semi-Volatile Organics in Soil

EPA Method 8270

Work Order #: 96-136-53

Collector's Sample # LE-9 (22-24)

Analyte	Spike Added mg/Kg	Sample Conc. mg/Kg	MS Conc. mg/Kg	MSD Conc. mg/Kg	MS % Recovery	MSD % Recovery	RPD %	Acceptability Limits % RPD	Acceptability Limits % % Recovery
1,2,4-Trichlorobenzene	8	<0.660	5.52	5.8	69	72	4	40	34-107
Acenaphthene	8	<0.660	6.29	6.52	79	82	4	40	44-120
2,4-Dinitrotoluene	8	<0.660	5.62	5.8	70	73	4	40	39-123
Pyrene	8	<0.660	6.64	6.73	83	84	1	40	33-119
1,4-Dichlorobenzene	8	<0.660	5.31	5.44	66	68	3	40	33-110
Phenol	8	<0.660	6.05	6.18	76	77	2	40	32-115
2-Chlorophenol	8	<0.660	5.87	6.3	73	79	8	40	34-118
4-Chloro-3-Methylphenol	8	<1.300	6.63	6.75	83	84	1	40	46-132
Pentachlorophenol	8	<3.300	0.8	1.08	10	13	26	40	19-151
N-Nitrosodi-N-propylamin	8	<0.900	5.88	6.06	74	76	3	40	47-124
4-Nitrophenol	8	<3.300	3.75	4.53	47	57	19	40	13-111

Review / Date: 11/13/96

Project ID #: 32-08
Project ID Name: Dolton
SK Lab Project #: 96-136C
Date Reported: 11/13/96

MATRIX SPIKE (MS) & MATRIX SPIKE DUPLICATE (MSD) SUMMARY

PERCENT RECOVERY & RELATIVE PERCENT DIFFERENCE (RPD)

Semi-Volatile Organics in Soil

EPA Method 8270

Work Order #: 96-136-19

Collector's Sample #: VB-6 (20-22)

Analyte	Spike Added mg/Kg	Sample Conc. mg/Kg	MS Conc. mg/Kg	MSD Conc. mg/Kg	MS % Recovery	MSD % Recovery	RPD %	Acceptability Limits % RPD	Acceptability Limits % Recovery
1,2,4-Trichlorobenzene	8	<0.660	5.84	5.53	73	69	6	40	34-107
Acenaphthene	8	<0.660	6.7	6.36	84	80	5	40	44-120
2,4-Dinitrotoluene	8	<0.660	5.36	5.23	67	65	3	40	39-123
Pyrene	8	<0.660	6.56	6.31	82	79	4	40	33-119
1,4-Dichlorobenzene	8	<0.660	5.79	5.48	72	68	6	40	33-110
Phenol	8	<0.660	5.81	5.55	73	69	6	40	32-115
2-Chlorophenol	8	<0.660	5.85	5.44	73	68	7	40	34-118
4-Chloro-3-Methylphenol	8	<1.300	6.57	6.33	82	79	4	40	46-132
Pentachlorophenol	8	<3.300	0.5	0.32	6	4	4	40	19-151
N-Nitrosodi-N-propylamine	8	<0.900	6.39	5.74	80	72	11	40	47-124
4-Nitrophenol	8	<3.300	3.36	3.05	42	38	10	40	13-111

Review / Date: 11/13/96

MATRIX SPIKE (MS) & MATRIX SPIKE DUPLICATE (MSD) SUMMARY

PERCENT RECOVERY & RELATIVE PERCENT DIFFERENCE (RPD)

Semi-Volatile Organics in Soil

EPA Method 8270

Work Order #: 96-03869

Collector's Sample #: N/A

Analyte	Spike Added mg/Kg	Sample Conc. mg/Kg	MS Conc. mg/Kg	MSD Conc. mg/Kg	MS % Recovery	MSD % Recovery	RPD %	Acceptability Limits % RPD	Acceptability Limits % % Recovery
1,2,4-Trichlorobenzene	8	<0.660	3.85	3.02	48	38	23	40	34-107
enaphthene	8	<0.660	5.08	3.85	64	48	28	40	44-120
2,4-Dinitrotoluene	8	<0.660	4.86	3.66	61	46	28	40	39-123
Pyrene	8	<0.660	5.9	4.1	74	51	27	40	33-119
1,4-Dichlorobenzene	8	<0.660	3.19	2.42	40	30	29	40	33-110
Phenol	8	<0.660	4.12	3.14	51	39	27	40	32-115
2-Chlorophenol	8	<0.660	3.95	2.85	49	36	40	40	34-118
4-Chloro-3-Methylphenol	8	<1.300	4.95	3.68	62	46	30	40	46-132
Pentachlorophenol	8	<3.300	3.56	2.52	45	31	37	40	19-151
N-Nitrosodi-N-propylamine	8	<0.900	3.73	3.16	47	40	16	40	47-124
4-Nitrophenol	8	<3.300	5.32	3.67	67	46	37	40	13-111

Review / Date: 11/13/96

MATRIX SPIKE (MS) & MATRIX SPIKE DUPLICATE (MSD) SUMMARY

PERCENT RECOVERY & RELATIVE PERCENT DIFFERENCE (RPD)

Semi-Volatile Organics in Soil

EPA Method 8270

Work Order #: 96-026-356

Collector's Sample # N/A

Analyte	Spike Added mg/Kg	Sample Conc. mg/Kg	MS Conc. mg/Kg	MSD Conc. mg/Kg	MS % Recover	MSD % Recover	RPD %	Acceptability Limits %	
								RPD	% Recovery
1,2,4-Trichlorobenzene	7.6	<0.660	8.86	8.1	116	106	9	40	34-107
Acenaphthene	7.6	<0.660	10.6	9.83	139	129	7	40	44-120
2,4-Dinitrotoluene	7.6	<0.660	1.87	1.85	25	24	4	40	39-123
Pyrene	7.6	<0.660	9.01	8.84	118	116	2	40	33-119
1,4-Dichlorobenzene	7.6	<0.660	9.06	8.32	119	109	9	40	33-110
Phenol	7.6	<0.660	7.9	7.26	104	95	9	40	32-115
2-Chlorophenol	7.6	<0.660	8.85	8.25	116	108	7	40	34-118
4-Chloro-3-Methylphenol	7.6	<1.300	9.94	9.15	130	120	8	40	46-132
Pentachlorophenol	7.6	<3.300	5.24	4.43	69	58	17	40	19-151
N-Nitrosodi-N-propylamin	7.6	<0.900	12.26	11.01	161	144	11	40	47-124
4-Nitrophenol	7.6	<3.300	0.34	0.41	5	5	0	40	13-111

Review / Date: 11/13/96

MATRIX SPIKE (MS) & MATRIX SPIKE DUPLICATE (MSD) SUMMARY

PERCENT RECOVERY & RELATIVE PERCENT DIFFERENCE (RPD)

Semi-Volatile Organics in Soil

EPA Method 8270

Work Order #: 96-136-16

Collector's Sample #: N/A

Analyte	Spike Added mg/Kg	Sample Conc. mg/Kg	MS Conc. mg/Kg	MSD Conc. mg/Kg	MS % Recovery	MSD % Recovery	RPD %	Acceptability Limits % RPD	Acceptability Limits % % Recovery
1,2,4-Trichlorobenzene	8	<0.660	5	5	63	62	0	40	34-107
Acenaphthene	8	<0.660	6.2	6.1	78	76	3	40	44-120
2,4-Dinitrotoluene	8	<0.660	5.9	5.8	74	72	1	40	39-123
Pyrene	8	<0.660	5.8	6.1	72	76	5	40	33-119
1,4-Dichlorobenzene	8	<0.660	4.9	5	61	63	3	40	33-110
Phenol	8	<0.660	5.3	5.2	66	66	2	40	32-115
2-Chlorophenol	8	<0.660	5.1	5.2	64	65	2	40	34-118
4-Chloro-3-Methylphenol	8	<1.300	7.9	6.9	99	86	14	40	46-132
Pentachlorophenol	8	<3.300	5.8	5.2	73	65	12	40	19-151
N-Nitrosodi-N-propylamin	8	<0.900	5.3	5.4	66	67	3	40	47-124
4-Nitrophenol	8	<3.300	6.6	6.6	83	83	0	40	13-111

Review / Date: 11/13/96

MATRIX SPIKE (MS) & MATRIX SPIKE DUPLICATE (MSD) SUMMARY

PERCENT RECOVERY & RELATIVE PERCENT DIFFERENCE (RPD)

Semi-Volatile Organics in Soil

EPA Method 8270

Work Order #: 96-03869

Collector's Sample #: N/A

Analyte	Spike Added mg/Kg	Sample Conc. mg/Kg	MS Conc. mg/Kg	MSD Conc. mg/Kg	MS % Recover	MSD % Recovery	RPD %	Acceptability Limits % RPD	Acceptability Limits % Recovery
1,2,4-Trichlorobenzene	8	<0.660	4.71	3.16	59	40	38	40	34-107
Acenaphthene	8	<0.660	5.54	4.17	69	52	28	40	44-120
2,4-Dinitrotoluene	8	<0.660	5.18	4.21	65	53	20	40	39-123
Pyrene	8	<0.660	6.35	4.92	79	62	24	40	33-119
1,4-Dichlorobenzene	8	<0.660	4.12	3.09	52	39	29	40	33-110
Phenol	8	<0.660	4.9	3.64	61	46	28	40	32-115
2-Chlorophenol	8	<0.660	5.13	3.3	64	41	43	40	34-118
4-Chloro-3-Methylphenol	8	<1.300	5.79	4.03	72	50	36	40	46-132
Pentachlorophenol	8	<3.300	1.78	1.62	22	20	9	40	19-151
N-Nitrosodi-N-propylamine	8	<0.900	5.35	3.81	67	48	33	40	47-124
4-Nitrophenol	8	<3.300	3.58	2.77	45	35	25	40	13-111

Review / Date: 11/13/96

Project ID #: 32-08
Project ID Name: Dolton
SK Lab Project #: 96-136B
Date Reported: 11/11/96

MATRIX SPIKE (MS) & MATRIX SPIKE DUPLICATE (MSD) SUMMARY

PERCENT RECOVERY & RELATIVE PERCENT DIFFERENCE (RPD)

Semi-Volatile Organics in Soil

EPA Method 8270

Work Order #: 96-136-16

Collector's Sample #: VB-3 (36-38)

Analyte	Spike Added mg/Kg	Sample Conc. mg/Kg	MS Conc mg/Kg	MSD Conc. mg/Kg	MS % Recover	MSD % Recovery	RPD %	Acceptability Limits % RPD	Acceptability Limits % % Recovery
1,2,4-Trichlorobenzene	8	<0.660	5	5	63	62	1	40	34-107
Acenaphthene	8	<0.660	6.2	6.1	78	76	3	40	44-120
2,4-Dinitrotoluene	8	<0.660	5.9	5.8	74	72	2	40	39-123
Pyrene	8	<0.660	5.8	6.1	72	76	5	40	33-119
1,4-Dichlorobenzene	8	<0.660	4.9	5	61	63	3	40	33-110
Phenol	8	<0.660	5.3	5.2	66	66	0	40	32-115
2-Chlorophenol	8	<0.660	5.1	5.2	64	65	2	40	34-118
4-Chloro-3-methylphenol	8	<1.300	7.9	6.9	99	86	14	40	46-132
Pentachlorophenol	8	<3.300	5.8	5.2	73	65	12	40	19-151
N-Nitroso-di-N-propylamin	8	<0.900	5.3	5.4	66	67	2	40	47-124
4-Nitrophenol	8	<3.300	6.6	6.6	83	83	0	40	13-111

Review / Date: 11/13/96

MATRIX SPIKE (MS) & MATRIX SPIKE DUPLICATE (MSD) SUMMARY

PERCENT RECOVERY & RELATIVE PERCENT DIFFERENCE (RPD)

Semi-Volatile Organics in Soil

EPA Method 8270

Work Order #: 96-136-05

Collector's Sample #: LE-1 (2-4)

Analyte	Spike Added mg/Kg	Sample Conc. mg/Kg	MS Conc. mg/Kg	MSD Conc. mg/Kg	MS % Recovery	MSD % Recovery	RPD %	Acceptability Limits % RPD	Acceptability Limits % Recovery
1,2,4-Trichlorobenzene	7.62	<0.660	3.24	4.63	43	61	35	40	34-107
Acenaphthene	7.62	<0.660	4.41	6.17	58	81	33	40	44-120
2,4-Dinitrotoluene	7.62	<0.660	4.36	5.75	57	75	27	40	39-123
Pyrene	7.62	<0.660	4.82	5.92	63	77	20	40	33-119
1,4-Dichlorobenzene	7.62	<0.660	3.28	4.84	43	64	39	40	33-110
Phenol	7.62	<0.660	3.94	5.07	52	67	25	40	32-115
2-Chlorophenol	7.62	<0.660	3.91	5.33	51	70	31	40	34-118
4-Chloro-3-Methylphenol	7.62	<1.300	5.5	7.31	72	96	28	40	46-132
Pentachlorophenol	7.62	<3.300	5.36	6.35	70	83	17	40	19-151
N-Nitrosodi-N-propylamin	7.62	<0.900	4.11	5.77	54	76	34	40	47-124
4-Nitrophenol	7.62	<3.300	4.34	5.68	57	75	27	40	13-111

Review / Date: 11/13/96

Project ID #: 32-08
Project ID Name: Dolton
Lab Project #: 96-136A
Date Reported: 10/25/96

SURROGATE RECOVERY SUMMARY

PCBs in Soil

EPA Method 8080

Work Order #	Collector's Sample #	Decachlorobiphenyl
01	LE-2 (4-6)	Present
02	LE-2 (18-20)	Present
03	VB-2 (20-22)	Present
04	VB-2 (25-27)	Present
05	LE-1 (2-4)	Present
06	LE-1 (18-20)	Present
07	LE-3 (20-22)	Present
08	LE-5 (18-20)	Present
09	LE-5 (2-4)	Present
10	LE-4 (4-6)	Present
11	LE-4 (18-20)	Present

Review / Date: 10/25/96

Project ID #: 32-07
Project ID Name: Dolton, IL
SK Lab Project #: 96-136F
Date Reported: 11/13/96

INITIAL CALIBRATION VERIFICATION CHECK SAMPLE REPORT

PCBs

Analyte	Date Analyzed	Expected Result mg/L	Observed Result mg/L	% Recovery	% Acceptability Limits
Arochlor 1016	6/14/96	0.01	0.0121	121	>50
Arochlor 1260	6/14/96	0.01	0.0143	143	>50

METHOD BLANK SUMMARY

PCBs in Soil

EPA Method 8080

Lab Blank #	G090614A
Date Analyzed	6/14/96
Analyte	**Concentration mg/Kg**
PCBs	<1

Project ID #: 32-07
Project ID Name: Dolton, IL
SK Lab Project #: 96-136F
Date Reported: 10/25/96

INITIAL CALIBRATION VERIFICATION CHECK SAMPLE REPORT

PCBs

Analyte	Date Analyzed	Expected Result mg/L	Observed Result mg/L	% Recovery	% Acceptability Limits
Arochlor 1016	6/11/96	0.01	0.0131	131	>50
Arochlor 1260	6/11/96	0.01	0.0139	139	>50

METHOD BLANK SUMMARY

PCBs in Soil

EPA Method 8080

Lab Blank #	G080611A
Date Analyzed	6/11/96
Analyte	**Concentration mg/Kg**
PCBs	<1

Project ID #: 32-08
Project ID Name: Dolton
SK Lab Project #: 96-136D
Date Reported: 10/25/96

SURROGATE RECOVERY SUMMARY

PCBs in Soil

EPA Method 8080

Work Order #	Collector's Sample #	Decachlorobiphenyl
39	VB-1 (20-22)	Present
40	VB-1 (24-26)	Present
41	LE-10 (4-6)	Present
42	LE-10 (18-20)	Present

CHAIN-OF-CUSTODY RECORD

Project No.:	Today's Date:	Date Results Requested:
32-08	6/8/96	STANDARD T-A-T

Sampler's Name:	Phone No.:	Fax No.:
C Dewalt / B. Culnan	307-745-7474	307-745-7729

Company Name and Address:	Company Contact:
TriHydro Corporation 920 Sheridan Laramie, WY 82070	C. Dewalt B. Culnan

Collector's Sample No.	Sample Matrix	Date Sampled/ Time Sampled	No. of Containers	Analyses Requested: VOCs 8240	SVOCs 8270	MEMS TCLP (Cd, Ba, Pb, Hg)	PCBs 8080
VB-1(20-22)	SOIL	6/6/96 0950	2	X	X	X	X
VB-1 (24-26)	SOIL	6/6/96 1000	2	X	X	X	X
LE-10(4-6)	SOIL	6/6/96 1350	1 JAR	X	X	X	X
LE-10 (18-20)	SOIL	6/6/96 1410	2	X	X	X	X
LE-10 (24-26)	SOIL	6/6/96 1420	2	X	X	X	
VB-7 (20-22)	SOIL	6/6/96 1600	2	X	X	X	
VB-7 (24-26)	SOIL	6/6/96 1630	2	X	X	X	
VB-5 (20-22)	SOIL	6/6/96 1300	1	X	X	X	

Remarks:

Relinquished by:	Affiliation:	Date/Time:	Received by:	Affiliation:	Date/Time:
[signature]	THC	6/8/96 1046			
Relinquished by:	Affiliation:	Date/Time:	Received by:	Affiliation:	Date/Time:
Relinquished by:	Affiliation:	Date/Time:	Received by:	Affiliation:	Date/Time:

Were samples received in good condition?	Remarks:

CHAIN-OF-CUSTODY RECORD

Page 2 3

Project No.:	Today's Date:	Date Results Requested:
32-08	6/8/96	STANDARD T-A-T

Sampler's Name:	Phone No.:	Fax No.:
C DeWolf	307-745-7474	307-745-7729

Company Name and Address:	Company Contact:
TriHydro Corporation 920 Sheridan Laramie, WY 82070	C. DeWolf B. Culnan

Collector's Sample No.	Sample Matrix	Date Sampled/ Time Sampled	No. of Containers	Analyses Requested: VOCs 8240	SVOCs 8270	Metals TCLP (Ba, Cd, Pb, Hg)	PCBs 8080
VB-5 (24-26)	SOIL	6/7/96 1330	1	X	X	X	
LE-8 (4-6)	SOIL	6/7/96 1040	2	X	X	X	
LE-8 (18-20)	SOIL	6/7/96 1050	2	X	X	X	
LE-8 (20-22)	SOIL	6/7/96 1100	2	HOLD			
LE-9 (2-4)	SOIL	6/7/96 1500	1	X	X	X	
XX-5	SOIL	6/7/96 1805	1	X	X	X	
LE-9 (18-20)	SOIL	6/7/96 1530	2	X	X	X	
LE-9 (22-24)	SOIL	6/7/96 1600	2	X	X	X	

Remarks:

Relinquished by:	Affiliation:	Date/Time:	Received by:	Affiliation:	Date/Time:
[signature]	THC	6/8/96 1040			
Relinquished by:	Affiliation:	Date/Time:	Received by:	Affiliation:	Date/Time:
Relinquished by:	Affiliation:	Date/Time:	Received by:	Affiliation:	Date/Time:

Were samples received in good condition?	Remarks:

CHAIN-OF-CUSTODY RECORD

Project No.:	Today's Date:	Date Results Requested:
32-08	6/8/96	STANDARD TAT

Sampler's Name:	Phone No.:	Fax No.:
DeWolf/Culnan	307-745-7474	307-745-7729

Company Name and Address:	Company Contact:
TriHydro Corporation 920 Sheridan Laramie, WY 82070	C. DeWolf B Culnan

Collector's Sample No.	Sample Matrix	Date Sampled/ Time Sampled	No. of Containers	Analyses Requested: VOCs 8240	SVOCs 8270	METALS TCLP	(8 RCI, Pb, Hg)	PCBs
VB-3 (22-24)	SOIL	6/3/96 1405	1	X	X	X		
VB-8 (22-24)	SOIL	6/5/96 1514	1	HOLD				
VB-8 (24-26)	SOIL	6/5/96 1516	1	X	X			

Remarks: NOTE Sampling Date! on VB-3 (22-24)

Relinquished by:	Affiliation:	Date/Time:	Received by:	Affiliation:	Date/Time:
[signature]	THC	6/8/96 1040			
Relinquished by:	Affiliation:	Date/Time:	Received by:	Affiliation:	Date/Time:
Relinquished by:	Affiliation:	Date/Time:	Received by:	Affiliation:	Date/Time:

Were samples received in good condition?	Remarks:

CHAIN OF CUSTODY RECORD

Page ___ of ___

Project No.:	Today's Date:	Date Results Requested:
32-08	6/4/96	STANDARD T-A-T

Sampler's Name:	Phone No.:	Fax No.:
C Dewolf B. Colnan	307-745-7474	307-745-7729

Company Name and Address:	Company Contact:
TriHydro Corporation 920 Sheridan Laramie, WY 82070	C Dewolf

Collector's Sample No.	Sample Matrix	Date Sampled/ Time Sampled	No. of Containers	Analyses Requested: VOCs 8240	SVOCs 8270	TCLP Metals (Ba, Cd, Pb, Hg)	
LE-6 (~~4-6~~)	SOIL	6/3/96 1700	2	X	X	X	
LE-6 (18-20)		1720	2	X	X	X	
MW-4 (2-4)		1200	1	HOLD			
MW-4 (~~2-4~~ 18-20)		1230	2	HOLD			
VB-3 (20-22)		1400	2	HOLD			
VB-3 (26-28)		1430	2	HOLD			
VB-3 (32-34)		1445 ~~1500~~	2	X	X	X	RUSH VOC
VB-3 (34-36)		1500	2	X	X		RUSH VOC, NO METALS
VB-3 (36-38)	↓	1530	2	X	X	X	RUSH VOC

Remarks: Rush VB-3(34-36) VB-3(32-34), VB-3(36-38) VOCs

Relinquished by:	Affiliation:	Date/Time:	Received by:	Affiliation:	Date/Time:
[signature]	TriHydro	6/4 1000			
Relinquished by:	Affiliation:	Date/Time:	Received by:	Affiliation:	Date/Time:
Relinquished by:	Affiliation:	Date/Time:	Received by:	Affiliation:	Date/Time:

Were samples received in good condition?	Remarks:

CHAIN-OF-CUSTODY RECORD

Page 1 3

Project No.:	Today's Date:	Date Results Requested:
32-08	5/31/96	STANDARD T-A-T

Sampler's Name:	Phone No.:	Fax No.:
C. DeWolf/Brian Colman	307-745-7474	307-745-7729

Company Name and Address:	Company Contact:
TriHydro Corporation 920 Sheridan Laramie, WY 82070	C. DeWolf

Collector's Sample No.	Sample Matrix	Date Sampled/ Time Sampled	No. of Containers	Analyses Requested: VOCs 8240	SVOCs 8270	TCLP Metals	PCBs 8080	Ba, Cd, Pb, Hg
✓ LE-2(4-6)	SOIL	5/30/96 1220	2 Brass	X	X	X	X	
✓ LE-2(18-20)		5/30/96 1250	2 Brass	X	X	X	X	
✓ LE-2 (22-24)		5/30/96 1300	2 Brass	HOLD				
✓ VB-2(20-22)		5/30/96 1120	2 Brass	X	X	X	X	
✓ VB-2(25-27)		5/30/96 1140	2 Brass	X	X	X	X	
✓ LE-1 (~~3-4~~ 2-4)		5/30/96 1500	2 Brass	X	X	X	X	
✓ LE-1 (18-20)		5/30/96 1520	2 Brass	X	X	X	X	
✓ LE-1 (~~20-22~~)	↓	5/30/96 1580	~~1~~ 2 Brass	HOLD				

Remarks: Note for all Dolton Samples: Hold Remaing Sample for Possible metals analysis
- Please alert me of prelim QA/ac + Data w/in Holdtime

Relinquished by:	Affiliation:	Date/Time:	Received by:	Affiliation:	Date/Time:
Brian Colman	THC	5-31-96 19:54	Carmody 19:55 5/31/96		
Relinquished by:	Affiliation:	Date/Time:	Received by:	Affiliation:	Date/Time:
Relinquished by:	Affiliation:	Date/Time:	Received by:	Affiliation:	Date/Time:

Were samples received in good condition?	Remarks:

CHAIN-OF-CUSTODY RECORD Page 2 of 3

Project No.:	Today's Date:	Date Results Requested:
32-08	5/31/96	STANDARD TAT

Sampler's Name:	Phone No.:	Fax No.:
C. DeWolf / B. Culnan	307-745-7474	307-745-7729

Company Name and Address:
TriHydro Corporation
920 Sheridan
Laramie, WY 82070

Company Contact: C. DeWolf / J Beckstrom

Collector's Sample No.	Sample Matrix	Date Sampled/ Time Sampled	No. of Containers	VOCs 8240	SVOCs 8270	TCLP METALS	PCBs 8080	Ba, Cd, Pb, Hg	Analyses Requested
LE-3(20-22)	soil	5/31/96 940	2 Brass	X	X	X	X		
LE-3(22-24)		5/31/96 950	2 Brass	HOLD				NO PCBs!	
LE-5(18-20)		5/31/96 1200	2 Brass	X	X	X	X		
LE-5(20-22)		5/31/96 1210	1 Brass					HOLD	
LE-5(0-2)		5/31/96 1050	1 Brass	HOLD					
LE-5(2-4)		5/31/96 1100	2 Brass	X	X	X			
LE-4(4-6)		5/31/96 1340	1 Brass	X	X	X			
LE-4(18-20)		5/31/96 1420	1 Brass	X	X	X			

Remarks: See p. 1

Relinquished by:	Affiliation:	Date/Time:	Received by:	Affiliation:	Date/Time:
Brian Culnan	THC	5-31-96 19:54	[illegible] 5/31/96		
Relinquished by:	Affiliation:	Date/Time:	Received by:	Affiliation:	Date/Time:
Relinquished by:	Affiliation:	Date/Time:	Received by:	Affiliation:	Date/Time:

Were samples received in good condition?

Remarks:

CHAIN-OF-CUSTODY RECORD

Project No.:	Today's Date:	Date Results Requested:
32-08	5/31/96	STANDARD TAT

Sampler's Name:	Phone No.:	Fax No.:
CDeWolf/Brian Culnan	307-745-7474	307-745-7729

Company Name and Address:	Company Contact:
TriHydro Corporation 920 Sheridan Laramie, WY 82070	C. DeWolf / J. Boleesen

Collector's Sample No.	Sample Matrix	Date Sampled/ Time Sampled	No. of Containers	Analyses Requested: VOCs 8240	SVOCs 8270	TCLP metals	RCRA 5050	Ba, Cd Pb, Hg
LE-4 (22-24)	SOIL	5/31/96 1430	2 Brass	HOLD				
~~MW-12 (6-8)~~		~~5/31/96 1620~~	~~Brass~~	~~HOLD~~				
MW-12 (18-20)		5/31/96 1650	2 Brass	HOLD				

Remarks: See p. 1

Relinquished by:	Affiliation:	Date/Time:	Received by:	Affiliation:	Date/Time:
Brian Culnan	THC	5-31-96 19:54	Cathomley 19:55 5/31/96		
Relinquished by:	Affiliation:	Date/Time:	Received by:	Affiliation:	Date/Time:
Relinquished by:	Affiliation:	Date/Time:	Received by:	Affiliation:	Date/Time:

Were samples received in good condition?	Remarks:

CHAIN-OF-CUSTODY RECORD

Page 1

Project No.:	Today's Date:	Date Results Requested:
32-08	6/6/96	STANDARD T-A-T

Sampler's Name:	Phone No.:	Fax No.:
Charlie DeWolf Brian Colnar	307-745-7474	307-745-7729

Company Name and Address:	Company Contact:
TriHydro Corporation 920 Sheridan Laramie, WY 82070	Charlie DeWolf Jack Bedessem

Collector's Sample No.	Sample Matrix	Date Sampled/ Time Sampled	No. of Containers	Analyses Requested: VOCs 8240	SVOCs 8270	TCLP Metals Ba, Cd, Pb, Hg
VB-9 (22-24)	SOIL	6/4/96 1600	2	X	X	X
VB-9 (24-26)	SOIL	6/4/96 1630	1	HOLD		
VB-9 (26-28)	SOIL	6/4/96 1645	2	X	X	X
VB-6 (20-22)	SOIL	6/4/96 1430	1	X	X	X
VB-6 (22-24)	SOIL	6/4/96 1445	2	HOLD		
VB-6 (24-26)	SOIL	6/4/96 1500	2	X	X	X
VB-4 (22-24)	SOIL	6/4/96 1000	1	X	X	X
VB-4 (24-26)	SOIL	6/4/96 1015	2	HOLD		

Remarks:

Relinquished by:	Affiliation:	Date/Time:	Received by:	Affiliation:	Date/Time:
[signature]	TriHydro	6/6/96 1500	[signature]	SK	6/6/96 1510
Relinquished by:	Affiliation:	Date/Time:	Received by:	Affiliation:	Date/Time:
Relinquished by:	Affiliation:	Date/Time:	Received by:	Affiliation:	Date/Time:

96-136 part III

Were samples received in good condition?

Remarks:

CHAIN-OF-CUSTODY RECORD

Project No.:	Today's Date:	Date Results Requested:
32-08	6/6/96	STANDARD T-A-T

Sampler's Name:	Phone No.:	Fax No.:
Charlie DeWolf Brian Colnar	307-745-7474	307-745-7729

Company Name and Address:	Company Contact:
TriHydro Corporation 920 Sheridan Laramie, WY 82070	Charlie DeWolf Jack Beclessem

Collector's Sample No.	Sample Matrix	Date Sampled/ Time Sampled	No. of Containers	Analyses Requested: VOCs 8240	SVOCs 8270	TCLP Metals Ba, Cd, Pb, Hg
VB-4 (26-28)	SOIL	6/4/96 1030	1	X	X	X
LE-7 (4-6)	SOIL	6/5/96 845	2	X	X	X
LE-7 (18-20)	SOIL	6/5/96 0930	1	X	X	X
MW-6 (4-6)	SOIL	6/5/96 1200	1	X	X	X
MW-6 (~~4-6~~ 18-20)	SOIL	6/5/96 1230	2	HOLD		
MW-6 (20-22)	SOIL	6/5/96 1300	2	X	X	X
VB-8 (26-28)	SOIL	6/5/96 1530	2	HOLD		
VB-8 (30-32)	SOIL	6/5/96 1600	2	X	X	X

Remarks:

Relinquished by:	Affiliation:	Date/Time:	Received by:	Affiliation:	Date/Time:
[signature]	TRIHYDRO	6/6/96 1500	[signature]	SK	6/6/96 1500
Relinquished by:	Affiliation:	Date/Time:	Received by:	Affiliation:	Date/Time:
Relinquished by:	Affiliation:	Date/Time:	Received by:	Affiliation:	Date/Time:

Were samples received in good condition?	Remarks:

IC2

CHAIN-OF-CUSTODY RECORD

Project No.:	Today's Date:	Date Results Requested:
32-08	6/6/96	STANDARD T-A-T

Sampler's Name:	Phone No.:	Fax No.:
Charlie DeWolf Brian Colnan	307-745-7474	307-745-7729

Company Name and Address:	Company Contact:
TriHydro Corporation 920 Sheridan Laramie, WY 82070	Charlie DeWolf Jack Bedessem

Collector's Sample No.	Sample Matrix	Date Sampled/ Time Sampled	No. of Containers	Analyses Requested: Vocs 8240	SVocs 8270	TCLP Metals Ba, Cd, Pb, Hg
VB-8 (32-34)	SOIL	6/5/96 1615	2	HOLD		
VB-8 (34-36)	SOIL	6/5/96 1630	2	X	X	X
XX-1	SOIL	6/5/96 1801	1	X	X	X
XX-2	SOIL	6/5/96 1802	1	X	X	X
XX-3	SOIL	6/5/96 1803	1	X	X	X
XX-4	SOIL	6/5/96 1804	1	X	X	X

Remarks:

Relinquished by:	Affiliation:	Date/Time:	Received by:	Affiliation:	Date/Time:
[signature]	TRIHYDRO	6/6 PG 1500	[signature]	SK	6/6/96 1530
Relinquished by:	Affiliation:	Date/Time:	Received by:	Affiliation:	Date/Time:
Relinquished by:	Affiliation:	Date/Time:	Received by:	Affiliation:	Date/Time:

Were samples received in good condition?	Remarks:

APPENDIX K

GROUND-WATER QUALITY ANALYTICAL REPORTS

PHASE II/III RCRA FACILITY INVESTIGATION
SAFETY-KLEEN CORP. RECYCLE CENTER
DOLTON, ILLINOIS

safety-kleen®

July 10, 1996

Mr. Jack Bedessem
TriHydro Corporation
920 Sheridan

Laramie, WY 82070

Re: SK Lab Project #96-136e
Project ID Name: Dolton, IL

Dear Jack:

Enclosed please find the analytical results for the sample received by SK Environmental Laboratory on 6/25/96.

A formal Quality Control/Quality Assurance program is maintained by Safety-Kleen, which is designed to meet or exceed the EPA requirements. This information is available upon request.

If you have any questions concerning this analysis, or if we can be of further assistance, please contact Rick Cook at 312-825-7351.

Sincerely,

Mark A. Hartwig
Environmental Lab Manager

MAH:

Allan A. Manteuffel Technical Center

P.O. Box 92050
Elk Grove Village, IL
60009-2050

12555 W. Old Higgins Rd.
Elk Grove Village, IL 60007
Telephone: 312/694-2700
Fax: 312/825-7850

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 7/10/96

ANALYTICAL RESULTS

Total Metals

	Work Order #	57	58	59	60	61	62
	Collector's Sample #	MW-1	MW-2	MW-4	MW-5	MW-6	MW-7
	Date Sampled	6/25/96	6/25/96	6/25/96	6/25/96	6/25/96	6/25/96
	Date Analyzed (EPA Method 6010)	6/27/96	6/27/96	6/27/96	6/27/96	6/27/96	6/27/96
	Date Analyzed (EPA Method 7131)	6/27/96	6/27/96	6/27/96	6/27/96	6/27/96	6/27/96
	Date Analyzed (EPA Method 7421)	6/28/96	6/28/96	6/28/96	6/28/96	6/28/96	6/28/96
	Date Analyzed (EPA Method 7470)	6/27/96	6/27/96	6/27/96	6/27/96	6/27/96	6/27/96
Analyte	EPA Method	Reporting Limit mg/L	Concentration mg/L					
Barium	6010	2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Cadmium	7131	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Lead	7421	0.0075	<0.0075	<0.0075	<0.0075	0.011	<0.0075	<0.0075
Mercury	7470	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002

	Work Order #	64	65	66	67	68	69
	Collector's Sample #	MW-8	MW-9	MW-12	SK-7	SK-8	SK-11
	Date Sampled	6/25/96	6/25/96	6/25/96	6/25/96	6/25/96	6/25/96
	Date Analyzed (EPA Method 6010)	6/27/96	6/27/96	6/27/96	6/27/96	6/27/96	6/27/96
	Date Analyzed (EPA Method 7131)	6/27/96	6/27/96	6/27/96	6/27/96	6/27/96	6/27/96
	Date Analyzed (EPA Method 7421)	6/28/96	6/28/96	7/1/96	6/28/96	6/28/96	6/28/96
	Date Analyzed (EPA Method 7470)	6/27/96	6/27/96	6/27/96	6/27/96	6/27/96	6/27/96
Analyte	EPA Method	Reporting Limit mg/L	Concentration mg/L					
Barium	6010	2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Cadmium	7131	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Lead	7421	0.0075	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075
Mercury	7470	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002

Analytical Review / Date: W Clark 7/10/96

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 7/10/96

ANALYTICAL RESULTS

Total Metals

	Work Order #	70	71	72	73
	Collector's Sample #	DUPE-1	DUPE-2	FB	EB-1
	Date Sampled	6/25/96	6/25/96	6/25/96	6/25/96
	Date Analyzed (EPA Method 6010)	6/27/96	6/27/96	6/27/96	6/27/96
	Date Analyzed (EPA Method 7131)	6/27/96	6/27/96	6/27/96	6/27/96
	Date Analyzed (EPA Method 7421)	6/28/96	6/28/96	6/28/96	6/28/96
	Date Analyzed (EPA Method 7470)	6/27/96	6/27/96	6/27/96	7/3/96
Analyte	EPA Method	Reporting Limit mg/L	Concentration mg/L			
Barium	6010	2.0	<2.0	<2.0	<2.0	<2.0
Cadmium	7131	0.005	<0.005	<0.005	<0.005	<0.005
Lead	7421	0.0075	<0.0075	<0.0075	<0.0075	<0.0075
Mercury	7470	0.002	<0.002	<0.002	<0.002	<0.002

Analytical Review / Date: 7/10/96

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 7/10/96

ANALYTICAL RESULTS

Semi-Volatile Organics in Water

EPA Method 8270

	Work Order #	57	58	59	60	61	62
	Collector's Sample #	MW-1	MW-2	MW-4	MW-5	MW-6	MW-7
	Date Sampled	6/25/96	6/25/96	6/25/96	6/25/96	6/25/96	6/25/96
	Date Extracted	6/26/96	6/26/96	6/26/96	6/26/96	6/26/96	6/26/96
	Date Analyzed	6/28/96	6/28/96	7/1/96	6/28/96	6/28/96	6/28/96
	Dilution Factor	1	1	1	1	1	1
Analyte	Reporting Limit µg/L	Concentration µg/L					
Acenaphthene	12	<12	<12	<12	<12	<12	<12
Acenaphthylene	11	<11	<11	<11	<11	<11	<11
Anthracene	10	<10	<10	<10	<10	<10	<10
Benz(a)anthracene	10	<10	<10	<10	<10	<10	<10
Benzo(b)fluoranthene	10	<10	<10	<10	<10	<10	<10
Benzo(k)fluoranthene	10	<10	<10	<10	<10	<10	<10
Benzoic Acid	50	<50	<50	<50	<50	<50	<50
Benzo(g,h,i)perylene	10	<10	<10	<10	<10	<10	<10
Benzo(a)pyrene	10	<10	<10	<10	<10	<10	<10
Benzyl Alcohol	20	<20	<20	<20	<20	<20	<20
bis(2-Chloroethoxy)Methane	11	<11	<11	<11	<11	<11	<11
bis(2-Chloroethyl)Ether	16	<16	<16	<16	<16	<16	<16
bis(2-Chloroisopropyl)Ether	13	<13	<13	<13	<13	<13	<13
4-Bromophenyl-phenylether	10	<10	<10	<10	<10	<10	<10
Butylbenzylphthalate	10	<10	<10	<10	<10	<10	<10
4-Chloroaniline	50	<50	<50	<50	<50	<50	<50
4-Chloro-3-Methylphenol	20	<20	<20	<20	<20	<20	<20
2-Chloronaphthalene	15	<15	<15	<15	<15	<15	<15
2-Chlorophenol	15	<15	<15	<15	<15	<15	<15
4-Chlorophenyl-phenylether	10	<10	<10	<10	<10	<10	<10
Chrysene	10	<10	<10	<10	<10	<10	<10
Dibenz(a,h)anthracene	10	<10	<10	<10	<10	<10	<10

ANALYTICAL RESULTS

Semi-Volatile Organics in Water

EPA Method 8270

	Work Order #	57	58	59	60	61	62
	Collector's Sample #	MW-1	MW-2	MW-4	MW-5	MW-6	MW-7
	Date Sampled	6/25/96	6/25/96	6/25/96	6/25/96	6/25/96	6/25/96
	Date Extracted	6/26/96	6/26/96	6/26/96	6/26/96	6/26/96	6/26/96
	Date Analyzed	6/28/96	6/28/96	7/1/96	6/28/96	6/28/96	6/28/96
	Dilution Factor	1	1	1	1	1	1
Analyte	Reporting Limit µg/L	Concentration µg/L					
Dibenzofuran	10	<10	<10	<10	<10	<10	<10
1,2-Dichlorobenzene	15	<15	<15	<15	<15	<15	<15
1,3-Dichlorobenzene	15	<15	<15	<15	<15	<15	<15
[redacted]Dichlorobenzene	15	<15	<15	<15	<15	<15	<15
3,3'-Dichlorobenzidine	20	<20	<20	<20	<20	<20	<20
2,4-Dichlorophenol	24	<24	<24	<24	<24	<24	<24
Diethylphthalate	10	<10	<10	<10	<10	<10	<10
2,4-Dimethylphenol	10	<10	<10	<10	<10	<10	<10
Dimethylphthalate	10	<10	<10	<10	<10	<10	<10
4,6-Dinitro-2-Methylphenol	50	<50	<50	<50	<50	<50	<50
2,4-Dinitrophenol	50	<50	<50	<50	<50	<50	<50
2,4-Dinitrotoluene	10	<10	<10	<10	<10	<10	<10
2,6-Dinitrotoluene	10	<10	<10	<10	<10	<10	<10
Di-n-octyl phthalate	10	<10	<10	<10	<10	<10	<10
bis(2-ethylhexyl)phthalate	10	<10	<10	<10	<10	<10	<10
Fluoranthene	10	<10	<10	<10	<10	<10	<10
Fluorene	14	<14	<14	<14	<14	<14	<14
Hexachlorobenzene	10	<10	<10	<10	<10	<10	<10
[redacted]achlorobutadiene	11	<11	<11	<11	<11	<11	<11
Hexachlorocyclopentadiene	10	<10	<10	<10	<10	<10	<10
Hexachloroethane	22	<22	<22	<22	<22	<22	<22
Indeno(1,2,3-cd)pyrene	10	<10	<10	<10	<10	<10	<10

ANALYTICAL RESULTS

Semi-Volatile Organics in Water

EPA Method 8270

Work Order #		57	58	59	60	61	62
Collector's Sample #		MW-1	MW-2	MW-4	MW-5	MW-6	MW-7
Date Sampled		6/25/96	6/25/96	6/25/96	6/25/96	6/25/96	6/25/96
Date Extracted		6/26/96	6/26/96	6/26/96	6/26/96	6/26/96	6/26/96
Date Analyzed		6/28/96	6/28/96	7/1/96	6/28/96	6/28/96	6/28/96
Dilution Factor		1	1	1	1	1	1
Analyte	Reporting Limit µg/L	Concentration µg/L					
Isophorone	10	<10	<10	<10	<10	<10	<10
2-Methylnaphthalene	10	<10	<10	<10	<10	<10	<10
2-Methylphenol	11	<11	<11	<11	<11	<11	56
4-Methylphenol	10	<10	<10	<10	<10	<10	75
Naphthalene	12	<12	<12	<12	<12	<12	<12
2-Nitroaniline	50	<50	<50	<50	<50	<50	<50
3-Nitroaniline	50	<50	<50	<50	<50	<50	<50
Nitrobenzene	12	<12	<12	<12	<12	<12	<12
2-Nitrophenol	25	<25	<25	<25	<25	<25	<25
4-Nitrophenol	50	<50	<50	<50	<50	<50	<50
N-Nitrosodiphenylamine	13	<13	<13	<13	<13	<13	<13
N-Nitroso-di-n-propylamine	10	<10	<10	<10	<10	<10	<10
Pentachlorophenol	50	<50	<50	<50	<50	<50	<50
Phenanthrene	10	<10	<10	<10	<10	<10	<10
Phenol	18	<18	<18	<18	<18	<18	<18
Pyrene	10	<10	<10	<10	<10	<10	<10
Pyridine	10	<10	<10	<10	<10	<10	<10
1,2,4-Trichlorobenzene	11	<11	<11	<11	<11	<11	<11
2,4,5-Trichlorophenol	10	<10	<10	<10	<10	<10	<10
2,4,6-Trichlorophenol	11	<11	<11	<11	<11	<11	<11

Analytical Review / Date: 7/10/96

ANALYTICAL RESULTS

Semi-Volatile Organics in Water

EPA Method 8270

Work Order #		64	65	66	67	68	69
Collector's Sample #		MW-8	MW-9	MW-12	SK-7	SK-8	SK-11
Date Sampled		6/25/96	6/25/96	6/25/96	6/25/96	6/25/96	6/25/96
Date Extracted		6/26/96	6/26/96	6/28/96	6/28/96	6/28/96	6/28/96
Date Analyzed		6/28/96	6/28/96	7/5/96	7/5/96	7/5/96	7/9/96
Dilution Factor		1	1	1	1	1	1
Analyte	Reporting Limit µg/L	Concentration µg/L					
Acenaphthene	12	<12	<12	<12	<12	<12	<12
Acenaphthylene	11	<11	<11	<11	<11	<11	<11
Anthracene	10	<10	<10	<10	<10	<10	<10
[illegible](a)anthracene	10	<10	<10	<10	<10	<10	<10
Benzo(b)fluoranthene	10	<10	<10	<10	<10	<10	<10
Benzo(k)fluoranthene	10	<10	<10	<10	<10	<10	<10
Benzoic Acid	50	<50	<50	<50	<50	<50	<50
Benzo(g,h,i)perylene	10	<10	<10	<10	<10	<10	<10
Benzo(a)pyrene	10	<10	<10	<10	<10	<10	<10
Benzyl Alcohol	20	<20	<20	<20	<20	<20	<20
bis(2-Chloroethoxy)Methane	11	<11	<11	<11	<11	<11	<11
bis(2-Chloroethyl)Ether	16	<16	<16	<16	<16	<16	<16
bis(2-Chloroisopropyl)Ether	13	<13	<13	<13	<13	<13	<13
4-Bromophenyl-phenylether	10	<10	<10	<10	<10	<10	<10
Butylbenzylphthalate	10	<10	<10	<10	<10	<10	<10
4-Chloroaniline	50	<50	<50	<50	<50	<50	<50
4-Chloro-3-Methylphenol	20	<20	<20	<20	<20	<20	<20
2-Chloronaphthalene	15	<15	<15	<15	<15	<15	<15
[illegible]lorophenol	15	<15	<15	<15	<15	<15	<15
4-Chlorophenyl-phenylether	10	<10	<10	<10	<10	<10	<10
Chrysene	10	<10	<10	<10	<10	<10	<10
Dibenz(a,h)anthracene	10	<10	<10	<10	<10	<10	<10

ANALYTICAL RESULTS

Semi-Volatile Organics in Water

EPA Method 8270

	Work Order #	64	65	66	67	68	69
	Collector's Sample #	MW-8	MW-9	MW-12	SK-7	SK-8	SK-11
	Date Sampled	6/25/96	6/25/96	6/25/96	6/25/96	6/25/96	6/25/96
	Date Extracted	6/26/96	6/26/96	6/28/96	6/28/96	6/28/96	6/28/96
	Date Analyzed	6/28/96	6/28/96	7/5/96	7/5/96	7/5/96	7/9/96
	Dilution Factor	1	1	1	1	1	1
Analyte	Reporting Limit µg/L	Concentration µg/L					
Dibenzofuran	10	<10	<10	<10	<10	<10	<10
1,2-Dichlorobenzene	15	<15	<15	<15	<15	<15	<15
1,3-Dichlorobenzene	15	<15	<15	<15	<15	<15	<15
1,4-Dichlorobenzene	15	<15	<15	<15	<15	<15	<15
3,3'-Dichlorobenzidine	20	<20	<20	<20	<20	<20	<20
2,4-Dichlorophenol	24	<24	<24	<24	<24	<24	<24
Diethylphthalate	10	<10	<10	<10	<10	<10	<10
2,4-Dimethylphenol	10	<10	<10	<10	<10	<10	<10
Dimethylphthalate	10	<10	<10	<10	<10	<10	<10
4,6-Dinitro-2-Methylphenol	50	<50	<50	<50	<50	<50	<50
2,4-Dinitrophenol	50	<50	<50	<50	<50	<50	<50
2,4-Dinitrotoluene	10	<10	<10	<10	<10	<10	<10
2,6-Dinitrotoluene	10	<10	<10	<10	<10	<10	<10
Di-n-octyl phthalate	10	<10	<10	<10	<10	<10	<10
bis(2-ethylhexyl)phthalate	10	<10	<10	<10	<10	<10	<10
Fluoranthene	10	<10	<10	<10	<10	<10	<10
Fluorene	14	<14	<14	<14	<14	<14	<14
Hexachlorobenzene	10	<10	<10	<10	<10	<10	<10
Hexachlorobutadiene	11	<11	<11	<11	<11	<11	<11
Hexachlorocyclopentadiene	10	<10	<10	<10	<10	<10	<10
Hexachloroethane	22	<22	<22	<22	<22	<22	<22
Indeno(1,2,3-cd)pyrene	10	<10	<10	<10	<10	<10	<10

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 7/10/96

ANALYTICAL RESULTS

Semi-Volatile Organics in Water

EPA Method 8270

	Work Order #	64	65	66	67	68	69
	Collector's Sample #	MW-8	MW-9	MW-12	SK-7	SK-8	SK-11
	Date Sampled	6/25/96	6/25/96	6/25/96	6/25/96	6/25/96	6/25/96
	Date Extracted	6/26/96	6/26/96	6/28/96	6/28/96	6/28/96	6/28/96
	Date Analyzed	6/28/96	6/28/96	7/5/96	7/5/96	7/5/96	7/9/96
	Dilution Factor	1	1	1	1	1	1
Analyte	Reporting Limit µg/L	Concentration µg/L					
Isophorone	10	<10	<10	<10	<10	<10	<10
2-Methylnaphthalene	10	<10	<10	<10	<10	<10	<10
2-Methylphenol	11	<11	<11	<11	<11	<11	<11
4-Methylphenol	10	<10	<10	<10	<10	<10	<10
Naphthalene	12	<12	<12	<12	<12	<12	<12
2-Nitroaniline	50	<50	<50	<50	<50	<50	<50
3-Nitroaniline	50	<50	<50	<50	<50	<50	<50
Nitrobenzene	12	<12	<12	<12	<12	<12	<12
2-Nitrophenol	25	<25	<25	<25	<25	<25	<25
4-Nitrophenol	50	<50	<50	<50	<50	<50	<50
N-Nitrosodiphenylamine	13	<13	<13	<13	<13	<13	<13
N-Nitroso-di-n-propylamine	10	<10	<10	<10	<10	<10	<10
Pentachlorophenol	50	<50	<50	<50	<50	<50	<50
Phenanthrene	10	<10	<10	<10	<10	<10	<10
Phenol	18	<18	<18	<18	<18	<18	<18
Pyrene	10	<10	<10	<10	<10	<10	<10
Pyridine	10	<10	<10	<10	<10	<10	<10
1,2,4-Trichlorobenzene	11	<11	<11	<11	<11	<11	<11
2,4,5-Trichlorophenol	10	<10	<10	<10	<10	<10	<10
2,4,6-Trichlorophenol	11	<11	<11	<11	<11	<11	<11

Analytical Review / Date: 7/10/96

ANALYTICAL RESULTS

Semi-Volatile Organics in Water

EPA Method 8270

Work Order #		70	71	72	73	74
Collector's Sample #		DUPE-1	DUPE-2	FB	EB-1	EB-2
Date Sampled		6/25/96	6/25/96	6/25/96	6/25/96	6/25/96
Date Extracted		6/28/96	6/28/96	6/28/96	6/28/96	6/28/96
Date Analyzed		7/5/96	7/1/96	7/9/96	7/9/96	7/5/96
Dilution Factor		1	1	1	1	1
Analyte	Reporting Limit µg/L	Concentration µg/L				
Acenaphthene	12	<12	<12	<12	<12	<12
Acenaphthylene	11	<11	<11	<11	<11	<11
Anthracene	10	<10	<10	<10	<10	<10
Benz(a)anthracene	10	<10	<10	<10	<10	<10
Benzo(b)fluoranthene	10	<10	<10	<10	<10	<10
Benzo(k)fluoranthene	10	<10	<10	<10	<10	<10
Benzoic Acid	50	<50	<50	<50	<50	<50
Benzo(g,h,i)perylene	10	<10	<10	<10	<10	<10
Benzo(a)pyrene	10	<10	<10	<10	<10	<10
Benzyl Alcohol	20	<20	<20	<20	<20	<20
bis(2-Chloroethoxy)Methane	11	<11	<11	<11	<11	<11
bis(2-Chloroethyl)Ether	16	<16	<16	<16	<16	<16
bis(2-Chloroisopropyl)Ether	13	<13	<13	<13	<13	<13
4-Bromophenyl-phenylether	10	<10	<10	<10	<10	<10
Butylbenzylphthalate	10	<10	<10	<10	<10	<10
4-Chloroaniline	50	<50	<50	<50	<50	<50
4-Chloro-3-Methylphenol	20	<20	<20	<20	<20	<20
2-Chloronaphthalene	15	<15	<15	<15	<15	<15
2-Chlorophenol	15	<15	<15	<15	<15	<15
4-Chlorophenyl-phenylether	10	<10	<10	<10	<10	<10
Chrysene	10	<10	<10	<10	<10	<10
Dibenz(a,h)anthracene	10	<10	<10	<10	<10	<10

ANALYTICAL RESULTS

Semi-Volatile Organics in Water

EPA Method 8270

Work Order #		70	71	72	73	74
Collector's Sample #		DUPE-1	DUPE-2	FB	EB-1	EB-2
Date Sampled		6/25/96	6/25/96	6/25/96	6/25/96	6/25/96
Date Extracted		6/28/96	6/28/96	6/28/96	6/28/96	6/28/96
Date Analyzed		7/5/96	7/1/96	7/9/96	7/9/96	7/5/96
Dilution Factor		1	1	1	1	1
Analyte	**Reporting Limit µg/L**	**Concentration µg/L**				
Dibenzofuran	10	<10	<10	<10	<10	<10
1,2-Dichlorobenzene	15	<15	<15	<15	<15	<15
1,3-Dichlorobenzene	15	<15	<15	<15	<15	<15
Dichlorobenzene	15	<15	<15	<15	<15	<15
3,3'-Dichlorobenzidine	20	<20	<20	<20	<20	<20
2,4-Dichlorophenol	24	<24	<24	<24	<24	<24
Diethylphthalate	10	<10	<10	<10	<10	<10
2,4-Dimethylphenol	10	<10	<10	<10	<10	<10
Dimethylphthalate	10	<10	<10	<10	<10	<10
4,6-Dinitro-2-Methylphenol	50	<50	<50	<50	<50	<50
2,4-Dinitrophenol	50	<50	<50	<50	<50	<50
2,4-Dinitrotoluene	10	<10	<10	<10	<10	<10
2,6-Dinitrotoluene	10	<10	<10	<10	<10	<10
Di-n-octyl phthalate	10	<10	<10	<10	<10	<10
bis(2-ethylhexyl)phthalate	10	<10	<10	<10	<10	<10
Fluoranthene	10	<10	<10	<10	<10	<10
Fluorene	14	<14	<14	<14	<14	<14
Hexachlorobenzene	10	<10	<10	<10	<10	<10
xachlorobutadiene	11	<11	<11	<11	<11	<11
Hexachlorocyclopentadiene	10	<10	<10	<10	<10	<10
Hexachloroethane	22	<22	<22	<22	<22	<22
Indeno(1,2,3-cd)pyrene	10	<10	<10	<10	<10	<10

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 7/10/96

ANALYTICAL RESULTS

Semi-Volatile Organics in Water

EPA Method 8270

Work Order #		70	71	72	73	74
Collector's Sample #		DUPE-1	DUPE-2	FB	EB-1	EB-2
Date Sampled		6/25/96	6/25/96	6/25/96	6/25/96	6/25/96
Date Extracted		6/28/96	6/28/96	6/28/96	6/28/96	6/28/96
Date Analyzed		7/5/96	7/1/96	7/9/96	7/9/96	7/5/96
Dilution Factor		1	1	1	1	1
Analyte	**Reporting Limit µg/L**	**Concentration µg/L**				
Isophorone	10	<10	<10	<10	<10	<10
2-Methylnaphthalene	10	<10	<10	<10	<10	<10
2-Methylphenol	11	**54**	<11	<11	<11	<11
4-Methylphenol	10	**73**	<10	<10	<10	<10
Naphthalene	12	<12	<12	<12	<12	<12
2-Nitroaniline	50	<50	<50	<50	<50	<50
3-Nitroaniline	50	<50	<50	<50	<50	<50
Nitrobenzene	12	<12	<12	<12	<12	<12
2-Nitrophenol	25	<25	<25	<25	<25	<25
4-Nitrophenol	50	<50	<50	<50	<50	<50
N-Nitrosodiphenylamine	13	<13	<13	<13	<13	<13
N-Nitroso-di-n-propylamine	10	<10	<10	<10	<10	<10
Pentachlorophenol	50	<50	<50	<50	<50	<50
Phenanthrene	10	<10	<10	<10	<10	<10
Phenol	18	<18	<18	<18	<18	<18
Pyrene	10	<10	<10	<10	<10	<10
Pyridine	10	<10	<10	<10	<10	<10
1,2,4-Trichlorobenzene	11	<11	<11	<11	<11	<11
2,4,5-Trichlorophenol	10	<10	<10	<10	<10	<10
2,4,6-Trichlorophenol	11	<11	<11	<11	<11	<11

Analytical Review / Date: 7/10/96

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 7/10/96

ANALYTICAL RESULTS

Volatile Organics in Water

EPA Method 8240

Work Order #		57	58	59	60	61	62
Collector's Sample #		MW-1	MW-2	MW-4	MW-5	MW-6	MW-7
Date Sampled		6/25/96	6/25/96	6/25/96	6/25/96	6/25/96	6/25/96
Date Analyzed		6/27/96	6/27/96	6/28/96	6/28/96	6/28/96	6/28/96
Dilution Factor		1	1	1	1	1	1
Analyte	Report Limit µg/L	Concentration µg/L					
Acetone	100	<100	<100	<100	<100	<100	<100
Acetonitrile	100	<100	<100	<100	<100	<100	<100
Allyl Chloride	5	<5	<5	<5	<5	<5	<5
Benzene	5	<5	<5	<5	<5	<5	116
[illegible]yl Chloride	100	<100	<100	<100	<100	<100	<100
Bromodichloromethane	5	<5	<5	<5	<5	<5	<5
Bromoform	5	<5	<5	<5	<5	<5	<5
Bromomethane	10	<10	<10	<10	<10	<10	<10
2-Butanone	100	<100	<100	<100	<100	<100	<100
Carbon Disulfide	100	<100	<100	<100	<100	<100	<100
Carbon Tetrachloride	5	<5	<5	<5	<5	<5	<5
Chlorobenzene	5	<5	<5	<5	<5	<5	10
Chlorodibromomethane	5	<5	<5	<5	<5	<5	<5
Chloroethane	10	<10	<10	<10	<10	<10	<10
2-Chloroethyl vinyl ether	10	<10	<10	<10	<10	<10	<10
Chloroform	5	<5	<5	<5	<5	<5	<5
Chloromethane	10	<10	<10	<10	<10	<10	<10
1,2-Dibromo-3-chloropropane	100	<100	<100	<100	<100	<100	<100
1,2-Dibromoethane	5	<5	<5	<5	<5	<5	<5
[illegible]omomethane	5	<5	<5	<5	<5	<5	<5
1,4-Dichloro-2-butene	100	<100	<100	<100	<100	<100	<100
1,2-Dichlorobenzene	5	<5	<5	<5	<5	<5	<5

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 7/10/96

ANALYTICAL RESULTS

Volatile Organics in Water

EPA Method 8240

	Work Order #	57	58	59	60	61	62
	Collector's Sample #	MW-1	MW-2	MW-4	MW-5	MW-6	MW-7
	Date Sampled	6/25/96	6/25/96	6/25/96	6/25/96	6/25/96	6/25/96
	Date Analyzed	6/27/96	6/27/96	6/28/96	6/28/96	6/28/96	6/28/96
	Dilution Factor	1	1	1	1	1	1
Analyte	Report Limit µg/L	Concentration µg/L					
1,3-Dichlorobenzene	5	<5	<5	<5	<5	<5	<5
1,4-Dichlorobenzene	5	<5	<5	<5	<5	<5	<5
Dichlorodifluoromethane	5	<5	<5	<5	<5	<5	<5
1,1-Dichloroethane	5	<5	<5	<5	<5	<5	8
1,2-Dichloroethane	5	<5	<5	<5	<5	<5	<5
1,1-Dichloroethene	5	<5	<5	<5	<5	<5	<5
cis-1,2-Dichloroethene	5	<5	16	<5	<5	<5	6
trans-1,2-Dichloroethene	5	<5	<5	<5	<5	<5	<5
1,2-Dichloropropane	5	<5	<5	<5	<5	<5	<5
cis-1,3-Dichloropropene	5	<5	<5	<5	<5	<5	<5
trans-1,3-Dichloropropene	5	<5	<5	<5	<5	<5	<5
Ethylbenzene	5	<5	<5	<5	<5	<5	155
Ethyl methacrylate	5	<5	<5	<5	<5	<5	<5
2-Hexanone	50	<50	<50	<50	<50	<50	<50
Isobutyl Alcohol	1000	<1000	<1000	<1000	<1000	<1000	<1000
Methacrylonitrile	100	<100	<100	<100	<100	<100	<100
Methylene Chloride	5	<5	<5	<5	<5	<5	<5
Methyl Iodide	5	<5	<5	<5	<5	<5	<5
Methyl methacrylate	50	<50	<50	<50	<50	<50	<50
4-Methyl-2-pentanone	50	<50	<50	<50	<50	<50	383
Pentachloroethane	10	<10	<10	<10	<10	<10	<10
Styrene	5	<5	<5	<5	<5	<5	<5

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 7/10/96

ANALYTICAL RESULTS

Volatile Organics in Water

EPA Method 8240

Work Order #	57	58	59	60	61	62
Collector's Sample #	MW-1	MW-2	MW-4	MW-5	MW-6	MW-7
Date Sampled	6/25/96	6/25/96	6/25/96	6/25/96	6/25/96	6/25/96
Date Analyzed	6/27/96	6/27/96	6/28/96	6/28/96	6/28/96	6/28/96
Dilution Factor	1	1	1	1	1	1
Analyte	Report Limit µg/L	Concentration µg/L					
1,1,1,2-Tetrachloroethane	5	<5	<5	<5	<5	<5	<5
1,1,2,2-Tetrachloroethane	5	<5	<5	<5	<5	<5	<5
Tetrachloroethene	5	<5	<5	<5	<5	<5	<5
Toluene	5	<5	<5	<5	<5	<5	**330000 ****
1,1,1-Trichloroethane	5	<5	<5	<5	<5	<5	<5
1,1,2-Trichloroethane	5	<5	<5	<5	<5	<5	<5
Trichloroethene	5	<5	9	<5	<5	<5	16
1,2,3-Trichloropropane	5	<5	<5	<5	<5	<5	<5
Vinyl Acetate	50	<50	<50	<50	<50	<50	<50
Vinyl Chloride	10	<10	11	<10	<10	<10	<10
Xylene (Total)	5	<5	<5	<5	<5	<5	284

* 1:10 Dilution

** 1:5000 Dilution

Analytical Review / Date: 7/16/96

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 7/10/96

ANALYTICAL RESULTS

Volatile Organics in Water

EPA Method 8240

Work Order #	63	64	65	66	67	68
Collector's Sample #	MW-7TD	MW-8	MW-9	MW-12	SK-7	SK-8
Date Sampled	6/25/96	6/25/96	6/25/96	6/25/96	6/25/96	6/25/96
Date Analyzed	7/5/96	7/2/96	6/28/96	6/28/96	6/28/96	7/2/96
Dilution Factor	1	1	1	1	1	1
Analyte	Report Limit µg/L	Concentration µg/L					
Acetone	100	<100	102	<100	<100	<100	<100
Acetonitrile	100	<100	<100	<100	<100	<100	<100
Allyl Chloride	5	<5	<5	<5	<5	<5	<5
Benzene	5	<5	<5	7	<5	<5	<5
Benzyl Chloride	100	<100	<100	<100	<100	<100	<100
Bromodichloromethane	5	<5	<5	<5	<5	<5	<5
Bromoform	5	<5	<5	<5	<5	<5	<5
Bromomethane	10	<10	<10	<10	<10	<10	<10
2-Butanone	100	<100	<100	<100	<100	<100	<100
Carbon Disulfide	100	<100	<100	<100	<100	<100	<100
Carbon Tetrachloride	5	<5	<5	<5	<5	<5	<5
Chlorobenzene	5	<5	<5	<5	<5	<5	<5
Chlorodibromomethane	5	<5	<5	<5	<5	<5	<5
Chloroethane	10	<10	87	<10	<10	<10	<10
2-Chloroethyl vinyl ether	10	<10	<10	<10	<10	<10	<10
Chloroform	5	<5	<5	<5	<5	<5	<5
Chloromethane	10	<10	<10	<10	<10	<10	<10
1,2-Dibromo-3-chloropropane	100	<100	<100	<100	<100	<100	<100
1,2-Dibromoethane	5	<5	<5	<5	<5	<5	<5
Dibromomethane	5	<5	<5	<5	<5	<5	<5
1,4-Dichloro-2-butene	100	<100	<100	<100	<100	<100	<100
1,2-Dichlorobenzene	5	<5	<5	<5	<5	<5	<5

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 7/10/96

ANALYTICAL RESULTS

Volatile Organics in Water

EPA Method 8240

	Work Order #	63	64	65	66	67	68
	Collector's Sample #	MW-7TD	MW-8	MW-9	MW-12	SK-7	SK-8
	Date Sampled	6/25/96	6/25/96	6/25/96	6/25/96	6/25/96	6/25/96
	Date Analyzed	7/5/96	7/2/96	6/28/96	6/28/96	6/28/96	7/2/96
	Dilution Factor	1	1	1	1	1	1
Analyte	Report Limit µg/L	Concentration µg/L					
1,3-Dichlorobenzene	5	<5	<5	<5	<5	<5	<5
1,4-Dichlorobenzene	5	<5	<5	<5	<5	<5	<5
Dichlorodifluoromethane	5	<5	<5	<5	<5	<5	<5
1,1-Dichloroethane	5	<5	**71**	**68**	<5	<5	<5
1,2-Dichloroethane	5	<5	<5	<5	<5	<5	<5
1,1-Dichloroethene	5	<5	<5	<5	<5	<5	<5
cis-1,2-Dichloroethene	5	<5	<5	<5	<5	<5	<5
trans-1,2-Dichloroethene	5	<5	<5	<5	<5	<5	<5
1,2-Dichloropropane	5	<5	<5	<5	<5	<5	<5
cis-1,3-Dichloropropene	5	<5	<5	<5	<5	<5	<5
trans-1,3-Dichloropropene	5	<5	<5	<5	<5	<5	<5
Ethylbenzene	5	<5	<5	**91**	<5	<5	<5
Ethyl methacrylate	5	<5	<5	<5	<5	<5	<5
2-Hexanone	50	<50	<50	<50	<50	<50	<50
Isobutyl Alcohol	1000	<1000	<1000	<1000	<1000	<1000	<1000
Methacrylonitrile	100	<100	<100	<100	<100	<100	<100
Methylene Chloride	5	<5	<5	<5	<5	<5	<5
Methyl Iodide	5	<5	<5	<5	<5	<5	<5
Methyl methacrylate	50	<50	<50	<50	<50	<50	<50
4-Methyl-2-pentanone	50	<50	<50	**118**	<50	<50	<50
Pentachloroethane	10	<10	<10	<10	<10	<10	<10
Styrene	5	<5	<5	<5	<5	<5	<5

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 7/10/96

ANALYTICAL RESULTS

Volatile Organics in Water

EPA Method 8240

	Work Order #	63	64	65	66	67	68
	Collector's Sample #	MW-7TD	MW-8	MW-9	MW-12	SK-7	SK-8
	Date Sampled	6/25/96	6/25/96	6/25/96	6/25/96	6/25/96	6/25/96
	Date Analyzed	7/5/96	7/2/96	6/28/96	6/28/96	6/28/96	7/2/96
	Dilution Factor	1	1	1	1	1	1
Analyte	Report Limit µg/L	Concentration µg/L					
1,1,1,2-Tetrachloroethane	5	<5	<5	<5	<5	<5	<5
1,1,2,2-Tetrachloroethane	5	<5	<5	<5	<5	<5	<5
Tetrachloroethene	5	<5	<5	<5	<5	<5	<5
Toluene	5	<5	<5	**166**	<5	<5	<5
1,1,1-Trichloroethane	5	<5	**8**	**9**	<5	<5	<5
1,1,2-Trichloroethane	5	<5	<5	<5	<5	<5	<5
Trichloroethene	5	<5	<5	<5	<5	<5	<5
1,2,3-Trichloropropane	5	<5	<5	<5	<5	<5	<5
Vinyl Acetate	50	<50	<50	<50	<50	<50	<50
Vinyl Chloride	10	<10	<10	<10	<10	<10	<10
Xylene (Total)	5	<5	<5	**84**	<5	<5	<5

Analytical Review / Date: 7/10/96

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 7/10/96

ANALYTICAL RESULTS

Volatile Organics in Water

EPA Method 8240

	Work Order #	69	70	71	72	73	74
	Collector's Sample #	SK-11	DUPE-1	DUPE-2	FB	EB-1	EB-2
	Date Sampled	6/25/96	6/25/96	6/25/96	6/25/96	6/25/96	6/25/96
	Date Analyzed	7/2/96	7/5/96	7/5/96	7/2/96	7/2/96	7/2/96
	Dilution Factor	1	10	1	1	1	1
Analyte	Report Limit µg/L	Concentration µg/L					
Acetone	100	<100	<100	<100	<100	<100	<100
Acetonitrile	100	<100	<500	<100	<100	<100	<100
Allyl Chloride	5	<5	<50	<5	<5	<5	<5
Benzene	5	<5	**136**	**7**	<5	<5	<5
Bromyl Chloride	100	<100	<100	<100	<100	<100	<100
Bromodichloromethane	5	<5	<50	<5	<5	<5	<5
Bromoform	5	<5	<50	<5	<5	<5	<5
Bromomethane	10	<10	<50	<10	<10	<10	<10
2-Butanone	100	<100	<100	<100	<100	<100	<100
Carbon Disulfide	100	<100	<100	<100	<100	<100	<100
Carbon Tetrachloride	5	<5	<50	<5	<5	<5	<5
Chlorobenzene	5	<5	<50	<5	<5	<5	<5
Chlorodibromomethane	5	<5	<50	<5	<5	<5	<5
Chloroethane	10	<10	<50	<10	<10	<10	<10
2-Chloroethyl vinyl ether	10	<10	<50	<10	<10	<10	<10
Chloroform	5	<5	<50	<5	<5	<5	<5
Chloromethane	10	<10	<50	<10	<10	<10	<10
1,2-Dibromo-3-chloropropane	100	<100	<100	<100	<100	<100	<100
1,2-Dibromoethane	5	<5	<50	<5	<5	<5	<5
Dibromomethane	5	<5	<50	<5	<5	<5	<5
1,4-Dichloro-2-butene	100	<100	<100	<100	<100	<100	<100
1,2-Dichlorobenzene	5	<5	<50	<5	<5	<5	<5

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 7/10/96

ANALYTICAL RESULTS

Volatile Organics in Water

EPA Method 8240

	Work Order #	69	70	71	72	73	74
	Collector's Sample #	SK-11	DUPE-1	DUPE-2	FB	EB-1	EB-2
	Date Sampled	6/25/96	6/25/96	6/25/96	6/25/96	6/25/96	6/25/96
	Date Analyzed	7/2/96	7/5/96	7/5/96	7/2/96	7/2/96	7/2/96
	Dilution Factor	1	10	1	1	1	1
Analyte	Report Limit µg/L	Concentration µg/L					
1,3-Dichlorobenzene	5	<5	<50	<5	<5	<5	<5
1,4-Dichlorobenzene	5	<5	<50	<5	<5	<5	<5
Dichlorodifluoromethane	5	<5	<50	<5	<5	<5	<5
1,1-Dichloroethane	5	<5	<50	**61**	<5	<5	<5
1,2-Dichloroethane	5	<5	<50	<5	<5	<5	<5
1,1-Dichloroethene	5	<5	<50	<5	<5	<5	<5
cis-1,2-Dichloroethene	5	<5	<50	<5	<5	<5	<5
trans-1,2-Dichloroethene	5	<5	<50	<5	<5	<5	<5
1,2-Dichloropropane	5	<5	<50	<5	<5	<5	<5
cis-1,3-Dichloropropene	5	<5	<50	<5	<5	<5	<5
trans-1,3-Dichloropropene	5	<5	<50	<5	<5	<5	<5
Ethylbenzene	5	<5	**168**	**89**	<5	<5	<5
Ethyl methacrylate	5	<5	<50	<5	<5	<5	<5
2-Hexanone	50	<50	<100	<50	<50	<50	<50
Isobutyl Alcohol	1000	<1000	<10000	<1000	<1000	<1000	<1000
Methacrylonitrile	100	<100	<100	<100	<100	<100	<100
Methylene Chloride	5	<5	<50	<5	<5	<5	<5
Methyl Iodide	5	<5	<50	<5	<5	<5	<5
Methyl methacrylate	50	<50	<50	<50	<50	<50	<50
4-Methyl-2-pentanone	50	<50	**336**	**108**	<50	<50	<50
Pentachloroethane	10	<10	<50	<10	<10	<10	<10
Styrene	5	<5	<50	<5	<5	<5	<5

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 7/10/96

ANALYTICAL RESULTS

Volatile Organics in Water

EPA Method 8240

	Work Order #	69	70	71	72	73	74
	Collector's Sample #	SK-11	DUPE-1	DUPE-2	FB	EB-1	EB-2
	Date Sampled	6/25/96	6/25/96	6/25/96	6/25/96	6/25/96	6/25/96
	Date Analyzed	7/2/96	7/5/96	7/5/96	7/2/96	7/2/96	7/2/96
	Dilution Factor	1	10	1	1	1	1
Analyte	Report Limit µg/L	Concentration µg/L					
1,1,1,2-Tetrachloroethane	5	<5	<50	<5	<5	<5	<5
1,1,2,2-Tetrachloroethane	5	<5	<50	<5	<5	<5	<5
Tetrachloroethene	5	<5	<50	<5	<5	<5	<5
Toluene	5	<5	**314000 ****	**178**	<5	<5	<5
1,1,1-Trichloroethane	5	<5	<50	**8**	<5	<5	<5
1,1,2-Trichloroethane	5	<5	<50	<5	<5	<5	<5
Trichloroethene	5	<5	<50	<5	<5	<5	<5
1,2,3-Trichloropropane	5	<5	<50	<5	<5	<5	<5
Vinyl Acetate	50	<50	<100	<50	<50	<50	<50
Vinyl Chloride	10	<10	<50	<10	<10	<10	<10
Xylene (Total)	5	<5	**313**	**77**	<5	<5	<5

** 1:5000 Dilution

Analytical Review / Date: 7/10/96

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 7/10/96

ANALYTICAL RESULTS

Volatile Organics in Water

EPA Method 8240

Work Order #		75	76	77	78
Collector's Sample #		Trip Blank 1	Trip Blank 2	Trip Blank 3	Trip Blank 4
Date Sampled		6/25/96	6/25/96	6/25/96	6/25/96
Date Analyzed		7/2/96	7/5/96	7/5/96	7/5/96
Dilution Factor		1	1	1	1
Analyte	Report Limit µg/L	Concentration µg/L			
Acetone	100	<100	<100	<100	<100
Acetonitrile	100	<100	<100	<100	<100
Allyl Chloride	5	<5	<5	<5	<5
Benzene	5	<5	<5	<5	<5
Benzyl Chloride	100	<100	<100	<100	<100
Bromodichloromethane	5	<5	<5	<5	<5
Bromoform	5	<5	<5	<5	<5
Bromomethane	10	<10	<10	<10	<10
2-Butanone	100	<100	<100	<100	<100
Carbon Disulfide	100	<100	<100	<100	<100
Carbon Tetrachloride	5	<5	<5	<5	<5
Chlorobenzene	5	<5	<5	<5	<5
Chlorodibromomethane	5	<5	<5	<5	<5
Chloroethane	10	<10	<10	<10	<10
2-Chloroethyl vinyl ether	10	<10	<10	<10	<10
Chloroform	5	<5	<5	<5	<5
Chloromethane	10	<10	<10	<10	<10
1,2-Dibromo-3-chloropropane	100	<100	<100	<100	<100
1,2-Dibromoethane	5	<5	<5	<5	<5
Dibromomethane	5	<5	<5	<5	<5
1,4-Dichloro-2-butene	100	<100	<100	<100	<100
1,2-Dichlorobenzene	5	<5	<5	<5	<5

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 7/10/96

ANALYTICAL RESULTS

Volatile Organics in Water

EPA Method 8240

	Work Order #	75	76	77	78
	Collector's Sample #	Trip Blank 1	Trip Blank 2	Trip Blank 3	Trip Blank 4
	Date Sampled	6/25/96	6/25/96	6/25/96	6/25/96
	Date Analyzed	7/2/96	7/5/96	7/5/96	7/5/96
	Dilution Factor	1	1	1	1
Analyte	Report Limit µg/L	Concentration µg/L			
1,3-Dichlorobenzene	5	<5	<5	<5	<5
1,4-Dichlorobenzene	5	<5	<5	<5	<5
Dichlorodifluoromethane	5	<5	<5	<5	<5
1,1-Dichloroethane	5	<5	<5	<5	<5
1,2-Dichloroethane	5	<5	<5	<5	<5
1,1-Dichloroethene	5	<5	<5	<5	<5
cis-1,2-Dichloroethene	5	<5	<5	<5	<5
trans-1,2-Dichloroethene	5	<5	<5	<5	<5
1,2-Dichloropropane	5	<5	<5	<5	<5
cis-1,3-Dichloropropene	5	<5	<5	<5	<5
trans-1,3-Dichloropropene	5	<5	<5	<5	<5
Ethylbenzene	5	<5	<5	<5	<5
Ethyl methacrylate	5	<5	<5	<5	<5
2-Hexanone	50	<50	<50	<50	<50
Isobutyl Alcohol	1000	<1000	<1000	<1000	<1000
Methacrylonitrile	100	<100	<100	<100	<100
Methylene Chloride	5	<5	<5	<5	<5
Methyl Iodide	5	<5	<5	<5	<5
Methyl methacrylate	50	<50	<50	<50	<50
4-Methyl-2-pentanone	50	<50	<50	<50	<50
Pentachloroethane	10	<10	<10	<10	<10
Styrene	5	<5	<5	<5	<5

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 7/10/96

ANALYTICAL RESULTS

Volatile Organics in Water

EPA Method 8240

Work Order #		75	76	77	78
Collector's Sample #		Trip Blank 1	Trip Blank 2	Trip Blank 3	Trip Blank 4
Date Sampled		6/25/96	6/25/96	6/25/96	6/25/96
Date Analyzed		7/2/96	7/5/96	7/5/96	7/5/96
Dilution Factor		1	1	1	1
Analyte	Report Limit µg/L	Concentration µg/L			
1,1,1,2-Tetrachloroethane	5	<5	<5	<5	<5
1,1,2,2-Tetrachloroethane	5	<5	<5	<5	<5
Tetrachloroethene	5	<5	<5	<5	<5
Toluene	5	<5	<5	<5	<5
1,1,1-Trichloroethane	5	<5	<5	<5	<5
1,1,2-Trichloroethane	5	<5	<5	<5	<5
Trichloroethene	5	<5	<5	<5	<5
1,2,3-Trichloropropane	5	<5	<5	<5	<5
Vinyl Acetate	50	<50	<50	<50	<50
Vinyl Chloride	10	<10	<10	<10	<10
Xylene (Total)	5	<5	<5	<5	<5

Analytical Review / Date: 7/10/96

safety-kleen®

July 25, 1996

Mr. Jack Bedessem
TriHydro Corporation
920 Sheridan

Laramie, WY 82070

Re: SK Lab Project #96-136
Project ID Name: Dolton, IL

Dear Jack:

Enclosed please find the dissolved metals results for MW-5as requested on July 11,1996.

A formal Quality Control/Quality Assurance program is maintained by Safety-Kleen, which is designed to meet or exceed the EPA requirements. This information is available upon request. The sample bottle for metals analysis was received with the lid off and no sample in the container.

If you have any questions concerning this analysis, or if we can be of further assistance, please contact Rick Cook at 312-825-7351.

Sincerely,

Mark A. Hartwig
Environmental Lab Manager

MAH:

Allan A. Manteuffel Technical Center

P.O. Box 92050
Elk Grove Village, IL
60009-2050

12555 W. Old Higgins Rd.
Elk Grove Village, IL 60007
Telephone: 312/694-2700
Fax: 312/825-7850

Project ID #: 32-08
Project ID Name: Dolton, IL
SK Lab Project #: 96-136
Date Reported: 7/24/96

ANALYTICAL RESULTS

Dissolved Metals

Work Order #	60
Collector's Sample #	MW-5
Date Sampled	6/25/96
Date Analyzed (EPA Method 6010)	7/22/96
Date Analyzed (EPA Method 7131)	7/22/96
Date Analyzed (EPA Method 7421)	7/16/96
Date Analyzed (EPA Method 7470)	7/23/96

Analyte	EPA Method	Reporting Limit mg/L	Concentration mg/L
Barium	6010	2.0	<2.0
Cadmium	7131	0.005	<0.005
Lead	7421	0.0075	<0.0075
Mercury	7470	0.002	<0.002

Analytical Review / Date: 7/25/96

INITIAL CALIBRATION VERIFICATION CHECK SAMPLE REPORT

Metals in TCLP Leachate

Analyte	Date Analyzed	Expected Result mg/L	Observed Result mg/L	% Recovery	% Acceptability Limits
Barium	6/27/96	5	4.979	99.58	90 - 110
Cadmium	6/27/96	0.005	0.00537	107.4	90 - 110
Lead	6/27/96	0.05	0.0507	101.4	90 - 110
Mercury	6/18/96	0.0025	0.00262	104.8	90 - 110

METHOD BLANK SUMMARY

Metals in TCLP Leachate

Lab Blank #:	626ADB3010	RBLANK1
Date Digested:	6/26/96	7/3/96
Date Analyzed:	6/27/96	7/3/96
Analyte	**Concentration mg/L**	
Barium	<0.010	N/A
Cadmium	<0.0004	N/A
Lead	<0.0031	N/A
Mercury	N/A	<0.0002

Review / Date: 11/13/96

LABORATORY CONTROL SAMPLE RESULTS

Metals in TCLP Leachate

% Acceptability Limits: 80 - 120

Lab Control Sample ID LCSE614

Analyte	Date Prepared	Date Analyzed	Expected Result mg/L	Observed Result mg/L	% Recovery
Barium	6/27/96	6/27/96	1	0.9401	94.01
Cadmium	6/27/96	6/27/96	0.005	0.0052	104
Lead	6/27/96	6/27/96	0.05	0.0514	102.8

Review / Date: 11/13/96

Project ID #: 32-08
Project ID Name: Dolton
SK Lab Project #: 96-136E
Date Reported: 10/25/96

LABORATORY CONTROL SAMPLE RESULTS

Total Metals

% Acceptability Limits: 80 - 120

Lab Control Sample ID LCSE627

Analyte	Date Prepared	Date Analyzed	Expected Result mg/L	Observed Result mg/L	% Recovery
Barium	6/27/96	6/27/96	1	0.9401	94.01

Review / Date:

Project ID #: 32-08
Project ID Name: Dolton
SK Lab Project #: 96-136E
Date Reported: 10/25/96

MATRIX SPIKE (MS) &
MATRIX SPIKE DUPLICATE (MSD) SUMMARY
PERCENT RECOVERY & RELATIVE PERCENT DIFFERENCE (RPD)
Total Metals

Acceptability Limits %

Work Order #: 96-136-73 RPD: 20

Collector's Sample #: EB-1 % Recovery: 80 - 120

Analyte	Spike Added mg/L	Sample Conc. mg/L	MS Conc. mg/L	MSD Conc. mg/L	MS % Recovery	MSD % Recovery
Barium	1.000	<0.010	0.8547	0.862	85	86
Mercury	0.00250	<0.0002	0.00248	0.00255	99	102

Work Order #: 96-136-72

Collector's Sample #: FB

Analyte	Spike Added mg/L	Sample Conc. mg/L	MS Conc. mg/L	MSD Conc. mg/L	MS % Recovery	MSD % Recovery
Cadmium	0.005	<0.0004	0.005	0.00508	100	102
Lead	0.05	0.0047	0.0523	0.0513	95	93

Review / Date:

SURROGATE RECOVERY SUMMARY

Semi-Volatile Organics in Water

EPA Method 8270

Work Order #	Collector's Sample #	Percent Recovery					
		S1 (2FP)	S2 (PHL)	S3 (NB)	S4 (2FBP)	S5 (246TBP)	TOTAL OUT
57	MW-1	38	27	61	67	88	0
58	MW-2	44	28	72	70	81	0
59	MW-4	50	32	76	79	101	0
60	MW-5	42	32	66	76	92	0
61	MW-6	39	27	67	68	86	0
62	MW-7	34	29	76	83	95	0
64	MW-8	40	26	64	72	91	0
65	MW-9	55	27	86	87	91	0
66	MW-12	30	25	58	57	101	0
67	SK-7	18	10	62	63	93	1
68	SK-8	49	31	78	77	119	0
69	SK-11	45	34	74	79	102	0
70	DUPE-1	40	29	73	71	121	0
71	DUPE-2	27	21	72	60	72	0
72	FB	29	22	68	70	75	0
73	EB-1	27	22	71	69	72	0
74	EB-2	35	25	76	73	92	0

Surrogates			Recovery Limits
S1	2FP	2-Fluorophenol	16-108
S2	PHL	Phenol-d6	13-121
S3	NB	Nitrobenzene-d5	27-112
S4	2FBP	2-Fluorobiphenyl	34-118
S5	246TBP	2,4,6-Tribromophenol	32-123

Review / Date: 11/13/96

METHOD BLANK SUMMARY

Semi-Volatile Organics in Water

EPA Method 8270

Lab Blank #	8WBL0626	8WBL0627
Date Extracted	6/26/96	6/27/96
Date Analyzed	7/1/96	7/9/96
Analyte	Concentration µg/Kg	
Acenaphthene	<12	<12
Acenaphthylene	<11	<11
Anthracene	<10	<10
Benz(a)anthracene	<10	<10
Benzo(b)fluoranthene	<10	<10
Benzo(k)fluoranthene	<10	<10
Benzoic Acid	<50	<50
Benzo(g,h,i)perylene	<10	<10
Benzo(a)pyrene	<10	<10
Benzyl Alcohol	<20	<20
bis(2-Chloroethoxy)Methan	<11	<11
bis(2-Chloroethyl)Ether	<16	<16
bis(2-Chloroisopropyl)Ether	<13	<13
4-Bromophenyl-phenylether	<10	<10
Butylbenzylphthalate	<10	<10
4-Chloroaniline	<50	<50
4-Chloro-3-Methylphenol	<20	<20
2-Chloronaphthalene	<15	<15
2-Chlorophenol	<15	<15
4-Chlorophenyl-phenylethe	<10	<10
Chrysene	<10	<10
Dibenz(a,h)anthracene	<10	<10
Dibenzofuran	<10	<10

METHOD BLANK SUMMARY

Semi-Volatile Organics in Water

EPA Method 8270

Lab Blank #	8WBL0626	8WBL0627
Date Extracted	6/26/96	6/27/96
Date Analyzed	7/1/96	7/9/96
Analyte	Concentration µg/Kg	
1,2-Dichlorobenzene	<15	<15
1,3-Dichlorobenzene	<15	<15
1,4-Dichlorobenzene	<15	<15
3,3'-Dichlorobenzidine	<20	<20
[illegible]Dichlorophenol	<24	<24
Diethylphthalate	<10	<10
2,4-Dimethylphenol	<10	<10
Dimethylphthalate	<10	<10
4,6-Dinitro-2-Methylphenol	<50	<50
2,4-Dinitrophenol	<50	<50
2,4-Dinitrotoluene	<10	<10
2,6-Dinitrotoluene	<10	<10
Di-n-octyl phthalate	<10	<10
bis(2-ethylhexyl)phthalate	<10	<10
Fluoranthene	<10	<10
Fluorene	<14	<14
Hexachlorobenzene	<10	<10
Hexachlorobutadiene	<11	<11
Hexachlorocyclopentadien	<10	<10
Hexachloroethane	<22	<22
[illegible]eno(1,2,3-cd)pyrene	<10	<10
Isophorone	<10	<10

METHOD BLANK SUMMARY

Semi-Volatile Organics in Water

EPA Method 8270

Lab Blank #	8WBL0626	8WBL0627
Date Extracted	6/26/96	6/27/96
Date Analyzed	7/1/96	7/9/96
Analyte	Concentration µg/Kg	
2-Methylnaphthalene	<10	<10
2-Methylphenol	<11	<11
4-Methylphenol	<10	<10
Naphthalene	<12	<12
2-Nitroaniline	<50	<50
3-Nitroaniline	<50	<50
Nitrobenzene	<12	<12
2-Nitrophenol	<25	<25
4-Nitrophenol	<50	<50
N-Nitrosodiphenylamine	<13	<13
N-Nitroso-di-n-propylamine	<10	<10
Pentachlorophenol	<50	<50
Phenanthrene	<10	<10
Phenol	<18	<18
Pyrene	<10	<10
Pyridine	<10	<10
1,2,4-Trichlorobenzene	<11	<11
2,4,5-Trichlorophenol	<10	<10
2,4,6-Trichlorophenol	<11	<11

Project ID #: 32-08
Project ID Name: Dolton
SK Lab Project #: 96-136E
[redacted]te Reported: 11/13/96

MATRIX SPIKE (MS) & MATRIX SPIKE DUPLICATE (MSD) SUMMARY

PERCENT RECOVERY & RELATIVE PERCENT DIFFERENCE (RPD)

Semi-Volatile Organics in Water

EPA Method 8270

Work Order #: 8WBL0626

ollector's Sample #: N/A

Analyte	Spike Added ug/L	Sample Conc. ug/L	MS Conc. ug/L	MSD Conc. ug/L	MS % Recovery	MSD % Recovery	RPD %	Acceptability Limits %	
								RPD	% Recovery
1,2,4-Trichlorobenzene	80	<11	33.01	35.32	41	44	7	40	34-107
A[redacted]naphthene	80	<12	53.38	55.07	67	69	3	40	44-120
2,[redacted]initrotoluene	80	<10	63.6	63.27	80	79	1	40	39-123
Pyrene	80	<10	71.37	71.03	89	89	0	40	33-119
1,4-Dichlorobenzene	80	<15	33.27	33.97	42	42	0	40	33-110
Phenol	80	<18	26.57	26.83	33	34	1	40	32-115
2-Chlorophenol	80	<15	53.45	60.05	67	75	11	40	34-118
4-Chloro-3-Methylphenol	80	<20	59.67	69.4	75	87	15	40	46-132
Pentachlorophenol	80	<50	60.39	58.26	75	73	3	40	19-151
N-Nitrosodi-N-propylamin	80	<10	81.75	68.92	102	86	17	40	47-124
4-Nitrophenol	80	<50	14.76	10.99	18	14	25	40	13-111

Review / Date: [signature] 11/13/96

MATRIX SPIKE (MS) & MATRIX SPIKE DUPLICATE (MSD) SUMMARY

PERCENT RECOVERY & RELATIVE PERCENT DIFFERENCE (RPD)

Semi-Volatile Organics in Water

EPA Method 8270

Work Order #: 8WBL0627

ollector's Sample #: N/A

Analyte	Spike Added µg/L	Sample Conc. µg/L	MS Conc. µg/L	MSD Conc. µg/L	MS % Recover	MSD % Recovery	RPD %	Acceptability Limits %	
								RPD	% Recovery
1,2,4-Trichlorobenzene	80	<10	28.75	29.59	36	37	3	40	34-107
Acenaphthene	80	<10	52.15	53.68	65	67	3	40	44-120
2,4-Dinitrotoluene	80	<10	60.15	62.71	75	78	4	40	39-123
Pyrene	80	<10	65.67	64.97	82	81	1	40	33-119
1,4-Dichlorobenzene	80	<10	28.93	27.92	36	35	4	40	33-110
Phenol	80	<10	26	25.73	33	32	1	40	32-115
2-Chlorophenol	80	<10	56.82	58.59	71	73	3	40	34-118
4-Chloro-3-Methylphenol	80	<10	68.52	71.79	86	90	5	40	46-132
Pentachlorophenol	80	<10	48.27	50.69	60	63	5	40	19-151
N-Nitrosodi-N-propylamin	80	<10	65.73	66.61	82	83	1	40	47-124
4-Nitrophenol	80	<10	19.5	20.4	24	26	4	40	13-111

Review / Date: 11/13/96

Project ID Name: Dolton
SK Lab Project #: 96-136E
Date Reported: 11/13/96

SURROGATE RECOVERY SUMMARY

Volatile Organics in Water

EPA Method 8240

Work Order #	Collector's Sample #	Percent Recovery			
		S1 (TOL)	S2 (BFB)	S3 (DCE)	TOTAL OUT
57	MW-1	97	101	103	0
58	MW-2	99	101	99	0
59	MW-4	98	100	100	0
60	MW-5	96	101	105	0
61	MW-6	98	98	105	0
62	MW-7	11	97	96	1
63	MW-7TD	99	97	101	0
64	MW-8	100	103	95	0
65	MW-9	102	95	97	0
66	MW-12	101	94	103	0
67	SK-7	101	92	109	0
68	SK-8	100	102	99	0
69	SK-11	100	103	94	0
70	DUPE-1	79	95	107	1
71	DUPE-2	100	96	102	0

	Surrogates		Recovery Limits
S1	TOL	Toluene-d8	81 - 117
S2	BFB	Bromofluorobenzene	74 - 121
S3	DCE	1,2-Dichloroethane-d4	70 - 121

Review / Date: 11/13/96

SURROGATE RECOVERY SUMMARY

Volatile Organics in Water

EPA Method 8240

Work Order #	Collector's Sample #	Percent Recovery			
		S1 (TOL)	S2 (BFB)	S3 (DCE)	TOTAL OUT
72	FB	100	101	93	0
73	EB-1	96	98	93	0
74	EB-2	103	96	99	0
75	TRIP 1	102	97	100	0
76	TRIP 2	100	94	103	0
77	TRIP 3	100	94	108	0
78	TRIP 4	99	92	107	0

	Surrogates		Recovery Limits
S1	TOL	Toluene-d8	81 - 117
S2	BFB	Bromofluorobenzene	74 - 121
S3	DCE	1,2-Dichloroethane-d4	70 - 121

Review / Date: 10/25/96

METHOD BLANK SUMMARY

Volatile Organics in Water

EPA Method 8240

Lab Blank #	5MBL62796	5MBL62896	5MBL70296	5MBL70596
Date Analyzed	6/27/96	6/28/96	7/2/96	7/5/96
Analyte	Concentration pg/L			
Acetone	<100	<100	<100	<100
Acetonitrile	<100	<100	<100	<100
Allyl Chloride	<5	<5	<5	<5
Benzene	<5	<5	<5	<5
Benzyl Chloride	<100	<100	<100	<100
Bromodichloromethane	<5	<5	<5	<5
Bromoform	<5	<5	<5	<5
Bromomethane	<10	<10	<10	<10
2-Butanone	<100	<100	<100	<100
Carbon Disulfide	<100	<100	<100	<100
Carbon Tetrachloride	<5	<5	<5	<5
Chlorobenzene	<5	<5	<5	<5
Chlorodibromomethan	<5	<5	<5	<5
Chloroethane	<10	<10	<10	<10
2-Chloroethyl vinyl ethe	<10	<10	<10	<10
Chloroform	<5	<5	<5	<5
Chloromethane	<10	<10	<10	<10
1,2-Dibromo-3-chloropr	<100	<100	<100	<100
1,2-Dibromoethane	<5	<5	<5	<5
Dibromomethane	<5	<5	<5	<5
1,4-Dichloro-2-butene	<100	<100	<100	<100
1,2-Dichlorobenzene	<5	<5	<5	<5
1,3-Dichlorobenzene	<5	<5	<5	<5
1,4-Dichlorobenzene	<5	<5	<5	<5
Dichlorodifluoromethan	<5	<5	<5	<5

METHOD BLANK SUMMARY

Volatile Organics in Water

EPA Method 8240

Lab Blank #	5MBL62796	5MBL62896	5MBL70296	5MBL70596
Date Analyzed	6/27/96	6/28/96	7/2/96	7/5/96
Analyte	Concentration µg/L			
1,1-Dichloroethane	<5	<5	<5	<5
1,2-Dichloroethane	<5	<5	<5	<5
1,1-Dichloroethene	<5	<5	<5	<5
cis-1,2-Dichloroethene	<5	<5	<5	<5
trans-1,2-Dichloroethen	<5	<5	<5	<5
1,2-Dichloropropane	<5	<5	<5	<5
cis-1,3-Dichloropropene	<5	<5	<5	<5
trans-1,3-Dichloroprope	<5	<5	<5	<5
Ethylbenzene	<5	<5	<5	<5
Ethyl methacrylate	<5	<5	<5	<5
2-Hexanone	<50	<50	<50	<50
Isobutyl Alcohol	<1000	<1000	<1000	<1000
Methacrylonitrile	<100	<100	<100	<100
Methylene Chloride	<5	<5	<5	<5
Methyl Iodide	<5	<5	<5	<5
Methyl methacrylate	<50	<50	<50	<50
4-Methyl-2-pentanone	<50	<50	<50	<50
Pentachloroethane	<10	<10	<10	<10
Styrene	<5	<5	<5	<5
1,1,1,2-Tetrachloroetha	<5	<5	<5	<5
1,1,2,2-Tetrachloroetha	<5	<5	<5	<5
Tetrachloroethene	<5	<5	<5	<5
Toluene	<5	<5	<5	<5

METHOD BLANK SUMMARY

Volatile Organics in Water

EPA Method 8240

Lab Blank #	5MBL62796	5MBL62896	5MBL70296	5MBL70596
Date Analyzed	6/27/96	6/28/96	7/2/96	7/5/96
Analyte	Concentration µg/L			
1,1,1-Trichloroethane	<5	<5	<5	<5
1,1,2-Trichloroethane	<5	<5	<5	<5
Trichloroethene	<5	<5	<5	<5
1,2,3-Trichloropropane	<5	<5	<5	<5
Vinyl Acetate	<50	<50	<50	<50
Vinyl Chloride	<10	<10	<10	<10
Xylene (Total)	<5	<5	<5	<5

MATRIX SPIKE (MS) & MATRIX SPIKE DUPLICATE (MSD) SUMMARY

PERCENT RECOVERY & RELATIVE PERCENT DIFFERENCE (RPD)

Volatile Organics in Water

EPA Method 8240

Work Order #: 96-171-07

Collector's Sample #: N/A

Analyte	Spike Added ug/L	Sample Conc. ug/L	MS Conc. ug/L	MSD Conc. ug/L	MS % Recover.	MSD % Recovery	RPD %	Acceptability Limits % RPD	Acceptability Limits % Recovery
Benzene	50	<5	51.3	51.1	103	102	0	40	76 - 127
Chlorobenzene	50	<5	50	50.7	100	101	1	40	75 - 110
1,1-Dichloroethylene	50	<5	47.7	45.3	95	91	5	40	61 - 145
Toluene	50	<5	50.5	50.5	101	101	0	40	76 - 125
Trichloroethylene	50	<5	51.3	51.4	103	103	0	40	71 - 120

Work Order #: 96-136-59

Collector's Sample #: MW-4

Analyte	Spike Added ug/L	Sample Conc. ug/L	MS Conc. ug/L	MSD Conc. ug/L	MS % Recover.	MSD % Recovery	RPD %	Acceptability Limits % RPD	Acceptability Limits % Recovery
Benzene	50	<5	46.6	47.5	93	95	2	40	76 - 127
Chlorobenzene	50	<5	37.8	43.4	76	87	14	40	75 - 110
1,1-Dichloroethylene	50	<5	49.8	47	100	94	6	40	61 - 145
Toluene	50	<5	39	44.2	78	88	13	40	76 - 125
Trichloroethylene	50	<5	49.7	48.8	99	98	2	40	71 - 120

Review / Date: [signature] 11/13/96

MATRIX SPIKE (MS) & MATRIX SPIKE DUPLICATE (MSD) SUMMARY

PERCENT RECOVERY & RELATIVE PERCENT DIFFERENCE (RPD)

Volatile Organics in Water

EPA Method 8240

Work Order #: 96-136-69

Collector's Sample #: SK-11

Analyte	Spike Added ug/L	Sample Conc. ug/L	MS Conc. µg/L	MSD Conc. ug/L	MS % Recover	MSD % Recovery	RPD %	Acceptability Limits % RPD	Acceptability Limits % % Recovery
Benzene	50	<5	50.9	49.1	102	98	4	40	76 - 127
Chlorobenzene	50	<5	51.1	49	102	98	4	40	75 - 110
1,1-Dichloroethylene	50	<5	51.2	48.6	102	97	5	40	61 - 145
Toluene	50	<5	51.7	49.9	103	100	4	40	76 - 125
Trichloroethylene	50	<5	51	48.4	102	97	5	40	71 - 120

Work Order #: 96-136-63

Collector's Sample #: MW-7TD

Analyte	Spike Added ug/L	Sample Conc. ug/L	MS Conc. µg/L	MSD Conc. ug/L	MS % Recover	MSD % Recovery	RPD %	Acceptability Limits % RPD	Acceptability Limits % % Recovery
Benzene	50	<5	52.7	53.8	105	108	2	40	76 - 127
Chlorobenzene	50	<5	52.8	53.4	106	107	1	40	75 - 110
1,1-Dichloroethylene	50	<5	50.3	50.9	101	102	1	40	61 - 145
Toluene	50	<5	56.2	58	112	116	3	40	76 - 125
Trichloroethylene	50	<5	50.3	50.9	101	102	1	40	71 - 120

Review / Date: 11/13/96

Safety-Kleen Corp.

RECEIVED
JAN - 9 1996
IEPA
PERMIT SECTION

RCRA Facility Investigation
Phase II Extent of Release Assessment and
Phase III Ground-Water Release Assessment Workplan

Safety-Kleen Corp. Recycle Center
Dolton, Illinois
ILD980613913

October 13, 1995

PROJECT 32-06

RCRA FACILITY INVESTIGATION
PHASE II EXTENT OF RELEASE ASSESSMENT AND
PHASE III GROUND-WATER RELEASE ASSESSMENT WORKPLAN
SAFETY-KLEEN CORP. RECYCLE CENTER
DOLTON, ILLINOIS
ILD 980613913

October 13, 1995

RECEIVED
OCT 16 1995
IEPA-BOL
PERMIT SECTION

Submitted by:

Safety-Kleen Corp.
1000 N. Randall Road
Elgin, IL 60123

TriHydro Corporation

920 Sheridan Street
Laramie, Wyoming 82070

(307) 745-7474
FAX: (307) 745-7729

B-120-CA-1

cc: Maywood
USEPA

W.E.

JKM ?

ILD 980 613 913

safety-kleen®

VIA EXPRESS DELIVERY - TRACKING # 1Z7X90210102389506
RETURN RECEIPT REQUESTED

October 13, 1995

WRONG NUMBER

RECEIVED
OCT 16 1995
IEPA/DLPC
PERMIT SECTION

Edwin C. Bakowski, PE
Manager, Permit Section
Illinois Environmental Protection Agency
Division of Land Pollution Control
2200 Churchill Road
Post Office Box 19276
Springfield, IL 62794-9276

Re: RCRA Facility Investigation Phase II/III Workplan, Safety-Kleen Corp. Recycle Center, Dolton, Illinois ~~(ILD 981088388)~~

Dear Mr. Bakowski:

Transmitted with this letter are three copies of the document entitled "RCRA Facility Investigation Phase II Extent of Release Assessment and Phase III Ground-Water Release Assessment Workplan, Safety-Kleen Corp. Recycle Center, 633 138th Street, Dolton, Illinois (ILD 980613913)." The Workplan contains the procedures to determine the extent of soil and ground-water impacts at the facility. The Workplan was developed in accordance with Attachment F of the final RCRA Permit for the Dolton Recycle Center and in accordance with the August 17, 1995, IEPA approval letter for the Phase I Report. This Workplan pertains to the Phase II and Phase III Investigation at the Dolton Recycle Center (633 138th Street) only. S-K will submit a separate Phase II Workplan for the former Barker Chemical Property (700 138th Street) by November 15, 1995.

If you have any questions concerning this Workplan, please contact me at (708) 468-2216.

Sincerely,
SAFETY-KLEEN CORP.

for Anne Lunt
Senior Project Manager - Remediation

CD:ahj/32-06

Enclosure(s)

cc: Keith Marcott (S-K, Elgin)
John Valerius (S-K, Dolton)
TriHydro Corporation

1000 NORTH RANDALL ROAD ELGIN, ILLINOIS 60123-7857 PHONE 708/697-8460 FAX 708/468-8500

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CHAPTER 1.0

INTRODUCTION

Safety-Kleen Corp. (S-K) purchased and has operated a recycling facility (SIC 2851) in Dolton, Illinois since 1987. Prior to S-K ownership, Barker Chemical Company (1951-1981) and Foremost McKesson, Inc. (1981-1987) owned the property and operated the facility to manufacture coatings and adhesives and for reclamation of paint solvents and lacquer thinner wastes. Under S-K operation, the facility accepts spent organic chemicals and solvent wastes from S-K service centers, other S-K recycle centers, and industrial and commercial facilities. Spent materials brought to the facility are recycled and regenerated into product or blended for use as a fuel in cement kilns. The location of the facility is shown on Figure 1-1. Principal wastes managed at the facility are paint waste, lacquer thinner, mineral spirits, and waste oil.

Additional facility details are presented in the Phase I RCRA Facility Investigation (RFI) Workplan dated March 4, 1994. S-K conducted the Phase I RFI at the Dolton Recycle Center in September 1994. A report containing the results of the Phase I Investigation was submitted to the Illinois Environmental Protection Agency (IEPA) on March 2, 1995. In a letter dated August 17, 1995, IEPA approved the Phase I RFI Report and indicated that S-K should conduct Phase II and Phase III Investigations at the site. The approval letter is presented in Appendix A.

In the August 17, 1995 letter, IEPA acknowledged concurrence with the S-K recommendation that the Phase II and Phase III investigations be conducted on the basis of groups of Solid Waste Management Units (SWMUs) due to their proximity to one another. These areas or groups of SWMUs are referred to as Investigation Areas in this workplan. In the August 17, 1995 letter, IEPA also concurred that subsequent investigations at the former Barker Chemical Property (700 138th Street) located north of 138th Street, will be conducted under a separate workplan. S-K will submit a workplan for a Phase II Investigation at that site by November 15, 1995, as specified in Condition 3 of the approval letter.

1.1 RFI Objectives

The Dolton Recycle Center is permitted to store and treat RCRA hazardous wastes (ILD980613913; RCRA Log B-121). As a condition of the RCRA permit, IEPA required that S-K conduct an RFI. In accordance with the RCRA permit, the RFI is divided into three phases:

Phase I - Release Assessment - Phase I is designed to provide information on the characteristics and integrity of each Solid Waste Management Unit/Area of Concern (SWMU/AOC) and to determine if a SWMU/AOC has released, is currently releasing, or has the potential to release hazardous waste and/or

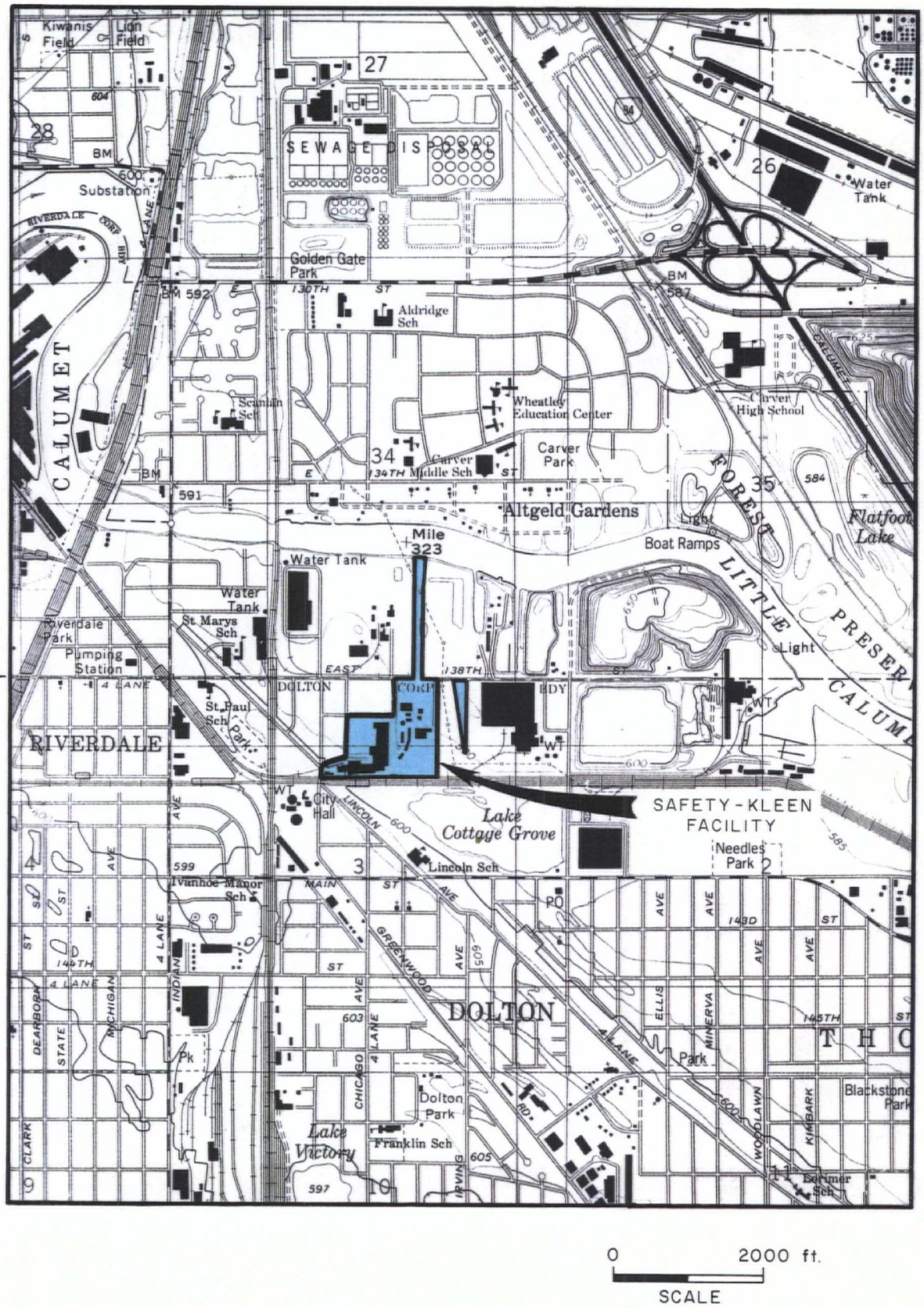


FIGURE 1-1 :VICINITY MAP, SAFETY-KLEEN CORP. RECYCLE CENTER, DOLTON, ILLINOIS (ILD980613913)

hazardous constituents to the soil or air. Phase I of the RFI has been completed.

Phase II - Extent of Release Assessment - Phase II is designed to define the extent of impacts (if any) to soil from the subject SWMUs/AOCs.

Phase III - Ground-Water Release Assessment - Phase III is designed to define the extent of impacts to ground water (if any) from the SWMU/AOC releases identified in Phases I or II.

The September 1994 investigation at the Dolton Recycle Facility primarily addressed the Phase I objectives. During the September 1994 investigation, S-K voluntarily collected additional soil and ground-water quality data, which were pertinent to determining the characteristics and degree of impacts. This workplan has been designed to address Phases II and III of the RFI, in accordance with the IEPA approval letter dated August 17, 1995.

1.2 Organization of the Phase II/III Workplan

This Phase II/III Workplan includes the procedures that will be used to determine the extent of soil (Phase II) impacts and evaluate the extent of ground-water (Phase III) impacts in the subsurface at the site. In Condition 5 of the August 17, 1995 letter, IEPA approved the approach of conducting portions of a Phase III investigation in conjunction with the Phase II investigation. The primary objective of Phase III is to determine the extent of impacts to ground water (if any) from identified SWMUs or AOCs.

Many portions of the Phase I RFI Workplan (dated March 4, 1994) are incorporated as appendices to this Phase II/III Workplan. These include the Project Management Plan (Appendix B), the Health and Safety Plan (Appendix C), the Data Management Plan (Appendix D), and the Quality Assurance Plan (Appendix E). For Phases II and III of the RFI, S-K will implement the sampling, analytical and reporting procedures contained in all relevant sections of those documents.

Identification of the SWMUs and Investigation Areas covered by the Phase II/III RFI is contained in Chapter 2.0 of this workplan. Relevant historical data and Phase I results are summarized in Chapter 3.0. Detailed descriptions of the individual SWMUs are presented in Chapter 2.0 of the Phase I Release Assessment Report. A more detailed compilation of historical data is presented in Part II of the Phase I RFI Workplan. The Phase II investigation procedures to be used to determine the extent of soil impacts are presented in Chapter 4.0, and the Phase III investigation procedures to be used to evaluate the extent of ground-water impacts are presented in Chapter 5.0.

Chapters 4.0 and 5.0 present proposed Phase II/III soil sampling and ground-water monitoring well locations, well installation, surveying, and development procedures, soil and ground-water sampling procedures, and laboratory analyses. Analytical and additional sampling procedures (i.e., pre-field activities, field documentation, chain-of-custody control, and post-field activities) are contained in the approved Phase I RFI Workplan (Part IV, Sampling and Analysis Plan and Part VII, Quality Assurance Plan) and included in Appendix E of this Workplan. S-K will implement these other procedures during Phases II and III of the RFI.

Several personnel changes have occurred since completion of Phase I of the RFI. These include changes in the IEPA Project Coordinator, the S-K Senior Project Manager, the TriHydro Corporation Project Team, and drilling subcontractors. The newly identified S-K and TriHydro project team members have been involved with Phase I and/or have had previous experience at this site, and are qualified to perform the Phase II/III RFI. No changes have been made to laboratory personnel. A summary of the updated Project Management Team is presented in Appendix F.

CHAPTER 2.0

PHASE II/III INVESTIGATION AREAS

In the August 17, 1995 approval letter (Appendix A), IEPA acknowledged concurrence with the S-K recommendation that the Phase II investigation be conducted on the basis of groups of SWMUs due to their proximity to one another. These areas or groups of SWMUs are referred to as Investigation Areas throughout the remainder of this workplan.

The SWMUs and Investigation Areas are shown on Figure 2-1. These investigation areas are consistent with Condition 1 of the IEPA approval letter. The four Investigation Areas covered by this workplan are:

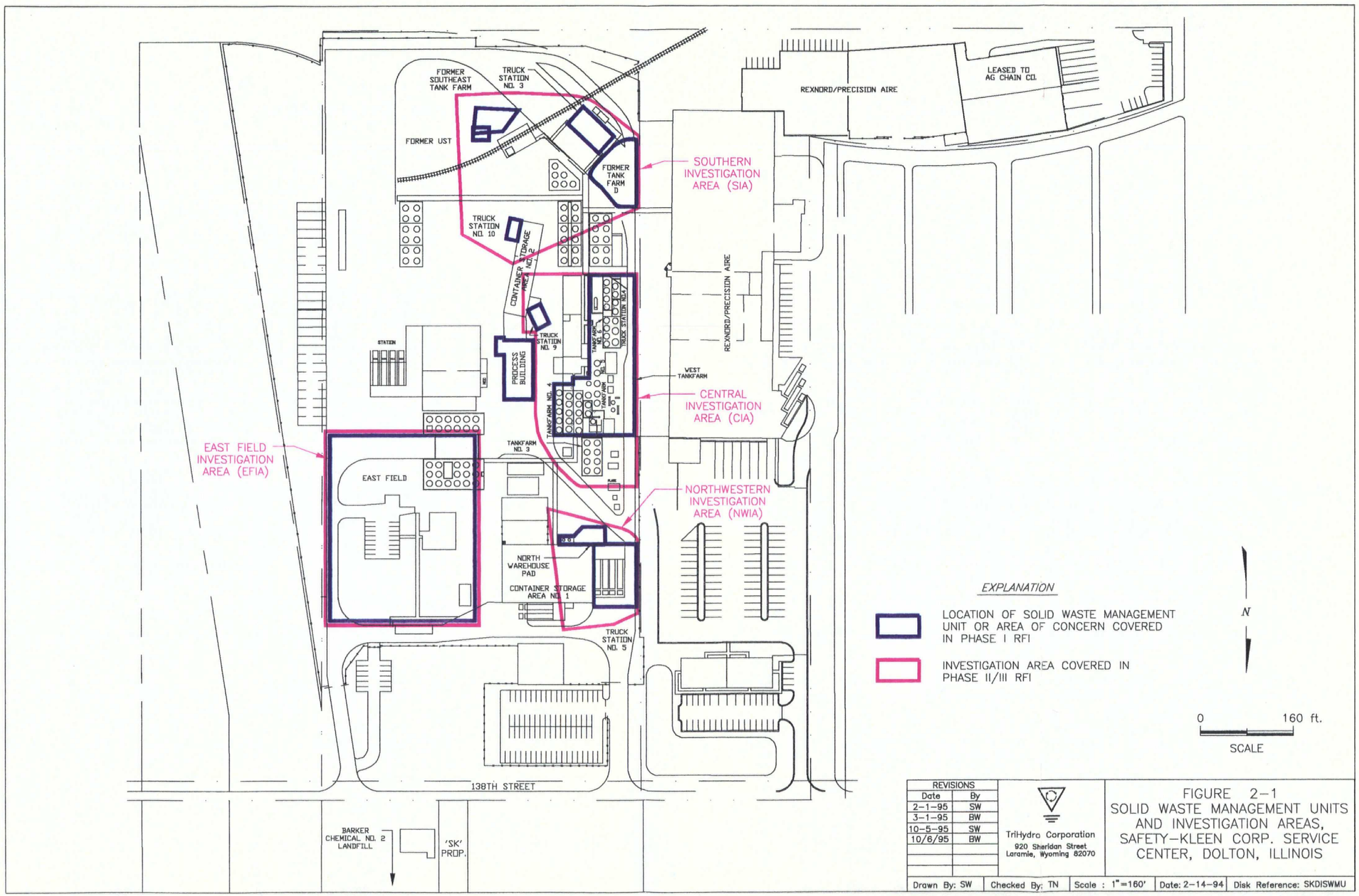
The Southern Investigation Area (SIA): This area includes the Former Tank Farm D, the Former Southeast Tank Farm, Truck Station Nos. 3 and 10, and the former underground storage tank in the vicinity of the Former Southeast Tank Farm.

The Central Investigation Area (CIA): This area includes Truck Station Nos. 4 and 9, and Tank Farm Nos. 3, 4, 5, and 6.

The Northwestern Investigation Area (NWIA): This area includes the North Warehouse Pad and Truck Station Nos. 5 and 6.

The East Field Investigation Area (EFIA): This area includes the East Field and Tank Farm No. 2 (note that Tank Farm No. 2 was not identified as a SWMU in the Phase I RFI Workplan, but was referenced as part of the East Field in Condition 1.d of the approval letter.

Due to the unique location and characteristics of the former Barker Chemical Property, subsequent investigations in that area will be conducted under a separate Phase II RFI Workplan which will be submitted to IEPA by November 15, 1995. This approach was specified in Condition 3 of the August 17, 1995 approval letter. The former Barker Chemical Property (700 138th Street) is a 50-foot wide strip of land owned by S-K, located north of 138th Street, between 138th Street and the Little Calumet River (see Figure 1-1). This area was referenced as the Barker Chemical No. 2 Area in previous IEPA correspondence and the Phase I RFI report.



REVISIONS	
Date	By
2-1-95	SW
3-1-95	BW
10-5-95	SW
10/6/95	BW

TriHydro Corporation
920 Sheridan Street
Laramie, Wyoming 82070

FIGURE 2-1
SOLID WASTE MANAGEMENT UNITS AND INVESTIGATION AREAS, SAFETY-KLEEN CORP. SERVICE CENTER, DOLTON, ILLINOIS

Drawn By: SW	Checked By: TN	Scale : 1"=160'	Date: 2-14-94	Disk Reference: SKDISWMU

CHAPTER 3.0

PREVIOUS ASSESSMENT RESULTS

Seven soil investigations and four ground-water investigations have been conducted at the facility since 1979, including the September 1994 Phase I RFI. Prior to the Phase I RFI, S-K had conducted environmental investigations at the site in 1988, 1990 and 1990-1991. S-K is aware of investigations at the site in 1979, 1981 and 1983 conducted under previous owners. The data collected at the site prior to the initial RFI were referenced and described in detail in the Phase I RFI Workplan, dated March 4, 1994. The Phase I results are described in detail in the Phase I RFI Report, dated March 2, 1995. Previous data which pertains to achieving the Phase II/III objectives are discussed and summarized in this chapter.

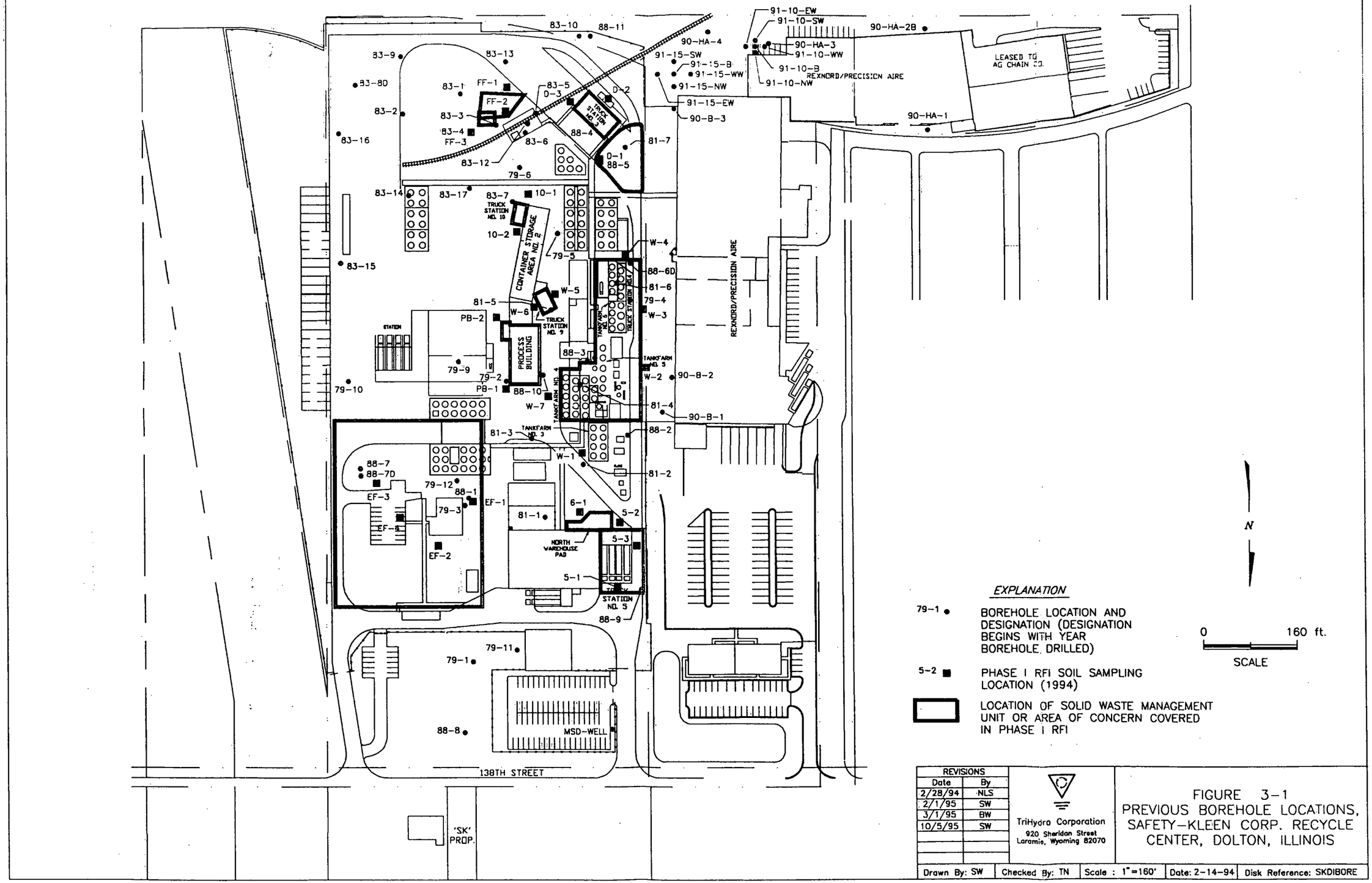
The results of the Phase I RFI were generally consistent with previous soil and ground-water quality data from the site. Therefore, a considerable amount of qualitative information and quantitative data have been collected on soil lithology, hydraulic conductivity, soil quality, ground-water occurrence, ground-water flow direction, and ground-water quality in the vicinity of the designated SWMUs and Investigation Areas. The Phase I RFI data combined with the historical data provide a detailed characterization of environmental conditions at the site. Given the large amount of existing information, the remaining Phase II and III investigations have been designed to focus on accomplishing the specific remaining RFI objectives (see Section 1.1).

3.1 Soil Conditions

During the seven previous soil investigations at the site, qualitative and quantitative information has been generated in the vicinity of the designated SWMUs and Investigation Areas. In general, the following soils information has been collected at the site:

- Physical descriptions of the soils at 89 locations.
- Qualitative descriptions of soil quality at the same 89 locations, and quantitative data on soil quality at 47 locations.
- A soil gas survey at 27 locations to determine the presence of volatile organic compounds (VOCs).
- An electromagnetic conductivity survey at 110 locations to indicate the possible presence of buried objects and/or elevated salinity.

The locations from which soil quality data were collected during previous investigations, including the Phase I RFI are shown on Figure 3-1. These existing data have led



REVISIONS	
Date	By
2/28/94	NLS
2/1/95	SW
3/1/95	BW
10/5/95	SW

TriHydro Corporation
920 Sheridan Street
Laramie, Wyoming 82070

FIGURE 3-1
PREVIOUS BOREHOLE LOCATIONS, SAFETY-KLEEN CORP. RECYCLE CENTER, DOLTON, ILLINOIS

Drawn By: SW	Checked By: TN	Scale : 1"=160'	Date: 2-14-94	Disk Reference: SKDIBORE

to the identification of four impacted areas at the facility and have identified site-specific conditions which limit the potential for migration of soil and ground-water impacts. The data pertinent to establishing the basis for the Phase II RFI are summarized in the following subsections.

3.1.1 Lithology

The large number of soil borings and their distribution throughout the site have resulted in comprehensive definition of subsurface lithology. The lithology underlying the site consists predominantly of low permeability lake silts and clays, with a few interbedded sand lenses. The sediments generally become more granular to the north. However, at least 30 feet of low-permeability silts and clays have been documented to underlie the entire site.

Lithologic cross sections, based on data collected prior to the Phase I RFI, are shown on figures 3-2 and 3-3. The lithology appears to be generally consistent across the site. At the surface is a layer of topsoil (silty clay loam) or fill which is 1 to 4 feet thick. The fill consists of clay, silt, sand, gravel and rubble. The area backfilled with clay, which is shown on Figure 3-2, corresponds geographically with the area where drums were reportedly excavated by the previous facility owners.

Underlying the topsoil or fill are low-permeability, gray to brown silty clays and clayey silts which constitute the predominant shallow lithology beneath the site. Based on the borehole logs, the clays are 35 to 40 feet thick across the entire site, and extend to bedrock. The character of the clays changes from stiff at shallow depths to very stiff and hard near bedrock.

In the east-central and southeastern parts of the site, medium to coarse-grained sand interbedded in a silt and fine sand or silty clay matrix underlies the topsoil or fill. The silts and fine sands attain a maximum thickness of approximately 5 feet in the southeastern corner of the site. However, the silts and fine sands appear to be absent throughout most of the remainder of the site. The silts and fine sands are underlain by the previously described silty clays and clayey silts.

Based on four boreholes drilled in 1988 at the corners of the property, the upper bedrock contact occurs consistently at a depth of approximately 45 feet below ground surface. The uppermost bedrock is reported to be a hard, gray dolomite (the Silurian-age Niagaran Dolomite) which is moderately fractured in the upper several feet, but less fractured with depth. No open voids were encountered in the bedrock during drilling (ATEC Associates, 1989, Report, Hydrogeologic Assessment, Safety-Kleen Facility, Dolton, Illinois).

The Phase I RFI soil borings were constructed to a depth of 20 feet below ground surface (ft-bgs). The subsurface lithologies encountered during the Phase I RFI were similar to those previously encountered at the site. In the northeast corner (EF-2), fill is absent and clay extends from ground surface to the total investigated depth. At two locations (FF-1 in the former UST area and EF-4 in the former drum

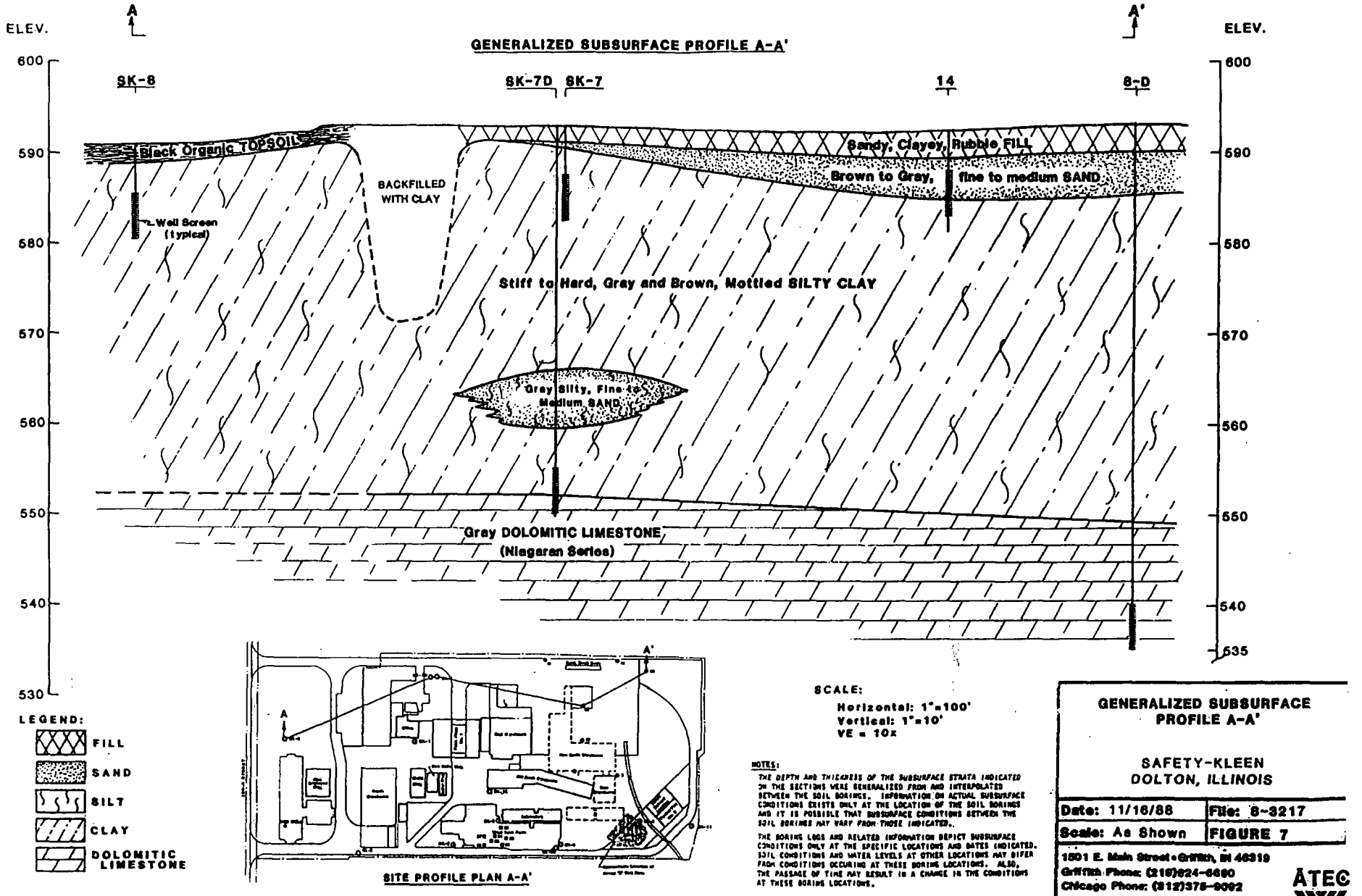


FIGURE 3-2 :CROSS SECTION A–A', SAFETY–KLEEN CORP. RECYCLE CENTER, DOLTON, ILLINOIS

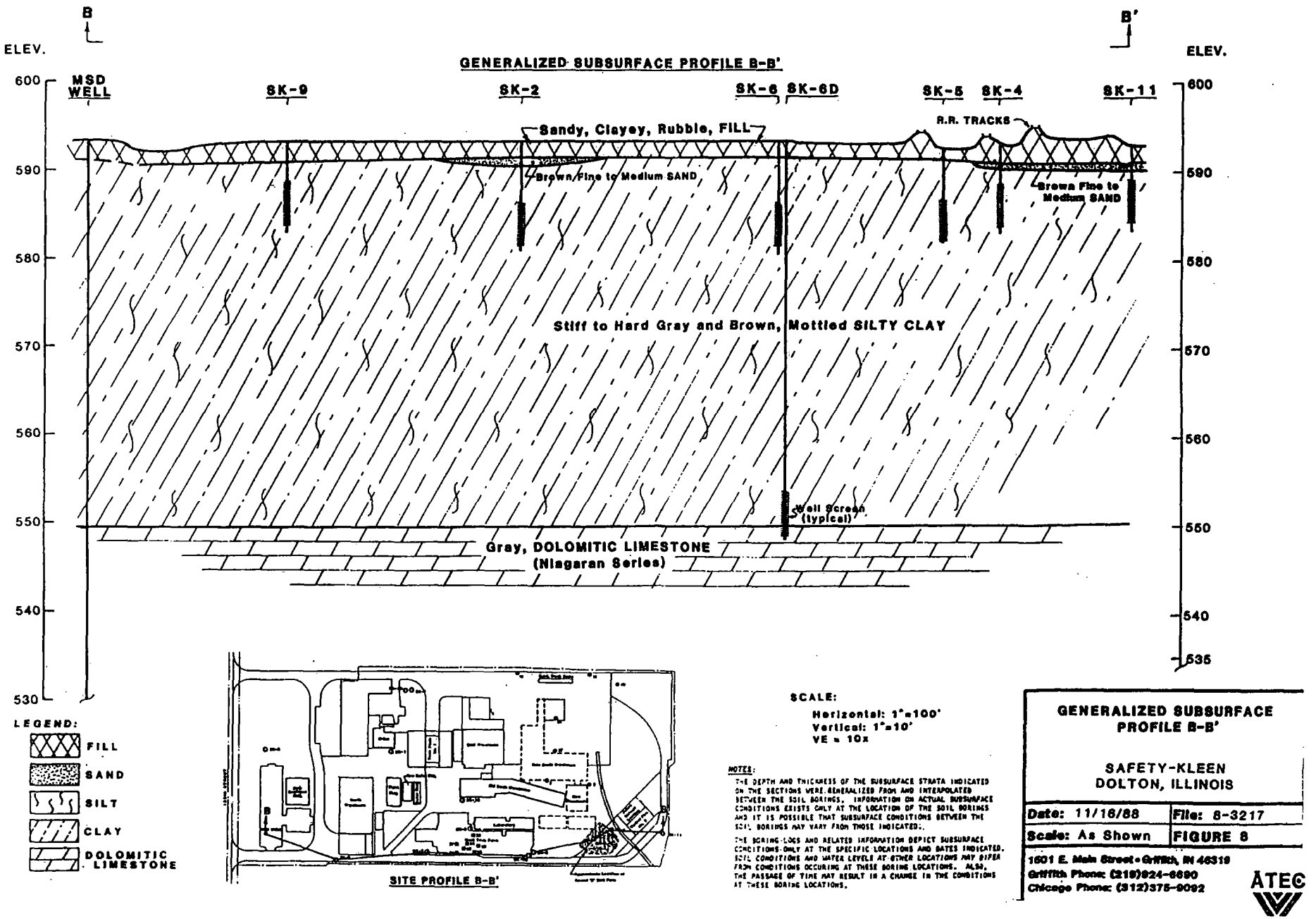


FIGURE 3-3 :CROSS SECTION B–B', SAFETY–KLEEN CORP. RECYCLE CENTER, DOLTON, ILLINOIS

disposal area), excavation fill material (gravel, sand) was encountered to depths of approximately 8 ft-bgs.

At all other locations, fill material consisting of medium-fine silty sand with occasional gravel and brick fragments was encountered from around surface to a depth of approximately 3 ft-bgs. Below the fill, a gray-brown silty clay with 5 to 10 percent sand and minor gravel was encountered to the total investigated depth of 20 ft-bgs. Based on previous soil investigation results from the site, the clay extends to a depth of approximately 45 ft-bgs.

3.1.2 RFI Phase I Soil Quality Data

Soil samples were collected at 25 locations during the Phase I RFI. The Phase I RFI soil quality data are summarized on figures 3-4 through 3-7. A list of constituents detected during the Phase I Investigation and abbreviations that are used on the figures is presented in Table 3-1. USEPA Draft Soil Screening Levels (SSGLs) for the constituents detected at this facility are also shown on Table 3-1. This list includes constituents that may be "indicators" of facility-related impacts, naturally occurring constituents, and non-facility related constituents. As described in the Phase I RFI Report, several constituents (phenol and phthalates) may not be indicative of facility-related impacts.

The results of a quality assurance review of the Phase I RFI soil analytical data indicated that the soil samples from the facility presented a number of challenges for VOC analyses, due to the presence of matrix interferences. Sample dilution (5x) was required for many samples to achieve acceptable VOC quality control results. This dilution resulted in raising the VOC detection limits by a factor of five for most, but not all samples.

The soil VOC detection limits, although frequently elevated, were generally below the SSGLs and the IEPA Class II levels for ground water. Therefore, the VOC data are useful for determining whether there have been releases from the SWMUs and characterizing the nature and degree of the releases, based upon the types of constituents present. The pattern of a detection of VOCs during the Phase I RFI was consistent with data and observations generated during the previous investigations.

3.1.2.1 SWMU Releases

S-K collected and analyzed shallow soil samples to address the Phase I objective of determining whether a release had occurred from any of the SWMUs under investigation. Shallow soil samples were collected at a depth of 1 to 3 ft-bgs at most locations to accomplish this objective. The sampling depths are shown on figures 3-4 through 3-7. Based on the detection of the indicator constituents in the Phase I shallow soil samples, possible SWMU-related impacts to soil occurred in the following Investigation Areas:

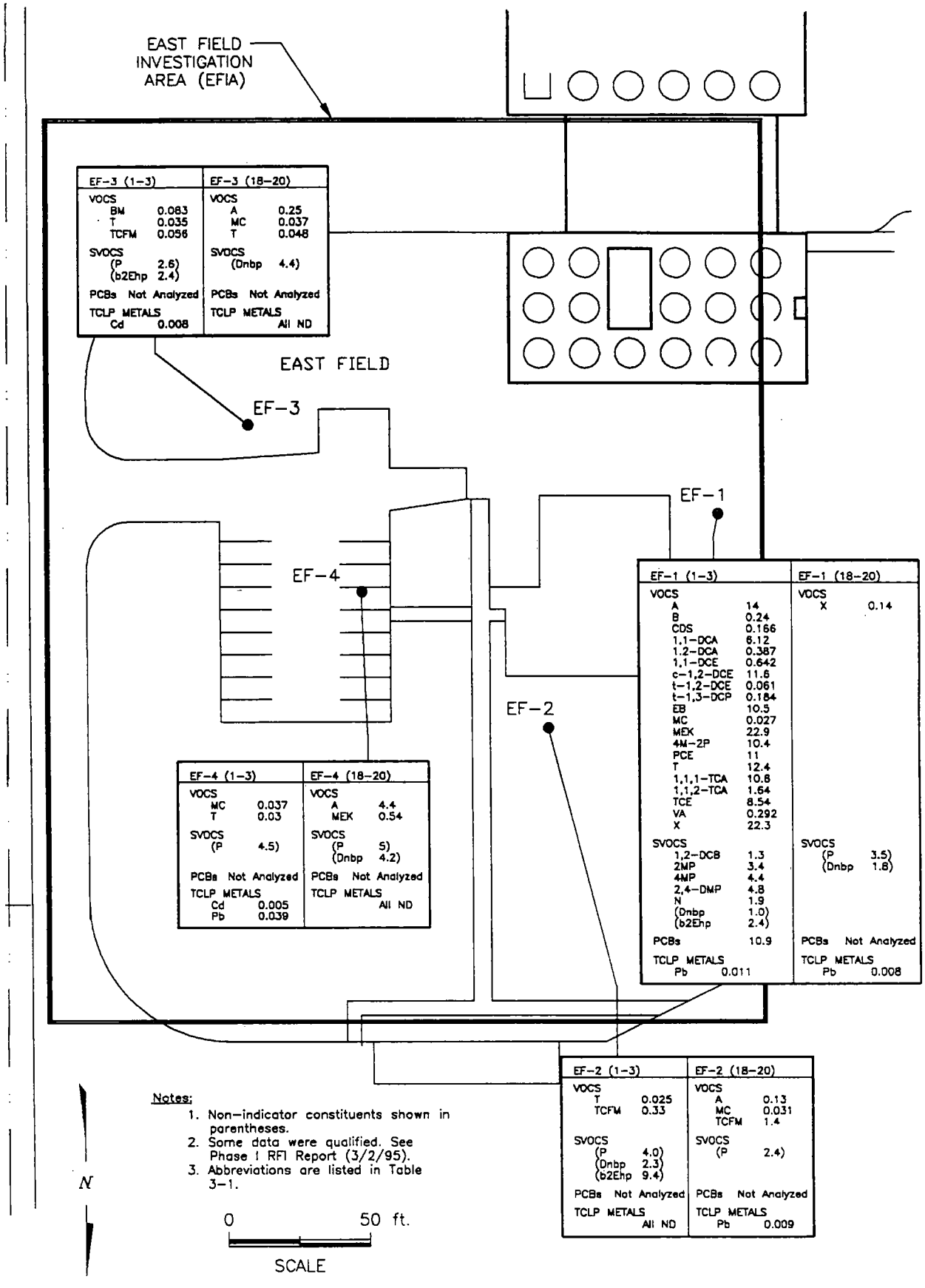


FIGURE 3-4 :SOIL QUALITY DATA, EAST FIELD, RFI PHASE I RELEASE ASSESSMENT, SAFETY-KLEEN CORP. RECYCLE CENTER, DOLTON, ILLINOIS (1994)

SKDIEISQ

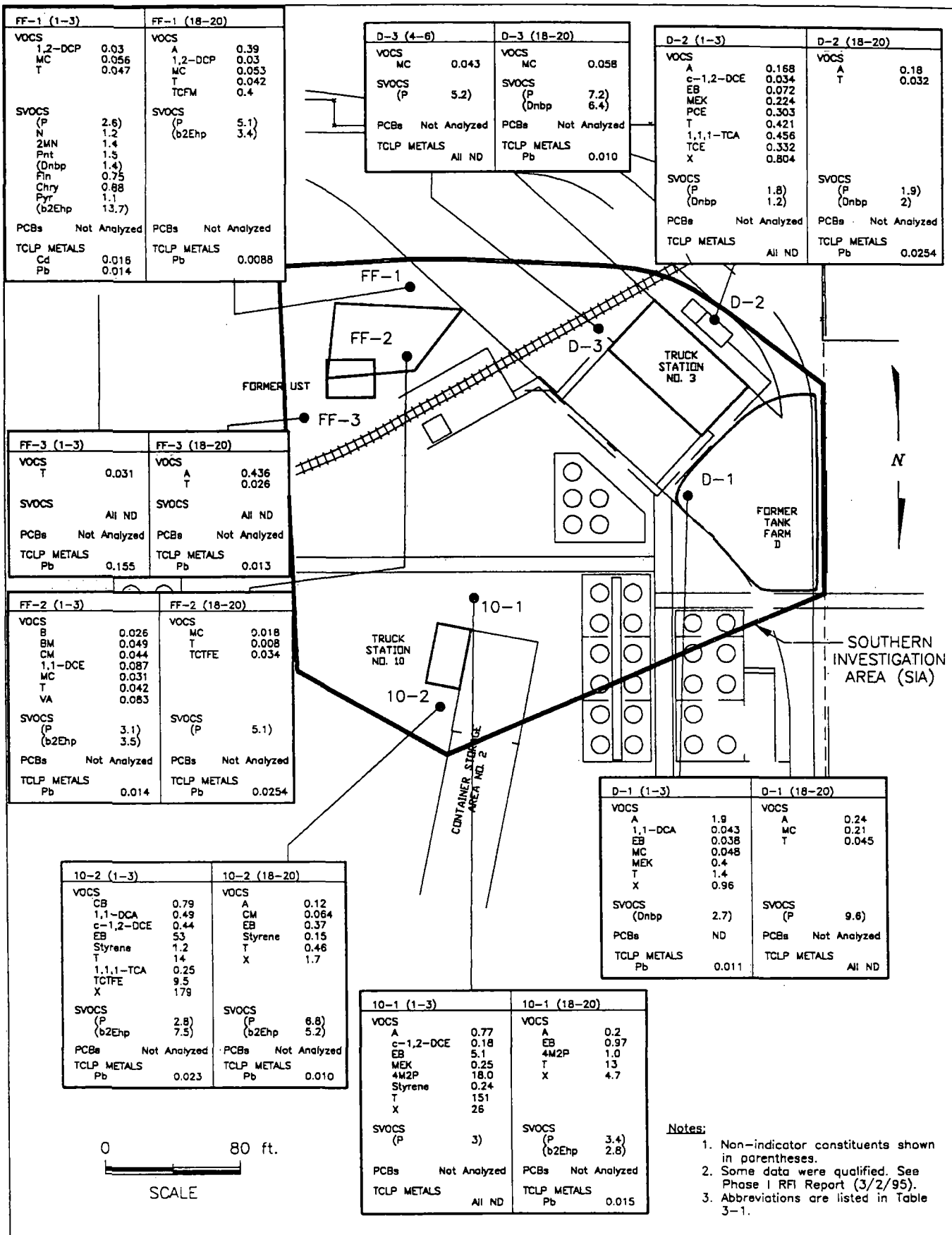
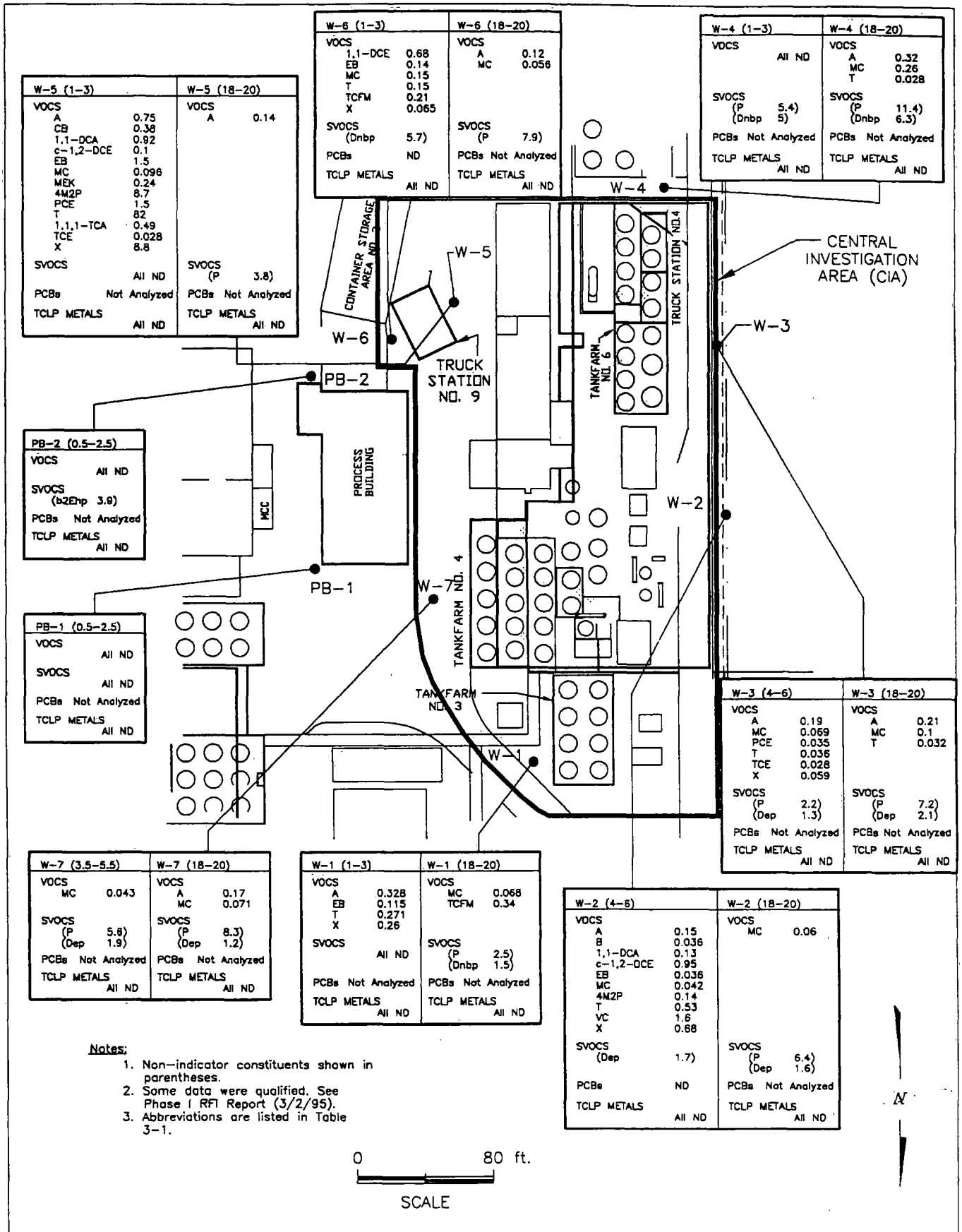


FIGURE 3-5 :SOIL QUALITY DATA, TRUCK STATION NO. 10/FORMER TANK FARM D/ FORMER SOUTHEAST TANK FARM, SAFETY-KLEEN CORP. RECYCLE CENTER, DOLTON, ILLINOIS (1994)

SKDI11SQ

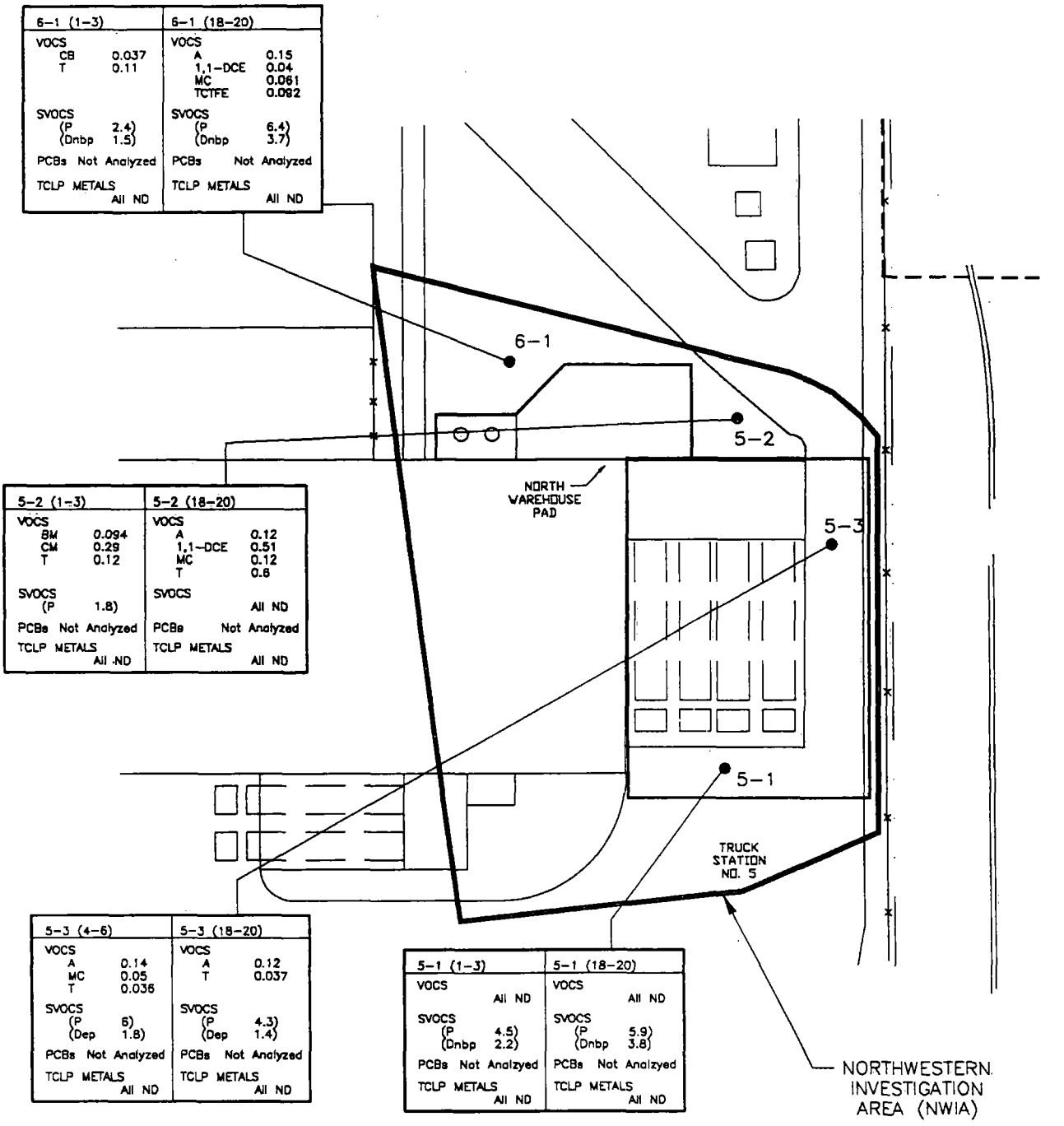


Notes:

1. Non-indicator constituents shown in parentheses.
2. Some data were qualified. See Phase I RFI Report (3/2/95).
3. Abbreviations are listed in Table 3-1.

FIGURE 3-6 :SOIL QUALITY DATA, WEST TANK FARM, RFI PHASE I RELEASE ASSESSMENT, SAFETY-KLEEN CORP. RECYCLE CENTER, DOLTON, ILLINOIS (1994)

SKDIWISQ



Notes:

1. Non-indicator constituents shown in parentheses.
2. Some data were qualified. See Phase I RFI Report (3/2/95).
3. Abbreviations are listed in Table 3-1.

FIGURE 3-7 :SOIL QUALITY DATA, TRUCK STATION NO. 5/NORTH WAREHOUSE PAD, RFI PHASE I RELEASE ASSESSMENT, SAFETY-KLEEN CORP. RECYCLE CENTER, DOLTON, ILLINOIS (1994)

SKD151SQ

Table 3-1. List of Abbreviations and Draft USEPA Soil Screening Guidance Levels (SSGLs)[1] for Constituents, RFI Phase I Release Assessment, Safety-Kleen Corp. Recycle Center, Dolton, Illinois.

Constituent	Symbol	SSGL 10 DAF (mg/kg)	Constituent	Symbol	SSGL 10 DAF (mg/kg)
VOCs			SVOCs		
Acetone	A	8	Phenol	P	49
Benzene	B	0.02	1,2-Dichlorobenzene	1,2-DCB	6
Bromomethane	BM	--[3]	Naphthalene	N	30
Carbon disulfide	CDS	14	2-Methylnapthalene	2-MN	--
Chlorobenzene	CB	0.6	2-Methylphenol	2-MP	6
Chloroethane	CE	--	4-Methylphenol	4-MP	--
Chloroform	CF	--	2,4-Dimethyl phenol	2,4-DMP	3
Chloromethane	CM	--	Phenanthrene	Pnt	--
1,1-Dichloroethane	1,1-DCA	11	Di-n-butyl phthalate	Dnbp	--
1,2-Dichloroethane	1,2-DCA	0.01	Fluoranthene	Fln	980
1,1-Dichloroethene	1,1-DCE	0.03	bis(2-Ethylhexyl)phthalate	b2Ehp	11
cis-1,2-Dichloroethene	c-1,2-DCE	0.2	Diethyl phthalate	Dep	110
trans-1,2-Dichloroethene	t-1,2-DCE	0.3	Pyrene	Pyr	1400
trans-1,3-Dichloropropene	t-1,3-DCP	0.001[2]	Butyl benzyl phthalate	Bbp	68
1,2-Dichloropropane	1,2-DCP	0.02	Chrysene	Chry	1
Ethylbenzene	EB	5	Benzo(k)fluoranthene	Bkf	4
2-Hexanone	2HEX	--			
Methylene Chloride	MC	0.01			
2-Butanone	MEK	--	Metals		
4-Methyl-2-Pentanone	4M2P	--	Barium	Ba	32
Styrene	Sty	2	Cadmium	Cd	6
Tetrachloroethene	PCE	0.04	Lead	Pb	--
Toluene	T	5	Mercury	Hg	3
1,1,1-Trichloroethane	1,1,1-TCA	0.9			
1,1,2-Trichloroethane	1,1,2-TCA	0.01			
Trichloroethene	TCE	0.02	PCBs		
Trichlorofluoromethane	TCFM	--	Polychlorinated biphenyls (total)	PCBs	1
1,1,2-Trichlorotrifluoroethane	TCTFE	--			
Vinyl Acetate	VA	84			
Vinyl Chloride	VC	0.01			
Xylenes (total)	X	74			

Notes:

1. SSGLs from Draft USEPA Soil Screening Guidance, December 1994. SSGLs are given for the Migration to Ground-Water Pathway with a Dilution/Attenuation Factor (DAF) of 10.

2. SSGL applies to total 1,3-dichloropropane.

3. -- Indicates no SSGL established for constituent.

- The East Field Investigation Area. Indicator constituents were detected at all four sampling sites (EF-1 through EF-4 on Figure 3-4). At EF-1, near where the drums were excavated during a sewer installation, the constituents detected included 21 VOCs and five indicator SVOCs. Polychlorinated biphenyls (PCBs), and lead were also detected in the shallow soil sample at this location. At the other three sampling sites, drums and impacted soil had been previously detected, and soils were excavated and removed by Barker Chemical Company. The constituents detected during the Phase I RFI at these locations included four VOCs, cadmium and lead. No indicator SVOCs were detected in the Phase I samples at these three other locations. Toluene was the only constituent detected at all four sampling sites; toluene concentrations were three orders of magnitude higher at EF-1 than at the other three sites.

- The Southern Investigation Area. Indicator constituents were detected at all three sampling sites (FF-1 through FF-3, Figure 3-5) in the former Southeast Tank Farm Area. Five VOCs, six indicator SVOCs (at FF-1 only), and lead were detected in the Phase I RFI soil samples from the southeast portion of the SIA. Toluene was the only constituent detected at all locations.

  Up to 12 VOCs and lead, but no indicator SVOCs, were detected in shallow samples from all three sampling sites near Former Tank Farm D and Truck Station No. 3 (D-1 through D-3). Acetone was the only constituent detected at all three sites; acetone concentrations decreased with distance from former Tank Farm D. Based on this pattern, the impacts are likely related to former Tank Farm D, and not Truck Station No. 3.

  Up to 12 VOCs and lead, but no indicator SVOCs were detected in shallow samples from both sampling sites (10-1 and 10-2) near Truck Station No. 10. Cis-1,2-dichlorobenzene, ethylbenzene, styrene, toluene and xylenes were detected at both sites.

- Central Investigation Area. Indicator constituents were detected at six of the nine sampling sites in the CIA (Figure 3-6). Indicator constituents were not detected in the shallow soil samples at W-4 (south of Truck Station No. 4) and the two sites (PB-1 and PB-2), located north and east of the Process Building. Indicator constituents were detected in the vicinity of the process units and three tank farms in the West Tank Farm (W-1 through W-3 and W-7) and in the vicinity of Truck Station No. 9 (W-5 and W-6). The indicator constituents that were detected in the CIA included 13 VOCs, but no indicator SVOCs or metals. Commonly detected constituents in this area were acetone, ethylbenzene, methylene chloride, toluene and xylenes.

- Northwest Investigation Area. Indicator constituents were detected at the three locations near the North Warehouse Pad (5-2, 5-3 and 6-1 on Figure 3-7), but not at site 5-1 near Truck Station No. 5. Six VOCs, but

no indicator SVOCs or metals, were detected in the shallow soil samples from this area. Toluene was detected at the three sites near the North Warehouse Pad; toluene concentrations decreased with distance from the pad.

In summary, laboratory analysis indicated impacts to soil at sampling locations in the vicinity of the East Field Investigation Area, the Southern Investigation Area, the Central Investigation Area, and the Northwest Investigation Area. The constituents, that were detected during the Phase I RFI, were similar to those detected during investigations done prior to S-K operations at the facility. The Phase I RFI data provide no evidence of soil quality impacts in the vicinity of the Process Building, and Truck Stations Nos. 3 and 5.

Based on the Phase I results, S-K has also identified "non-indicator" constituents that do not appear to be representative of facility-related impacts. The presence of certain constituents (particularly phenol and phthalates) are not likely related to releases from target SWMUs. In Condition 4 of the approval letter, IEPA concurred with this conclusion. However, the Agency requested further investigation to determine whether concentrations of these constituents increase or decrease with depth. Phase I results have been used to design the additional soil sampling efforts during Phase II.

3.1.2.2 Vertical Extent of Soil Degradation

In addition to the shallow soil quality assessment (Phase I), S-K collected deeper soil samples to evaluate the vertical extent of potential SWMU/AOC-related impacts. The deep soil quality data are presented on figures 3-4 through 3-7. Deep soil samples were collected at a depth of 18 to 20 ft-bgs from 23 locations at the facility. A summary of the constituents detected in the deep soil samples from each investigation area are presented below.

A summary of the constituents detected in the deep soil samples from each Investigation Area are presented in Table 3-2. This summary also identifies the detected constituents that were common to both the shallow and deep soil samples from a specific sampling location. Note, only four VOCs (methylene chloride, 1,2-dichloropropone, toluene and 1,1-dichloroethene) were detected in the deeper soil samples at concentrations above the established SSGLs.

The two potential non-indicator SVOCs, phenol and phthalates, were commonly detected in the deeper samples; 20 of 23 deep samples for phenol and 16 of 23 deep samples for phthalates. Phenol concentrations in the deep samples appeared to be slightly higher in the western part of the facility, and there was no apparent pattern in phthalate concentrations in the deep samples. The data from the deep samples for these two constituents strengthen the conclusion that the presence of phenol and phthalates in the soils at the facility may not be facility-related (past or present).

The deep sample data from the Phase I RFI indicate minor soil impacts to a depth of 20 ft-bgs at most locations. These low levels of impacts were not detected

Table 3-2. Constituents Detected in Deeper Soil Samples during the Phase I RFI, Safety-Kleen Corp. Recycle Center, Dolton, Illinois (September 1994).

Investigation Area	Volatile Organic Compounds	Semi-Volatile Organic Compounds	TCLP Metals
EFI	Acetone	*Di-n-butyl phthalate[1]	*Lead
	2-Butanone	*Phenol[1]	
	Methylene Chloride		
	*Toluene		
	*Trichlorofluoromethane		
	*Xylenes		
SIA	*Acetone	*Bis(2-Ethylhexyl)phthalate[1]	*Lead
	Chloromethane	*Di-n-butyl phthalate[1]	
	***1,2-Dichloropropane**	*Phenol[1]	
	*Ethylbenzene		
	***Methylene Chloride**		
	*4-Methyl-2-Pentanone		
	*Styrene		
	***Toluene**		
	Trichlorofluoromethane		
	1,1,2-Trichloro-trifluoroethane		
	*Xylenes		
CIA	*Acetone	*Diethyl phthalate[1]	None
	***Methylene Chloride**	*Di-n-butyl phthalate[1]	
	Toluene	*Phenol[1]	
	Trichlorofluoromethane		
NWIA	*Acetone	*Diethyl phthalate[1]	None
	1,1-Dichloroethene	*Di-n-butyl phthalate[1]	
	Methylene Chloride	*Phenol[1]	
	*Toluene		
	1,1,2-Trichloro-trifluoroethane		

Notes:
* = Constituents detected in both the deep and shallow samples from a specific sample location.
Bold = Constituents detected above the respective USEPA Draft Soil Screening Guidance Level (12/94).
[1] = phenols and phthalates are not considered to be facility-related constituents.

during field screening. This observation is consistent with previous assessments, which indicated no apparent impacts below depths of between 4 and 15 ft-bgs in the Central Investigation Area, 6.5 to 8.5 ft-bgs in the East Field Investigation Area, and 4 ft-bgs in the Northwest Investigation Area.

3.3 Ground-Water Conditions

Four previous ground-water investigations have been conducted at the site, including the Phase I RFI. During the previous investigations, information has been generated in the vicinity of the SWMUs/AOCs or Investigation Areas. To date, the following ground-water information has been collected:

- Physical descriptions of ground-water occurrence at 58 locations.
- Permeability data on the perched water-bearing zone and underlying clay aquitard.
- Fluid level data at 27 locations in the perched water-bearing zone and three locations in the dolomite aquifer.
- Water quality data at 42 locations in the perched water-bearing zone and three locations in the dolomite aquifer.

The ground-water quality data collected during these investigations led to the identification of the same impacted areas as described in Section 3.1. In addition, the data identify site-specific conditions which limit the potential for migration of ground-water impacts. The data pertinent to establishing the basis for the RFI Phase II/III ground-water investigation are summarized in the following subsections.

3.3.1 Regional Hydrogeology

The regional hydrogeologic units include two shallow water-bearing zones: a near-surface water-bearing zone perched on low-permeability clays and silts and the Silurian-age Niagaran Dolomite aquifer. The shallow perched zone occurs at a depth of 4 to 5 ft-bgs and is reported to be 10 to 20 feet thick.

A clay aquitard, at least 30 feet thick, appears to underlie the entire facility. Previous falling head permeability test results on clays from two locations (on the east and west sides of the plant; SK-6D at 22-22 ft-bgs and SK-7D at 30 ft-bgs) yielded average permeabilities of 2.7 to 5.5 x 10^{-8} cm/sec (ATEC, 1989). Based on this low permeability and thicknesses greater than 30 feet, the clay layer should serve as an effective aquitard to minimize the potential for downward migration of constituents from the perched zone to the dolomite aquifer.

The contact between the clay aquitard and the underlying Silurian Dolomite aquifer occurs at a reported depth of 45 ft-bgs. Ground water was encountered near the bedrock surface in the three shallow bedrock monitoring wells installed at the site (SK-6D, SK-7D, 8D). The Silurian Dolomite aquifer is reported to be capable of producing significant yields of potable water. Water supply wells at and near the facility are completed considerably deeper in the bedrock; total depths of the water supply wells are a minimum of 210 feet below ground surface.

3.3.2 Ground-Water Occurrence and Flow Directions

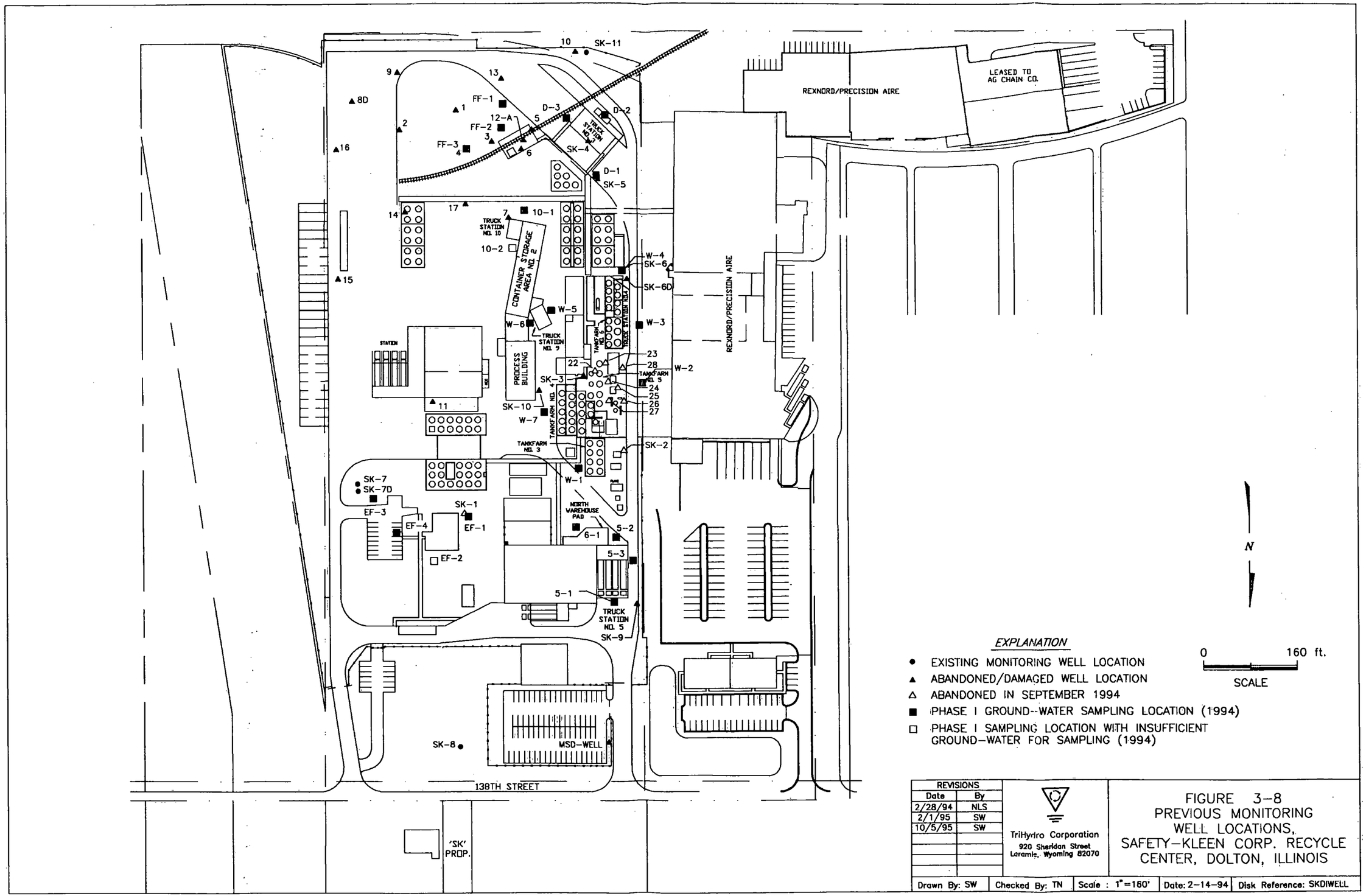
Prior to the Phase I RFI, thirty-eight monitoring wells had been installed at the plant site: one by the Metropolitan Sanitary District and 37 by current or past owners of the site. The existing and abandoned/damaged monitoring well locations from which ground-water data have been collected previously are shown on Figure 3-8. Most of these wells have been plugged and abandoned.

The occurrence of ground water at the facility is consistent with the regional hydrogeology. During previous assessments, a shallow perched water-bearing zone occurred at depths of 1 to 5 ft-bgs where permeable materials (fill and fine sand) were present. The shallow, more permeable materials reach a maximum thickness of approximately 5 feet in the southeastern part of the facility. The shallow zone is apparently absent at Well SK-8, located in the northeastern corner of the facility; Well SK-8 has remained dry since it was installed in 1988. Low permeability clay is present from ground surface to total well depth (10 ft-bgs) at SK-8.

During the Phase I RFI, ground water was generally encountered at depths of 4 to 5 ft-bgs. In the vicinity of Container Storage Area No. 2, ground water was encountered approximately 2 ft-bgs in the low-permeability sediments. This perched zone extends to at least 10 to 15 ft-bgs in the southeastern corner of the facility. The clay encountered at 20 ft-bgs was described as wet or saturated at six locations, moist at 14 locations, and dry at three locations.

Because the topography in the area is flat, the hydraulic gradients in the perched zone are low. Shallow ground water generally flows toward the nearest surface water body; however, the flow direction can be locally influenced by leaky water lines and sewers and sump pumps (ATEC, 1989). The regional flow direction in the underlying Silurian dolomite aquifer is reported to be generally east or southeast, in the direction of bedrock dip (ATEC, 1989).

The potentiometric surface of the shallow perched zone, determined during the Phase I RFI, is shown Figure 3-9. Water levels equilibrated for a minimum of three days before achieving relatively static conditions. Based on the September 1994 water level measurements, ground-water flow is generally to the northeast across the site. This flow direction is consistent with the results of previous ground-water investigations at the site. Note that water levels at two locations (W-6 and W-7) may not indicate static conditions, based on the anomalously low elevations. These data were not used in constructing the potentiometric surface map.



EXPLANATION

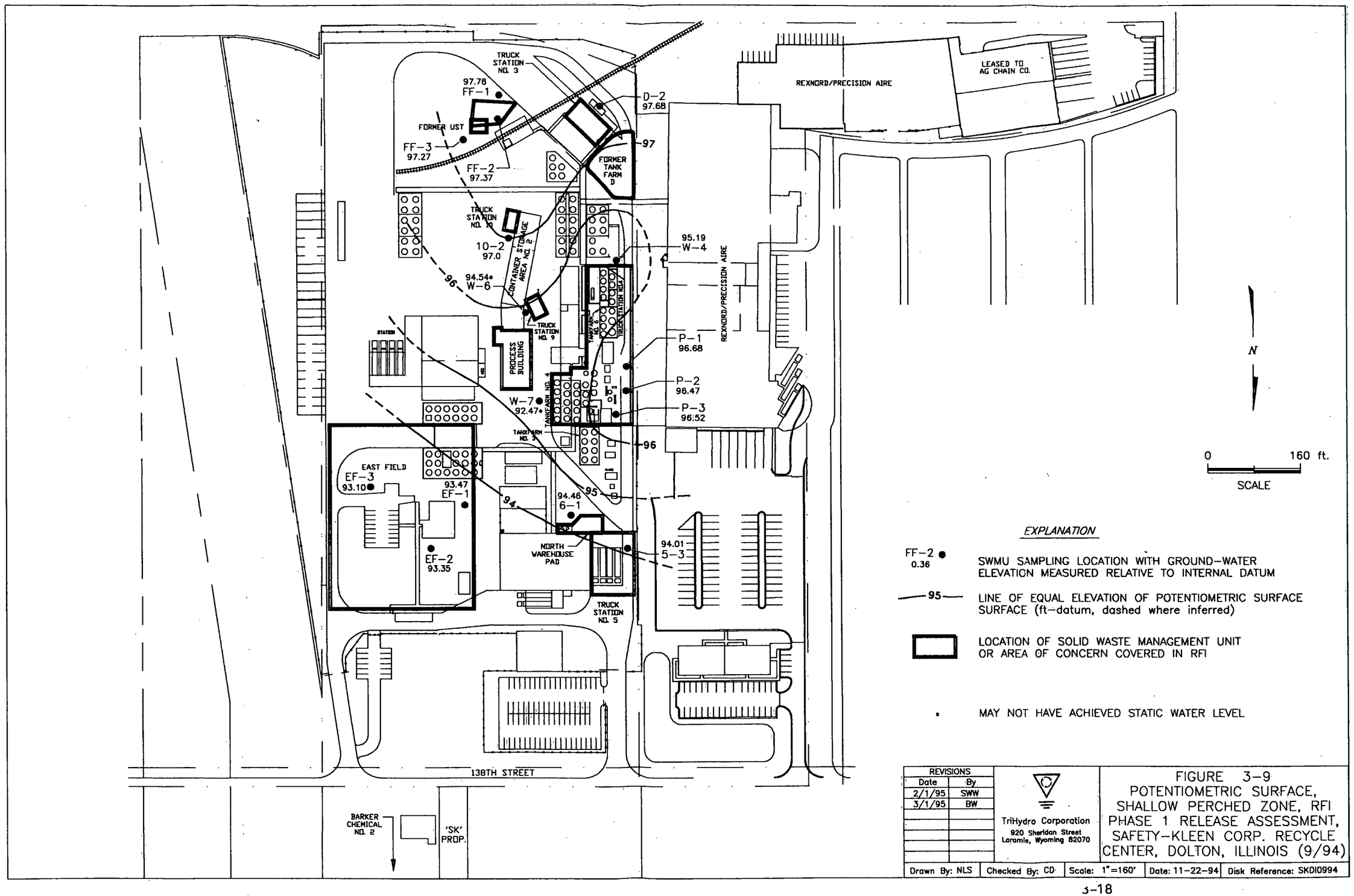
- ● EXISTING MONITORING WELL LOCATION
- ▲ ABANDONED/DAMAGED WELL LOCATION
- △ ABANDONED IN SEPTEMBER 1994
- ■ PHASE I GROUND--WATER SAMPLING LOCATION (1994)
- □ PHASE I SAMPLING LOCATION WITH INSUFFICIENT GROUND–WATER FOR SAMPLING (1994)

REVISIONS	
Date	By
2/28/94	NLS
2/1/95	SW
10/5/95	SW

TriHydro Corporation
920 Sheridan Street
Laramie, Wyoming 82070

FIGURE 3–8
PREVIOUS MONITORING WELL LOCATIONS,
SAFETY–KLEEN CORP. RECYCLE CENTER, DOLTON, ILLINOIS

Drawn By: SW	Checked By: TN	Scale : 1"=160'	Date: 2–14–94	Disk Reference: SKDIWELL



EXPLANATION

FF-2 ● 0.36 — SWMU SAMPLING LOCATION WITH GROUND-WATER ELEVATION MEASURED RELATIVE TO INTERNAL DATUM

—95— LINE OF EQUAL ELEVATION OF POTENTIOMETRIC SURFACE SURFACE (ft-datum, dashed where inferred)

▭ LOCATION OF SOLID WASTE MANAGEMENT UNIT OR AREA OF CONCERN COVERED IN RFI

* MAY NOT HAVE ACHIEVED STATIC WATER LEVEL

REVISIONS	
Date	By
2/1/95	SWW
3/1/95	BW

TriHydro Corporation
920 Sheridan Street
Laramie, Wyoming 82070

FIGURE 3-9
POTENTIOMETRIC SURFACE, SHALLOW PERCHED ZONE, RFI PHASE 1 RELEASE ASSESSMENT, SAFETY-KLEEN CORP. RECYCLE CENTER, DOLTON, ILLINOIS (9/94)

Drawn By: NLS	Checked By: CD	Scale: 1"=160'	Date: 11-22-94	Disk Reference: SKDI0994

The potentiometric surface map is consistent with the qualitative observations of permeability made during the investigation. Based on observations during monitoring, the shallow soil permeability was moderate (the total volume necessary for sample collection could be collected at one time) in the northern part of the site (D-2, D-3, FF-2 and FF-3), in the west-central part of the site (W-3 and W-4), and in the relatively coarse excavation fill at EF-4 in the East Field. In the other areas, the observed permeability was relatively low (total volume for sampling could not be collected at one time). On Figure 3-9, contours are relatively far apart (lower hydraulic gradient) in the higher permeability areas, and relatively close (higher hydraulic gradient) in the lower permeability areas.

3.4 Phase I RFI Ground-Water Quality Data

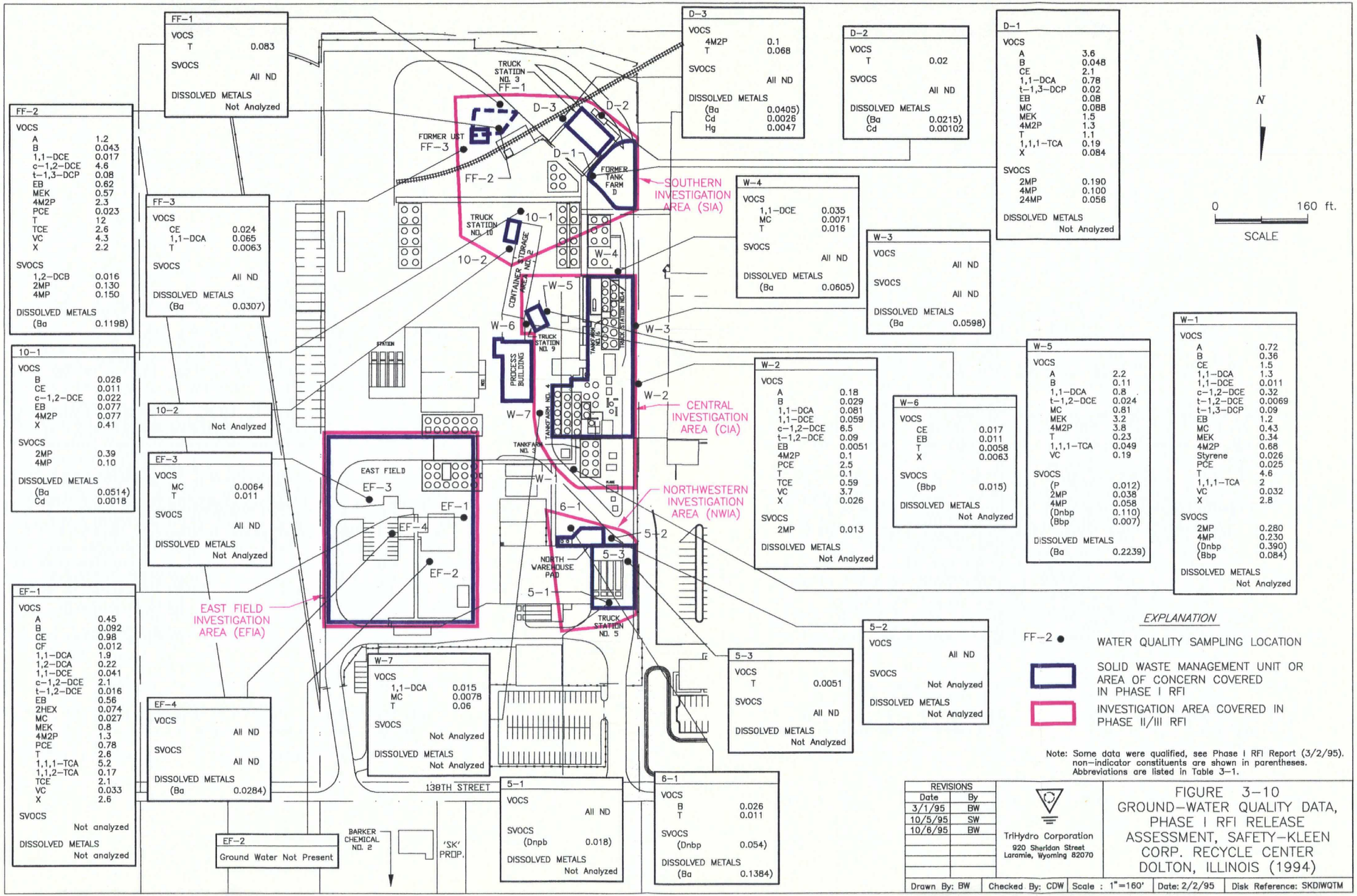
Ground water was sampled at 21 locations during the Phase I RFI. In many cases, insufficient sample was obtained to perform all analyses. Two sampling points (EF-2 and 10-2) produced insufficient water for any analyses. This difficulty is attributed to the low permeability of the clay underlying the site (see Section 3.3.1). The ground-water quality data are presented on Figure 3-10. A list of constituent abbreviations used on the figure is presented in Table 3-1.

Evaluation of the extent of ground-water quality impacts constitute the objective of the Phase III RFI to be conducted at this facility. Several patterns are apparent, based on the ground-water quality data collected during the Phase I investigation. These patterns will be investigated further during Phase III, and are summarized below.

- VOCs were present in the shallow ground water at all SWMUs where indicator constituents were identified in the Phase I shallow soil samples.

- Indicator SVOCs were present in shallow ground-water samples at all SWMUs where these indicators were identified in the Phase I shallow soil samples; except in the Northwest Investigation Area, where indicator SVOCs were not present in the shallow soils, and at the East Field, where there was insufficient water to collect a sample for SVOC analysis at the site with the highest SVOC concentrations in the shallow soil (EF-1).

- Cadmium (D-2, D-3 and 10-1) and mercury (D-3) were present at low concentrations in the southwest corner of the facility. Lead, which was present in shallow and deep soils at several SWMUs, was not detected in the ground water. Barium was present in many ground-water samples, but was not detected in any soil sample. The ubiquitous presence of barium in ground water suggests a naturally occurring rather than a facility-related source.



Note: Some data were qualified, see Phase I RFI Report (3/2/95). non-indicator constituents are shown in parentheses. Abbreviations are listed in Table 3-1.

REVISIONS	
Date	By
3/1/95	BW
10/5/95	SW
10/6/95	BW

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920 Sheridan Street
Laramie, Wyoming 82070

FIGURE 3-10
GROUND-WATER QUALITY DATA, PHASE I RFI RELEASE ASSESSMENT, SAFETY-KLEEN CORP. RECYCLE CENTER DOLTON, ILLINOIS (1994)

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- At the most down-gradient locations (EF-3, EF-4 and 5-1 to the north and W-3 and W-4 in the west-central part of the facility), concentrations of facility-related constituents were below detection limits except for low concentrations (0.006 to 0.016 mg/L) of methylene chloride and toluene at EF-3 and W-4 and 1,1-dichloroethene (0.035 mg/L) at W-4.

CHAPTER 4.0

PHASE II SOIL SAMPLING AND ANALYSIS PLAN

The objective of the Phase II RFI Extent of Release Assessment at the Dolton Recycle Center is to define the lateral and vertical extent of soil quality impacts that may be associated with the designated SWMUs/AOCs within the Investigation Areas. As discussed in Chapter 2.0, the designated SWMUs/AOCs have been grouped into Investigation Areas for the purpose of Phase II of the RFI. These include the East Field Investigation Area (EFIA), Northwestern Investigation Area (NWIA), Central Investigation Area (CIA), and Southern Investigation Area (SIA).

This chapter presents the investigative procedures that will be used to accomplish the Phase II objective. Sampling and analysis procedures will be implemented in a manner which promotes the quality assurance goals presented in the Quality Assurance Plan (Part VII of the Phase I RFI Workplan, included as Appendix E). In summary, these goals are to obtain precise, accurate, complete, comparable and representative data.

4.1 Vertical Extent Soil Quality Sampling

The vertical extent of soil quality impacts has not been completely defined in the Investigation Areas. S-K has used the results of the Phase I RFI to design an effective program to achieve the Phase II objective. The rationale for the vertical extent soil sampling program is described in the following subsections.

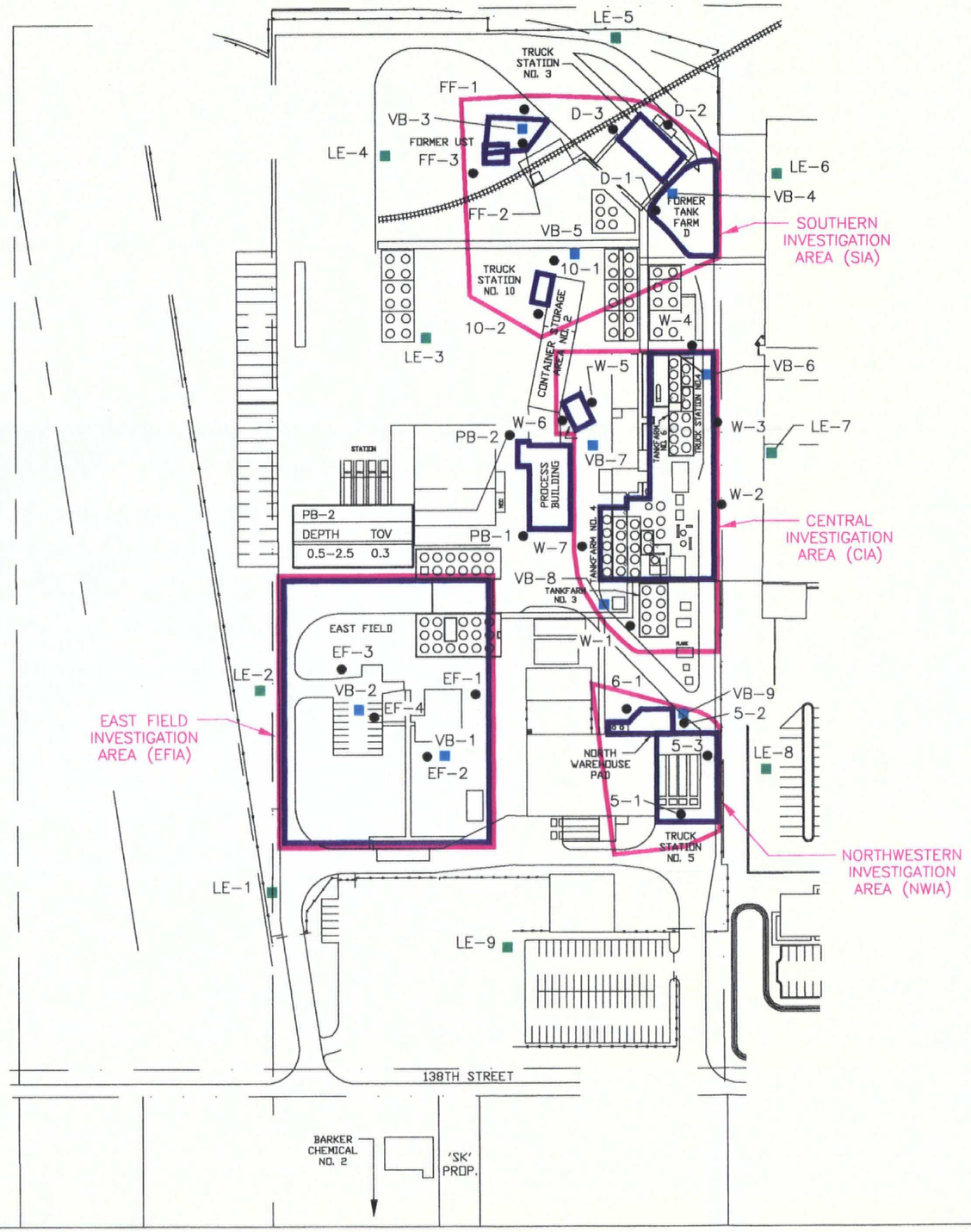
4.1.1 Vertical Extent Soil Sampling Locations

The proposed locations of the Phase II vertical extent borings are shown on Figure 4-1. The following criteria were used to establish vertical extent sampling locations:

1. Spatial distribution within the investigation areas.

2. Sampling at or near areas where the highest levels of VOCs were detected in the deep soil samples [18-20 feet below ground surface (ft-bgs)] during the Phase I RFI.

3. Sampling at or near areas where concentrations of specific constituents exceeded the December 1994 USEPA Draft Soil Screening Guidance Levels (SSGLs) in the deep Phase I soil samples.



EXPLANATION

FF-2 ● PHASE I RFI SOIL SAMPLING LOCATION

LE-4 ■ PROPOSED PHASE II RFI LATERAL EXTENT SOIL SAMPLING LOCATION

VB-5 ■ PROPOSED PHASE II RFI VERTICAL EXTENT SOIL SAMPLING LOCATION

SOLID WASTE MANAGEMENT UNIT OR AREA OF CONCERN COVERED IN PHASE I RFI

INVESTIGATION AREA COVERED IN PHASE II/III RFI

N

0 160 ft.

SCALE

REVISIONS	
Date	By
10/6/95	BW

TriHydro Corporation
920 Sheridan Street
Laramie, Wyoming 82070

FIGURE 4-1
PROPOSED SOIL SAMPLING LOCATIONS, RFI PHASE II EXTENT OF RELEASE ASSESSMENT, SAFETY-KLEEN CORP. RECYCLE CENTER, DOLTON, ILLINOIS

Drawn By: SW	Checked By: TN	Scale : 1"=160'	Date: 10/5/95	Disk Reference: SKDISSLO

4. Sampling at or near areas where relatively high concentrations of phenol and phthalate were detected in the deep Phase I soil samples.

Low concentrations of up to 13 VOCs were detected in the deep samples from the investigation areas. However, the detected concentrations of only the four following VOCs exceeded the SSGLs (in parentheses below) in the deep samples at one or more locations during the Phase I RFI:

Methylene chloride (0.01 ppm) at 14 locations;
1,1-dichloroethene (0.03 ppm) at two locations (6-1 and 5-2);
1,2-dichloropropane (0.02 ppm) at one location (FF-1); and
Toluene (5 ppm) at one location (10-1).

As shown on Figure 4-1, at least two vertical extent sampling locations (nine total) are proposed for each investigation area. The rationale for the specific boring locations is given in Table 4-1.

4.1.2 Vertical Extent Soil Sampling Depths

Based on the Phase I RFI and on the previous investigative results, it is anticipated that only minor impacts will be encountered in the soils below a depth of approximately 10 ft-bgs and that the level of impacts may be below that typically detectable by field screening methods (TOV monitoring or visual inspection). Therefore, special attention will be given to identifying the bottom of the saturated perched zone during the Phase II logging activities. The bottom of this zone has been reported to be at approximately 15 ft-bgs. During the Phase I RFI the clay encountered at 20 ft-bgs was described as wet or saturated at six locations, moist at 14 locations, and dry at 3 locations.

The vertical extent soil borings will be sampled continuously from approximately 18 ft-bgs to total depth. To further evaluate the vertical extent of impacts, total sampling depths and sample selection for laboratory analysis will be based on the following criteria:

1. If field screening indicates the absence of VOCs and unsaturated soils at a depth of 20 ft-bgs, and the lithology below 20 ft-bgs consists of gray-brown silty clay (as anticipated), then one sample will be collected from 22-24 ft-bgs.

2. If saturated soil occurs below a depth of 20 ft-bgs, and field screening indicates the absence of VOCs, then a sample from immediately below the saturated zone will be collected.

3. If field screening indicates the possible presence of VOCs below the apparent base of the saturated zone, then a sample will be collected from immediately below the deepest interval where field screening indicates that VOCs may be present.

Table 4-1. Rationale for Selection of Vertical Extent Soil Sampling Locations, Phase II/III RFI, Safety-Kleen Corp. Recycle Center, Dolton, Illinois.

East Field Investigation Area (EFIA)

VB-1: Methylene chloride exceeded the SSGL in the Phase I deep sample from EF-2.

VB-2: Methylene chloride exceeded the SSGL in the Phase I deep sample from EF-3.

Southern Investigation Area (SIA)

VB-3: Between FF-1 and FF-2, where methylene chloride exceeded the SSGL in deep samples. Adjacent to FF-1 where 1,2-Dichloropropane exceeded the SSGL and relatively high concentrations of phenol (5.1 mg/kg) and bis(2-ethylhexyl)phthalate (3.4 mg/kg) were detected in this deep sample. Provides spatial distribution within SIA.

VB-4: Near location D-1, where the highest methylene chloride concentration was detected in the deep samples from the SIA and where the highest phenol concentration was detected in the SIA. Provides good spatial distribution within SIA.

VB-5: Near location 10-1, where highest total organic vapor (TOV) concentrations were detected in the deep samples, and where toluene exceeded the SSGL in the deep sample. Phenol and bis (2-ethylhexyl) phthalate were also detected in the deep sample at this location.

Central Investigation Area (CIA)

VB-6: Near location W-4, where the highest phenol, di-n-butyl phthalate, and methylene chloride concentrations were detected in the deep samples from the entire Phase I RFI.

VB-7: Close to location W-6, where methylene chloride exceeded the SSGL and where a relatively high concentration of phenol was detected in the deep sample. Also provides spatial distribution within the CIA.

VB-8: Between locations W-7 and W-1, where methylene chloride exceeded the SSGL in the deep sample. Relatively high phenol concentration and diethyl phthalate detected in the deep sample at W-7. Phenol and di-n-butyl phthalate were also detected at W-1. Provides spatial distribution of deep sampling within the CIA.

Northwest Investigation Area (NWIA)

VB-9: Between two locations (6-2 and 5-2) where methylene chloride and 1,1-dichloroethene exceeded the SSGL in the deep sample.

4. In all cases, a second sample will be collected at a depth of approximately 5 feet below the first, unsaturated and apparently impact-free sample.

5. At three locations (VB-3, VB-6, and VB-8), in the vicinity of deep Phase I samples where elevated concentrations of phenol and phthalates were detected, soil samples will be collected at 2.5 to 5-foot intervals and three samples will be submitted for laboratory analysis (per Condition 4 of the IEPA approval letter).

4.2 Lateral Extent Soil Quality Sampling

The lateral extent of impacts surrounding the Investigation Areas has not been defined at this facility. The Phase I RFI and previous investigation results have been used to design an effective program to achieve the Phase II objective of determining the lateral extent of soil impacts. The rationale for the lateral extent soil sampling program is described in the following subsections.

4.2.1 Lateral Extent Soil Sampling Locations

The proposed lateral extent sampling locations are presented on Figure 4-1. Those locations were selected to provide coverage of the perimeters of the impacted portions of the site (i.e., the Investigation Areas), based on locations where one or more constituents exceeded the SSGLs. Additional locations will be sampled (if necessary) to determine the lateral extent of soil impacts.

Two of the lateral extent soil sampling locations (LE-6 and LE-7) will also function as preliminary sampling locations to address SWMUs at the Rexnord/Precision Aire Property and Agrichain Area. Data from these locations will be used, in part, to develop a SWMU Assessment Workplan for these areas.

4.2.2 Lateral Extent Soil Sampling Depths

To evaluate the lateral extent of soil quality impacts, samples will be collected at 2.5 to 5-foot intervals from ground surface to a total depth equal to the deepest sample interval in which impacts were identified in the nearest Phase I boring or deeper depending on the Phase II field screening results. Samples will be selected for submittal to the laboratory for determination of the lateral extent of soil degradation based on the following rationale:

1. The interface between the permeable fill and low-permeability clay is the most likely depth for constituents from a release to accumulate. Therefore, if field screening indicates no soil impacts are present, one soil sample will be selected from the base of the fill zone. A second

sample will be submitted from the depth equal to the deepest sample interval in which impacts were identified in the nearest Phase I or II boring.

2. If field screening indicates the presence of soil impacts in the shallow soils, a soil sample will not be submitted for the determination of lateral extent. One or more additional locations (sited radially away from the Investigation Area) will be sampled until the criteria in Item 1 above are achieved or the property line is reached.

4.3 Soil Sampling Procedures

The soil sampling procedures that will be implemented during the Phase II RFI have been designed to meet the goals presented in the Quality Assurance Plan (Section VII of the Phase I RFI Workplan, included in Appendix E). The borehole drilling and sampling, field screening, decontamination and borehole abandonment procedures are described in the following subsections:

4.3.1 Borehole Drilling and Soil Sample Collection Procedures

A hydraulic probe rig was used to collect soil samples during the Phase I RFI. During Phase II, soil borings will be constructed using a hollow-stem auger rig equipped with a split-spoon sampler. The split-spoon samplers will be lined with decontaminated/clean brass rings.

The hollow-stem auger drilling technique should be a preferred alternative to the hydraulic probe technique for this phase of the RFI because sampling will be performed within and below the shallow saturated zone. The auger flights will act to seal off the low-permeability saturated zone while sampling takes place, thus minimizing the potential for cross-contamination from the potentially impacted saturated zone. This will be particularly important for determining the vertical extent of impacts in areas with previously identified shallow soil impacts.

When the sample is brought to the surface, the brass liners will be separated by a field team member. The brass liners will be capped with Teflon sheets and slip-on plastic caps, marked with a sample number, and placed in an opaque cooler on ice immediately upon collection. Sample collection for volatile organic compound analyses will adhere to IEPA "Soil Volatile Sampling Procedures" except that teflon sheeting rather than aluminum foil will be used to seal the brass rings. Care will be taken to minimize headspace during this procedure.

The uppermost brass ring will be discarded from each sample interval because it may contain slough. An aliquot of representative sample from each interval will be subjected to the field screening procedures described in the next subsection. Sample aliquots that are selected for laboratory analysis will not be subjected to field screening.

4.3.2 Field Screening Procedures

For each sample interval an aliquot of soil will be extruded from a brass ring and placed into a clean Ziploc bag. The headspace vapor in each bag will be monitored with a portable PID that is equipped with a 11.8 electron volt (eV) lamp. The 11.8 eV lamp will be used because the primary constituent of concern for the determination of the vertical extent of soil impacts may be methylene chloride (ionization potential 11.3 eV). The TOV concentration in the headspace will be measured through a small opening in the seal. TOV measurements will be recorded on the borehole logs in parts per million (ppm) relative to a 100 ppm isobutylene standard. The soil samples will also be described by the onsite geologist in terms of texture (per ASTM Method D-2488), moisture content, staining, and any other pertinent information.

4.3.3 Decontamination Procedures

All sample containers will be cleaned prior to sampling. The brass rings will be decontaminated and dried in the field prior to use. Any glass jars used for samples will be certified as pre-cleaned by the independent supplier or the laboratory.

In the field, all sampling equipment (including brass rings, split-spoon samplers, and cutting shoes) will be decontaminated with a detergent-water solution and rinsed in warm tap water and/or a distilled water rinse prior to use at each borehole or sample interval. The drill rig will be decontaminated prior to entering and before leaving the site. Decontaminated brass rings will be stored in clean plastic bags. All down-hole drilling equipment (auger flights and split-spoon rods) will be decontaminated in a designated containment area with high pressure spray/steam prior to drilling at each location.

All wash and rinse water will be containerized. Soil cuttings and sampling wastes will also be containerized. The wash/rinse water, drill cuttings and sampling wastes will be handled in accordance with applicable regulations.

4.3.4 Borehole Abandonment

The soil borings will be plugged by pouring bentonite chips or granules down the hole and hydrating in approximately two-foot lifts to the surface. All surfaces will be repaired and patched to match existing grade.

4.4 Laboratory Analysis

Aliquots of soil samples will be retained from each sampled interval for possible laboratory analysis. Blind duplicates will be collected at a rate of one per ten investigative samples in accordance with the requirements of the Phase I Quality Assessment Plan (Appendix E). Samples selected for laboratory analysis will be stored

on ice in opaque coolers prior to shipment to the S-K Environmental Laboratory in Elk Grove Village, Illinois.

Coolers will be transported to the laboratory by courier within 48 hours of collection. All coolers will be sealed with a custody seal, and accompanied by a Chain-of-Custody/Sample Analysis Request form. For each shipment, the field team leader will confirm sample arrival at the laboratory by telephone.

Each sample will be analyzed for those volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and metals (TCLP extract) that had been detected in soil or ground water during the Phase I RFI. Samples that are collected in the vicinity of the East Field Investigation Area will also be analyzed for polychlorinated biphenols (PCBs). The target constituent list, including analytical methods and anticipated/potential reporting limits, is presented in Table 4-2. The laboratory will be instructed to meet the EQLs listed in SW-846 (Revision 1) for each of the specified analytical methods and to follow the level of QA/QC effort established in the Quality Assurance Plan (Part VII of the Phase I RFI Workplan, included as Appendix E). The EQLs and an evaluation of QA/QC data for all analyses will be presented in the Phase II RFI Report.

Table 4-2. Target Constituent List, Soil Sampling Program, RFI Phase II Extent of Release Assessment, Safety-Kleen Corp. Recycle Center, Dolton, Illinois.

Constituent	USEPA SW-846 Method	Reporting Limit (mg/kg)	Constituent	USEPA SW-846 Method	Reporting Limit (mg/kg[1])
VOCs			SVOCs		
Acetone	8240	0.1	Phenol	8270	0.66
Benzene	8240	0.005	1,2-Dichlorobenzene	8270	0.66
Bromomethane	8240	0.01	Naphthalene	8270	0.66
Carbon disulfide	8240	0.1	2-Methylnaphthalene	8270	0.66
Chlorobenzene	8240	0.005	2-Methylphenol	8270	0.66
Chloroethane	8240	0.01	4-Methylphenol	8270	0.66
Chloroform	8240	0.005	2,4-Dimethyl phenol	8270	0.74
Chloromethane	8240	0.01	Phenanthrene	8270	0.66
1,1-Dichloroethane	8240	0.005	Di-n-butyl phthalate	8270	0.66
1,2-Dichloroethane	8240	0.005	Fluoranthene	8270	0.66
1,1-Dichloroethene	8240	0.005	bis(2-Ethylhexyl)phthalate	8270	0.66
cis-1,2-Dichloroethene	8240	0.005	Diethyl phthalate	8270	0.66
trans-1,2-Dichloroethene	8240	0.005	Pyrene	8270	0.66
trans-1,3-Dichloropropene	8240	0.005	Butyl benzyl phthalate	8270	0.66
1,2-Dichloropropane	8240	0.005	Chrysene	8270	0.66
Ethylbenzene	8240	0.005	Benzo(k)fluoranthene	8270	0.66
2-Hexanone	8240	0.05			
Methylene Chloride	8240	0.005			
2-Butanone	8240	0.1	Metals (TCLP)		
4-Methyl-2-Pentanone	8240	0.05	Barium	6010	2.0
Styrene	8240	0.005	Cadmium	7131	0.005
Tetrachloroethene	8240	0.005	Lead	7421	0.0075
Toluene	8240	0.005	Mercury	7471	0.002
1,1,1-Trichloroethane	8240	0.005			
1,1,2-Trichloroethane	8240	0.005	PCBs[2]	8080	0.05
Trichloroethene	8240	0.005			
Trichlorofluoromethane	8240	0.01			
1,1,2-Trichlorotrifluoroethane	8240	0.005			
Vinyl Acetate	8240	0.05			
Vinyl Chloride	8240	0.01			
Xylenes (total)	8240	0.005			

[1] Units for TCLP extract metals are in mg/L
[2] PCBs analyzed for soil samples collected from East Field Investigation Area only

CHAPTER 5.0

PHASE III GROUND-WATER SAMPLING AND ANALYSIS PLAN

The objective of the Phase III Ground-Water Release Assessment RFI is to define the extent of ground-water quality impacts identified in Phases I and II that may be associated with the SWMUs/AOCs. As discussed in Chapter 1.0, S-K plans to further evaluate ground-water quality in conjunction with the Phase II RFI.

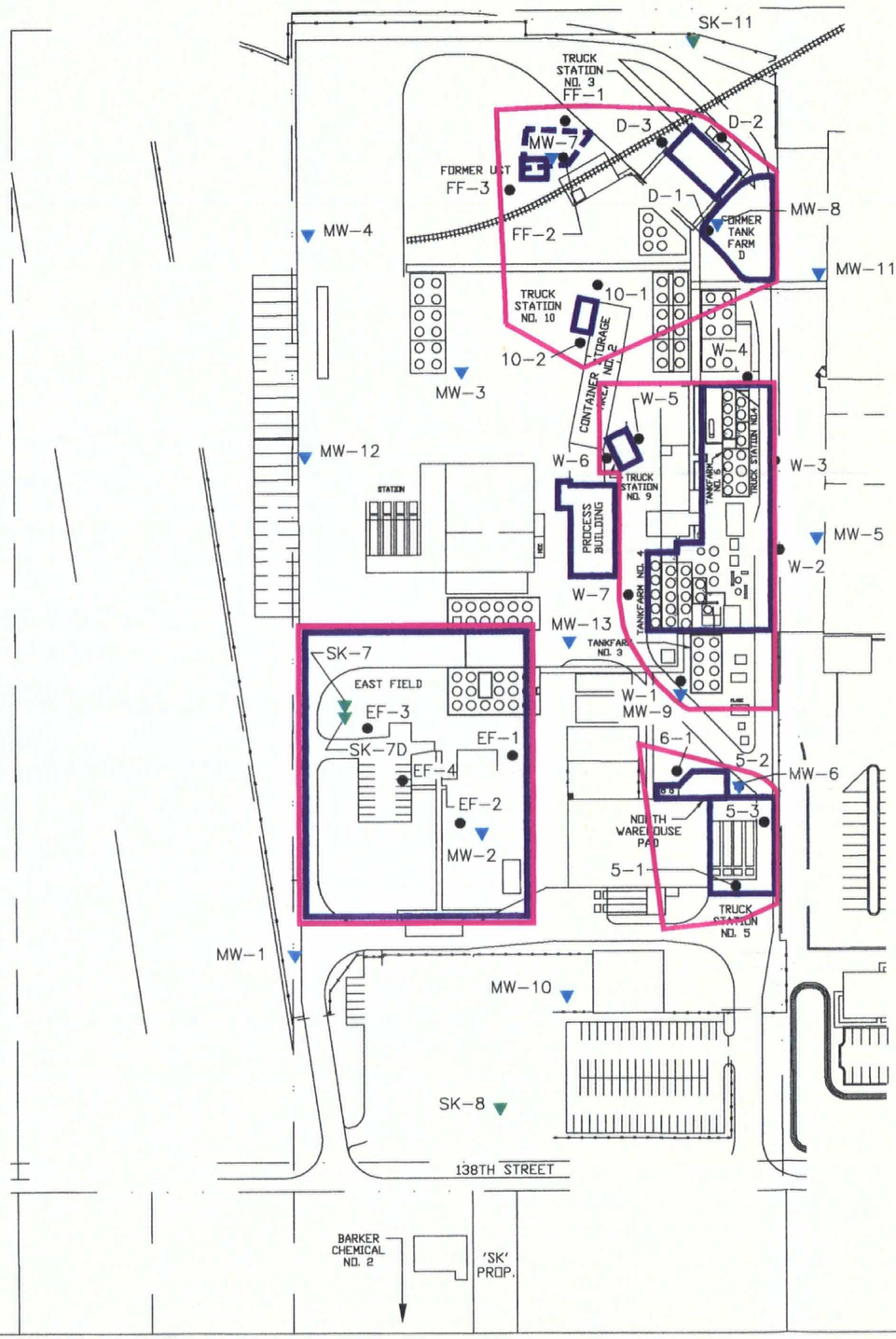
Preliminary ground-water sampling was conducted in conjunction with the Phase I RFI. This data (presented in Chapter 3.0) has been used to design the additional ground-water assessment activities. This chapter presents the investigative procedures that will be used to evaluate the extent of ground-water impacts. Sampling and analysis procedures will be implemented in a manner which promotes the quality assurance goals presented in the Quality Assurance Plan (Part VII of the Phase I RFI Workplan, included as Appendix E). In summary, these goals are to obtain precise, accurate, complete, comparable and representative data.

5.1 Monitoring Well Locations

S-K proposes to install 10-13 monitoring wells and utilize the existing monitoring wells to evaluate ground-water quality in the shallow perched zone. The proposed monitoring well locations are shown on Figure 5-1. S-K may modify these locations based on the Phase II soil sampling results. After review of the Phase II field screening or analytical results, S-K will arrange a teleconference with IEPA for concurrence on well placements. Approximately four wells will be used to monitor the nature and degree of ground-water impacts in the East Field Investigation Area (MW-2), the Southern Investigation Area (MW-7, MW-8) and the Central Investigation Area (MW-9). The remaining wells will be sited around the perimeter of the Investigation Areas to define the lateral extent of ground-water impacts. The locations of the lateral extent wells may be modified (moved outward from the target Investigation Areas) if field screening during borehole construction indicates the presence of ground-water impacts.

5.2 Monitoring Well Screen Intervals

All of the proposed wells will be installed to monitor the shallow perched water-bearing zone. The top of the screen will be selected so that the water table is within the screened interval. Based on data collected during the Phase I RFI, the depth to ground water in the shallow perched zone is estimated to be 4 to 5 ft-bgs. Therefore, the screened intervals of the proposed wells will likely be from 4 to 19 ft-bgs.



EXPLANATION

FF-2 ● PHASE I RFI WATER QUALITY SAMPLING LOCATION

MW-3 ▼ PROPOSED PHASE III MONITORING WELL LOCATION

SK-11 ▼ EXISTING MONITORING WELL LOCATION

SOLID WASTE MANAGEMENT UNIT OR AREA OF CONCERN COVERED IN PHASE I RFI

INVESTIGATION AREA COVERED IN PHASE II/III RFI

N

0 160 ft.

SCALE

REVISIONS	
Date	By
10/6/95	BW
10/13/95	SW

TriHydro Corporation
920 Sheridan Street
Laramie, Wyoming 82070

FIGURE 5-1
PROPOSED MONITORING WELL LOCATIONS, PHASE III RFI
GROUND-WATER RELEASE ASSESSMENT, SAFETY-KLEEN CORP. RECYCLE CENTER, DOLTON, ILLINOIS

Drawn By: SW | Checked By: TN | Scale : 1"=160' | Date: 10/5/95 | Disk Reference: SKDIPMWL

S-K does not plan to install monitoring wells in the limestone aquifer at this time. If soil quality data collected during the Phase II investigation indicate that soil impacts extend to the Silurian Dolomite aquifer (greater than 45 ft-bgs), then S-K will coordinate activities as necessary with IEPA.

5.3 Monitoring Well Installation Procedures

The monitoring wells will be designed and constructed in general accordance with specifications in the USEPA Technical Guidance Document (TEGD). Boreholes for the monitoring wells will be constructed using a hollow-stem auger drilling rig equipped with 10.5 inch O.D./6.25-inch I.D. (approximate) hollow-stem augers. Soil samples will be collected continuously with a split-spoon sampler during construction of the boreholes for well installation. The soil samples will be field screened for TOV and described by a qualified geologist for texture (per ASTM Method D-2488), moisture content, staining, and any other pertinent information. TOV measurements and physical soil characteristics will be recorded on borehole logs.

Proposed well completion details are shown on Figure 5-2. The wells will be constructed with a 4-inch I.D. flush joint, threaded Schedule 40 PVC well casing and screen. A screen length of 15 feet is proposed for the new wells to facilitate sampling in the relatively low-permeability shallow water-bearing zone. The wells will be completed such that at least 70 percent of the well screen is below the water table at the time of completion. The annular space adjacent to the screen will be packed with appropriately-sized silica sand to a point at least 0.5 feet above the top of the well screen.

The annular space above the sand filter pack will be sealed with bentonite pellets or chips. The sodium bentonite pellets or chips will be hydrated on lifts during emplacement to seal the annular space between the filter pack and ground surface. Due to the shallow nature of the proposed well design, no grout will be placed above the bentonite seal.

Surface completion of the monitoring wells will include a flush-to-grade manhole or locking steel protective riser and concrete pad. Wells may be completed with a flush-to-grade manhole, if required by the facility or to facilitate vehicular traffic. A protective riser may be installed if a flush-to-grade completion is not required. An as-constructed diagram and well completion data sheet will be prepared after completion of each well.

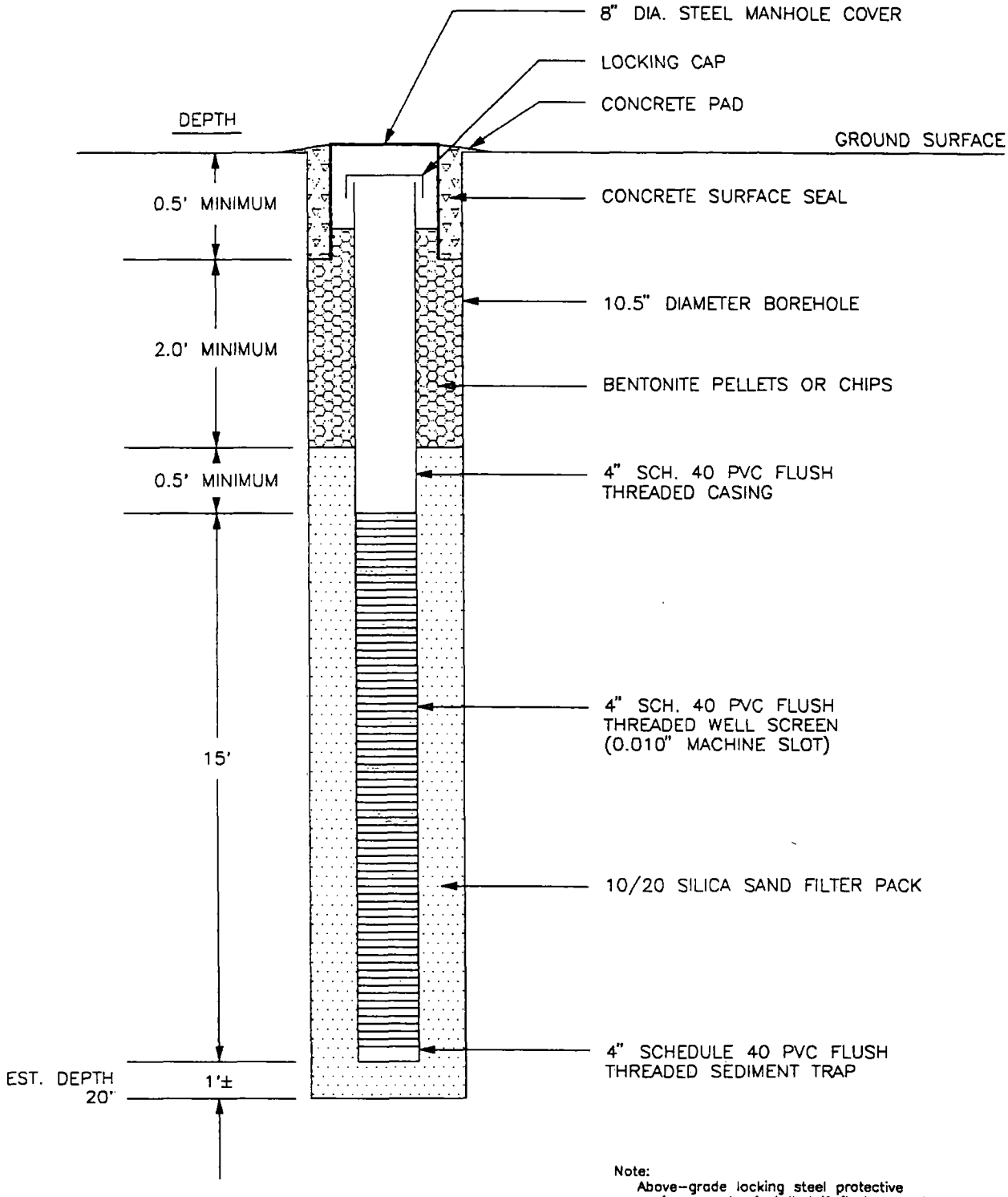


FIGURE 5-2 :PROPOSED MONITORING WELL COMPLETION DIAGRAM, SAFETY-KLEEN CORP. RECYCLE CENTER, DOLTON, ILLINOIS

SKDITYP--

5.4 Monitoring Well Development

Development will be conducted by surging and bailing until produced water is free of sediment to the extent practicable. Specific conductance, temperature, and pH readings will be measured following evacuation of each casing volume of development water. To the extent practicable, development will be considered complete when the water is relatively free of sediment/turbidity and indicates measurements have stabilized to within ± 10 percent.

The development water will be containerized and managed through the S-K waste processing system at the Dolton Recycle Center or other appropriate disposal facility. Well development information, including physical characteristics of the ground water, relative recovery rate, volume developed, date, development method, and disposal procedure will be documented on a standard schedule format.

5.5 Monitoring Well Surveying

A measuring point will be established and clearly marked at the top of the north side of each well casing. The elevation of the measuring point will be determined relative to mean sea level or other permanent datum and surveyed to an accuracy of ±0.01 feet. The monitoring well locations and elevations of the water surface will be plotted on an accurate base map so that ground-water flow direction and gradient may be determined.

5.6 Well Preparation and Sampling Frequency

A detailed description of the ground-water monitoring procedures is presented in Appendix C. S-K proposes to conduct two ground-water monitoring events as part of this Phase II/III RFI. Samples will be initially collected for analysis following installation/development and an equilibration period that may be necessary to allow sufficient ground water to enter the wells for sampling. The second monitoring event will be conducted approximately six months after the first event.

Both the new and existing shallow wells will be monitored for fluid levels and water quality. Water levels and hydrocarbon thickness (if present) will be measured prior to evacuating the well for sampling. Fluid levels will be measured to a precision of ±0.01 foot using an electronic oil/water interface probe. Any part of the fluid level measuring device which contacts the water will be decontaminated and rinsed with distilled/deionized water between wells.

Three casing volumes will be evacuated from each well prior to collecting water samples if feasible, given the low permeability water-bearing zone. Specific

conductance, temperature, and pH measurements will be monitored during well purging to ensure that evacuation procedures produce representative water quality. Ground water will be evacuated from each well using a clean bailer and dedicated polypropylene rope.

Prior to use, the bailers will be decontaminated to prevent cross-contamination between wells. The bailers will be thoroughly washed with a water/detergent solution and rinsed with distilled water after each use. The purge water will be containerized and disposed through the S-K waste processing system at the Dolton Recycle Center or other appropriate facility.

5.7 Ground-Water Sample Collection and Handling

A stainless steel or disposable bailer will be used to collect water samples in a manner which minimizes turbidity. The rope used to lower the bailer into each well will be dedicated to that well. The bailer will be cleaned after sample collection at each well. Cleaning procedures will consist of washing the bailer in a water/detergent solution and rinsing with distilled water.

Water produced from the well will not be unnecessarily agitated during sampling. The water will be transferred directly from the bailer to the appropriate sample containers. Samples to be analyzed for dissolved metals will be transferred into a barrel filter (with a 0.45 μm filter) and then into the sample containers. Dissolved metals will be field-filtered with pressurized nitrogen. Clean sample containers with appropriate preservatives shall be provided by the laboratory. The containers and preservatives will be prepared in accordance with EPA (SW-846) guidance.

Blind duplicate samples will be collected at a frequency of one per ten investigative samples and submitted to the laboratory for quality assurance, in accordance with the requirements of the Quality Assurance Plan (Part VII of the Phase I RFI Workplan, included in Appendix E). Additionally, one set of trip, field and equipment blanks will be submitted with the samples for quality assurance/quality control (QA/QC). Field blanks will be prepared by pouring distilled water (used for decontamination) directly from the product container into laboratory provided sample containers. Equipment blanks will be prepared in the same manner, except that the distilled water will first be transferred into the decontaminated bailer and barrel filter (for dissolved metals) and then into the sample containers.

The trip blank will be prepared by the laboratory using reagent water. The trip blank will be carried in the cooler holding the VOC sampler containers throughout the field sampling activities and during transport to and from the laboratory.

The sample containers will be labeled and immediately placed into opaque coolers, packed with ice. The samples will be delivered within 48 hours to S-K Environmental Laboratory, Elk Grove Village, Illinois, for chemical analysis. Chain-

of-custody/sample-analysis-request forms will be completed and accompany the samples to the laboratory.

5.8 Laboratory Analysis

Each sample will be analyzed for those VOCs, SVOCs, and total and dissolved metals that had been detected in soils or ground water during the Phase I RFI. The target constituent list, including analytical methods, and reporting limits, is presented in Table 5-1. The laboratory will be instructed to meet the EQLs listed in SW-846 (Revision 1) for each of the specified analytical methods and to follow the level of QA/QC effort established in the Quality Assurance Plan (Chapter VII of the Phase I RFI Workplan, included as Appendix E). The EQLs and an evaluation of QA/QC data for all analyses will be presented in the Phase II/III RFI Report.

Table 5-1. Target Constituent List, RFI Phase III Ground-Water Release Assessment, Safety-Kleen Corp. Recycle Center, Dolton, Illinois.

Constituent	USEPA SW-846 Method	Reporting Limit (mg/L)	Constituent	USEPA SW-846 Method	Reporting Limit (mg/L)
VOCs			SVOCs		
Acetone	8240	0.1	Phenol	8270	0.004
Benzene	8240	0.005	1,2-Dichlorobenzene	8270	0.009
Bromomethane	8240	0.01	Naphthalene	8270	0.01
Carbon disulfide	8240	0.1	2-Methylnaphthalene	8270	0.01
Chlorobenzene	8240	0.005	2-Methylphenol	8270	0.008
Chloroethane	8240	0.01	4-Methylphenol	8270	0.006
Chloroform	8240	0.005	2,4-Dimethyl phenol	8270	0.01
Chloromethane	8240	0.01	Phenanthrene	8270	0.005
1,1-Dichloroethane	8240	0.005	Di-n-butyl phthalate	8270	0.01
1,2-Dichloroethane	8240	0.005	Fluoranthene	8270	0.004
1,1-Dichloroethene	8240	0.005	bis(2-Ethylhexyl)phthalate	8270	0.006
cis-1,2-Dichloroethene	8240	0.005	Diethyl phthalate	8270	0.01
trans-1,2-Dichloroethene	8240	0.005	Pyrene	8270	0.003
trans-1,3-Dichloropropene	8240	0.005	Butyl benzyl phthalate	8270	0.005
1,2-Dichloropropane	8240	0.005	Chrysene	8270	0.005
Ethylbenzene	8240	0.005	Benzo(k)fluoranthene	8270	0.008
2-Hexanone	8240	0.05			
Methylene Chloride	8240	0.005			
2-Butanone	8240	0.1	Metals (total and dissolved)		
4-Methyl-2-Pentanone	8240	0.05	Barium	6010	2.0
Styrene	8240	0.005	Cadmium	7131	0.005
Tetrachloroethene	8240	0.005	Lead	7421	0.0075
Toluene	8240	0.005	Mercury	7471	0.002
1,1,1-Trichloroethane	8240	0.005			
1,1,2-Trichloroethane	8240	0.005			
Trichloroethene	8240	0.005			
Trichlorofluoromethane	8240	0.01			
1,1,2-Trichlorotrifluoroethane	8240	0.005			
Vinyl Acetate	8240	0.05			
Vinyl Chloride	8240	0.01			
Xylenes (total)	8240	0.005			

APPENDIX A

AUGUST 17, 1995 IEPA APPROVAL LETTER
FOR PHASE I RCRA FACILITY INVESTIGATION REPORT
(MARCH 2, 1995)
SAFETY-KLEEN CORP. RECYCLE CENTER
DOLTON, ILLINOIS

State of Illinois
ENVIRONMENTAL

Post-it™ brand fax transmittal memo 7671 | # of pages ▸ 3

To Jack B.	From Anne Lint
Co. TRIHYDRO	Co. S-K
Dept.	Phone #
Fax #	Fax #

Mary A. Gade, Director
217/524-3300

August 17, 1995

RECEIVED
AUG 21 1995
EHS Dept. - Remediation
SAFETY-KLEEN CORP.

Safety-Kleen Corporation
Attn: Mr. Gary Long, Manager-Remediation
1000 North Randall Road
Elgin, Illinois 60123

Re: 0310690006 -- Cook County
Safety-Kleen Envirosystems (Dolton)
ILD980613913
Date Received: March 3, 1995
Log No. B-120-CA-1
RCRA - Permit

Dear Mr. Long:

This letter is in response to the Phase I RCRA Facility Investigation ("RFI") Report for the above-referenced facility which you submitted February 27, 1995. This report was prepared on your behalf by TriHydro Corporation and was submitted in accordance with Condition 2 of this Agency's August 30, 1994 RFI Phase I Workplan approval letter and the final RCRA permit issued to the above-referenced facility. The subject Phase I RFI report is hereby approved subject to the following conditions and modifications:

1. Based upon a review of the subject submittal, a Phase II investigation should be conducted at the following areas. The "Areas" listed below have been created in order to group together SWMUs which are in close physical proximity to each other. Any references to SWMUs in this letter is intended to refer to these Areas. Phase II of the RCRA corrective action process should concentrate on the Areas as a whole and not on individual units:

   a. Southern Area: This area includes former Tank Farm D, the Former Southeast Tank Farm, Truck Station Nos. 3 and 10, and the former UST.

   b. Central Area: This area includes Truck Station Nos. 4 and 9, and Tankfarm Nos. 3, 4, 5, and 6.

   c. Northwestern Area: This area includes the North Warehouse Pad and Truck Station Nos. 5 and 6.

   d. East Field: This area includes the East Field and Tank Farm No. 2.

   e. Barker Chemical Property

   f. Rexnord/Precision Aire Property

   g. Agri-Chain Area

2. It is understood that reports as summarized in the Agency's March 9, 1994 letter for the Former Rexnord/Precision Aire Property and the Agri-Chain area SWMUs present at the subject facility will be submitted to the Agency for review and approval by no later than December 31, 1997.

3. Due to the unique nature of the Barker Chemical Property area relative to the other SWMUs at this facility, further corrective action activities at this SWMU should be carried out separately from such activities at the other SWMUs of concern at this facility. Therefore, a separate workplan for this SWMU for further corrective action activities at this SWMU should be submitted to the Agency by November 15, 1995. This workplan should contain a general description of the corrective action activities which Safety-Kleen would propose to carry out at this SWMU. A thorough description of the initial investigation efforts and/or interim measures to be carried out must also be provided in this workplan. This workplan should be developed in general accordance with the final RCRA permit issued to the subject facility and IEPA/USEPA guidance regarding RCRA corrective action.

4. While the Agency agrees with the last paragraph on Page 6-11 of the subject submittal which was concerned with the idea that the phenol and phthalates detected throughout the site are not related to any past or present releases, the Agency is still unable to explain their presence in numerous soil samples. The possibility of larger values at an even greater depth needs to be evaluated. Therefore, the Agency is requesting that three additional borings be conducted as part of the Phase II investigation at depths sufficient enough to demonstrate conclusively that the levels of phenols and phthalates are decreasing with depth. If this is demonstrated, then no further action will be required for the levels of phenols and phthalates currently found on site.

5. The next step in the general RCRA corrective action process for the subject facility is the development of a Phase II RFI Workplan for further investigation at the Areas (SWMUs) identified in Condition 1.a through 1.d above. Phase II of the RFI should focus on determining the rate and extent of migration of hazardous waste or hazardous constituents and the concentration of the hazardous waste or hazardous constituents in the soil at each SWMU of concern. This Phase II Workplan should be submitted to the Agency by October 15, 1995 and should be developed in accordance with this letter, and Section IV and Attachment F of the September 29, 1993 final RCRA permit issued to the above-referenced facility (B-120).

   a. Safety-Kleen may propose to conduct certain Phase III activities (investigation for possible groundwater contamination) in conjunction with Phase II activities in order to avoid duplication of effort and to shorten the amount of time necessary for the corrective action process. Development of any portions of this Phase II workplan which deal with a groundwater investigation (Phase III investigation) should be carried out in accordance with

Attachment F of the final RCRA permit issued to the subject facility.

b. The Agency understands that certain activities to be proposed by Safety-Kleen as part of the Phase II investigation may include investigations near the SWMUs referenced in Condition 2 above.

Should you have any questions regarding this matter, please contact Michael A. Heaton at 217/524-3312.

Sincerely,

Edwin C. Bakowski, P.E.
Manager, Permit Section
Bureau of Land

ECB:mah

cc: USEPA Region V -- George Hamper
Jack G. Bedessem, P.E. -- TriHydro Corporation (Laramie, WY)

APPENDIX B

PHASE I RFI PROJECT MANAGEMENT PLAN
PART III OF PHASE I RELEASE ASSESSMENT WORKPLAN
SAFETY-KLEEN CORP. RECYCLE CENTER
DOLTON, ILLINOIS
DATED MARCH 4, 1995

PART III

PROJECT MANAGEMENT PLAN

RCRA FACILITY INVESTIGATION
PHASE I RELEASE ASSESSMENT WORKPLAN
DOLTON RECYCLE CENTER

PART III - PROJECT MANAGEMENT PLAN

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CHAPTER III-1

INTRODUCTION

Safety-Kleen Corp. (S-K) owns and operates a recycling facility (SIC 2851) in Dolton, Illinois. S-K has owned and operated the facility since March 1987. The Dolton Recycle Center occupies a 30-acre site in an industrialized area about 20 miles south of downtown Chicago, Illinois (Figure III-1-1). The address of the facility is:

Safety-Kleen Corp.
633 East 138th Street
Dolton, IL 60419

The Dolton Recycle Center is a reclamation and recycling facility that accepts organic chemicals and solvent wastes from S-K service centers and other S-K recycle centers, and from industrial and commercial facilities. Spent materials brought to the facility are regenerated into product or blended for use as a fuel in cement kilns. Principal wastes managed at the facility are paint waste, lacquer thinner, mineral spirits, and waste oil.

RFI Objective

The Dolton Recycle Center is permitted to store and treat RCRA hazardous wastes (ILD980613913). As a condition of the RCRA permit, the Illinois Environmental Protection Agency (IEPA) requires S-K to conduct a RCRA Facility Investigation (RFI). The purpose of the RFI is to determine the nature and extent of releases of hazardous wastes and hazardous constituents from certain solid waste management units (SWMUs) and areas of concern (AOC) at the facility. The locations of the SWMUs and AOCs under investigation are shown on Figure III-1-2.

In order to achieve the RFI objective, Illinois Environmental Protection Agency (IEPA) designed a three-phase process and incorporated it into the Part B Permit:

- Phase I - Release Assessment - Phase I is designed to provide information on the characteristics and integrity of each SWMU and to determine if a SWMU has released, is currently releasing, or has the potential to release hazardous waste and/or hazardous constituents to the soil or air.

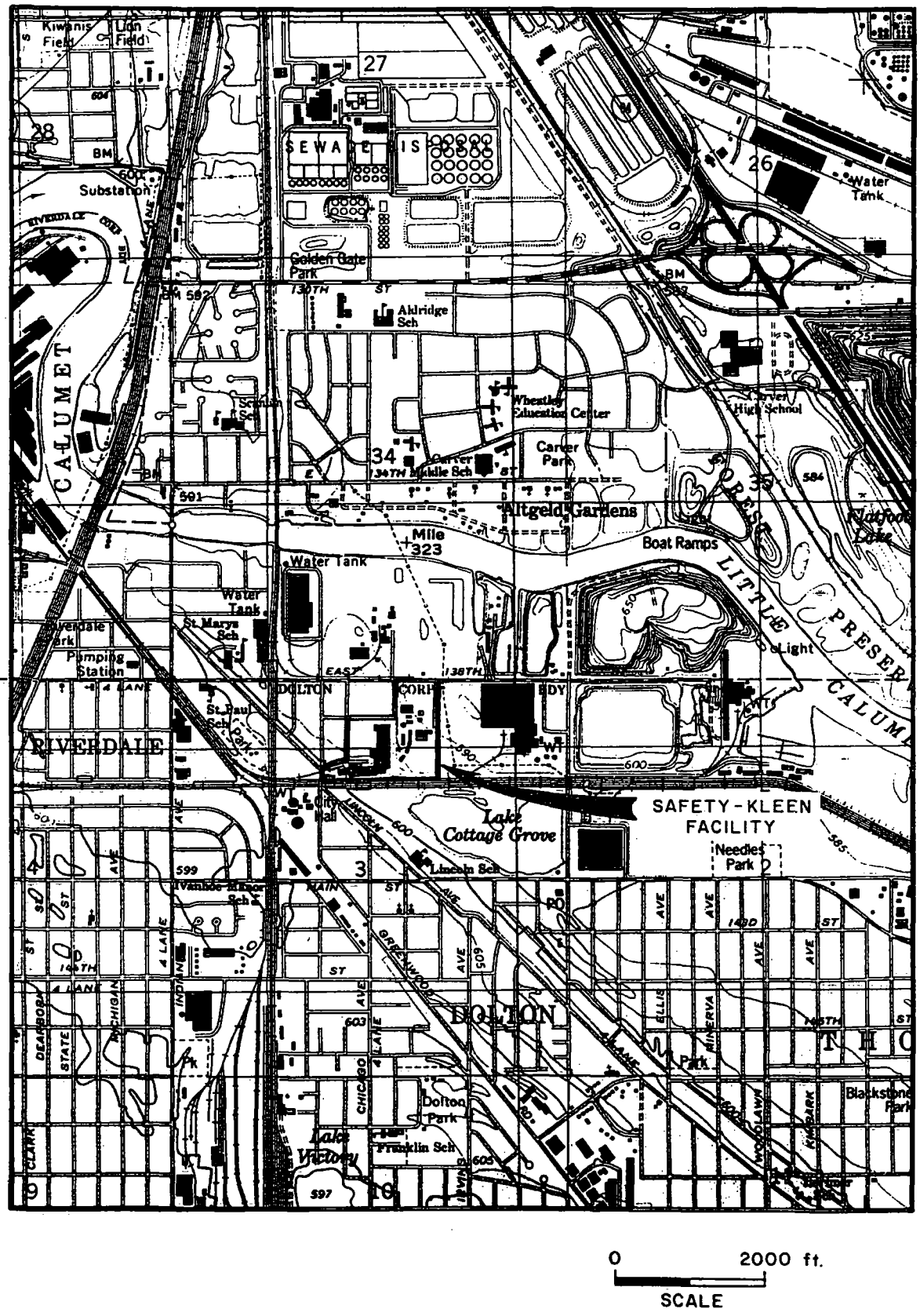
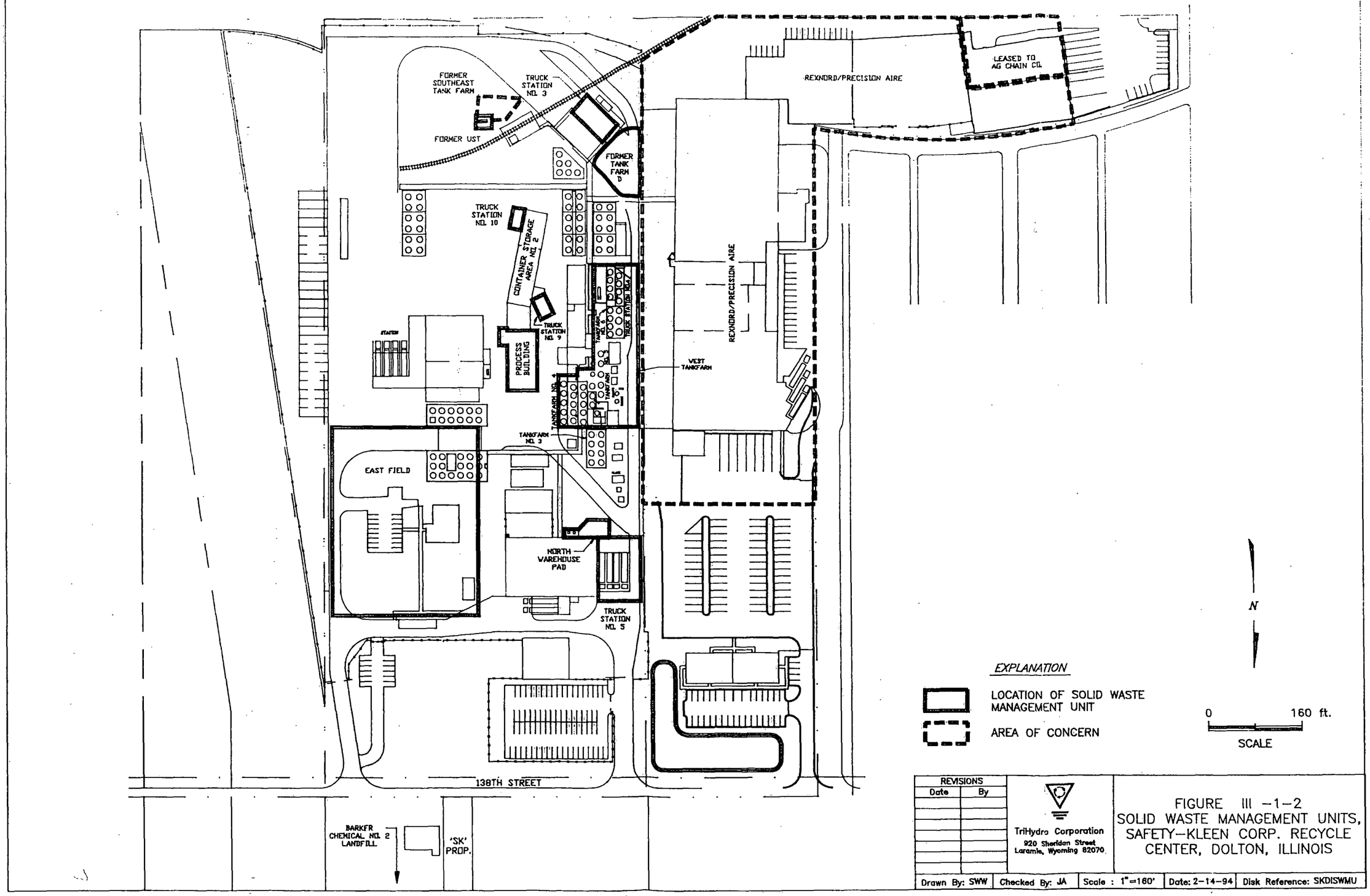


FIGURE III-1-1 :VICINITY MAP, SAFETY-KLEEN CORP. RECYCLE CENTER, DOLTON, ILLINOIS (ILD980613913)



REVISIONS	
Date	By

TriHydro Corporation
920 Sheridan Street
Laramie, Wyoming 82070

FIGURE III -1-2
SOLID WASTE MANAGEMENT UNITS,
SAFETY-KLEEN CORP. RECYCLE CENTER, DOLTON, ILLINOIS

Drawn By: SWW	Checked By: JA	Scale : 1"=160'	Date: 2-14-94	Disk Reference: SKDISWMU

- Phase II - Extent of Release Assessment - Phase II is designed to define the extent of releases (if any) to soil from the subject SWMUs.

- Phase III - Ground-Water Release Assessment - Phase III is designed to define the extent of releases to the ground water (if any) from SWMUs identified in Phase I or II to have potentially released hazardous waste or hazardous constituents to the ground water.

RFI Phase I Workplan Organization

The Phase I investigation will be conducted in accordance with this Phase I Release Assessment Workplan. The content of the Workplan follows the IEPA guidance in Attachment F of the Part B Permit, entitled "Required Scope of Work for a RCRA Facility Investigation." Therefore, the Dolton Phase I release assessment is designed to be consistent with Phase I release assessments at other facilities in Illinois. The Workplan contains the following parts:

- General Facility Information (Part I), which presents general information about present facility operations, previous facility operations, SWMU descriptions, and regional information.

- Nature and Extent of Impacts (Part II), which describes previous information on soils and ground water and information on potential migration pathways.

- Project Management Plan (Part III), which presents the objectives of Phase I and the project organization necessary to achieve the objectives.

- Sampling and Analysis Plan (Part IV), which describes the procedures to determine the presence or absence of a release of hazardous waste or hazardous constituents from SWMUs to soil or air. S-K has voluntarily expanded Phase I to include some ground-water assessment.

- Health and Safety Plan (Part V), which describes the procedures to protect the health and safety of those conducting field activities during Phase I.

- Data Management Plan (Part VI), which describes the techniques to document and track Phase I information, data, and conclusions.

- Quality Assurance/Quality Control Plan (Part VII), which details the procedures to ensure that information, data, and resulting conclusions are technically sound and properly documented.

CHAPTER III-2

PHASE I TECHNICAL APPROACH

The Phase I technical approach has been designed to achieve the Phase I objective and to be consistent with the IEPA guidance in Attachment F of the Part B Permit for the Dolton Recycle Center. The technical approach accommodates the physical and chemical conditions present at the facility, which are detailed in Parts I and II of this Workplan.

Phase I Scope

Sampling and analysis will be conducted according to the time schedule presented on Figure III-2-1. In order to achieve the Phase I objectives, the specific goals of the SAP are to:

- Collect soil samples from those accessible locations and depths which are most likely to permit identification and proper characterization of a SWMU-related release of hazardous wastes or hazardous constituents, if a release has occurred.

- Analyze the soil samples for the SWMU-related hazardous constituents which permit the identification, characterization, and hazard evaluation of a release.

- Implement sampling and analysis procedures which promote the quality assurance goals of completeness, representativeness, comparability, accuracy, and precision.

The soils data will also be used to determine the potential for a release to air, as described in the Data Management Plan (Part VI of the Workplan).

Although not required for Phase I by the Part B Permit, Safety-Kleen Corp. (S-K) intends to conduct voluntary ground-water assessment during Phase I to identify and characterize ground-water quality impacts and further evaluate ground-water flow directions in the shallow perched zone. This information will be used to design appropriate activities during subsequent phases of the RCRA Facility Investigation (RFI).

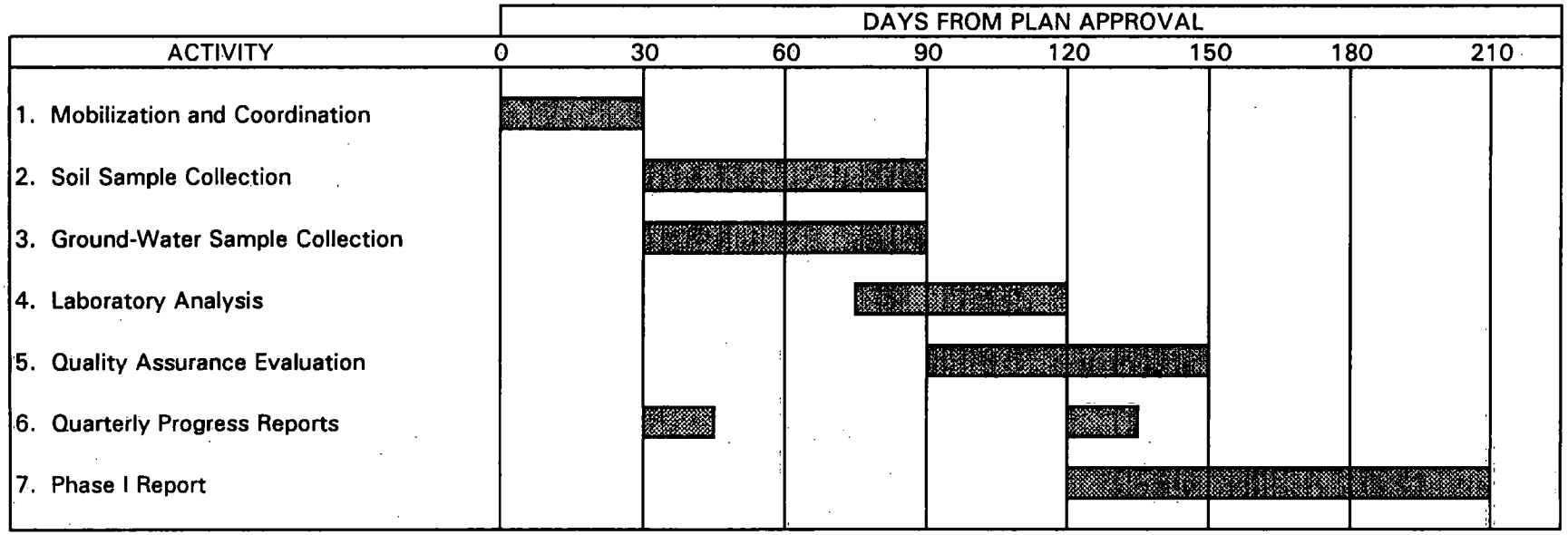


FIGURE III-2-1 :TIME SCHEDULE, PHASE I RELEASE ASSESSMENT, DOLTON RECYCLE CENTER

Sampling Locations

Sampling locations have been selected to provide an evaluation of worst-case conditions caused by a release or potential release of hazardous wastes or hazardous constituents. Sampling will take place in areas of known releases, in areas where previous field screening data indicate releases have occurred, and in areas where experience from similar sites indicates releases are most likely to occur.

Background Locations

The background sampling locations are shown on Figure III-2-2. The four background locations have been selected to satisfy the following criteria:

1. Located on Dolton facility property to minimize uncertainties about prior uses in the background areas.

2. Located at least 50 feet from any SWMUs listed in the Part B Permit as modified by IEPA and S-K.

3. Located at least 50 feet from any current or past industrial activity, based on review of aerial photos.

4. Spatial distribution across facility.

5. Same soil textures as encountered in SWMU soil samples (because natural inorganic constituent concentrations are a function in part of soil texture).

Background locations will be sampled first to minimize the potential for cross-contamination. If the onsite geologist determines that background soil samples are of a different soil texture than SWMU soil samples, he/she will collect samples from other background locations in order to satisfy the five background selection criteria listed above.

SWMU Locations

Twenty-three locations south of 138th Street will be sampled to identify and characterize releases to soils and shallow perched ground water. Criteria used to select sampling locations are:

1. Within or adjacent to SWMUs. For areas with secondary containment (truck stations and West Tank

Farm), sampling is planned next to the containment, because of access problems at several locations and concerns about damaging containment integrity at all locations.

2. In areas of known impact, based on previous soil data (Figure II-2-8) and ground-water data (Figure II-3-6).

3. In areas of suspected impact, based on information presented in Part II.

4. Areas where releases are more likely, which include valve locations where wastes are transferred between tank and tanker.

The 23 SWMU sampling locations south of 138th Street are shown on Figure III-2-2 along with much of the rationale used for selecting the locations.

Three locations will be investigated in the apparently disturbed part of the Barker Chemical No. 2 Area north of 138th Street to determine whether a SWMU is or was present on S-K property. Sampling locations are shown on Figure III-2-3. Two locations will be within the possible area of disturbance on an April 1980 aerial photo and along the eastern boundary of S-K property. The third location will be outside the apparent area of disturbance on the April 1980 aerial photo. The purpose for sampling this location will be to define native soil conditions in order to determine whether the other two locations are sited in backfill (possibly indicative of a SWMU) or native soil conditions. If there is a SWMU in the Barker Chemical No. 2 Area, sample collection and chemical analysis will be conducted.

Soil Sampling Depths

In the Barker Chemical No. 2 Area, soil samples will be collected at 5-foot intervals from ground surface to 20 feet below ground surface. The onsite geologist will evaluate soil texture and field-screen the samples according to the procedures in Chapter IV-2. Based on this information, the geologist will determine if the SWMU is on S-K property, and subject to the soil sampling procedures described below. If no SWMU is present on S-K property (Barker Chemical No. 2 Area), no soil sample collection and laboratory analysis will be performed in this area.

Soil sampling will occur during the Phase I Release Assessment to identify and characterize releases from Dolton

facility SWMUs. In addition, soil sampling and analysis will be conducted to define the vertical extent of soil impacts.

Soil samples will be collected at about 2 feet and 20 feet below ground surface for chemical analysis. Data from the shallow depth will be used to identify soil impacts, and data from the greater depth will be used to define extent. The deep sample at each location will be field screened, and a deeper sample will be collected if necessary to define the vertical extent of impacts.

During the sampling program, the onsite geologist will evaluate the range of soil textures from the background locations to ensure that they match the range of soil textures encountered in soil samples underlying the SWMUs. If they do not match, additional background intervals and/or locations may be sampled to ensure a match.

Ground-Water Sampling Depths

A ground-water level will be measured and a water sample collected at all background and SWMU locations south of 138th Street where ground water is present in the perched zone (historically 1 to 5 feet below ground surface). Ground-water samples will be collected from the perched zone at approximately 5 to 10 feet below ground surface. In the Barker Chemical No. 2 Area north of 138th, ground-water levels will be measured and water samples collected only if perched ground water is present and if the SWMU is determined to be on S-K property.

Laboratory Analysis

Samples will be submitted to S-K Environmental Laboratory for chemical analysis. The laboratory is located in Elk Grove Village, Illinois. The samples to be analyzed are shown in Table III-2-1. The samples will be analyzed for the 107 constituents described in Table III-2-2.

Table III-2-1. Sampling and Analysis Matrix, RFI Phase I Workplan, Dolton Recycle Center.

			Investigative Samples				Field Quality Control Samples		
Sample Matrix	Field Parameters	Lab Parameters	Type	No. of Sites	No. per Site	Total	Trip Blanks	Equipment Blanks	Field Duplicates
Soil	Physical Descriptions								
	Total Organic Vapors		BG SWMU	4 23-25	2 2	8 46-50	0	0	5
		Volatile Organic Compounds Semi-Volatile Organic Compounds Inorganic Compounds, Total	BG SWMU	4 23-25	2 2	8 46-50	0	0	5
Ground Water	Water Levels		BG SWMU	4 23-25	1 1	4 23-25	0	0	3
	Physical Descriptions								
		Volatile Organic Compounds Semi-Volatile Organic Compounds Inorganic Compounds, Dissolved	BG SWMU	4 23-25	1 1	4 23-25	3	3	3

Notes:

1. The number of sites depends on whether a SWMU exists in the Barker Chemical No. 2 Area on S-K property, and thus is subject to this investigation.

2. Laboratory control samples are described in Appendix VII-A.

3. BG means background. SWMU means solid waste management unit.

Table III-2-2. Constituent List, RFI Phase I Release Assessment, Dolton Recycle Center.

Constituent	Method (from SW-846)	Method Detection Limit (mg/kg)
Inorganics		
Arsenic	7060	1.25
Barium	6010	2.0
Cadmium	6010	2.0
Chromium	6010	4.0
Lead	6010	11.0
Mercury	7471	0.04
Selenium	7740	0.9
Silver	6010	3.0
Organics*		
Volatile Organic Compounds (37)	8240	0.005-0.100
Semi-Volatile Organic Compounds (62)	8270	0.33-3.3

* A complete list of organic compounds and method detection limits for individual compounds are presented in Appendix IV-C.

CHAPTER III-3

PHASE I REPORTING

Phase I includes a single, extensive soil and groundwater sampling and analysis event. A report on this event, including all field observations, laboratory data, and quality assurance evaluations, will be submitted to the Illinois Environmental Protection Agency (IEPA) within 90 days of receipt of the complete set of soil quality data. The Phase I Report will provide a summary of the Phase I investigation, problems and responses, staffing changes, and a schedule of upcoming activities. The report will include conclusions on whether a release of hazardous wastes and/or hazardous constituents has occurred to soils, ground water, or air, and whether the release has the potential to impact ground water in the dolomite aquifer.

Quarterly progress reports will be submitted to update IEPA on the progress of Phase I activities. Information included in the reports will be percentage of the project completed, activities completed during the reporting period, changes in the implementation of the Workplan, problems encountered during the reporting period, proposed corrections to these problems, projected work for the next reporting period, and any other pertinent information.

CHAPTER III-4

MANAGEMENT ORGANIZATION

Figure III-4-1 presents the proposed project management structure for the implementation of the RFI. The project will be directed by Mr. Scott Davies, Senior Project Manager - Remediation for Safety-Kleen Corp. (S-K). Mr. Davies has 8 years of experience in the environmental field and is responsible for cleanups and closures of S-K recycle centers throughout the United States and Puerto Rico.

Mr. Davies will be assisted by John Valerius, the Facility Manager at the Dolton Recycle Center. Mr. Valerius has more than 15 years of experience in waste management.

The IEPA Project Coordinator (Eric Minder) will ensure that the RFI project is conducted in accordance with the RCRA regulations and in general accordance with RFI guidance documents. The IEPA Project Coordinator will modify the RFI Workplan as needed, make site visits, and critically review the final report to ensure that the quality assurance objectives have been achieved.

The IEPA Project Coordinator and the S-K Project Director may conduct audits of field and laboratory activities.

S-K has developed an experienced project team in order to promote quality assurance during the RFI process. All team members have worked together on RFIs at other petroleum-impacted sites. The principal team members are:

- TriHydro Corporation will function as the prime contractor. TriHydro will be responsible for the proper implementation of the Phase I Workplan, collecting soil samples and submitting them to the laboratory, auditing laboratory performance, and preparation of the RFI report. In addition to working with S-K at the Dolton site, TriHydro is conducting assessment and/or remediation projects at 40 other S-K sites throughout the central and western United States. A summary of TriHydro qualifications and resumes of personnel to be involved in the project are included in Appendix III-A.

- GEO Corporation will perform the drilling services. As described in Appendix III-B, GEO Corporation has the specialized equipment to enter and drill in tight locations and has experience in drilling at petroleum-contaminated sites.

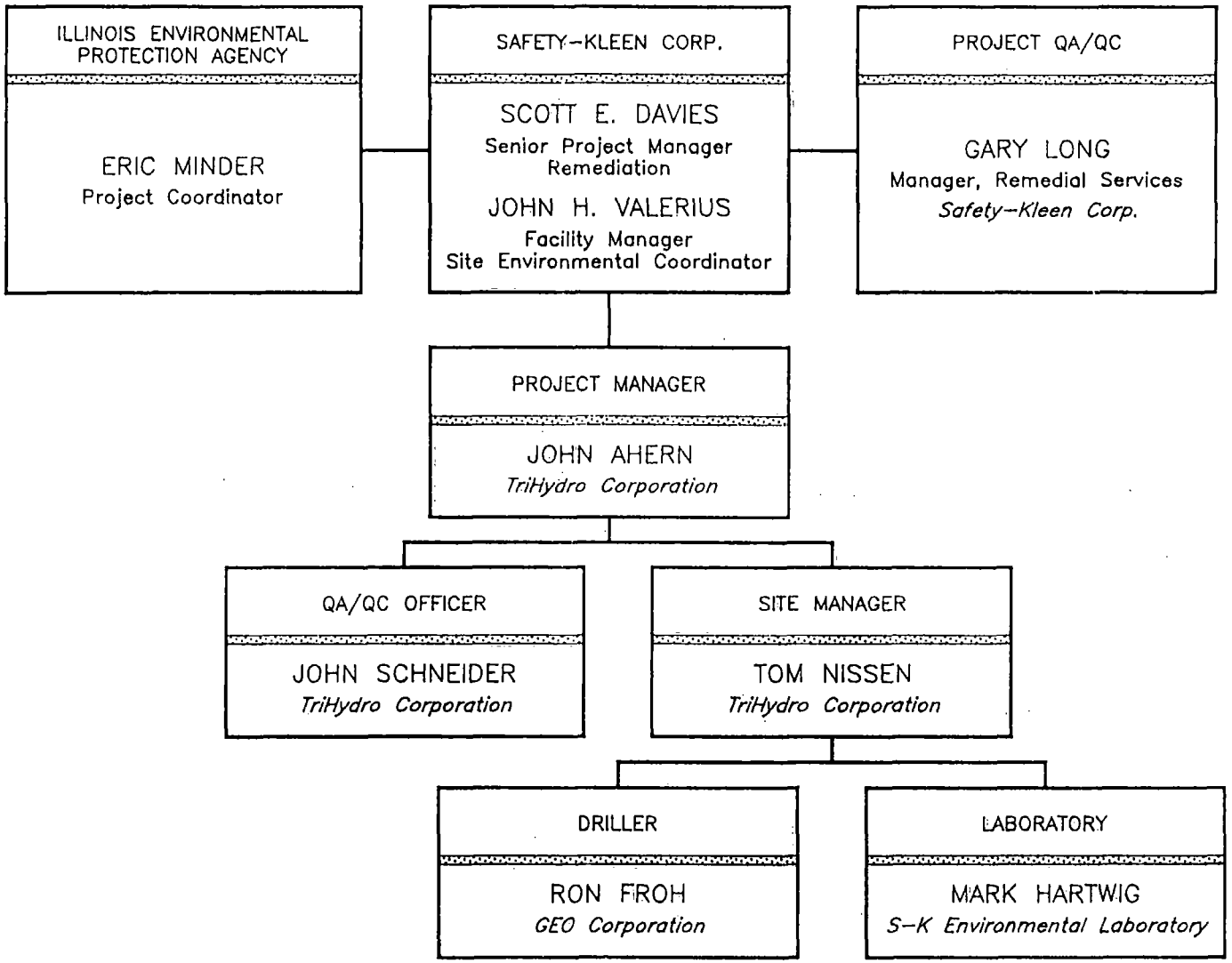


FIGURE III-4-1 :PROJECT MANAGEMENT TEAM, PHASE I RELEASE ASSESSMENT, SAFETY-KLEEN CORP. RECYCLE CENTER, DOLTON, ILLINOIS

SKDIMGNT

- S-K Environmental Laboratory will perform all laboratory analytical services. S-K Environmental Laboratory is performing the analytical services on many of S-K's monitoring, assessment, and remediation projects in the region. S-K Environmental Laboratory qualifications are summarized in Appendix III-C.

TriHydro Corporation

John Ahern, President of TriHydro Corporation, will be TriHydro's project manager for the RFI Phase I project. Mr. Ahern has 20 years of experience in assessment and remediation at petroleum-impacted sites. He has served as project manager and/or QA/QC officer on 25 Safety-Kleen projects over the previous two years. Mr. Ahern is located at the TriHydro Corporation office in Laramie, Wyoming, and will provide all onsite project personnel from this office.

Activities to be performed by the Project Manager during the RFI include:

- Select, coordinate, and schedule staff for the work assignments.
- Control budgets and schedules.
- Prepare bimonthly progress reports.
- Monitor the subcontractor.
- Implement quality assurance measures and any corrective action requirements.
- Attend review meetings.
- Perform final data assessment.
- Supervise the preparation of the RFI report and provide technical peer review.

Under the direct supervision of the project manager is the QA/QC officer and the site manager. Mr. John Schneider will serve as the project QA/QC officer. The activities presented below will be completed by the project QA/QC officer:

- Audit field memoranda prepared by field personnel to assure that the procedures for sample collection and sample custody are strictly adhered to.

- Review laboratory reports to assure that adequate QA/QC procedures are imposed on the laboratory analytical results.

- Interface with IEPA's QA Officer and Project Manager, when necessary.

- Organize the final evidence file, and turn over the custody of this evidence file to S-K's Project Manager at the end of the project.

Mr. Tom Nissen will serve as the project's site manager. Mr. Nissen has six years of experience directing field activities for environmental assessment and remediation at RCRA facilities. Mr. Nissen will be responsible for all onsite activities including scheduling, direction of the subcontractors, and maintaining the sampling procedures in accordance with the Quality Assurance Project Plan (Part VII) and the Sampling and Analysis Plan (Part IV).

GEO Corporation

GEO Corporation will conduct the soil and ground-water sample collection required during the RCRA Facility Investigation. GEO Corporation has custom-designed equipment for field sampling and can match the field sampling equipment to the particular task, type of sample needed, and site conditions. During the Phase I investigation, a Scorpion Series ATV Hydraulic Probing Rig will most likely be used to allow access to the tighter areas. A detailed explanation of soil and ground-water sample collection is described in the Sampling and Analysis Plan (Part IV).

S-K Environmental Laboratory

S-K Environmental Laboratory will conduct the laboratory services required during the RCRA Facility Investigation. The laboratory organization structure and internal responsibilities are described in detail in Appendix III-C.

CHAPTER III-5

COST ESTIMATE

The cost estimate for implementation of Phase I is presented in Table III-5-1. The estimate is organized per the field activities in the Sampling and Analysis Plan(Part IV) and reporting activities in the Project Management Plan (Part III). Safety-Kleen Corp. (S-K) has adequate resources to complete the Phase I release assessment.

S-K will submit financial assurance for completion of the Phase I release assessment in accordance with Paragraph IV.D.2 of the Part B Permit (Financial Assurance for Corrective Action). The documentation for financial assurance will be submitted by S-K within 60 days of approval of this Phase I Release Assessment Workplan by the Illinois Environmental Protection Agency.

Table III-5-1. Cost Estimate Worksheet, RFI Phase I Release Assessment, Safety-Kleen Corp. Recycle Center, Dolton, Illinois.

Phase/Activity	Cost
I. Phase I Investigation	
Activity I.1 - Pre-Field Activities	$500
Activity I.2 - Sample Collection/Decontamination	19,500
Activity I.3 - Field Documentation/Chain-of-Custody Control	500
Activity I.4 - Post-Field Activities	300
Activity I.5 - Laboratory Analysis ($645/soil sample)	40,600
	$61,400
II. Reporting	
Activity II.1 - QA/QC analysis per QAPjP	$1,900
Activity II.2 - Prepare Phase I Report	2,700
Activity II.3 - Prepare 2 quarterly progress reports	1,000
Activity II.4 - Compile data package and ship to facility	800
	$6,400
Cost Estimate Worksheet Summary	
1) Phase I Investigation	$61,400
2) Reporting	6,400
	$67,800

Note: S-K is conducting ground-water activities voluntarily under Phase I, and thus costs for ground-water sampling, analysis, and reporting are not included.

APPENDIX III-A

TRIHYDRO QUALIFICATIONS

Summary of Current TriHydro Clients

Client/Sites	Starting Date	Principal Services
Wyoming Department of Environmental Quality		
- Mountain View	1988	Contaminant source identification
- Laramie (Foster's Sinclair)	1990	Vapor and ground-water quality assessment, design and construction of trench to intercept vapors and hydrocarbon product
- Greybull	1992	Emergency response, design, and installation of residential vapor controls
Texaco Refining and Marketing, Inc.		
- Los Angeles Refinery (California)	1985	Hydrocarbon recovery, soil remediation, environmental assessment, regulatory reporting, ground-water monitoring
- El Dorado Refinery (Kansas)	1987	Hydrocarbon recovery, environmental assessment, air monitoring, vapor control, regulatory reporting
- Lockport Refinery (Illinois)	1985	Environmental assessment, regulatory reporting, NPDES evaluation, RCRA
- Bakersfield Refinery (California)	1992	Soil and ground-water quality remediation, environmental assessment
Golden West Refining Company		
- California Refinery	1985	Hydrocarbon recovery, environmental assessment, regulatory reporting, expert witness testimony, ground-water monitoring
Safety-Kleen Corp.		
- 40 sites (principally Midwest)	1988	RCRA closures, UST environmental assessments, regulatory reporting, soil remediation, ground-water remediation, RFIs
Sinclair Oil Corporation		
- Sinclair Refinery (Wyoming)	1985	Environmental assessment, ground-water monitoring, RCRA and State permitting, RFI, regulatory reporting
- Boise, Burley Terminals (Idaho)	1991	Environmental assessment
Miscellaneous Clients		
- Banner Associates (Wyoming)	1991	Municipal ground-water development
- Church and Dwight (Wyoming)	1991	Landfill permit, spill control plan at trona site
- D&B Services (Wyoming)	1992	Environmental assessment at oil field
- Enron (Colorado)	1991	UST environmental assessment
- First Interstate Bank	1992	Environmental audits

Summary of Current TriHydro Clients (continued)

Client/Sites	Starting Date	Principal Services
- Forsgren Associates (Wyoming)	1990	Municipal ground-water development
- Frontier Refining (Wyoming)	1991	Ground-water monitoring, RFI at petroleum refinery
- Holly Sugar Corporation (Wyoming, California, Montana)	1987	Ground-water assessment and monitoring, landfill permit
- Indian Refining Company (Illinois)	1985	RCRA closures, environmental assessments, waste management plans at petroleum refinery
- Koch Materials (Colorado, Kansas)	1991	Site assessments at asphalt plants
- Marathon Oil (Nebraska)	1992	Ground-water monitoring at oil/gas production site
- Shell Pipe Line Corp. (Wyoming)	1991	Assessment and remediation of crude oil spill
- Texaco Inc. (California)	1990	Expert witness testimony for tank farm
- Wheatland (Wyoming)	1987	Landfill permit and ground-water monitoring
- Wyoming Territorial Prison	1991	Ground-water monitoring

APPENDIX III-B

GEO CORPORATION QUALIFICATIONS

GEO CORPORATION

CORPORATE OFFICES

ROCKY MOUNTAIN REGION
400 Corporate Circle , Suite F
Golden, Colorado 80401
303-279-4655
1-800-872-6662

REGIONAL OFFICES

SOUTHWEST REGION
Houston, Texas
713-6682-6996
FAX # 713-682-6982

GREAT LAKES REGION
Detroit, Michigan
313-344-2110
313-344-1117

WESTERN REGION
Salt Lake City, Utah
801-566-4590

SOUTHEAST REGION
Atlanta, Georgia
404-425-2828
FAX # 404-425-4686

CENTRAL REGION
St. Loius, Missouri
314-890-0038

DISTRICT OFFICES

SOUTHWEST DISTRICT OFFICE
Baton Rouge, LA

SOUTHEAST DISTRICT OFFICE
Charlotte, NC

PROPOSED EXPANSION OFFICES:

SOUTHEAST DISTRICT OFFICE
Orlando, Florida

GREAT LAKES DISTRICT OFFFICE
Chicago, Illinois

Field Sampling Equipment

GEO Environmental has custom designed its equipment for field sampling and analysis. GEO matches field sampling equipment to the needs of the client, the type of sample taken, and the terrain on the job site. The following is a list of the kind of equipment available.

Scorpion Series-ATV Hydraulic Probing Rig

* Weight: 1200 lbs
* Height: 8 feet
* Length: 89 inches
* Width: 43 inches

Sampling Capability

* Soil vapor to 30 feet.
* Soil sampling continuous or interval to 30 feet.
* Groundwater sampling - real-time/temporary monitoring to 30 ft.
* Expendable Aquifer Sampling Implant:
  EASI system/10-30 per day
* GEOpunch real-time bailed water samples to 30 feet
* 1", 3/4", 1/2" factory-slotted PVC, set to 30 feet
* Soil vapor sampling by passive and dynamic methods
* Soil vapor monitoring by temporary or permanent techniques

Viper Series - 1 Ton 4x4 hydraulic probing rig

* Vehicle: rig is mounted on 1 ton 4x4 Ford F-350 pickup bed
* Engine: V-8, 460
* Mast height: 9 feet

Sampling Capability

* Soil vapor to 60 feet.
* Soil sampling continuous or interval to 60 feet.
* Groundwater sampling - real-time/temporary monitoring to 30 ft.
* Expendable Aquifer Sampling Implant:
  EASI system/10-30 per day
* GEOpunch real-time ground-water samples using bailer.
* 1", 3/4", 1/2" factory-slotted PVC
* Soil vapor sampling by passive and dynamic methods
* Soil vapor monitoring by temporary or permanent techniques

Steam Cleaner

* For decontaminating probe rods and samplers
* Hotsy/Landa models
* Hot (up to 200° F) and cold rinse capable
* 2500 psi washing pressure
* 200 gallon water tank

APPENDIX III-C

S-K ENVIRONMENTAL LABORATORY QUALIFICATIONS

4.0 ORGANIZATION AND RESPONSIBILITY

It is the objective of Safety-Kleen Corp. to provide an organizational structure that can enhance the attainment of Corporate goals. Quality services, cost competitiveness, client satisfaction, employee gratification and profitable operations are primary Safety-Kleen goals.

4.1 DESCRIPTION OF LABORATORY PERSONNEL RESPONSIBILITIES

Safety-Kleen's Environmental Laboratory , located in Elk Grove Village, Illinois, is a full-service environmental analytical laboratory. A total staff of 26 people, consisting of laboratory personnel and/or support personnel managed by Mr. Mark A. Hartwig provide environmental services to industrial and internal clients. The Environmental Laboratory has state certifications for the analysis of soils, waste water and/or drinking water in Connecticut, California, Illinois, Kansas, New York and Wisconsin. Also, all those states that recognize any of the previous mentioned states in reciprocity. We are accredited by the American Association for Laboratory Accreditation (A2LA). This enables the Environmental Laboratory to conduct analyses for internal and client projects throughout much of the country.

4.1.1 PROJECT MANAGEMENT

Safety-Kleen's Environmental Laboratory uses a system of lab managers and project managers to plan, coordinate, execute and monitor project activities. Efficient and effective project management is of prime importance to the successful execution of project establishing and maintaining credibility and lasting value. Project management at Safety-Kleen is the coordinated and cooperative effort of a team, in which each member actively participates in successful project planning and execution. Project Managers are involved from the start in planning the project and time tables. When the client proposal is accepted by the client, the lab project manager will schedule with the client the arrangements for supplying sample containers and a schedule for sampling.

When samples are received at Safety-Kleen's Environmental Laboratory, the sample custodian will verify that all sample container seals are intact, and if so, will sign the chain-of-custody statement accordingly. In the event that it appears chain-of-custody has been broken, the sample custodian will immediately bring it to the attention of the Project Manager who will in turn contact the client for consultation and resolution. Written documentation of the event will be furnished.

The sample custodian will also verify information on the sample labels is the same as that appearing on the chain-of-custody. Any inconsistencies will also be brought to the attention of the Project Manager for immediate resolution with the client. The resolution will be documented in a memorandum to the project file and a copy provided to the client. After log-in, the samples are stored at 4°C in storage refrigerators until analysis.

The sample identification information and analyses requested are then logged into the laboratory computer and entered onto the laboratory backlog. The laboratory backlog serves as a guide to the Laboratory Manager, Group Leaders and Project Managers to identify the status of all samples in the laboratory, and is used to ensure that project deliverable requirements are met. The backlog contains the laboratory sample work order number, client name, number of samples received by matrix, number of samples to be analyzed for each requested parameter, due date, type of QC and report requested.

Backlogs are updated daily and reviewed by the Environmental Laboratory Project Manager and group leaders. The responsibility of the Project Manager is to monitor the status of samples using the backlog report, daily status meetings and through status updates from the Laboratory Manager. Use of the backlog allows the Project Manager to track the progress of samples through the various steps of the analytical process and assure timely completion of each task. If for any reason the backlog indicates that sample analyses are not completed within seven days of the due date, the Project Manager will work with the Laboratory Manager and Group Leaders to reassess laboratory priorities to enable timely delivery of the analytical report. The laboratory manager and group leaders have a commitment to maintain project schedules with a goal of 100% on-time delivery of quality data packages. If at any time, a delay in the required project turnaround time is anticipated, the Project Manager will immediately contact the client and inform them of the nature of the problem, the corrective action taken and a revised delivery date for the analytical data report.

A flexible capacity helps the laboratories meet project commitments. The Environmental Laboratory operates two shifts, 5 days per week in many of the service areas. The shifts are 8 hours shifts. Capacity is expanded by using autosamplers on many of the instruments. As demand for specific analytical requirements grows, the Environmental Laboratory has added equipment and full time staff as analytical backlog is identified.

4.1.3 KEY PERSONNEL

The Environmental Laboratory provides ongoing training to maintain the quality of its personnel. The highly trained staff of experienced professional chemists and technicians is the key element in the lab's credibility as a provider of quality environmental testing service. A strong base of experience, organized and managed effectively, results in a value added service product appreciated by our clients. The accompanying Skills Matrix of Key Personnel summarizes the education and experience of the laboratory personnel. The Laboratory personnel assigned to this project have an excellent record of satisfying project requirements. The Group Leaders provide guidance and direction enabling their staff to routinely provide quality test results.

Table 4-1 provides the skills matrix of key laboratory personnel.

Table 4 - 1

Skills Matrix of Key Personnel
SAFETY-KLEEN CORP.
February 14, 1994

	DEGREE	YRS LAB EXP	PROJ MNGT	QA /QC	DATA MNGT	CLP EXP	SW846 EXP	EPA 600 EXP	DOD EXP	A.F. IRP EXP	INDST HYG EXP
Laboratory Manager Mark Hartwig	BS Chem	20	X		X	X	X	X			X
VP Technical James Breece	Ph.D. Chem	31	X	X	X		X				
QA/QC Manager Dave Reese	BS Chem	15	X	X	X	X	X	X	X		
Inorganic Group Leader Rita Shah	BS Chem	11	X	X		X	X				X
Organic Group Leader Rick Cook	MS Chem	14	X	X	X	X	X	X			X
Project Manager Matt Schweik	BS Economics										
Chemist Pravin Patel	MS Chem	11		X			X				
Chemist Atul Shah	BS Chem	23				X	X	X			X
Chemist Mark Scheuer	MS Chem	8				X	X				X

RESUME

Atul Shah
GC/MS Chemist
TCLP/Environmental Laboratory

EDUCATION:

Bombay University
Bombay, India
B.S. Major - Chemistry
Minor - Botany

PROFESSIONAL AFFILIATIONS:

American Chemical Society

EMPLOYMENT HISTORY:

June 1991 - Present
Safety-Kleen Corp.
P.O. Box 92050
Elk Grove Village, IL 60009-2050

Position: GC/MS Chemist

Responsibilities:

1. Scheduling work for TCLP/VOA analysis.
2. Preventive maintenance on GC/MS, Tekmar & Data System.
3. Data Review/reporting.
4. Training to new operator/technicians.
5. PE/QC samples - data reporting.
6. Purchasing routine/new items.
7. Communicating to lab manager/group leader.
8. Learning new system/software (target).

March 1990 - May 1991
I.E.A. Illinois Inc.
Schaumburg, IL 60195

Responsibilities:

1. TCLP/VOCs analysis by using:
   a. EPA methods 8240/524.2/624
   b. H.P. GC/MSD with RTE-A System
   c. Tekmar's LSC 2000 and ALS 2016

2. Also familiar with BASE-NEUTRAL/ACID analysis by GC/MS.

1989 - March 1990

Responsibilities:

1. Working with Finnigan ITD 700 using EPA 524.2 method.
2. As a back-up Operator for INCOS 50.
3. Familiar with FORMASTER and HPs MSD.

1985 - 1988

Responsibilities:

1. Initiated, organized and established an efficient GC section for analysis of VOCs, PCBs, Pesticides, Herbicides, PAH, etc. by EPA methods.
2. Trained and supervised three technicians.
3. Automated the GCs operation by adding Autosamplers and a multitasking PC based software.
4. Troubleshooting and routine maintenance.
5. Familiar with industrial hygiene samples with NIOSH methods.

1983 - 1984

Responsibilities:

1. Metal digestion analysis. Trained for GC analysis.

1982

Responsibilities:

1. Wet chemical analysis.

1974 - 1982
S. Merck Chemical
Baroda, India

Position: Analytical Chemist

Responsibilities:

1. Wet chemical analysis of fine chemicals. Organic-inorganic acids, solvents, Vitamin C, etc.
2. Instruments used include: Karl Fisher, Flame Photometer, GC.

1973 - 1974
Themis Pharmaceuticals
Bombay, India

Position: R & D Chemist

Responsibilities:

1. Product Development of paracetamol, phenacetin, phenylbutazone, oxyphenyl butazone.

RESUME

Mark A. Hartwig
Manager
TCLP/Environmental Laboratory

EDUCATION:

Eastern Michigan University
Ypsilanti, Michigan
B.S. Major - Chemistry
Minor - Math, Business

PROFESSIONAL AFFILIATIONS:

American Chemical Society
American Society for Mass Spectrometry
MCM Local Mass Spectrometry Discussion Group

EMPLOYMENT HISTORY:

October 1991 - Present
Safety-Kleen Corp.
12555 W. Old Higgins Road
Elk Grove Village, IL 60007

Position: TCLP Manager

Responsibilities:

1. Manage operation of environmental laboratory.
2. Prepare annual business plans and operational budgets.
3. Develop staff and departmental functions.
4. Prioritize and monitor laboratory production to ensure timely completion of reports.
5. Ensure implementation of analytical testing capabilities.

December 1990 - April 1991
IEA, Inc.
126 West Center Court
Schaumburg, IL 60195

Position: Director of Operations - Illinois

Responsibilities:

1. P & L of laboratory.
2. Business development.
3. Ensure professional growth and development of staff.
4. Prepare and review capital equipment authorization for expenditure.

April 1991 - October 1991
IEA, Inc.
126 West Center Court
Schaumburg, IL 60195

Position: Director of Midwest Region Business Development

Responsibilities:

1. Develop and maintain high level business relationships with Fortune 500 accounts.
2. Prepare and deliver sales presentations to major accounts.
3. Development of new product and service offerings.
4. Strategic market review and assessment.

July 1988 - December 1990
York Laboratories of Chicago, Inc.
126 West Center Court
Schaumburg, IL 60195

Position: President and founder of York Laboratories of Chicago, Inc.

Responsibilities:

1. P & L of the Laboratory.
2. Strategic Marketing Decisions.
3. Ensure professional growth and development of staff.
4. Approve major capital expenditures.
5. Serve on York Laboratories Strategy Development Team.
6. Serve on YWC, Inc., Steering Committee.

August 1981 to July 1988
Hewlett-Packard Company
1200 East Diehl Road
Naperville, IL 60566

Position: Systems Engineer, GC/MS Product Line

Responsibilities:

1. Pre/Post Sales Support on all GC/MS instruments for MidWest Sales Region.
2. Provide technical consulting and applications support to Industrial and Governmental clients.
3. Assist in the development and testing of new hardware and software for all GC/MS systems.
4. Participate at trade shows and conferences by presenting technical papers and conducting technical workshops.

May 1974 to August 1981
Kemron Environmental Services
32740 Northwestern Highway
Farmington Hills, Michigan 48024

Position: Manager - Organics Analysis Laboratory

Responsibilities:
Coordinate and Execute the analysis of Industrial Hygiene and Environmental samples for organic contaminants by GC, IR, UV, GC/MS techniques.

AWARDS:

American Chemical Society Undergraduate Award in Analytical Chemical, 1973.

PUBLICATIONS:

"**Use of Isooctyl Thioglycolate for the Separation of Tin and Antimony**", Mark A. Hartwig, K. Rengan, J. Radioanalysis Chem. 42 (1978).

"**Interfacing of an Hewlett Packard GC/MS with a HP-1000A Computer System to a Vax Computer and DEC Lims**" Sunil Srivastava, Dennis Couch, Mark A. Hartwig, Scientific Computing and Automation Conference and Exposition (October 1988).

"**Analysis to Phenols**", Mark A. Hartwig, Hewlett-Packard Publication #23-5953-8056, (August 1982).

"**Tuning the MSD to Meet DFTFF**", Mark A. Hartwig, Hewlett Packard Publication AB85-12, (1985).

"**Writing Procedure Files for the HP-1000 RTE VI GC/MS Data System**", a Workshop, Mark A. Hartwig, Hewlett-Packard Company, ASMS Annual Conference, Cincinnati, Ohio (June 1986).

"**Interpretation of Toxic Organic Data**", Mark A. Hartwig, Annual Meeting-Academy of Certified Hazardous Materials Managers, July 1989.

"**Running a Successful Environmental Laboratory**", Mark A. Hartwig, Hewlett-Packard Seminar Series "ENVIRO-90", Cleveland, Cincinnati, St. Paul, Lansing, Michigan (November 1989).

"**Productivity Gains through Quality Control**", Mark A. Hartwig, HAZMAT-CENTRAL, Rosemont, Illinois (March 14, 1990).

RESUME

Rita Shah
Inorganic Group Leader
TCLP/Environmental Laboratory

EDUCATION:

University of Bombay
Bombay, India
B.S. in Chemistry and Biology

PROFESSIONAL AFFILIATIONS:

American Chemical Society

EMPLOYMENT HISTORY:

March 1991 - Present
Safety-Kleen Corp.
12555 W. Old Higgins Rd.
Elk Grove Village, IL 60009-2050

Position: Inorganic Group Leader

Responsibilities:

1. Supervise TCLP extraction and metals analysis area.
2. Troubleshoot difficult to handle filter wastes.
3. Train staff in sample prep and metals analysis.
4. Order and maintain supplies necessary for prep and metals analysis.
5. Maintain and troubleshoot ICAP and AA.

1987 - March 1991
Caremark Inc., Baxter
Buffalo Grove, IL

Position: Sr. Analytical Chemist

Responsibilities:

1. Performance of stability studies and collection and documentation of data.
2. Coordinator for various testing protocols for stability studies.
3. Responsible for methods development and assay troubleshooting.
4. Training and supervision of new personnel.

1982 - 1987
Chemical Waste Management
Riverdale, IL

Position: Analytical Chemist

Responsibilities:

1. Analysis of hazardous waste according to CLP protocol using ICP and AA.
2. Trained and supervised others in operation of ICP and AA. Familiar with QA/QC in the laboratory.

1976 - 1981
Haffkine Bio-Pharm
Bombay, India

Position: Quality Control Chemist

Responsibilities:

1. Performed analysis of raw materials, intermediates and packed products according to Pharmacopeia. Performed stability testing of packed products.

HONORS:

Published paper on interferences in graphite furnace at Pittsburgh Conference in March 1986.

APPENDIX C

PHASE I RFI HEALTH AND SAFETY PLAN
PART V OF PHASE I RELEASE ASSESSMENT WORKPLAN
SAFETY-KLEEN CORP. RECYCLE CENTER
DOLTON, ILLINOIS
DATED MARCH 4, 1995

PROJECT: 815

PART V

HEALTH AND SAFETY PLAN

RCRA FACILITY INVESTIGATION
PHASE I RELEASE ASSESSMENT WORKPLAN
DOLTON RECYCLE CENTER

I certify that I have read and understand the contents of this "Health and Safety Plan" for the RCRA Facility Investigation, Phase I Release Assessment Workplan at the Dolton Recycle Center in Dolton, Illinois.

_____
Name

_____
Company

_____
Date

Note: To be reviewed and signed at beginning of sampling event.

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CHAPTER V-1

INTRODUCTION

This document describes the health and safety procedures for the RFI Phase I soil sampling program at the Dolton Recycle Center in Dolton, Illinois.

S-K has owned and operated the facility since March 1987. The Dolton Recycle Center occupies a 30-acre site in an industrialized area about 20 miles south of downtown Chicago, Illinois (Figure V-1-1). The address of the facility is:

Safety-Kleen Corp.
633 East 138th Street
Dolton, IL 60419

The Dolton Recycle Center is a reclamation and recycling facility that accepts organic chemicals and solvent wastes from S-K service centers and other recycle centers, and industrial and commercial facilities. Spent materials brought to the facility are regenerated into product or blended for use as a fuel in cement kilns. Principal wastes managed at the facility are paint waste, lacquer thinner, mineral spirits, and waste oil.

All TriHydro Corporation personnel will follow this plan. Each field team member working on this project will maintain a general responsibility to identify and correct any health and safety hazards and to cooperate toward working as safely as possible.

Supporting Health and Safety Documents

In addition to the health and safety procedures specified in this document, TriHydro Corporation personnel and subcontractor employees will comply with all S-K health and safety procedures. Project work will also comply with applicable sections of the Federal Occupational Health and Safety Codes.

A copy of S-K's health, safety, and environmental policy is included as Appendix V-A. S-K Material Safety Data Sheets (MSDS) for the materials of interest at this site are included in Appendix V-B.

Analytical results from previous soil boring and sampling investigations at the facility are summarized in Table V-1-1. Analytical results from previous ground-water sampling

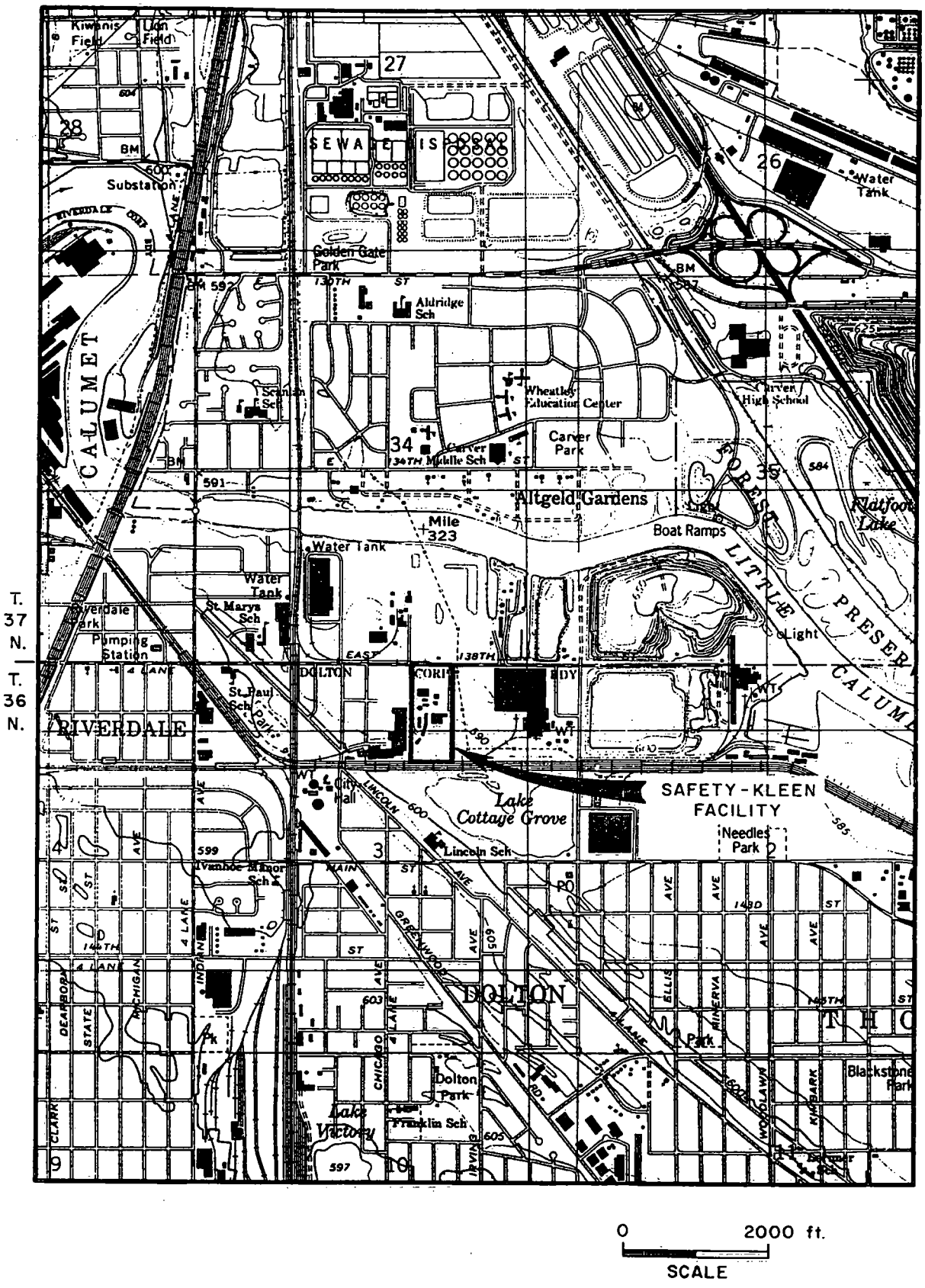

FIGURE V-1-1 :VICINITY MAP, SAFETY-KLEEN CORP. RECYCLE CENTER, DOLTON, ILLINOIS (ILD980613913)

Table V-1-1. Soil Quality, Dolton Recycle Center.

Location	Volatile Organic Compounds (mg/kg)										
	Acetone	Benzene	Ethylbenzene	Methyl Ethyl Ketone	Methyl Isobutyl Ketone	Methylene Chloride	Toluene	1,1,2-Trichloro-ethane	Trichloro-ethene	Xylenes, Total	All Others
Plant Site[a]											
88-1(2.5)	7.4	ND	10	6	4.2	0.25	65	0.44	ND	95	ND
88-2(2.5)	2.2	0.41	48	1.2	9.9	ND	680	ND	5.3	1400	ND
88-2(5)	2.5	ND	11	2.1	20	ND	110	ND	ND	28	ND
88-2(7.5)	ND	ND	0.32	ND	ND	ND	0.43	ND	ND	1.1	ND
88-2(10)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
88-4(2.5)	5.6	0.024	1.5	0.74	3.6	0.11	58	ND	ND	22	ND
88-5(2.5)	1400	ND	57	1.6	12	ND	390	ND	ND	290	ND
88-6D(2.5)	ND	ND	ND	ND	ND	ND	0.045	ND	ND	ND	ND
Precision Aire Site											
90-B-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
90-B-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
90-HA-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
90-HA-2B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
90-HA-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
90-HA-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Precision Aire Site - 10,000-Gallon UST Excavation											
91-10-B	--	ND	ND	--	--	--	ND	--	--	ND	--
91-10-EW	--	ND	ND	--	--	--	ND	--	--	0.005	--
91-10-NW	--	ND	ND	--	--	--	ND	--	--	ND	--
91-10-SW	--	ND	ND	--	--	--	ND	--	--	ND	--
91-10-WW	--	ND	ND	--	--	--	ND	--	--	ND	--
Precision Aire Site - 15,000-Gallon UST Excavation											
91-15-B	--	ND	ND	--	--	--	ND	--	--	ND	--
91-15-EW	--	ND	ND	--	--	--	ND	--	--	ND	--
91-15-NW	--	ND	ND	--	--	--	ND	--	--	ND	--
91-15-SW	--	ND	ND	--	--	--	ND	--	--	ND	--
91-15-WW	--	ND	ND	--	--	--	ND	--	--	ND	--

[a] Depth below ground surface (in feet) shown in location designation.

Table V-1-1. Soil Quality, Dolton Recycle Center (continued).

Location	TRPH (mg/kg)	PCB (mg/kg)	Metals (mg/kg)							
			Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver
Plant Site[a]										
88-1(2.5)	--	--	9	40	0.5	1.2	5.7	0.4	1	0.5
88-2(2.5)	--	--	9.3	41	0.5	1.3	9.5	0.4	1	0.5
88-4(2.5)	--	--	7.8	44	0.6	12	26	0.4	1	0.5
88-5(2.5)	--	--	8	47	0.6	1.4	13	0.4	1	0.5
88-6D(2.5)	--	--	6.7	28	0.5	7.9	3.4	0.4	1	0.5
Precision Aire Site										
90-B-1	270	ND	--	--	--	--	--	--	--	--
90-B-3	ND	ND	--	--	--	--	--	--	--	--
90-HA-1	ND	ND	--	--	--	--	--	--	--	--
90-HA-2B	1410	ND	--	--	--	--	--	--	--	--
90-HA-3	810	ND	--	--	--	--	--	--	--	--
90-HA-4	ND	ND	--	--	--	--	--	--	--	--

[a] Depth below ground surface (in feet) shown in location designation.

investigations are summarized in Table V-1-2. A list of chemicals which may be associated with recycle centers are presented in Table V-1-3. The present soil boring investigation will be conducted in the vicinity of the previous investigations. Field team personnel may be exposed to the compounds listed in tables V-1-1 through V-1-3.

Project Description

This project is the Dolton Recycle Center RCRA Facility Investigation - Phase I Release Assessment, which is to be conducted by TriHydro Corporation. The site activities will involve the collection of soil and ground-water samples at solid waste management units (SWMUs), areas of concern (AOCs), and background sites. The locations of the SWMUs are shown on Figure V-1-2. The SWMUs have been used to store, transfer, contain, treat, and/or dispose of used oil, spent mineral spirits, spent immersion cleaner, antifreeze, paint wastes, lacquer thinner, and dry cleaning wastes.

Personnel Responsibilities

Project personnel who will have responsibility for the operation of this project are:

Project Manager: John Ahern, TriHydro Corporation

Site Manager: Tom Nissen, TriHydro Corporation

Health and Safety Contacts: John Ahern/John Schneider, TriHydro Corporation

Field Team Members: _____

_____

_____

_____

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_____

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Table V-1-2. Ground-Water Quality, Safety-Kleen Corp. Recycle Center, Dolton, Illinois.

		Volatile Organic Compounds (mg/L)																	
Well	Date	Acetone	Benzene	Chloro-ethane	trans-1,2-Dichloro-ethene	1,1-Dichloro-ethane	1,1-Dichloro-ethene	Ethyl-benzene	2-Hexanone	Methyl Ethyl Ketone	Methyl Isobutyl Ketone	Methylene Chloride	Tetrachloro-ethene	Toluene	1,1,1-Trichloro-ethane	Trichloro-ethene	Vinyl Acetate	Xylenes, Total	All Others
SK-1	10-88	ND	0.005	0.2	0.023	0.012	0.006	ND	ND	ND	ND	0.014	0.059	ND	0.038	0.011	0.019	0.012	ND
SK-2	10-88	15(B)	0.055	ND	ND	ND	ND	0.31	ND	6.8	12	0.18	ND	8.7	ND	0.053	ND	1.8	ND
SK-3	10-88	3(B)	ND	ND	ND	ND	ND	ND	ND	0.82	0.37	ND	ND	0.32	ND	0.058	ND	0.054	ND
SK-4	10-88	15(B)	0.02	ND	ND	ND	ND	ND	0.018	1.4	1.8	1.6	ND	0.77	ND	ND	ND	0.81	ND
SK-5	10-88	130(B)	ND	ND	ND	ND	ND	ND	ND	11	64	ND	ND	230	ND	ND	ND	7.3	ND
SK-6	10-88	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SK-6D	10-88	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SK-7D	10-88	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SK-9	10-88	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SK-10	10-88	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1	10-83	--	--	--	--	--	--	--	--	--	--	--	--	--	ND	--	--	--	--
	11-83	--	--	--	--	--	--	--	--	--	--	--	--	--	ND	--	--	--	--
2	10-83	--	--	--	--	--	--	--	--	--	--	--	--	--	ND	--	--	--	--
	11-83	--	--	--	--	--	--	--	--	--	--	--	--	--	ND	--	--	--	--
3	10-83	--	--	--	--	--	--	--	--	--	--	--	--	--	0.016	--	--	--	--
	11-83	--	--	--	--	--	--	--	--	--	--	--	--	--	0.018	--	--	--	--
4	10-83	--	--	--	--	--	--	--	--	--	--	--	--	--	0.06	--	--	--	--
	11-83	--	--	--	--	--	--	--	--	--	--	--	--	--	0.04	--	--	--	--
6	10-83	--	--	--	--	--	--	--	--	--	--	--	--	--	0.001	--	--	--	--
	11-83	--	--	--	--	--	--	--	--	--	--	--	--	--	ND	--	--	--	--
8D	10-83	--	--	--	--	--	--	--	--	--	--	--	--	--	ND	--	--	--	--
	11-83	--	--	--	--	--	--	--	--	--	--	--	--	--	ND	--	--	--	--
	10-88	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
9	10-83	--	--	--	--	--	--	--	--	--	--	--	--	--	ND	--	--	--	--
	11-83	--	--	--	--	--	--	--	--	--	--	--	--	--	ND	--	--	--	--
12A	10-83	--	--	--	--	--	--	--	--	--	--	--	--	--	1.2	--	--	--	--
	11-83	--	--	--	--	--	--	--	--	--	--	--	--	--	0.79	--	--	--	--
13	10-83	--	--	--	--	--	--	--	--	--	--	--	--	--	ND	--	--	--	--
	11-83	--	--	--	--	--	--	--	--	--	--	--	--	--	ND	--	--	--	--
14	10-83	--	--	--	--	--	--	--	--	--	--	--	--	--	ND	--	--	--	--
	11-83	--	--	--	--	--	--	--	--	--	--	--	--	--	ND	--	--	--	--
15	10-83	--	--	--	--	--	--	--	--	--	--	--	--	--	ND	--	--	--	--
	11-83	--	--	--	--	--	--	--	--	--	--	--	--	--	ND	--	--	--	--
16	10-83	--	--	--	--	--	--	--	--	--	--	--	--	--	ND	--	--	--	--
	11-83	--	--	--	--	--	--	--	--	--	--	--	--	--	ND	--	--	--	--
17	10-83	--	--	--	--	--	--	--	--	--	--	--	--	--	ND	--	--	--	--
	11-83	--	--	--	--	--	--	--	--	--	--	--	--	--	ND	--	--	--	--

Note:
"B" means constituent detected in blank(s)

Table V-1-2. Ground-Water Quality, Safety-Kleen Corp. Recycle Center, Dolton, Illinois (continued).

Well	Date	TPH (ppb)	Total Metals (mg/L)							
			Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver
SK-1	10-88	--	ND	ND	ND	ND	ND	ND	ND	ND
SK-2	10-88	--	ND	ND	0.01	ND	ND	ND	ND	ND
SK-3	10-88	ND	--	--	--	--	--	--	--	--

Table V-1-3. Chemicals Which May Be Associated With Recycle Centers.

1. Chemicals Possibly Associated with Spent Mineral Spirits and Sludge.

Volatile Organics

Chlorobenzene
Chloroethane
Chloroform
Chloromethane
1,2-Dichlorobenzene
1,4-Dichlorobenzene
1,1-Dichloroethane
1,2-Dichloroethane
1,1-Dichloroethene
Trans-1,2-Dichloroethene
Cis-1,3-Dichloropropene
Ethylbenzene
Methylene Chloride
Tetrachloroethane
1,1,1-Trichloroethane
Trichloroethene
Toluene
Vinyl Chloride
Xylenes

Semi-Volatile Organics

Cresylic Acid
Naphthalene
Phenols

Parts Cleaner Solvent

Mineral Spirits
Petroleum Naphtha
Stoddard Solvent

Inorganic - Metals

Antimony
Arsenic
Barium
Cadmium*
Chromium*
Cobalt
Copper
Lead*
Mercury
Nickel
Silver
Tin
Zinc

2. Chemicals Associated with Other Product and Spent Solvents

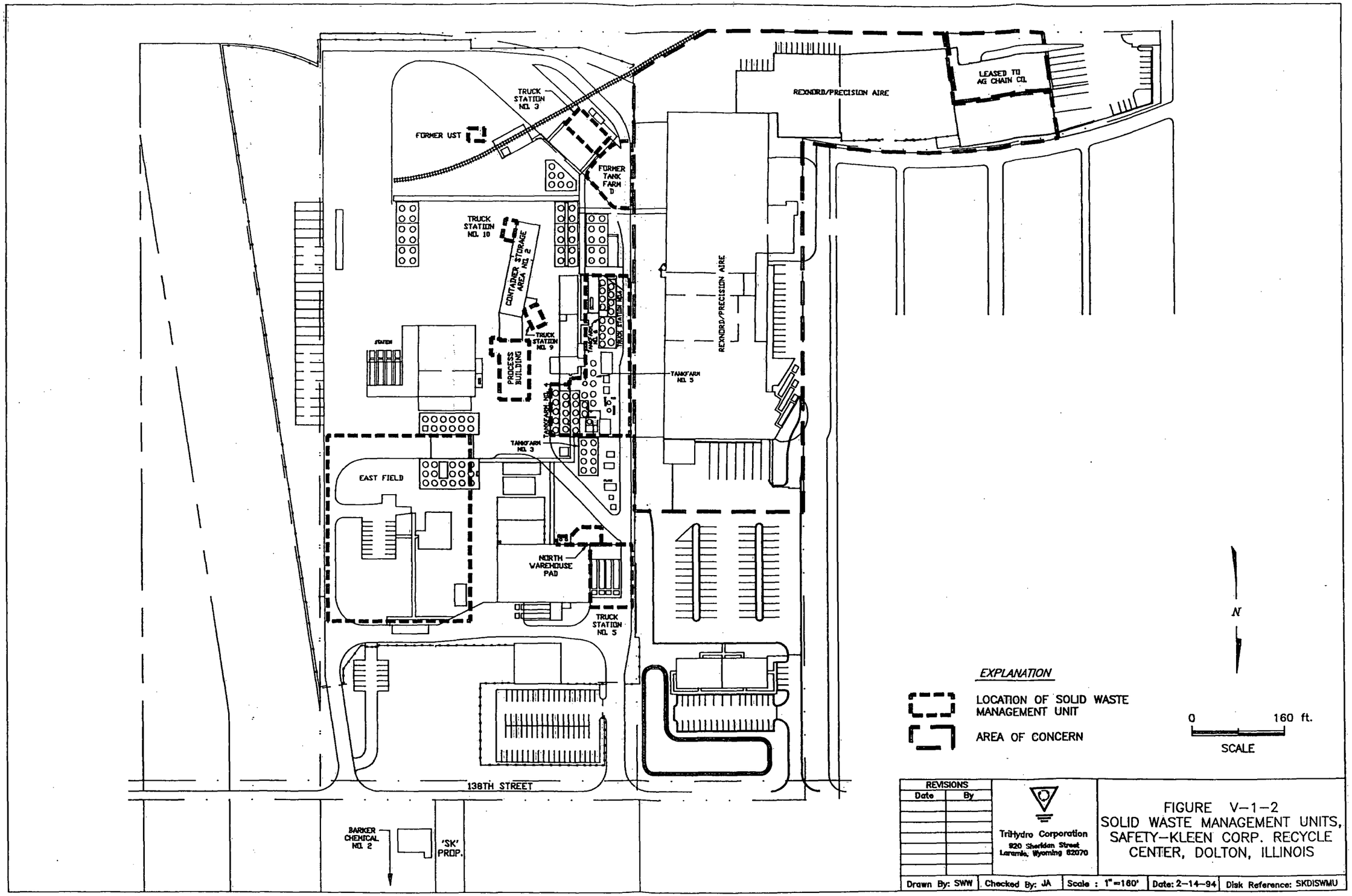
Constituents

Ortho-di-chlorobenzene
Cresylic Acids
Methylene Chloride
Perchloroethylene
Petroleum Sulfonate
Triethanolamine

Products and Spent Solvents

Carburetor Cleaner
Dry Cleaning Solvent
Immersion Cleaner
Mineral Spirits
Waste Paint Thinner

* Spent solvent or sludge may exhibit characteristic of EP Toxicity.



REVISIONS	
Date	By

TriHydro Corporation
920 Sheridan Street
Laramie, Wyoming 82070

FIGURE V-1-2
SOLID WASTE MANAGEMENT UNITS,
SAFETY-KLEEN CORP. RECYCLE CENTER, DOLTON, ILLINOIS

Drawn By: SWW	Checked By: JA	Scale : 1"=160'	Date: 2-14-94	Disk Reference: SKDISWMU

Field personnel will be required to have successfully completed health and safety training prior to any soil sampling. TriHydro Corporation personnel have completed the OSHA 40-hour and OSHA 8-hour supervisors training as specified by 29 CFR 1910.120.

TriHydro Project Manager

It is the responsibility of the Project Manager to ensure that the field team has access to this plan and reads the safety procedures. It is the individual's responsibility to bring to the attention of the Project Manager any portion of this plan and related training that he/she does not fully understand. The specific responsibilities of the Project Manager with respect to safety are to:

- Provide initial safety training for all project team personnel;
- Assure all TriHydro field team personnel have read and understand the Health and Safety Plan; and
- Make available to the field team personnel the data known to him on the chemical contaminants in the soils.

TriHydro Site Manager

Prior to beginning site work, the Site Manager will hold a meeting of the field team personnel at the Dolton, Illinois, facility to discuss the contents of this plan. The objective of this meeting is to ensure that all field team personnel are adequately informed in hazard evaluation and safe work practices.

The specific responsibilities of the Site Manager with respect to safety are to:

- Assure that all work performed by TriHydro Corporation is conducted in accordance with safe practices outlined in this plan;
- Coordinate with TriHydro field team personnel for firewatch, traffic control and security services at work sites;
- Provide applicable health and safety monitoring equipment;
- Monitor activities to ensure the proper use of personal protective equipment specified in this

plan, such as dust protection masks, respirators, protective coveralls, gloves, safety boots, protective eyewear, ear plugs, and hard hats;

- Assure effective workplace surveillance for hydrocarbon vapors is maintained and evaluate the results of surveillance;
- Ensure safety equipment for use by field team personnel is maintained in a usable condition;
- Initiate emergency phone calls when an emergency or accident requires medical attention; and
- Shut down or modify field work activity based on criteria presented in Chapter V-3.

Field Team Members

The responsibilities of field team members with respect to safety are to:

- Read, understand, and follow this plan or respective companies' plan;
- Perform work safely;
- Cooperate with safety personnel;
- Report any unsafe conditions to the TriHydro Site Manager;
- Be aware and alert for signs and symptoms of potential exposure to site contaminants and climatic or acoustic stress.

CHAPTER V-2

HAZARD EVALUATION

The activities expected to be conducted during this project are the following:

1. Cutting and removal of concrete or asphalt;

2. Sampling of soils to a depth of up to 35 feet below ground surface;

3. Monitoring of combustible gas and total organic vapor concentrations in breathing space and on soil samples; and

4. Collection of soil samples, preparation and shipment to lab.

Field team personnel will be exposed to the general types of hazards described below during the conduct of these activities.

Physical Hazards

Field team personnel may be exposed to physical hazards around vehicles and field equipment. The physical hazards include:

1. Cuts and contusions by being struck by swinging objects, concrete chips during concrete cutting, and falling objects; and

2. Muscular injury by overexertion or improper movement (e.g. back injury due to improper lifting).

Electrical Hazards

Field team personnel may be exposed to electrical hazards. The electrical hazards include digging into buried cables.

Fire/Explosion Hazards

Field team personnel may be exposed to fire/explosion hazards during all activities. The fire/explosion hazards include:

1. Digging into underground pipelines carrying liquid petroleum hydrocarbons and natural gas;

2. Sparking of combustible petroleum hydrocarbons in the air, in soil gas, on soils, and on the ground water; and

3. Equipment fires.

Chemical Hazards

Field team personnel may be exposed to chemical hazards during all activities. A list of products which may be associated with operations at the Dolton Recycle Center is included in Appendix V-B. Constituents found in soils to date are listed in Table V-1-1, and constituents found in groundwater to date are listed in Table V-1-2. The chemical hazards include:

1. Petroleum hydrocarbon liquids and vapors;

2. Paint wastes; and

3. Toxic and carcinogenic inorganic and organic compounds.

The likely exposure pathways are inhalation, ingestion, and skin contact. The petroleum hydrocarbon liquids will likely be used oil, spent mineral spirits or immersion cleaner, dry cleaning wastes, and waste antifreeze. These liquids and paint waste may contain toxic and carcinogenic inorganic and organic compounds.

Climatic Stress

Field team personnel may be exposed to climatic stress due to temperature extremes and high winds during all outside activities. In addition to climatic stress, high temperatures will increase the volatility of some toxic and carcinogenic compounds (thereby increasing the potential for inhalation).

High wind will increase the potential for physical and chemical hazards by blowing objects around and creating airborne particulates, mists, and spills.

Acoustical Hazards

Field team personnel may be exposed to excessive noise created during concrete cutting, sampling, or by unrelated operations at the Dolton Recycle Center.

CHAPTER V-3

SAFE WORK PRACTICES

The following sections present procedures on how to address safely the hazards expected to be encountered in the different activities of this project. Based on the work to be performed and the type of chemical hazards that may be encountered, EPA Level D personal protection has been determined to be adequately protective. Not all tasks require Level D protection; however, these determinations will be made by the Site Manager, and modifications to work practices and the required level of personal protection will be specified to the field team personnel by the Site Manager.

Work Zone Access

During concrete cutting and sampling operations, a 10-foot radius work zone around the excavation will be established. Only authorized personnel will be permitted to enter this work zone. Authorized personnel will include those who have duties requiring their presence in the work zone and have received appropriate health and safety training. The Site Manager has the right to require the exit of any person from the work zone.

Personal Protective Equipment

The personal protective equipment requirements are summarized in Table V-3-1. The equipment is described in more detail below.

Respiratory Protection: all field team personnel will have a half-face or full-face air purifying respirator with organic vapor cartridges with particulate prefilter available for use.

Protective Clothing: all field team personnel who handle contaminated soils, liquids, or auger flights, will have Tyvek coveralls (or equivalent) available for use.

Hand Protection: all field team personnel who handle contaminated soils, liquids, or auger flights, will wear butyl rubber or nitrile gloves. Wearing disposable PVC gloves under

Table V-3-1. Personal Protective Equipment Requirements.

Task	Personnel	Dust Protection Mask	Respirator	Tyvek Coveralls	Chemically Resistant Gloves	Chemically Resistant Boots	Safety Glasses	Splash Goggles	Ear Plugs/ Muffs	Safety Helmet
Concrete Cutting	Sampling Team	Available for use	Available for use	Available for use	Available for use	No	Yes	No	Yes	Yes
Soil Sampling	Sampling Team	Yes	Available for use	Yes[1,2]	Yes	Yes[1]	Yes	Available for use	Available for use	Yes
Sample Handling	Sampling Team	Available for use	Available for use	Available for use	Available for use	Available for use	Yes	Available for use	Available for use	Yes
Decontamination Operations	Sampling Team	Available for use	Available for use	Yes[1,2]	Yes	Yes[1]	Yes	Available for use	Available for use	Yes

[1]Not required if soil or water is not visibly contaminated, and if PID measurements of the soil samples are below 1000 ppm.

[2]Coveralls are to be taped to gloves and boots to minimize exposure pathways to contaminants.

butyl gloves will provide added protection when handling heavily contaminated material.

Foot Protection: field team personnel will wear neoprene (or equivalent) rubber boots (either with steel toes and shanks or over substantial shoes) when liquids are expected to be encountered. Under non-liquid exposure conditions, substantial shoes are permissible. The boots will be taped to the leg of Tyvek suits.

Eye Protection: field team personnel will wear impact-resistant safety glasses with attached side shield. Where splashes may occur of water which is visibly contaminated with free-floating hydrocarbon or which has moderate to strong odors, splash goggles will be required.

Ear Protection: field team personnel will be required to wear hearing protection devices (ear plugs or muffs) if involved in concrete cutting and if they complain of ear ringing or temporary hearing loss.

Safety Helmet: field team personnel will wear an OSHA-approved hard hat in the outside environment.

Hazard Protection

The following potential hazards were described in the previous section of this plan:

1. Physical Hazards
2. Electrical Hazards
3. Fire/Explosion Hazards
4. Chemical Hazards
5. Climatic Stress
6. Acoustical Hazards

Procedures to address safely each of these hazards are described below.

Physical Hazards

The personal protective equipment is designed to protect the field team personnel from most physical hazards expected at the work site. However, the field team personnel should be

aware of the potential physical hazards (see Chapter V-2), and remain alert during field work. The following procedures will be implemented to minimize the potential for injury from physical hazards:

1. Keep all support vehicles and unnecessary equipment outside of the work zone; and

2. Store and secure all equipment in the work zone until use is required.

Electrical Hazards

The potential exists for field team personnel to encounter electrical hazards. The following procedures will be implemented to minimize the potential for injury from electrical hazards:

1. Before digging commences at each location, obtain assurance from appropriate personnel that below-ground lines are absent at that location to the best of their knowledge;

2. During digging, proceed slowly; and

3. Stop digging if any resistance is encountered.

Fire/Explosion Hazards

The potential exists for field team personnel to encounter fire/explosion hazards during concrete cutting and soil sampling. Due to the flammable nature of the hydrocarbons, possible ignition sources will be kept out of the work zone:

1. Matches and lighters are not allowed in the work zone; and

2. Internal combustion engines must not be operated in the work zone while hydrocarbon-contaminated solids or liquids might be brought to the surface; alternatively, they must be equipped with spark arrestors.

The following additional precautions will be implemented to minimize the potential for fire or explosion:

1. Digging will proceed slowly to minimize damage to any underground lines;

2. Combustible gas measurements will be taken in the excavation at a minimum at the start and completion of digging;

3. If combustible gas measurements equal or exceed 100% LEL, the field team personnel will inject nitrogen gas into the excavation;

4. If fire, smoke, or heat emanate from the excavation, the field team personnel will inject nitrogen gas into the excavation; work will not recommence until the possibility for fire or explosion has abated; and

5. If total organic vapors exceed 1000 ppm or 30% LEL in the atmosphere of the work zone (see Chapter V-5 for monitoring procedures), the Site Manager will instruct the field team personnel to stop work and move upwind, and methods will be implemented to subdue potentially combustible vapor emissions (such as sprinkling soil piles or use of a nitrogen gas purge).

Chemical Hazards

The following chemical hazards may be encountered at the work site:

1. Hazardous organic and inorganic chemicals (see tables V-1-1 through V-1-3, and Appendix V-B), which may adversely affect human health through skin contact and inhalation.

The following procedures will be implemented to minimize potential harm from hazardous organic chemicals:

1. Work will begin in EPA Level D personal protection;

2. The protection levels at the work site will be upgraded in accordance with the responses to hydrocarbon vapor concentrations listed in Table V-3-2 (see Chapter V-5 for monitoring procedures); and

3. The Site Project Manager will refer to the NIOSH/OSHA Pocket Guide to Chemical Hazards for the proper response to hazardous organic and inorganic chemicals if field team personnel complain of irritation, giddiness, headache, or nausea, or other symptoms of chemical exposure.

Table V-3-2. Organic Vapor Criteria, As Determined by Photoionization Detector, and Personnel Protection Responses.

Concentrations	Response
<20 ppmv Organic Vapor (OV)	Limited hazard, no special action.
20-100 ppmv OV	Workers alerted to be conscious of symptoms such as headache, nausea, etc.
100-500 ppmv OV	Half-mask OV Respirators worn by all in work area. Collect and analyze samples for constituents of concern with detector tubes every 30 minutes.
>500 ppmv OV	Work stops; procedures taken to subdue excessive vapor levels (such as sprinkling cuttings with water or use of nitrogen gas flush).

Note: Organic vapor (OV) measurements are to be taken in the breathing space within the work zone. Organic vapor concentrations measured with a hand-held photoionization detector (PID) which is appropriately calibrated at the beginning of each day and as needed throughout the project. The threshold concentrations are based on the Exposure Limits contained in the NIOSH/OSHA Pocket Guide to Chemical Hazards for Stoddard solvent which is chemically similar to Mineral Spirits. Mineral Spirits will be as volatile or more volatile than the used oil and re-refined petroleum products expected to be encountered during sampling.

Climatic Stress

During day-to-day field work, the Site Manager will be alert for the signs and symptoms of climatic stress.

Field team members will be observed for the following signs and symptoms of climatic stress:

- Profuse sweating;
- Skin color change;
- Shivering;
- Disorientation or slurring of speech; and/or
- Vision problems.

Any team member who exhibits any of these signs or symptoms will be removed immediately from field work. If it is heat stress, the team member will be requested to consume electrolyte fluid or cool water while resting in a shaded area after removing impervious clothing. If it is cold stress, the team member will be requested to move into a heated area. The individual will be instructed to rest until the symptoms are no longer recognizable. If the symptoms appear critical, persist or get worse, immediate medical attention will be sought.

Acoustical Hazards

When working around concrete cutting equipment, the potential exists for exposure to excessive noise. Therefore, team members involved in concrete cutting will be required to use hearing protection equipment.

Some unrelated operations and activities at the Pekin facility may generate excessive noise. Any team member who complains of ringing in the ears or temporary hearing loss will be required to use hearing protective equipment.

Field team personnel are not allowed to use Walkmans or similar radios and tape decks.

Decontamination Procedures

Contact with hazardous organic chemicals is possible in the work zone. The following decontamination procedures will be implemented to minimize the movement of contaminants

outside the work zone and to minimize the period of contact with these contaminants.

Personal Hygiene

Field team personnel should conduct the following to ensure that contaminants will not remain in contact with their bodies:

1. All field personnel involved in sampling activities are instructed to wash their hands, face, neck and forearms at the end of the workday. The Site Manager will provide soap, water, and towels at the drilling site for this purpose;

2. All field personnel are instructed to take a full-body shower at home or hotel at the end of the workday; particular attention should be paid to areas of the body that are typically overlooked, such as behind the ears or between the toes;

3. No eating, drinking or smoking will be permitted in the work zone;

4. Tyvek suits, disposable ear plugs, and respirator cartridges will be discarded in garbage bags and then placed in trash bins after each day of use; and

5. Other personal protective equipment (see Table V-3-1) will be washed in warm or hot soapy water after each day of use.

Equipment Decontamination

Sampling equipment which has come in contact with contaminants will be cleaned before reuse at another location and at the end of each day. Decontamination will be a warm soapy water wash, tap water rinse, and distilled or deionized water rinse.

CHAPTER V-4

EMERGENCY RESPONSE

Emergency response shall be carried out immediately whenever there is a personal injury, fire, explosion, or release of hazardous waste or hazardous constituents which could threaten human health and the environment. Any field team member that sights or suspects a fire, explosion, or release of hydrocarbons, chemicals, hazardous waste, or hazardous constituents shall notify the TriHydro Site Manager immediately.

The primary and alternate evacuation routes are shown on Figure V-4-1. The facility evacuation alarm system will be used to notify personnel in all areas of the plant. The primary assembly area is at the recycle center visitors parking lot; the second assembly area is at the service center visitors parking lot. The Site Manager will account for all project personnel in the assembly area.

The site is equipped with an onsite communication system and telephones for access to offsite. Alarm systems for certain equipment, areas, and storage tanks are maintained. Emergency numbers are posted for quick response to an emergency.

Fire and spill response and other safety equipment is located across the site. The facility is equipped with a foam and water fire suppressant system. Portable fire extinguishers are placed, marked, and maintained at key locations. Spill and first aid stations on the site provide centralized access to tools, supplies, and equipment for efficient emergency response. Emergency showers and eye wash stations are located in various process buildings and storage areas.

The following information is provided in the event of an emergency:

Emergency Service Organization	Telephone
Fire Department	911
Ambulance	911
Police Department	911
Roseland Hospital, 45 West 111th Street, Chicago, Illinois 60628	312-995-3000

INDIANA HARBOR RAILROAD SYSTEM

REXNORD/PRECISION AIRE

WAREHOUSE STORAGE

WAREHOUSE STORAGE

LEASED TO AG CHAIN CO.

FUTURE CITY FIRE STATION

RAMP

CATALPA LANE

RAILROAD

PARK AVENUE

RESIDENTIAL

CONTAINER STORAGE AREA NO. 3

REXNORD/PRECISION AIRE

LIQUID & FLAMMABLE STORAGE

PLASTIC CONTAINER STORAGE

OFFICE

HIGH BAY RACK STORAGE FOR ALLIED PRODUCTS

CONTAINER STORAGE AREA NO.5

TRUCK STATION NO. 11

TRUCK PARKING

SVC CTR OFFICE BLDG

SVC CTR OFFICE BLDG

STAFF/VISITOR PARKING

DETENTION AREA

RAIL TANKER LOADING PAD

TRUCK STATION NO. 3

TANKFARM NO. 7

PIPE RACK

TRUCK STATION NO. 10

TANKFARM NO. 8

TANKFARM NO. 6

TRUCK STATION NO. 6

CONTAINER STORAGE AREA NO. 2

TRUCK STATION NO. 9

TRUCK STATION NO. 4

CONTAINER STORAGE AREA NO. 4

PROCESS BUILDING

CONCRETE PAD

TANKFARM NO. 5

TANKFARM NO. 4

TANKFARM NO. 2

TRUCK STATION NO. 2

TANKFARM NO. 1

BOILER BUILDING

BOILER BUILDING

MAINTENANCE BUILDING

OFFICE BUILDING

NORTH WAREHOUSE PAD

FIRE PUMP HOUSE

CONTAINER STORAGE AREA NO.1

TRUCK STATION NO. 7

TRUCK STATION NO. 5

TRUCK SCALES

OLD TRUCK SCALE

TRUCK PARKING AREA NO. 1

TRUCK PARKING AREA NO. 2

COMMONWEALTH EDISON

'SK' PROP.

PRIMARY EVACUATION AREA FOR RECYCLE CENTER

PRIMARY EVACUATION AREA FOR DISTRIBUTION CENTER AND BRANCH FACILITY

138TH STREET

BALL GLASS

COMMONWEALTH EDISON

EXECUTIVE HARBOR

'SK' PROP.

EXECUTIVE HARBOR

N

0 160 ft.

SCALE

REVISIONS	
Date	By

TriHydro Corporation
920 Sheridan Street
Laramie, Wyoming 82070

FIGURE V-4-1
EVACUATION ROUTES,
SAFETY-KLEEN CORP. RECYCLE
CENTER, DOLTON, ILLINOIS

Drawn By: SWW	Checked By: JA	Scale : 1"=160'	Date: 2-14-94	Disk Reference: SKDIEVAC

National Response Center
(Chemical/Oil Spills) 1-800-424-8802

These emergency service organizations will provide emergency medical care for injuries and toxicological problems.

The appropriate chain of communication for an emergency situation will be discussed during the onsite safety meeting before any work begins. A map showing the route from the facility to the hospital is shown on Figure V-4-2.

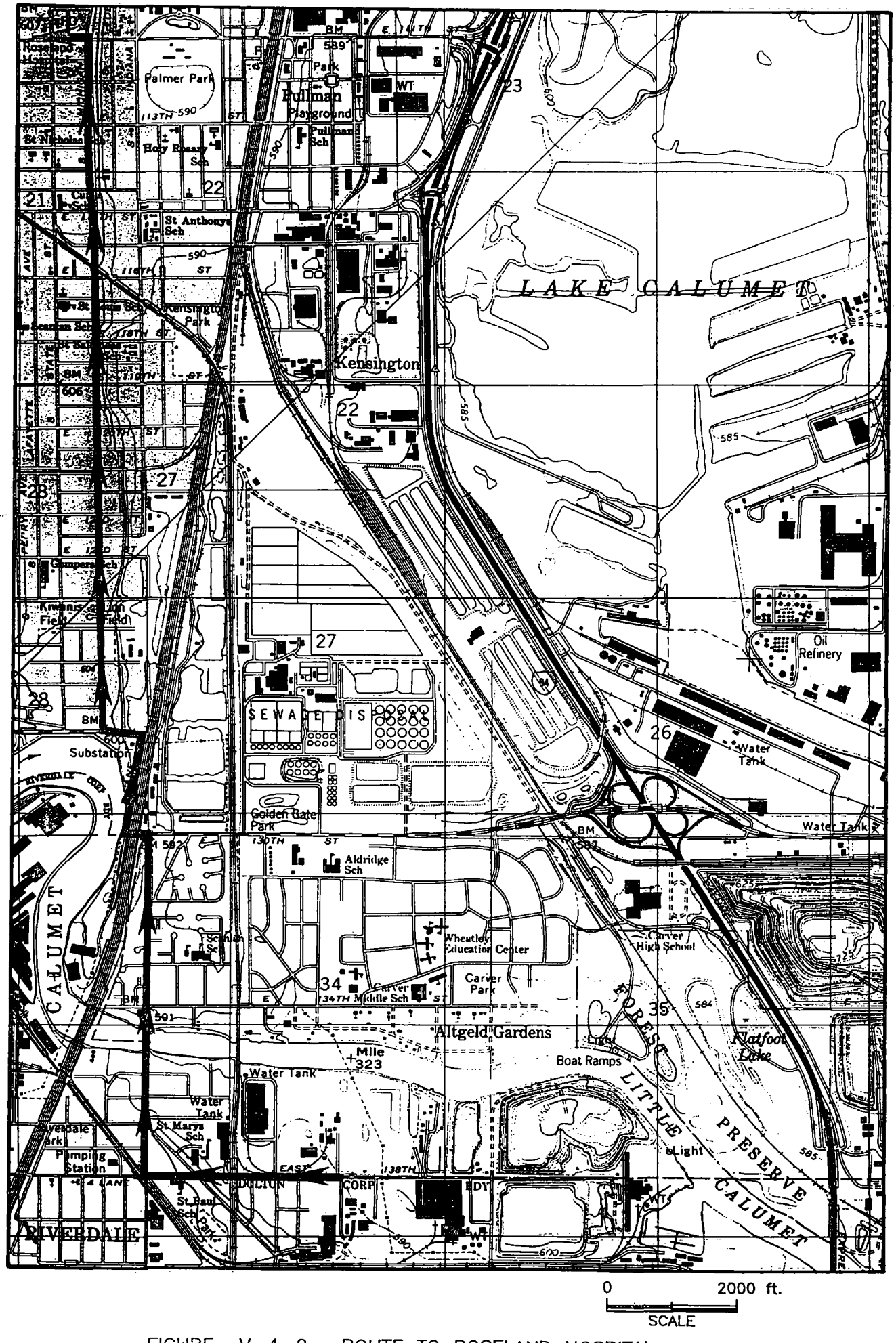


FIGURE V–4–2 :ROUTE TO ROSELAND HOSPITAL,

CHAPTER V-5

MONITORING PROCEDURES

The monitoring procedures are divided into a medical monitoring program and a field monitoring program. Each is described below. Under the field monitoring program, each piece of monitoring equipment is described.

Medical Monitoring Program

Site sampling work will involve active physical work and potential exposure to petroleum hydrocarbons and other chemicals, climatic stress, noise and physical safety hazards common to field operations. The work will require people of reasonable health with normal vision and hearing acuity. TriHydro Corporation will have documentation of employee medical fitness to perform the required work, evidenced by a signed document from the examining physician dated no later than one year prior to start-up of the project. This documentation will also indicate the employee's ability to perform the required work while wearing a dust protection mask or an air-purifying respirator.

Field Monitoring Program

Personal exposure to combustible gas, organic vapors, and contaminants will be monitored to insure that personal exposures do not exceed acceptable limits and that appropriate selection of protective equipment is made. The safety instrumentation to be used in the field include a combustible gas meter and an organic vapor meter. The Site Manager will be knowledgeable in the operation of each instrument.

Combustible Gas Meter

A combustible gas meter will be taken into the field to collect combustible soil gas data and to provide backup to the PID (one instrument per work zone). Each instrument will be calibrated at the beginning of each day with a pentane standard calibration gas. The instrument will be used to measure combustible gas concentrations at breathing zone locations within the work zone and in the sampling excavation.

The combustible gas meter measurements will identify conditions for fire/explosion control and site evacuation. These conditions are described in Chapter V-3 under the section entitled "Fire/Explosion Hazards."

Photoionization Detector

A photoionization detector (PID) will be taken into the field and operated during the project (one instrument per work zone). Each instrument will be calibrated at the beginning of each day with an isobutylene standard calibration gas. The instrument will be used to measure hydrocarbon vapor concentrations at breathing zone locations within the work zone (also downwind of the work zone if necessary).

The PID measurements will identify conditions for respirator use and site evacuation. These conditions are described in Chapter V-3 under the sections entitled "Fire/Explosion Hazards" and "Chemical Hazards."

CHAPTER V-6

RECORDKEEPING

The following documents and records will be maintained in the TriHydro Corporation project files:

1. A copy of this plan;

2. Documentation of employee's medical ability to perform work and wear respirators;

3. Health and safety training certification forms;

4. Respiratory training certification;

5. Field notes and field data pertaining to enforcement of health and safety practices; and

6. Accident and illness reports.

CHAPTER V-7

SAFETY EQUIPMENT LIST

The following documents and materials will be made available at the Dolton Recycle Center by the TriHydro Site Manager. The Site Manager will ensure that all these documents and materials are at the site before sampling commences. He will also ensure that the instrumentation is in working order before work begins.

Supporting Documentation

NIOSH/OSHA Pocket Guide to Chemical Hazards
S-K Health, Safety, and Environmental Policy (Appendix V-A)
S-K Material Safety Data Sheets (Appendix V-B)

Instrumentation

Combustible gas meter and calibration gas (one per work zone)
Organic vapor meter and calibration gas (one per work zone)
Chemical (benzene) detector tubes and pump
pH meter and buffers or pH indicator paper

Personal Protective Equipment

Dust protection masks
Respirators with organic vapor cartridges, acid mist cartridges, and particulate pre-filters
Tyvek coveralls
Chemically resistant gloves
Neoprene safety boots
Safety glasses
Splash goggles
Disposable ear plugs
Hard hats

Equipment

Fire extinguisher (type ABC) (one per work zone)
Nitrogen cylinder, regulator, and hose (one per work zone)

Supplies

Distilled water
Tape
Soap
Water
Towels
Brush
First aid kit

CHAPTER VI-8

REFERENCES

U.S. Department of Health and Human Services, 1990, NIOSH Pocket Guide to Chemical Hazards, June 1990.

APPENDIX V-A

SAFETY-KLEEN CORP.
HEALTH, SAFETY, AND ENVIRONMENTAL POLICY

IMPORTANT SAFETY REQUIREMENTS FOR VISITORS TO SAFETY-KLEEN'S DOLTON RECYCLE CENTER

The following precautions are necessary for the protection of our employees and visitors. We ask that you please read them carefully.

1. Smoking is not permitted within the facility.

2. A hard hat and safety glasses must be worn in the plant at all times.

3. Visitors must not tour the plant unescorted. We ask that all visitors be accompanied by an employee of the plant or another authorized Safety-Kleen person.

4. In the event of an emergency, please go directly to the Administrative Office. Following a personnel head count, all visitors will be escorted out of the facility.

THANKS FOR YOUR COOPERATION

safety-kleen®

633 East 138th Street
Dolton, Illinois 60419
(708) 849-4850

safety-kleen.

Health, Safety and Environmental Policy

Safety-Kleen is Safety First

It is the policy of Safety-Kleen Corp. that in the operation of its business the Company and all of its employees shall endeavor to minimize risk of harm to human health and the environment. Each employee shall place the highest importance and priority on the protection of health and safety, and preservation of the environment.

To implement this policy:

1. The Company's business operations shall be conducted in full compliance with all federal, state and local laws and regulations.
2. The Company shall develop guidances for the implementation of laws and regulations, and may adopt additional standards where laws and regulations may not be adequately protective. The Company's business operations shall be conducted in compliance with all such guidances and standards.
3. The Company shall establish and maintain training and compliance programs to assure that all laws and regulations, and all Company guidances and standards are known, understood and obeyed by all employees.
4. The Company shall establish and maintain accident prevention, product safety and integrity, occupational health, and pollution control programs to safeguard employees, customers and the public from injuries or health hazards, to protect the environment and to protect the corporation's assets and continuity of operations.
5. The Company shall cease any operations that cannot be conducted in a manner consistent with this policy.

It is the responsibility of each and every employee, at all levels, to adhere to the spirit as well as the letter of this policy. All employees shall have a responsibility to keep informed about health, safety and environmental matters, and to promptly advise their immediate superior of any adverse situation that comes to their attention.

Donald W. Brinkman
President and
Chief Executive Officer

November 1987

APPENDIX V-B

MATERIAL SAFETY DATA SHEETS
SAFETY-KLEEN CORP.

SAFETY-KLEEN 105 PARTS WASHING SOLVENT

MATERIAL SAFETY DATA SHEET

SECTION I -- PRODUCT INFORMATION

Safety-Kleen Corporation - 777 Big Timber Road - Elgin, IL 60123
For Product/Sales Information Call 708/697-8460

EMERGENCY TELEPHONE	*MEDICAL:*	*TRANSPORTATION:*
These numbers are for emergency use only. If you desire non-emergency information about this product, please call the telephone number listed above.	**800/942-5969 or 312/942-5969 RUSH POISON CONTROL CENTER CHICAGO, ILLINOIS (24 HOURS)**	**800/424-9300 CHEMTREC**

IDENTITY (TRADE NAME): **SAFETY-KLEEN 105 PARTS WASHING SOLVENT**

SYNONYMS: **PETROLEUM DISTILLATES, PETROLEUM NAPHTHA, MINERAL SPIRITS, STODDARD SOLVENT**

SK PART NUMBER: **6617**

FAMILY/CHEMICAL NAME: **HYDROCARBON SOLVENT**

PRODUCT USAGE: **SOLVENT FOR CLEANING AND DEGREASING PARTS**

SECTION II -- HAZARDOUS COMPONENTS

NAME	SYNONYM	%	CAS NO.	OSHA PEL (ppm)	ACGIH TLV (ppm)
Parts Washer Solvent (consists predominantly of C9-C13 hydrocarbon)	Mineral Spirits	(Typical % by Wt.)			
C9-C13 Saturated Hydrocarbon		85	64741-41-9	100 (Stoddard Solvent)	100 (Stoddard Solvent)
*Toluene		0.5	108-88-3	100 150 STEL	100 150 STEL
*Xylene		1.0	1330-20-7	100 150 STEL	100 150 STEL
*Ethyl Benzene		0.5	100-41-4	100 Skin 125 STEL	100 125 STEL
C8+ Aromatics		12.0	Mixture	N/E	N/E
Chlorinated Solvents		(Max 1% by Wt.)			
*1,1,1 Trichloroethane		<0.5	71-55-6	350 450 STEL	350 450 STEL
*Tetrachloroethylene		<0.5	127-18-4	25	50 200 STEL

N/E = Not Established
* See Section X - Other Regulatory Information

SECTION III -- PHYSICAL DATA

PHYSICAL STATE, APPEARANCE AND ODOR: **Combustible liquid - clear, green, with characteristic hydrocarbon odor.**

BOILING POINT: **300° - 429° F**

EVAPORATION RATE:	(Butyl Acetate = 1) 0.1
PERCENT VOLATILE:	99.9%
VAPOR DENSITY:	4.9 (Air = 1)
VAPOR PRESSURE:	2 mm of Hg at 68° F
SOLUBILITY IN WATER:	Negligible
pH:	Not Applicable
SPECIFIC GRAVITY:	0.77 to 0.80
MOLECULAR WEIGHT:	Approximately 142
VOLATILE ORGANIC COMPOUNDS:	795 g/L

SECTION IV -- FIRE AND EXPLOSION HAZARD DATA

FLASH POINT: 105° F (SETA)

AUTOIGNITION TEMPERATURE: 473° F

CONDITIONS OF FLAMMABILITY: Materials must be moderately heated before ignition can occur.

FLAMMABLE LIMITS IN AIR - LOWER: 0.7% *UPPER:* 6.0%

EXTINGUISHING MEDIA: Carbon dioxide, foam, dry chemical, water (mist only).

FIRE FIGHTING PROCEDURES -- SPECIAL: NFPA 704 Rating 2-2-0

Keep storage tanks cool with water spray. Use self-contained breathing apparatus (SCBA).

UNUSUAL FIRE AND EXPLOSION HAZARDS:

Decomposition and combustion products may be toxic. Heated tanks may rupture, explode or be thrown into the air. Vapors are heavier than air and may travel great distances to ignition source and flashback.

HAZARDOUS COMBUSTION PRODUCTS:

Thermal decomposition and burning may produce carbon monoxide.

SECTION V -- REACTIVITY DATA

STABILITY: Normally stable even under fire exposure conditions and is not reactive with water. Normal firefighting procedures may be used.

INCOMPATIBILITY (CONDITIONS TO AVOID): Strong oxidizing agents (e.g. chlorine, peroxides, strong acids).

HAZARDOUS POLYMERIZATION: Not known to occur under normal conditions.

HAZARDOUS DECOMPOSITION PRODUCTS: Normally none; however, incomplete burning may yield carbon monoxide.

SECTION VI -- HEALTH HAZARD DATA

PRIMARY ROUTES OF EXPOSURE: Skin and eye contact; inhalation.

HEALTH HAZARD DATA/SIGNS AND SYMPTOMS OF EXPOSURE:

ACUTE: *Skin*: Prolonged or repeated contact tends to remove skin oils, possibly leading to irritation and dermatitis. No significant skin absorption hazard.

Eyes: Contact may cause slight to moderate irritation. High vapor concentrations (> 500 ppm) are irritating to the eyes.

Inhalation: High concentrations of vapor or mist may be irritating to the respiratory tract, cause headaches, dizziness, nausea, impaired coordination, anesthesia and may have other central nervous system effects.

Ingestion: Low order of acute oral toxicity. May cause irritation of the throat, nausea, vomiting and symptoms of central nervous system depression. Aspiration into the lungs during ingestion or vomiting may cause mild to severe pulmonary injury and possibly death.

CHRONIC: Prolonged and/or repeated contact may cause drying and cracking of the skin or dermatitis.

OTHER POTENTIAL HEALTH HAZARDS:

The impurities that may be present are not expected to add significantly to the effects of exposure.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:

Individuals with pre-existing central nervous system dysfunction may have increased susceptibility to the effects of exposure. Contact with skin may aggravate pre-existing dermatitis.

CARCINOGENICITY: Tetrachloroethylene is listed by IARC and NTP as a suspected carcinogen. Studies indicate that Ethyl Benzene and 1,1,1 Trichloroethane are experimental teratogens.

SECTION VII -- EMERGENCY AND FIRST AID PROCEDURES

EYES: For direct contact, flush eyes with water for 15 minutes lifting upper and lower lids occasionally. Consult physician if irritation or pain persists. If irritation or redness from exposure to vapors or mists develop, move victim away from exposure into fresh air.

SKIN: Remove contaminated clothing. Wash skin twice with soap and water. If irritation develops and persists, consult a physician.

INGESTION: If conscious, dilute with 4 to 8 ounces of water and seek immediate medical attention. DO NOT induce vomiting.

INHALATION: Remove to fresh air immediately. Use oxygen if there is difficulty breathing or artificial respiration if respiration has stopped. Do not leave victim unattended. Seek immediate medical attention if necessary.

SECTION VIII -- PRECAUTIONS FOR SAFE USE AND HANDLING

SPILL PROCEDURES: Remove all ignition sources. Ventilate area and avoid breathing vapors. For large spills, isolate area and deny entry. If possible, contain as a liquid for possible re-refining. Absorb onto sand or other absorbent material. Shovel into closable container for disposal. Wear protective equipment specified below. Contain away from surface waters and sewers.

WASTE DISPOSAL METHODS: Dispose in accordance with Federal, State, and local regulations. Contact Safety-Kleen regarding recycling.

HANDLING PRECAUTIONS: Avoid contact with eyes, skin or clothing. Use in well ventilated area and avoid breathing vapors or mists. Keep away from heat, sparks and open flames.

SHIPPING AND STORING PRECAUTIONS: Empty product containers may contain product residue. Do not pressurize, cut, heat, weld, grind or expose containers to flame or other sources of ignition. Keep container tightly closed when not in use and during transport.

PERSONAL HYGIENE: Use good personal hygiene. Wash thoroughly with soap and water after handling and before eating, drinking or using tobacco products. Launder contaminated clothing and clean protective equipment before reuse.

SECTION IX -- CONTROL MEASURES

VENTILATION: Provide local exhaust or general dilution ventilation as determined necessary to maintain concentrations of vapors or mists below applicable exposure limits. Where explosive mixtures may be present, systems safe for such locations should be used.

PROTECTIVE GLOVES: Use nitrile or neoprene gloves to prevent contact with skin.

EYE PROTECTION: Where there is likelihood of spill or splash, wear chemical goggles or faceshield. Contact lenses should not be worn.

RESPIRATORY PROTECTION: Use NIOSH-approved respiratory protective equipment when concentration of vapors or mists exceeds applicable exposure limit. Depending on the airborne concentration, use a respirator or gas mask with appropriate cartridges and canisters (for organic vapor with mist prefilter). A self-contained breathing apparatus (SCBA) is required for large spills and emergencies. Selection and use of respiratory protective equipment should be in accordance with OSHA General Industry Standard 29 CFR 1910.134 - Respiratory Protection.

OTHER PROTECTIVE EQUIPMENT: Wear solvent-resistant boots, apron or other protective clothing where spills and splashes are possible. A source of clean water should be available in work areas for flushing the eyes and skin.

SECTION X -- OTHER REGULATORY INFORMATION

DOT PROPER SHIPPING NAME: Petroleum Naphtha

DOT CLASS: Combustible Liquid

DOT NUMBER: UN 1255

SARA TITLE III: Product contains a toxic chemical or chemicals subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372. Toxic constituents are listed with an asterisk in Section II of this Material Safety Data Sheet.

Product poses the following physical and/or health hazard(s) as defined in 40 CFR 370.3 (Sections 311, 312 of SARA Title III):

Immediate (Acute) Health Hazard
Delayed (Chronic) Health Hazard
Fire Hazard

SECTION XI -- PREPARATION INFORMATION

PREPARED BY: SK Product Review Committee *FORM NO.* 900-14-001

ORIGINAL ISSUE DATE: July 20, 1989 *REVISED:* March 12, 1990 *SUPERSEDES:* July 20, 1989

User assumes all risks incident to the use of this product. To the best of our knowledge, the information contained herein is accurate. However, Safety-Kleen assumes no liability whatsoever for the accuracy or completeness of the information contained herein. No representations or warranties, either express or implied, or merchantability, fitness for a particular purpose or of any other nature are made hereunder with respect to information or the product to which formation refers. The data contained on this sheet applies to the material as supplied to the user.

IMMERSION CLEANER/CARBURETOR AND COLD PARTS CLEANER 609

MATERIAL SAFETY DATA SHEET

SECTION I -- PRODUCT INFORMATION

Safety-Kleen Corporation - 777 Big Timber Road - Elgin, IL 60123
For Product/Sales Information Call 708/697-8460

EMERGENCY TELEPHONE	*MEDICAL:*	*TRANSPORTATION:*
These numbers are for emergency use only. If you desire non-emergency information about this product, please call the telephone number listed above.	**800/942-5969 or 312/942-5969** **RUSH POISON CONTROL CENTER** **CHICAGO, ILLINOIS (24 HOURS)**	**800/424-9300** **CHEMTREC**

IDENTITY (TRADE NAME): **IMMERSION CLEANER/CARBURETOR AND COLD PARTS CLEANER 609**

SK PART NUMBER: **609, 6631, 50**

FAMILY/CHEMICAL NAME: **N/A**

PRODUCT USAGE: **REMOVING CARBON RESIDUE FROM PARTS**

SECTION II -- HAZARDOUS COMPONENTS

NAME	SYNONYM	%	CAS NO.	OSHA PEL (ppm)	ACGIH TLV (ppm)
*Cresylic Acid	Mixed Cresols	11.9	1319-77-3	5 (Skin)	5 (Skin)
*Petroleum Sulfonate	Surfactant Blend	7.4			
Contains:					
Hexylene Glycol			107-41-5	25(C)	25(C)
Diethylene Glycol			111-46-6	N/E	N/E
*Methylene Chloride	Dichloromethane	31.7	75-09-2	500 1000(C)	50
Di-chlorobenzenes:					
*(o-dichlorobenzene)	ODCB	10.5	95-50-1	50(C)	50(C)
*(p-dichlorobenzene)		10.5	106-46-7	75 110 STEL	75 110 STEL
*(m-dichlorobenzene)		10.5	541-73-1	N/E	N/E
Complex Amines	Rust Inhibitor	0.4			
Contains:					
Propargyl Alcohol			107-19-7	1 (Skin)	1 (Skin)
*Isopropyl Alcohol			67-63-0	400 500 STEL	400 500 STEL
Triethanolamine	TEA	0.4	102-71-6	N/E	N/E
Water		16.8	7732-18-5	N/E	N/E

* See Section X - Other Regulatory Information
N/E = Not Established
(C) = Ceiling Concentration

SECTION III -- PHYSICAL DATA

PHYSICAL STATE, APPEARANCE AND ODOR: Liquid - clear, dark amber, with aromatic odor. Two distinct layers comprise the product; top layer water, lower layer solvent.

BOILING POINT: 102° - 395° F

MELTING POINT:	Not known
EVAPORATION RATE:	1.0 (Water = 1)
PERCENT VOLATILE:	Majority
VAPOR DENSITY:	Same as Water
VAPOR PRESSURE:	Same as Water
SOLUBILITY IN WATER:	Completely miscible in all proportions.
pH:	9-10 in water phase
SPECIFIC GRAVITY:	1.19 (Water = 1.0)
MOLECULAR WEIGHT:	Use molecular weights of individual components.
VOLATILE ORGANIC COMPOUNDS:	750 g/L

SECTION IV -- FIRE AND EXPLOSION HAZARD DATA

FLASH POINT: Non-Flammable

AUTOIGNITION TEMPERATURE: Not Known

CONDITIONS OF FLAMMABILITY: Non-Flammable

FLAMMABLE LIMITS IN AIR - LOWER: Non-Flammable *UPPER:* Non-Flammable

EXTINGUISHING MEDIA: None Special

FIRE FIGHTING PROCEDURES - SPECIAL: None; product is non-flammable. NFPA 704 Rating 3-2-0

UNUSUAL FIRE AND EXPLOSION HAZARDS:

Although product is non-flammable, flames, welding arcs or other high temperature sources can cause decomposition. This decomposition can yield corrosive and toxic gases, vapors mists or fumes. Use a self-contained breathing apparatus (SCBA).

HAZARDOUS COMBUSTION PRODUCTS:

Although product is non-flammable, flames, welding arcs or other high temperature sources can cause decomposition. This decomposition can yield corrosive and toxic gases, vapors, mists or fumes (e.g. hydrogen chloride, phosgene, carbon monoxide, etc.)

SECTION V -- REACTIVITY DATA

STABILITY: Normally stable.

INCOMPATIBILITY: (CONDITIONS TO AVOID) Strong oxidizing agents (e.g. chlorine, peroxides, strong acids)

HAZARDOUS POLYMERIZATION: Not known to occur under normal conditions.

HAZARDOUS DECOMPOSITION PRODUCTS: Normally none; however, flames and welding arcs can produce corrosive and toxic gases, vapors and fumes (e.g. hydrogen chloride, phosgene, carbon monoxide).

SECTION VI -- HEALTH HAZARD DATA

PRIMARY ROUTES OF EXPOSURE: Inhalation, skin and eye contact, skin absorption.

HEALTH HAZARD DATA/SIGNS AND SYMPTOMS OF EXPOSURE:

ACUTE:

Skin: Corrosive to living tissue and is rapidly absorbed through the skin causing systemic poisoning. Contact with unprotected skin can cause discoloration, irritation, blistering and slow healing chemical burns. Partial anesthetic properties may mask affects.

Eyes: Contact with liquid may cause severe chemical burns and produce permanent damage.

Inhalation: May result in severe respiratory irritation; gastrointestinal distress (nausea, vomiting), central nervous system depression (headache, drowsiness, dizziness, confusion) and tingling or numbness of the extremities. Severe exposures may lead to respiratory failure, coma and death.

Ingestion: May produce burning pain in the mouth and stomach, severe abdominal pain with nausea, vomiting, slow respiration and irregular pulse, and dark blue skin discoloration. Symptoms similar to those for inhalation also may occur.

CHRONIC: Exposure to high concentrations may lead to damage to the liver, kidneys and lungs. Contact with skin may cause dermatitis, gastrointestinal disorders and produce symptoms similar to those for inhalation.

OTHER POTENTIAL HEALTH HAZARDS:

Metabolism of methylene chloride may elevate carboxyhemoglobin levels.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Individuals with pre-existing liver, kidney, lung or cardiovascular dysfunction may have increased susceptibility to the effects of exposure. Contact with skin may aggravate pre-existing dermatitis.

CARCINOGENICITY: Methylene chloride is listed by NTP and IARC as a suspected carcinogen. P-dichlorobenzene is listed by IARC as a suspected carcinogen.

SECTION VII -- EMERGENCY AND FIRST AID PROCEDURES

EYES: For direct contact, flush eyes with clean water for 15 minutes lifting upper and lower lids occasionally. Consult physician if irritation persists. If irritation or redness from exposure to vapors or mists develop, move victim away from exposure and into fresh air.

SKIN: Remove contaminated clothing. Wash skin twice with soap and water. If irritation develops and persists, consult a physician.

INGESTION: Aspiration hazard. If conscious, dilute with 4 to 8 ounces of water and seek immediate medical attention. DO NOT induce vomiting.

INHALATION: Remove to fresh air immediately. Use oxygen if there is difficulty breathing or artificial respiration if respiration has stopped. Do not leave victim unattended. Seek immediate medical attention if necessary.

SECTION VIII -- PRECAUTIONS FOR SAFE USE AND HANDLING

SPILL PROCEDURES: Ventilate area and avoid breathing vapors. Absorb spill with oil absorbent or soda ash. Catch and collect for recovery as soon as possible. Shovel into closable container for disposal. Wear protective equipment specified below. Contain away from surface waters and sewers.

WASTE DISPOSAL METHODS: Dispose in accordance with Federal, State and local regulations. Contact Safety-Kleen regarding recycling.

HANDLING PRECAUTIONS: Keep away from heat, sparks and open flames. Use adequate ventilation. Avoid contact with skin, eyes and clothing. Avoid breathing vapors.

SHIPPING AND STORING PRECAUTIONS: Empty product containers may contain product residue. Do not pressurize, cut, heat, weld, grind or expose containers to flame or other sources of ignition. Keep container tightly closed when not in use and during transport.

PERSONAL HYGIENE: Use good personal hygiene. Wash thoroughly with soap and water after handling and before eating, drinking or using tobacco products.

SECTION IX - CONTROL MEASURES

VENTILATION: Provide local exhaust or general dilution ventilation, as determined necessary, to maintain concentrations of vapors below applicable exposure limits.

PROTECTIVE GLOVES: Wear Viton gloves to prevent skin contact.

EYE PROTECTION: Where there is a likelihood of contact with the face and/or eyes, wear a faceshield and chemical goggles. Contact lenses should not be worn.

RESPIRATORY PROTECTION: Use NIOSH-approved respiratory protective equipment when concentration of vapors exceeds applicable exposure limit. Depending on the airborne concentration, use a respirator or gas mask with appropriate cartridges or canisters (for organic vapors). A self-contained breathing apparatus (SCBA) is required for large spills and emergencies. Selection and use of respiratory protective equipment should be in accordance with OSHA General Industry Standard 29 CFR 1910.134 - Respiratory Protection.

OTHER PROTECTIVE EQUIPMENT: A source of clean water should be available in the work area for flushing eyes and skin. Wear solvent-resistant boots, apron or other protective clothing where spills or splashes are possible.

SECTION X -- OTHER REGULATORY INFORMATION

DOT PROPER SHIPPING NAME: Compound, Cleaning Liquid

DOT CLASS: Corrosive Liquid

DOT ID NUMBER: NA1760

SARA TITLE III: Product contains a toxic chemical or chemicals subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372. Toxic constituents are listed with an asterisk in Section II of this Material Safety Data Sheet.

Product poses the following physical and/or health hazard(s) as defined in 40 CFR 370.3 (Sections 311, 312 of SARA Title III):

Immediate (Acute) Health Hazard
Delayed (Chronic) Health Hazard

SECTION XI -- PREPARATION INFORMATION

PREPARED BY: SK Product Review Committee *FORM NO.* 900-14-002

ORIGINAL ISSUE DATE: July 20, 1989 *REVISED:* December 1, 1989 *SUPERSEDES:* July 20, 1989

User assumes all risks incident to the use of this product. To the best of our knowledge, the information contained herein is accurate. However, Safety-Kleen assumes no liability whatsoever for the accuracy or completeness of the information contained herein. No representations or warranties, either express or implied, or merchantability, fitness for a particular purpose or of any other nature are made hereunder with respect to information or the product to which information refers. The data contained on this sheet applies to the material as supplied to the user.

SAFETY-KLEEN IMMERSION CLEANER AND COLD PARTS CLEANER 699

MATERIAL SAFETY DATA SHEET

SECTION I -- PRODUCT INFORMATION

Safety-Kleen Corporation - 777 Big Timber Road - Elgin, IL 60123
For Product/Sales Information Call 708/697-8460

EMERGENCY TELEPHONE	*MEDICAL:*	*TRANSPORTATION:*
These numbers are for emergency use only. If you desire non-emergency information about this product, please call the telephone number listed above.	**800/942-5969 or 312/942-5969** **RUSH POISON CONTROL CENTER** **CHICAGO, ILLINOIS (24 HOURS)**	**800/424-9300** **CHEMTREC**

IDENTITY (TRADE NAME): **SAFETY-KLEEN IMMERSION CLEANER AND COLD PARTS CLEANER 699**

SK PART NUMBER: **6861, 699**

FAMILY/CHEMICAL NAME: **N/A**

PRODUCT USAGE: **REMOVING CARBON RESIDUE FROM PARTS**

SECTION II -- HAZARDOUS COMPONENTS

NAME	SYNONYM	TYPICAL % BY WT.	CAS NO.	OSHA PEL (ppm)	ACGIH TLV (ppm)
Aromatic 150	Heavy Aromatic Naphtha		64742-94-5	100 (Exxon)	100 (Exxon)
*(May contain up to 5% Naphthalene)			91-20-3	10 15 STEL	10 15 STEL
N-Methyl-2-Pyrrolidone	NMP		872-50-4	100 (BASF)	100 (BASF)
Dipropylene Glycol Methyl Ether	Dipropylene Glycol Monomethyl Ether		34590-94-8	100 150 STEL	100 150 STEL
Monoethanolamine	Ethanolamine		141-43-5	3 6 STEL	3 6 STEL
Oleic Acid	Red Oil		112-80-1	N/E	N/E
Water			7732-18-5	—	—
**(Total chlorinated solvents)		0.2 (Max)			

N/E = Not Established
* See Section X - Other Regulatory Information
**No individual chlorinated solvent > 0.1%

SECTION III -- PHYSICAL DATA

PHYSICAL STATE, APPEARANCE AND ODOR: Clear, reddish brown liquid with hydrocarbon odor.

BOILING RANGE: 210° - 439° F

MELTING POINT: < 10° F

EVAPORATION RATE: 1.0 (Water = 1)

PERCENT VOLATILE:	92 Wt. %
VAPOR DENSITY:	2.6 (Air = 1.0)
VAPOR PRESSURE:	10.9 mm Hg at 25° C
SOLUBILITY IN WATER:	Completely miscible in all proportions.
pH:	10.8, 50/50 (Water/Solvent)
SPECIFIC GRAVITY:	0.95 (Water = 1.0)
MOLECULAR WEIGHT:	127, Average molecular weight of components.
VOLATILE ORGANIC COMPOUNDS:	N/E

SECTION IV -- FIRE AND EXPLOSION HAZARD DATA

FLASH POINT:	SETA, 142° F (Min.)
AUTOIGNITION TEMPERATURE:	Not Known
CONDITIONS OF FLAMMABILITY:	Ignitable, if material is heated above its flash point.
FLAMMABLE LIMITS IN AIR - LOWER:	0.8 *UPPER:* 7.0
EXTINGUISHING MEDIA:	None Special
FIRE FIGHTING PROCEDURES - SPECIAL:	NFPA 704 Rating 2-2-1

UNUSUAL FIRE AND EXPLOSION HAZARDS:

Decomposition and combustion products may be toxic. Heated tanks may rupture, explode or be thrown into the air. Vapors are heavier than air and may travel great distances to ignition source and flashback.

HAZARDOUS COMBUSTION PRODUCTS:

Thermal decomposition and burning may produce carbon monoxide, oxides of nitrogen and acrid smoke.

SECTION V -- REACTIVITY DATA

STABILITY:	Normally stable.
INCOMPATIBILITY: (CONDITIONS TO AVOID)	Strong oxidizing agents (e.g. chlorine, peroxides, strong acids)
HAZARDOUS POLYMERIZATION:	Not known to occur under normal conditions, oxides of nitrogen and acrid smoke. Glycol ethers have been shown to form explosive peroxides.
HAZARDOUS DECOMPOSITION PRODUCTS:	Normally none; however, incomplete burning may yield carbon monoxide.

SECTION VI -- HEALTH HAZARD DATA

PRIMARY ROUTES OF EXPOSURE: Inhalation, skin and eye contact, skin absorption.

HEALTH HAZARD DATA/SIGNS AND SYMPTOMS OF EXPOSURE:

ACUTE: *Skin:* Corrosive to living tissue and is absorbed through the skin causing systemic poisoning. Contact with unprotected skin can cause discoloration, irritation, blistering and slow healing chemical burns.

Eyes: Contact with liquid may cause severe chemical burns and produce permanent damage.

Inhalation: May result in severe respiratory irritation; gastrointestinal distress (nausea, vomiting), central nervous system depression (headache, drowsiness, dizziness, confusion) and tingling or numbness of the extremities. Severe exposures may lead to respiratory failure, coma and death.

Ingestion: May produce burning pain in the mouth and stomach, severe abdominal pain with nausea, vomiting, slow respiration and irregular pulse. Symptoms similar to those for inhalation also may occur.

CHRONIC: Exposure to high concentrations may lead to damage to the liver, kidneys and lungs. Contact with skin may cause dermatitis, gastrointestinal disorders and produce symptoms similar to those for inhalation.

OTHER POTENTIAL HEALTH HAZARDS:

Dipropylene glycol methyl ether is a mild allergen.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Individuals with pre-existing liver, kidney, lung or cardiovascular dysfunction may have increased susceptibility to the effects of exposure. Contact with skin may aggravate pre-existing dermatitis.

CARCINOGENICITY: Naphthalene is an experimental tumorigen. Mutagenic data exists and Naphthalene is included in EPA Genetic Toxicology Program. Oleic acid is an experimental tumorigen.

SECTION VII -- EMERGENCY AND FIRST AID PROCEDURES

EYES: For direct contact, flush eyes with clean water for 20 minutes lifting upper and lower lids occasionally. Consult physician if irritation persists. If irritation or redness from exposure to vapors or mists develop, move victim away from exposure and into fresh air.

SKIN: Remove contaminated clothing. Wash skin twice with soap and water. If irritation develops and persists, consult a physician.

INGESTION: Aspiration hazard. If conscious, dilute with 4 to 8 ounces of water and seek immediate medical attention. DO NOT induce vomiting.

INHALATION: Remove to fresh air immediately. Use oxygen if there is difficulty breathing or artificial respiration if respiration has stopped. Do not leave victim unattended. Seek immediate medical attention if necessary.

SECTION VIII -- PRECAUTIONS FOR SAFE USE AND HANDLING

SPILL PROCEDURES: Ventilate area and avoid breathing vapors. Absorb spill with oil absorbent or soda ash. Catch and collect for recovery as soon as possible. Shovel into closable container for disposal. Wear protective equipment specified below. Contain away from surface waters and sewers.

WASTE DISPOSAL METHODS: Dispose in accordance with Federal, State and local regulations. Contact Safety-Kleen regarding recycling.

HANDLING PRECAUTIONS: Keep away from heat, sparks and open flames. Use adequate ventilation. Avoid contact with skin, eyes and clothing. Avoid breathing vapors.

SHIPPING AND STORING PRECAUTIONS: Empty product containers may contain product residue. Do not pressurize, cut, heat, weld, grind or expose containers to flame or other sources of ignition. Keep container tightly closed when not in use and during transport.

PERSONAL HYGIENE: Use good personal hygiene. Wash thoroughly with soap and water after handling and before eating, drinking or using tobacco products.

SECTION IX - CONTROL MEASURES

VENTILATION: Provide local exhaust or general dilution ventilation, as determined necessary, to maintain concentrations of vapors below applicable exposure limits.

PROTECTIVE GLOVES: Wear neoprene gloves to prevent skin contact.

EYE PROTECTION: Where there is a likelihood of contact with the face and/or eyes, wear a faceshield and chemical goggles. Contact lenses should not be worn.

RESPIRATORY PROTECTION: Use NIOSH-approved respiratory protective equipment when concentration of vapors exceeds applicable exposure limit. Depending on the airborne concentration, use a respirator or gas mask with appropriate cartridges or canisters (for organic vapors). A self-contained breathing apparatus (SCBA) is required for large spills and emergencies. Selection and use of respiratory protective equipment should be in accordance with OSHA General Industry Standard 29 CFR 1910.134 - Respiratory Protection.

OTHER PROTECTIVE EQUIPMENT: A source of clean water should be available in the work area for flushing eyes and skin. Wear solvent-resistant boots, apron or other protective clothing where spills or splashes are possible.

SECTION X -- OTHER REGULATORY INFORMATION

DOT PROPER SHIPPING NAME: Compound, Cleaning Liquid

DOT CLASS: Corrosive Liquid

DOT ID NUMBER: NA1760

SARA TITLE III: Product contains a toxic chemical or chemicals subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372. Toxic constituents are listed with an asterisk in Section II of this Material Safety Data Sheet.

Product poses the following physical and/or health hazard(s) as defined in 40 CFR 370.3 (Sections 311, 312 of SARA Title III):

Immediate (Acute) Health Hazard
Delayed (Chronic) Health Hazard
Fire Hazard
Reactivity Hazard

SECTION XI -- PREPARATION INFORMATION

PREPARED BY: SK Technical Services ***FORM NO.*** 900-14-057

ORIGINAL ISSUE DATE: December 1, 1989 ***REVISED:*** April 6, 1990 ***SUPERSEDES:*** December 1, 1989

User assumes all risks incident to the use of this product. To the best of our knowledge, the information contained herein is accurate. However, Safety-Kleen assumes no liability whatsoever for the accuracy or completeness of the information contained herein. No representations or warranties, either express or implied, or merchantability, fitness for a particular purpose or of any other nature are made hereunder with respect to information or the product to which information refers. The data contained on this sheet applies to the material as supplied to the user.

SAFETY-KLEEN 140 SOLVENT-MS

MATERIAL SAFETY DATA SHEET

SECTION I -- PRODUCT INFORMATION

Safety-Kleen Corporation - 777 Big Timber Road - Elgin, IL 60123
For Product/Sales Information Call 708/697-8460

EMERGENCY TELEPHONE	*MEDICAL:*	*TRANSPORTATION:*
These numbers are for emergency use only. If you desire non-emergency information about this product, please call the telephone number listed above.	**800/942-5969 or 312/942-5969** **RUSH POISON CONTROL CENTER** **CHICAGO, ILLINOIS (24 HOURS)**	**800/424-9300** **CHEMTREC**

IDENTITY (TRADE NAME): **SAFETY-KLEEN 140 SOLVENT-MS**

SYNONYMS: **PETROLEUM DISTILLATES, PETROLEUM NAPHTHA**

SK PART NUMBER: **6616**

FAMILY/CHEMICAL NAME: **HYDROCARBON SOLVENT**

PRODUCT USAGE: **SOLVENT FOR CLEANING AND DEGREASING PARTS**

SECTION II -- HAZARDOUS COMPONENTS

NAME	SYNONYM	%	CAS NO.	OSHA PEL (ppm)	ACGIH TLV (ppm)
Mineral Spirits	Petroleum Distillates	99.9	64742-88-7	100 (Stoddard Solvent)	100 (Stoddard Solvent)
*Dye (contains Xylene)		.003	1330-20-7	100 150 STEL	100 150 STEL
*Anti-Static Agent (contains Xylene)		0.0001	1330-20-7	100 150 STEL	100 150 STEL

* See Section X - Other Regulatory Information

SECTION III -- PHYSICAL DATA

PHYSICAL STATE, APPEARANCE AND ODOR: Combustible liquid - clear, green, with characteristic hydrocarbon odor.

BOILING POINT: 360° - 400° F

MELTING POINT: Not Available

EVAPORATION RATE: (Butyl Acetate = 1) 0.08

PERCENT VOLATILE: 99.9%

VAPOR DENSITY: 5.48 (Air = 1)

VAPOR PRESSURE: 0.5 mm of Hg at 68° F

SOLUBILITY IN WATER: Negligible

pH: Not Applicable

SPECIFIC GRAVITY: 0.770 to 0.811

MOLECULAR WEIGHT: Approximately 142

VOLATILE ORGANIC COMPOUNDS: 770 g/L

SECTION IV -- FIRE AND EXPLOSION HAZARD DATA

FLASH POINT: 140° F (TCC)

AUTOIGNITION TEMPERATURE: 473° F

CONDITIONS OF FLAMMABILITY: Materials must be moderately heated before ignition can occur.

FLAMMABLE LIMITS IN AIR - LOWER: 1.0% *UPPER:* 7.0%

EXTINGUISHING MEDIA: Carbon dioxide, foam, dry chemical, water (mist only).

FIRE FIGHTING PROCEDURES -- SPECIAL: NFPA 704 Rating 0-2-0

Keep storage tanks cool with water spray. Use self-contained breathing apparatus (SCBA).

UNUSUAL FIRE AND EXPLOSION HAZARDS:

Decomposition and combustion products may be toxic. Heated tanks may rupture, explode or be thrown into the air. Vapors are heavier than air and may travel great distances to ignition source and flashback.

HAZARDOUS COMBUSTION PRODUCTS:

Thermal decomposition and burning may produce carbon monoxide.

SECTION V -- REACTIVITY DATA

STABILITY: Normally stable even under fire exposure conditions and is not reactive with water. Normal firefighting procedures may be used.

INCOMPATIBILITY (CONDITIONS TO AVOID): Strong oxidizing agents (e.g. chlorine, peroxides, strong acids).

HAZARDOUS POLYMERIZATION: Not known to occur under normal conditions.

HAZARDOUS DECOMPOSITION PRODUCTS: Normally none; however, incomplete burning may yield carbon monoxide.

SECTION VI -- HEALTH HAZARD DATA

PRIMARY ROUTES OF EXPOSURE: Skin and eye contact; inhalation.

HEALTH HAZARD DATA/SIGNS AND SYMPTOMS OF EXPOSURE:

ACUTE: *Skin*: Prolonged or repeated contact tends to remove skin oils, possibly leading to irritation and dermatitis. No significant skin absorption hazard.

Eyes: Contact may cause slight to moderate irritation. High vapor concentrations (> 500 ppm) are irritating to the eyes.

Inhalation: High concentrations of vapor or mist may be irritating to the respiratory tract, cause headaches, dizziness, nausea, impaired coordination, anesthesia anesthetic and may have other central nervous system effects.

Ingestion: Low order of acute oral toxicity. May cause irritation of the throat, nausea, vomiting and symptoms of central nervous system depression. Aspiration into the lungs during ingestion or vomiting may cause mild to severe pulmonary injury and possibly death.

CHRONIC: Prolonged and/or repeated contact may cause drying and cracking of the skin or dermatitis.

OTHER POTENTIAL HEALTH HAZARDS: None Known

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Individuals with pre-existing central nervous system dysfunction may have increased susceptibility to the effects of exposure. Contact with skin may aggravate pre-existing dermatitis.

CARCINOGENICITY: None of the ingredients are known or suspected carcinogens.

SECTION VII -- EMERGENCY AND FIRST AID PROCEDURES

EYES: For direct contact, flush eyes with water for 15 minutes lifting upper and lower lids occasionally. Consult physician if irritation or pain persists. If irritation or redness from exposure to vapors or mists develop, move victim away from exposure into fresh air.

SKIN: Remove contaminated clothing. Wash skin twice with soap and water. If irritation develops and persists, consult a physician.

INGESTION: If conscious, dilute with 4 to 8 ounces of water and seek immediate medical attention. DO NOT induce vomiting.

INHALATION: Remove to fresh air immediately. Use oxygen if there is difficulty breathing or artificial respiration if respiration has stopped. Do not leave victim unattended. Seek immediate medical attention if necessary.

SECTION VIII -- PRECAUTIONS FOR SAFE USE AND HANDLING

SPILL PROCEDURES: Remove all ignition sources. Ventilate area and avoid breathing vapors. For large spills, isolate area and deny entry. If possible, contain as a liquid for possible re-refining. Absorb onto sand or other absorbent material. Shovel into closable container for disposal. Wear protective equipment specified below. Contain away from surface waters and sewers.

WASTE DISPOSAL METHODS: Dispose in accordance with Federal, State, and local regulations. Contact Safety-Kleen regarding recycling.

HANDLING PRECAUTIONS: Avoid contact with eyes, skin or clothing. Use in well ventilated area and avoid breathing vapors or mists. Keep away from heat, sparks and open flames.

SHIPPING AND STORING PRECAUTIONS: Empty product containers may contain product residue. Do not pressurize, cut, heat, weld, grind or expose containers to flame or other sources of ignition. Keep container tightly closed when not in use and during transport.

PERSONAL HYGIENE: Use good personal hygiene. Wash thoroughly with soap and water after handling and before eating, drinking or using tobacco products. Launder contaminated clothing and clean protective equipment before reuse.

SECTION IX -- CONTROL MEASURES

VENTILATION: Provide local exhaust or general dilution ventilation as determined necessary to maintain concentrations of vapors or mists below applicable exposure limits. Where explosive mixtures may be present, systems safe for such locations should be used.

PROTECTIVE GLOVES: Use nitrile or neoprene gloves to prevent contact with skin.

EYE PROTECTION: Where there is likelihood of spill or splash, wear chemical goggles or faceshield. Contact lenses should not be worn.

RESPIRATORY PROTECTION: Use NIOSH-approved respiratory protective equipment when concentration of vapors or mists exceeds applicable exposure limit. Depending on the airborne concentration, use a respirator or gas mask with appropriate cartridges and canisters (for organic vapor with mist prefilter). A self-contained breathing apparatus (SCBA) is required for large spills and emergencies. Selection and use of respiratory protective equipment should be in accordance with OSHA General Industry Standard 29 CFR 1910.134 - Respiratory Protection.

OTHER PROTECTIVE EQUIPMENT: Wear solvent-resistant boots, apron or other protective clothing where spills and splashes are possible. A source of clean water should be available in work areas for flushing the eyes and skin.

SECTION X -- OTHER REGULATORY INFORMATION

DOT PROPER SHIPPING NAME: Petroleum Naphtha

DOT CLASS: Combustible Liquid

DOT NUMBER: UN 1255

SARA TITLE III: Product does not contain a toxic chemical or chemicals subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

Product poses the following physical and/or health hazard(s) as defined in 40 CFR 370.3 (Sections 311, 312 of SARA Title III):

Immediate (Acute) Health Hazard
Delayed (Chronic) Health Hazard
Fire Hazard

SECTION XI -- PREPARATION INFORMATION

PREPARED BY: SK Product Review Committee ***FORM NO.*** 900-14-004

ORIGINAL ISSUE DATE: July 20, 1989 ***REVISED:*** December 1, 1989 ***SUPERSEDES:*** July 20, 1989

User assumes all risks incident to the use of this product. To the best of our knowledge, the information contained herein is accurate. However, Safety-Kleen assumes no liability whatsoever for the accuracy or completeness of the information contained herein. No representations or warranties, either express or implied, or merchantability, fitness for a particular purpose or of any other nature are made hereunder with respect to information or the product to which information refers. The data contained on this sheet applies to the material as supplied to the user.

SAFETY-KLEEN MULTI-USE LACQUER THINNER 6801

MATERIAL SAFETY DATA SHEET

SECTION I -- PRODUCT INFORMATION

Safety-Kleen Corporation - 777 Big Timber Road - Elgin, IL 60123
For Product/Sales Information Call 708/697-8460

EMERGENCY TELEPHONE	*MEDICAL:*	*TRANSPORTATION:*
These numbers are for emergency use only. If you desire non-emergency information about this product, please call the telephone number listed above.	**800/942-5969 or 312/942-5969** **RUSH POISON CONTROL CENTER** **CHICAGO, ILLINOIS (24 HOURS)**	**800/424-9300** **CHEMTREC**

IDENTITY (TRADE NAME): **SAFETY-KLEEN MULTI-USE LACQUER THINNER 6801**

SK PART NUMBER: **6801**

FAMILY/CHEMICAL NAME: **N/A**

PRODUCT USAGE: **LACQUER THINNER**

SECTION II -- HAZARDOUS COMPONENTS

NAME	SYNONYM	%	CAS NO.	OSHA PEL (ppm)	ACGIH TLV (ppm)
*Toluene	Toluol	11-43	108-88-3	100 150 STEL	100 150 STEL
*Xylene	Xylol	3-4	1330-20-7	100 150 STEL	100 150 STEL
*Methyl Ethyl Ketone	MEK	~5	78-93-3	200 300 STEL	200 300 STEL
*Methyl Isobutyl Ketone	MIBK	~3	108-10-1	50 75 STEL	50 75 STEL
*Acetone	2-Propanone	20-30	67-64-1	750 1000 STEL	750 1000 STEL
*Isopropanol	Isopropyl Alcohol	5-15	67-63-0	400 500 STEL	400 500 STEL
Special Lactol Spirits	VM & P Naphtha	0.5-32	8030-30-6	300 400 STEL	300 STEL
Isobutyl Acetate	Isobutyl Ester Acetic Acid	0.1-15	110-19-0	150	150
Ethyl 3-Ethoxypropionate	3-Ethoxypropionic Acid Ethyl Ester	~5	763-69-9	N/E	N/E

N/E = Not Established
* See Section X - Other Regulatory Information

SECTION III -- PHYSICAL DATA

PHYSICAL STATE, APPEARANCE AND ODOR: Liquid - colorless, clear, with a characteristic solvent odor.

BOILING POINT: ~131 - 347° F

MELTING POINT: Not Applicable

EVAPORATION RATE: 3.30 (N-Butyl = 1)

PERCENT VOLATILE:	100%
VAPOR DENSITY:	3.02 (Air = 1)
VAPOR PRESSURE:	78.6 mm Hg @ 20° C
SOLUBILITY IN WATER:	Appreciable
pH:	Not Applicable
SPECIFIC GRAVITY:	~0.8000 - 0.8438 (Water = 1)
MOLECULAR WEIGHT:	Use molecular weight of individual components.
VOLATILE ORGANIC COMPOUNDS:	800 - 844 g/L

SECTION IV -- FIRE AND EXPLOSION HAZARD DATA

FLASH POINT: < 20° F (TCC)

AUTOIGNITION TEMPERATURE: Not Available

CONDITIONS OF FLAMMABILITY: Normal temperatures and pressures.

FLAMMABLE LIMITS IN AIR - LOWER: 1.0% *UPPER:* 13.2%

EXTINGUISHING MEDIA: Carbon dioxide, foam, dry chemical, water (mist only)

FIRE FIGHTING PROCEDURES -- SPECIAL: NFPA 704 Rating 2-3-0

Water may be used to cool containers and fire fighters. However, water could cause free solvent to float and spread fire.

UNUSUAL FIRE AND EXPLOSION HAZARDS:

Flammable liquid. Most components are Class 1B with flash point below 73° F and boiling point above 100° F.

HAZARDOUS COMBUSTION PRODUCTS: Carbon Monoxide

SECTION V -- REACTIVITY DATA

STABILITY: Stable under normal temperatures and conditions.

INCOMPATIBILITY: (CONDITIONS TO AVOID) Heat sparks, flames, fire, strong oxidizing agents.

HAZARDOUS POLYMERIZATION: Not known to occur under normal conditions.

HAZARDOUS DECOMPOSITION PRODUCTS: Normally none. Incomplete burning may yield carbon monoxide.

SECTION VI -- HEALTH HAZARD DATA

PRIMARY ROUTES OF EXPOSURE: Inhalation, skin and eye contact.

HEALTH HAZARD DATA/SIGNS AND SYMPTOMS OF EXPOSURE:

ACUTE: ***Skin:*** **Contact may cause irritation, dryness and cracking. Prolonged or repeated contact may remove skin oils, possibly leading to irritation and dermatitis. Material is readily absorbed through skin.**

Eyes: Direct contact may cause severe irritation and temporary corneal damage. Vapors may cause noticeable redness, tearing, irritation and pain. Conjunctivitis may occur upon chronic exposure.

Inhalation: Can cause headache, dizziness, confusion, nausea, vomiting, irritation of the respiratory system and other central nervous system effects including unconsciousness in extreme cases.

Ingestion: Can cause burning of the mouth, throat and abdomen, nausea, vomiting, diarrhea, symptoms of the central nervous system depression, including weakness, dizziness, slow and shallow respiration, unconsciousness and convulsions. Aspiration into the lungs during ingestion or vomiting may cause mild to severe pulmonary injury and possible death.

CHRONIC: *Inhalation*: Prolonged overexposure may cause damage to the liver, kidney, spleen, lungs or nervous system.

OTHER POTENTIAL HEALTH HAZARDS:

Reports have associated prolonged and repeated occupational exposure to solvents with permanent brain and/or central nervous system damage. Intentional misuse by deliberately concentrating and inhaling this material may be harmful or fatal. Observe all appropriate control measures.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:

Individuals with pre-existing liver, kidney, spleen, lungs, skin or nervous system dysfunction may have increased susceptibility to the effects of the exposure. Contact with skin may aggravate pre-existing dermatitis.

CARCINOGENICITY: No components are known or suspected carcinogens.

SECTION VII -- EMERGENCY AND FIRST AID PROCEDURES

EYES: For direct contact, flush eyes with clean water for 15 minutes lifting upper and lower lids occasionally. Consult physician if irritation persists. If irritation or redness from exposure to vapors or mists develop, move victim away from exposure and into fresh air.

SKIN: Remove contaminated clothing. Wash skin twice with soap and water. If irritation develops and persists, consult a physician.

INGESTION: Aspiration hazard. If conscious, dilute with 4 to 8 ounces of water and seek immediate medical attention. DO NOT induce vomiting.

INHALATION: Remove to fresh air immediately. Use oxygen if there is difficulty breathing or artificial respiration if respiration has stopped. Do not leave victim unattended. Seek immediate medical attention if necessary.

SECTION VIII -- PRECAUTIONS FOR SAFE USE AND HANDLING

SPILL PROCEDURES: Remove all ignition sources. Isolate area and deny entry. If possible, contain as a liquid for possible recycling. Absorb onto sand or other absorbent material. Shovel into closable container for disposal. Wear protective equipment specified below. Contain away from surface waters and sewers.

WASTE DISPOSAL METHODS: Dispose in accordance with Federal, State and local regulations. Contact Safety-Kleen regarding recycling.

HANDLING PRECAUTIONS: Do not get into eyes, on skin or clothing. Avoid breathing vapors. DO NOT smoke when handling this product.

SHIPPING AND STORING PRECAUTIONS: Empty product containers may contain product residue. Do not pressurize, cut, heat, weld, grind or expose containers to flame or other sources of ignition. Keep container tightly closed when not in use and during transport.

PERSONAL HYGIENE: Use good personal hygiene. Wash thoroughly with soap and water after handling and before eating, drinking or using tobacco products.

SECTION IX - CONTROL MEASURES

VENTILATION: Provide local exhaust or general dilution ventilation as determined necessary, when concentrations of vapors exceed applicable exposure limits. Where explosive mixtures may be present, systems safe for such locations should be used.

PROTECTIVE GLOVES: To protect against contact with skin, wear nitrile gloves.

EYE PROTECTION: Where there is likelihood of eye contact, wear chemical goggles. Contact lenses should not be worn.

RESPIRATORY PROTECTION: Use NIOSH-approved respiratory protective equipment when concentration of vapors exceeds applicable exposure limit. Depending on the airborne concentration, use a respirator or gas mask with appropriate cartridges and canisters (for organic vapors). A self-contained breathing apparatus (SCBA) is required for large spills and emergencies. Selection and use of respiratory protective equipment should be in accordance with OSHA General Industry Standard 29 CFR 1910.134 - Respiratory Protection.

OTHER PROTECTIVE EQUIPMENT: A source of clean water should be available in the work area for flushing eyes and skin. Wear rubber apron or other protective clothing as needed to protect against spills or splash.

SECTION X -- OTHER REGULATORY INFORMATION

DOT PROPER SHIPPING NAME: Paint-Related Material

DOT CLASS: Flammable Liquid

DOT ID NUMBER: NA1263

SARA TITLE III: Product contains a toxic chemical or chemicals subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372. Toxic constituents are listed with an asterisk in Section II of this Material Safety Data Sheet.

Product poses the following physical and/or health hazard(s) as defined in 40 CFR 370.3 (Sections 311, 312 of SARA Title III):

Immediate (Acute) Health Hazard
Delayed (Chronic) Health Hazard
Fire Hazard

SECTION XI -- PREPARATION INFORMATION

PREPARED BY: SK Product Review Committee *FORM NO.* 900-14-056

ORIGINAL ISSUE DATE: July 20, 1989 *REVISED:* December 1, 1989 *SUPERSEDES:* July 20, 1989

User assumes all risks incident to the use of this product. To the best of our knowledge, the information contained herein is accurate. However, Safety-Kleen assumes no liability whatsoever for the accuracy or completeness of the information contained herein. No representations or warranties, either express or implied, or merchantability, fitness for a particular purpose or of any other nature are made hereunder with respect to information or the product to which information refers. The data contained on this sheet applies to the material as supplied to the user.

SAFETY-KLEEN HEAVY DUTY LACQUER THINNER 6782

MATERIAL SAFETY DATA SHEET

SECTION I -- PRODUCT INFORMATION

Safety-Kleen Corporation - 777 Big Timber Road - Elgin, IL 60123
For Product/Sales Information Call 708/697-8460

EMERGENCY TELEPHONE	*MEDICAL:*	*TRANSPORTATION:*
These numbers are for emergency use only. If you desire non-emergency information about this product, please call the telephone number listed above.	800/942-5969 or 312/942-5969 RUSH POISON CONTROL CENTER CHICAGO, ILLINOIS (24 HOURS)	800/424-9300 CHEMTREC

IDENTITY (TRADE NAME): SAFETY-KLEEN HEAVY DUTY LACQUER THINNER 6782

SK PART NUMBER: 5820, 5825

FAMILY/CHEMICAL NAME: N/A

PRODUCT USAGE: LACQUER THINNER

SECTION II -- HAZARDOUS COMPONENTS

NAME	SYNONYM	%	CAS NO.	OSHA PEL (ppm)	ACGIH TLV (ppm)
*Toluene	Toluol	5-60	108-88-3	100 150 STEL	100 150 STEL
*Xylene	Xylol	5-20	1330-20-7	100 150 STEL	100 150 STEL
Heptane	n-Heptane	N/E	142-82-5	400 500 STEL	400 500 STEL
*Methyl Ethyl Ketone	MEK	5-40	78-93-3	200 300 STEL	200 300 STEL
*Methyl Isobutyl Ketone	MIBK	0.1-10	108-10-1	50 75 STEL	50 75 STEL
Methylcyclohexane	Cyclohexylmethane	0.10-40	108-87-2	400	400
*Acetone	2-Propanone	2-20	67-64-1	750 1000 STEL	750 1000 STEL
*Cyclohexane			110-82-7	300	300
*Isopropanol	Isopropyl Alcohol	0.1-20	67-63-0	400 500 STEL	400 500 STEL
*Methanol	Methyl Alcohol	2-10	67-56-1	200 250 STEL	200 250 STEL
Lactol Spirits	VM & P Naphtha	0.1-20	8030-30-6	300 400 STEL	300
Ethanol	Ethyl Alcohol	0.1-10	64-17-5	1000	1000
n-Butyl Acetate	Butyl Acetate	0.1-15	123-86-4	150 200 STEL	150 200 STEL
Isobutyl Acetate	Isobutyl Ester Acetic Acid	0.1-15	110-19-0	150	150
Ethyl 3-Ethoxypropionate	3-Ethoxypropionic Acid Ethyl Ester	N/E	763-69-9	N/E	N/E

N/E = Not Established
* See Section X - Other Regulatory Information

SECTION III -- PHYSICAL DATA

PHYSICAL STATE, APPEARANCE AND ODOR:	Liquid - colorless, clear, with a characteristic solvent odor.
BOILING POINT:	~ 131 - 347° F
MELTING POINT:	Not Applicable
EVAPORATION RATE:	3.68 (N-Butyl = 1)
PERCENT VOLATILE:	100%
VAPOR DENSITY:	3.02 (Air = 1)
VAPOR PRESSURE:	94.7 mm Hg @ 20 ° C
SOLUBILITY IN WATER:	Appreciable
pH:	Not Applicable
SPECIFIC GRAVITY:	~ 0.802 (Water = 1)
MOLECULAR WEIGHT:	Use molecular weight of individual components.
VOLATILE ORGANIC COMPOUNDS:	802 g/L

SECTION IV -- FIRE AND EXPLOSION HAZARD DATA

FLASH POINT: < 20° F (TCC)

AUTOIGNITION TEMPERATURE: Not Available

CONDITIONS OF FLAMMABILITY: Normal temperatures and pressures.

FLAMMABLE LIMITS IN AIR - LOWER: 1.0% ***UPPER:*** 13.2%

EXTINGUISHING MEDIA: Carbon dioxide, foam, dry chemical, water (mist only)

FIRE FIGHTING PROCEDURES -- SPECIAL: NFPA 704 Rating 2-3-0

Water may be used to cool containers and firefighters. However, water could cause free solvent to float and spread fire.

UNUSUAL FIRE AND EXPLOSION HAZARDS:

Flammable liquid. Most components are Class 1B with flash point below 73° F and boiling point above 100° F.

HAZARDOUS COMBUSTION PRODUCTS: Carbon Monoxide

SECTION V -- REACTIVITY DATA

STABILITY:	Stable under normal temperatures and conditions.
INCOMPATIBILITY: (CONDITIONS TO AVOID)	Heat sparks, flames, fire, strong oxidizing agents.
HAZARDOUS POLYMERIZATION:	Not known to occur under normal conditions.
HAZARDOUS DECOMPOSITION PRODUCTS:	Normally none. Incomplete burning may yield carbon monoxide.

SECTION VI -- HEALTH HAZARD DATA

PRIMARY ROUTES OF EXPOSURE: Inhalation, skin and eye contact.

HEALTH HAZARD DATA/SIGNS AND SYMPTOMS OF EXPOSURE:

ACUTE:

Skin: Contact may cause irritation, dryness and cracking. Prolonged or repeated contact may remove skin oils, possibly leading to irritation and dermatitis. Material is readily absorbed through skin.

Eyes: Direct contact may cause severe irritation and temporary corneal damage. Vapors may cause noticeable redness, tearing, irritation and pain. Conjunctivitis may occur upon chronic exposure.

Inhalation: Can cause headache, dizziness, confusion, nausea, vomiting, irritation of the respiratory system and other central nervous system effects including unconsciousness in extreme cases.

Ingestion: Can cause burning of the mouth, throat and abdomen, nausea, vomiting, diarrhea, symptoms of the central nervous system depression, including weakness, dizziness, slow and shallow respiration, unconsciousness and convulsions. Aspiration into the lungs during ingestion or vomiting may cause mild to severe pulmonary injury and possible death.

CHRONIC: ***Inhalation***: Prolonged overexposure may cause damage to the liver, kidney, spleen, lungs or nervous system.

OTHER POTENTIAL HEALTH HAZARDS:

Reports have associated prolonged and repeated occupational exposure to solvents with permanent brain and/or central nervous system damage. Intentional misuse by deliberately concentrating and inhaling this material may be harmful or fatal. Observe all appropriate control measures.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:

Individuals with pre-existing liver, kidney, spleen, lungs, skin or nervous system dysfunction may have increased susceptibility to the effects of the exposure. Contact with skin may aggravate pre-existing dermatitis.

CARCINOGENICITY: No components are known or suspected carcinogens.

SECTION VII -- EMERGENCY AND FIRST AID PROCEDURES

EYES: For direct contact, flush eyes with clean water for 15 minutes lifting upper and lower lids occasionally. Consult physician if irritation persists. If irritation or redness from exposure to vapors or mists develop, move victim away from exposure and into fresh air.

SKIN: Remove contaminated clothing. Wash skin twice with soap and water. If irritation develops and persists, consult a physician.

INGESTION: Aspiration hazard. If conscious, dilute with 4 to 8 ounces of water and seek immediate medical attention. DO NOT induce vomiting.

INHALATION: Remove to fresh air immediately. Use oxygen if there is difficulty breathing or artificial respiration if respiration has stopped. Do not leave victim unattended. Seek immediate medical attention if necessary.

SECTION VIII -- PRECAUTIONS FOR SAFE USE AND HANDLING

SPILL PROCEDURES: Remove all ignition sources. Isolate area and deny entry. If possible, contain as a liquid for possible recycling. Absorb onto sand or other absorbent material. Shovel into closable container for disposal. Wear protective equipment specified below. Contain away from surface waters and sewers.

WASTE DISPOSAL METHODS: Dispose in accordance with Federal, State and local regulations. Contact Safety-Kleen regarding recycling.

HANDLING PRECAUTIONS: Do not get into eyes, on skin or clothing. Avoid breathing vapors. DO NOT smoke when handling this product.

SHIPPING AND STORING PRECAUTIONS: Empty product containers may contain product residue. Do not pressurize, cut, heat, weld, grind or expose containers to flame or other sources of ignition. Keep container tightly closed when not in use and during transport.

PERSONAL HYGIENE: Use good personal hygiene. Wash thoroughly with soap and water after handling and before eating, drinking or using tobacco products.

SECTION IX - CONTROL MEASURES

VENTILATION: Provide local exhaust or general dilution ventilation as determined necessary, when concentrations of vapors exceed applicable exposure limits. Where explosive mixtures may be present, systems safe for such locations should be used.

PROTECTIVE GLOVES: To protect against contact with skin, wear nitrile gloves.

EYE PROTECTION: Where there is likelihood of eye contact, wear chemical goggles. Contact lenses should not be worn.

RESPIRATORY PROTECTION: Use NIOSH-approved respiratory protective equipment when concentration of vapors exceeds applicable exposure limit. Depending on the airborne concentration, use a respirator or gas mask with appropriate cartridges and canisters (for organic vapors). A self-contained breathing apparatus (SCBA) is required for large spills and emergencies. Selection and use of respiratory protective equipment should be in accordance with OSHA General Industry Standard 29 CFR 1910.134 - Respiratory Protection.

OTHER PROTECTIVE EQUIPMENT: A source of clean water should be available in the work area for flushing eyes and skin. Wear rubber apron or other protective clothing as needed to protect against spills or splash.

SECTION X -- OTHER REGULATORY INFORMATION

DOT PROPER SHIPPING NAME: Paint-Related Material

DOT CLASS: Flammable Liquid

DOT ID NUMBER: NA1263

SARA TITLE III: Product contains a toxic chemical or chemicals subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372. Toxic constituents are listed with an asterisk in Section II of this Material Safety Data Sheet.

Product poses the following physical and/or health hazard(s) as defined in 40 CFR 370.3 (Sections 311, 312 of SARA Title III):

Immediate (Acute) Health Hazard
Delayed (Chronic) Health Hazard
Fire Hazard

SECTION XI -- PREPARATION INFORMATION

PREPARED BY: SK Product Review Committee *FORM NO.* 900-14-055

ORIGINAL ISSUE DATE: July 20, 1989 *REVISED:* December 1, 1989 *SUPERSEDES:* July 20, 1989

User assumes all risks incident to the use of this product. To the best of our knowledge, the information contained herein is accurate. However, Safety-Kleen assumes no liability whatsoever for the accuracy or completeness of the information contained herein. No representations or warranties, either express or implied, or merchantability, fitness for a particular purpose or of any other nature are made hereunder with respect to information or the product to which information refers. The data contained on this sheet applies to the material as supplied to the user.

SAFETY-KLEEN PERCHLOROETHYLENE
MATERIAL SAFETY DATA SHEET

SECTION I -- PRODUCT INFORMATION

Safety-Kleen Corporation - 777 Big Timber Road - Elgin, IL 60123
For Product/Sales Information Call 708/697-8460

EMERGENCY TELEPHONE	*MEDICAL:*	*TRANSPORTATION:*
These numbers are for emergency use only. If you desire non-emergency information about this product, please call the telephone number listed above.	800/942-5969 or 312/942-5969 RUSH POISON CONTROL CENTER CHICAGO, ILLINOIS (24 HOURS)	800/424-9300 CHEMTREC

IDENTITY (TRADE NAME): SAFETY-KLEEN PERCHLOROETHYLENE

SK PART NUMBER: 775, 778, 10778, 30778

FAMILY/CHEMICAL NAME: CHLORINATED HYDROCARBON

PRODUCT USAGE: DRY CLEANING SOLVENT

SECTION II -- HAZARDOUS COMPONENTS

NAME	SYNONYM	%	CAS NO.	OSHA PEL (ppm)	ACGIH TLV (ppm)
*Perchloroethylene (Stabilized)	1,1,2,2 - Tetrachloroethylene	100	127-18-4	25	50 200 STEL

* See Section X - Other Regulatory Information

SECTION III -- PHYSICAL DATA

PHYSICAL STATE, APPEARANCE AND ODOR: Liquid - colorless, clear liquid with mildly sweet odor.

BOILING POINT: 250° F

MELTING POINT: - 9° F

EVAPORATION RATE: 0.09 (Toluene = 1)

PERCENT VOLATILE: Approximately 100%

VAPOR DENSITY: 5.83

VAPOR PRESSURE: 13 mm Hg @ 20° C (Concentrate)

SOLUBILITY IN WATER: 0.015 mg/100 gm @ 25° C

pH: Not Applicable

SPECIFIC GRAVITY: 1.6 (Water = 1.0)

MOLECULAR WEIGHT: 164

VOLATILE ORGANIC COMPOUNDS: None

CHRONIC: Prolonged and repeated exposure to high concentrations may result in damage to the liver, kidneys and central nervous system. Prolonged or repeated contact with skin may cause skin to become reddened, rough and dry and may result in dermatitis.

OTHER POTENTIAL HEALTH HAZARDS:

Animals exposed to high levels have shown cardiac sensitization.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:

Individuals with pre-existing liver, kidney or central nervous system dysfunction may have increased susceptibility to effects of the exposure. Contact with skin may aggravate pre-existing dermatitis.

CARCINOGENICITY: Perchloroethylene is listed by OSHA, NTP and IARC as a suspected carcinogen.

SECTION VII -- EMERGENCY AND FIRST AID PROCEDURES

EYES: Flush eyes with water for 20 minutes lifting upper and lower lids occasionally. Consult physician if irritation persists. If irritation or redness from exposure to vapors or mists develop, move victim away from exposure and into fresh air.

SKIN: Remove contaminated clothing. Wash skin twice with soap and water. If irritation persists, consult a physician.

INGESTION: Aspiration hazard. If conscious, dilute with 4 to 8 ounces of water and seek immediate medical attention. DO NOT induce vomiting.

INHALATION: Remove to fresh air immediately. Use oxygen if there is difficulty breathing or artificial respiration if breathing has stopped. Do not leave victim unattended. Seek immediate medical attention if necessary.

SECTION VIII -- PRECAUTIONS FOR SAFE HANDLING AND USE

SPILL PROCEDURES: Isolate area and deny entry. Ventilate area and avoid breathing vapors. Absorb onto sand or other absorbent material. Shovel into closable container for disposal. Wear protective equipment specified below. Contain away from surface waters and sewers.

WASTE DISPOSAL METHODS: Dispose in accordance with Federal, State and local regulations. Contact Safety-Kleen regarding recycling.

HANDLING PRECAUTIONS: Do not get into eyes, on skin or clothing. Avoid breathing vapors. DO NOT smoke when using this product.

SHIPPING AND STORING PRECAUTIONS: Empty product containers may contain product residue. Do not pressurize, cut, heat, weld, grind or expose containers to flame or other sources of ignition. Keep container tightly closed when not in use and during transport. Because vapors are much heavier than air, do not store in basements, pits or depressions without ventilation at floor level.

PERSONAL HYGIENE: Use good personal hygiene. Wash thoroughly with soap and water after handling and before eating, drinking or using tobacco products. Clothing which becomes soaked with solvent should be removed immediately and must not be worn until it is thoroughly laundered and dried.

SAFETY-KLEEN DRY CLEANING GRADE SOLVENT F 780
MATERIAL SAFETY DATA SHEET

SECTION I -- PRODUCT INFORMATION

Safety-Kleen Corporation - 777 Big Timber Road - Elgin, IL 60123
For Product/Sales Information Call 708/697-8460

EMERGENCY TELEPHONE	*MEDICAL:*	*TRANSPORTATION:*
These numbers are for emergency use only. If you desire non-emergency information about this product, please call the telephone number listed above.	800/942-5969 or 312/942-5969 RUSH POISON CONTROL CENTER CHICAGO, ILLINOIS (24 HOURS)	800/424-9300 CHEMTREC

IDENTITY (TRADE NAME): SAFETY-KLEEN DRY CLEANING GRADE SOLVENT F 780

SK PART NUMBER: 780

FAMILY/CHEMICAL NAME: CHLORINATED/FLUORINATED HYDROCARBON

PRODUCT USAGE: DRY CLEANING SOLVENT

SECTION II -- HAZARDOUS COMPONENTS

NAME	SYNONYM	%	CAS NO.	OSHA PEL (ppm)	ACGIH TLV (ppm)
*Trichlorotrifluoroethane	Fluorocarbon 113	~100	76-13-1	1000 1250 STEL	1000

* See Section X - Other Regulatory Information

SECTION III -- PHYSICAL DATA

PHYSICAL STATE, APPEARANCE AND ODOR: Liquid - clear, colorless liquid with slight ethereal odor.

BOILING POINT: 117.6° F

MELTING POINT: Not Applicable

EVAPORATION RATE: 0.1 (CCl_4 = 1)

PERCENT VOLATILE: 100%

VAPOR DENSITY: 6.5 (Air = 1)

VAPOR PRESSURE: 334 mm Hg @ 77° F

SOLUBILITY IN WATER: 0.02% by weight (77° F)

pH: Not Applicable

SPECIFIC GRAVITY: 1.57 (Water = 1, @ 77° F)

MOLECULAR WEIGHT: 187

VOLATILE ORGANIC COMPOUNDS: None

OTHER POTENTIAL HEALTH HAZARDS: None Known

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:

Individuals with pre-existing lung, skin and cardiovascular system dysfunction may have increased susceptibility to effects of the exposure. Contact with skin may aggravate pre-existing dermatitis.

CARCINOGENICITY: No components are listed by OSHA, NTP or IARC as known or suspected carcinogens.

SECTION VII -- EMERGENCY AND FIRST AID PROCEDURES

EYES: Flush eyes with water for 20 minutes lifting upper and lower lids occasionally. Consult physician if irritation persists. If irritation or redness from exposure to vapors or mists develop, move victim away from exposure and into fresh air.

SKIN: Remove contaminated clothing. Wash skin twice with soap and water. If irritation persists, consult a physician.

INGESTION: Aspiration hazard. If conscious, dilute with 4 to 8 ounces of water and seek immediate medical attention. DO NOT induce vomiting.

INHALATION: Remove to fresh air immediately. Use oxygen if there is difficulty breathing or artificial respiration if breathing has stopped. Do not leave victim unattended. Seek immediate medical attention if necessary.

SECTION VIII -- PRECAUTIONS FOR SAFE HANDLING AND USE

SPILL PROCEDURES: Isolate area and deny entry. Ventilate area and avoid breathing vapors. Remove residue with inert sorbent such as sand, oil dry or other absorbent material. Shovel into closable container for disposal. Wear protective equipment specified below. Contain away from surface waters and sewers.

WASTE DISPOSAL METHODS: Dispose in accordance with Federal, State and local regulations. Contact Safety-Kleen regarding recycling.

HANDLING PRECAUTIONS: Do not get into eyes, on skin or clothing. Avoid breathing vapors or mists.

SHIPPING AND STORING PRECAUTIONS: Empty product containers may contain product residue. Do not pressurize, cut, heat, weld, grind or expose containers to flame or other sources of ignition. Keep container tightly closed when not in use and during transport. Do not store above 125° F.

PERSONAL HYGIENE: Use good personal hygiene. Wash thoroughly with soap and water after handling and before eating, drinking or using tobacco products.

SECTION IX -- CONTROL MEASURES

VENTILATION: Provide local exhaust or general dilution ventilation as determined necessary to maintain concentrations of vapors below applicable exposure limits.

PROTECTIVE GLOVES: Wear neoprene or nitrile gloves for repeated or prolonged contact.

EYE PROTECTION: Where there is likelihood of spill or splash, wear chemical goggles or faceshield. Contact lenses should not be worn.

Recycled Perchloroethylene for Dry Cleaning

Specifications

Physical Test	Specification
Specific Gravity 20°C/20°C	1.61 - 1.63
Pounds Per Gallon	13.4
Appearance	Clear, Free of Sediment Suspended Material
Color, APHA	25 maximum
Water, PPM	50 maximum
Purity: Perchloroethylene by Volume % G.C.	99.5 minimum
Impurities: Other halogenated	.5% maximum
Other hydrocarbons	.5% maximum
Odor	Characteristic; no residual
Spot Test	No Spot or Stain
Nonvolatile Residue, ppm	50 maximum
Acid Acceptance	.02 maximum

MATERIAL SAFETY DATA SHEET OHS09400

OCCUPATIONAL HEALTH SERVICES, INC. FOR EMERGENCY SOURCE INFORMATION,
11 WEST 42ND STREET, 12TH FLOOR CONTACT: 1-212-[illegible]
NEW YORK, NEW YORK 10036
1-800-445-MSDS 1-800-445-6777 OR 1-212-790-7575

SUBSTANCE IDENTIFICATION

CAS-NUMBER 107-21-1
RTEC-NUMBER KW2975000

SUBSTANCE: ETHYLENE GLYCOL

TRADE NAMES/SYNONYMS:
1,2-DIHYDROXYETHANE: 1,2-ETHANEDIOL: ETHYLENE ALCOHOL: GLYCOL:
GLYCOL ALCOHOL: MONOETHYLENE GLYCOL: DOWTHERM SR 1: ETHANE-1,2-DIOL:
LUTROL-9: MACROGOL 400 BPC: M.E.G.: TESCOL: 2-HYDROXYETHANOL:
ETHYLENE DIHYDRATE: DOWTHERM SR: C2H6O2: OHS09400

CHEMICAL FAMILY:
GLYCOL

MOLECULAR FORMULA: H-O-C-H2-C-H2-O-H MOLECULAR WEIGHT: 62.07

CERCLA RATINGS (SCALE 0-3): HEALTH=2 FIRE=1 REACTIVITY=0 PERSISTENCE=0
NFPA RATINGS (SCALE 0-4): HEALTH=1 FIRE=1 REACTIVITY=0

COMPONENTS AND CONTAMINANTS

COMPONENT: ETHYLENE GLYCOL CAS# 107-21-1 PERCENT: 100

OTHER CONTAMINANTS: NONE

EXPOSURE LIMIT:
ETHYLENE GLYCOL:
50 PPM (125 MG/M3) OSHA CEILING
50 PPM (125 MG/M3) ACGIH CEILING (VAPOR AND MIST)

SUBJECT TO SARA SECTION 313 ANNUAL TOXIC CHEMICAL RELEASE REPORTING

PHYSICAL DATA

DESCRIPTION: ODORLESS, COLORLESS, HYGROSCOPIC LIQUID WITH A SWEET TASTE.

BOILING POINT: 388 F (198 C) MELTING POINT: 10 F (-12 C)

SPECIFIC GRAVITY: 1.1088 SOLUBILITY IN WATER: SOLUBLE

VAPOR DENSITY: 2.14 VAPOR PRESSURE: 0.05 MMHG @ 20 C

OTHER SOLVENTS (SOLVENT - SOLUBILITY):
SOLUBLE IN ALCOHOL, ACETONE, GLYCEROL, ACETIC ACID,
ALDEHYDES, KETONES, PYRIDINE; SLIGHTLY SOLUBLE IN ETHER; PRACTICALLY INSOLUBLE
IN BENZENE, PETROLEUM ETHER, OILS, CHLORINATED HYDROCARBONS.

LD50: 7700 MG/KG INTRAMUSCULAR-RAT LD50: 4500 MG/KG INTRAMUSCULAR-RABBIT LD50: 1650 MG/KG UNREPORTED ROUTE-MAN LDLO:
MUTAGENIC DATA (RTECS): REPRODUCTIVE EFFECTS DATA (RTECS).
CARCINOGEN STATUS: NONE.
LOCAL EFFECTS: IRRITANT- INHALATION, SKIN, EYE.
ACUTE TOXICITY LEVEL: MODERATELY TOXIC BY INGESTION; SLIGHTLY TOXIC BY DERMAL ABSORPTION.
TARGET EFFECTS: CENTRAL NERVOUS SYSTEM DEPRESSANT; NEPHROTOXIN; NEUROTOXIN. POISONING MAY AFFECT THE LUNGS, HEART, BLOOD, BRAIN AND LIVER.

HEALTH EFFECTS AND FIRST AID

INHALATION:
ETHYLENE GLYCOL:
IRRITANT.
ACUTE EXPOSURE- INHALATION IS UNLIKELY AT ROOM TEMPERATURE, DUE TO THE LOW VAPOR PRESSURE. AEROSOLS AT 140 MG/M3 WERE IRRITATING, AND 200 MG/M3 WERE INTOLERABLE CAUSING A BURNING SENSATION OF THROAT AND COUGHING. EXPOSURE TO HIGH CONCENTRATIONS OF MISTS OR AEROSOLS MAY RESULT IN EFFECTS ON THE HEMATOPOIETIC SYSTEM AND CENTRAL NERVOUS SYSTEM WITH HEADACHE, DIZZINESS AND DROWSINESS.
CHRONIC EXPOSURE- HUMANS EXPOSED TO AEROSOLS FROM 3-67 MG/M3 CONTINUOUSLY FOR 1 MONTH REPORTED IRRITATION OF THE RESPIRATORY TRACT. OCCASIONALLY SLIGHT HEADACHE AND LOW BACKACHE, BUT NO OTHER SIGNIFICANT ADVERSE EFFECTS. CONTINUED EXPOSURE TO VAPORS FROM A PROCESS UTILIZING A MIXTURE OF ETHYLENE GLYCOL, BORIC ACID AND AMMONIA HEATED ABOVE 100 C RESULTED IN NYSTAGMUS, LYMPHOCYTOSIS AND SUDDEN LOSS OF CONSCIOUSNESS FOR 5-10 MINUTES. NYSTAGMUS OCCURRED 2-3 TIMES WEEKLY UNTIL EXPOSURE CEASED. REPEATED EXPOSURE TO SATURATED ETHYLENE GLYCOL VAPORS PRODUCED SLIGHT NARCOSIS IN RATS. EFFECTS ON THE FETUS HAVE BEEN REPORTED IN RATS AND MICE FOLLOWING EXPOSURE DURING GESTATION. THERE WAS A LIKELIHOOD THAT AT LEAST A PORTION OF THE EFFECTS RESULTED FROM INGESTION SINCE ANIMALS GROOMED CONSTANTLY BEFORE AND AFTER EXPOSURE.

FIRST AID- REMOVE FROM EXPOSURE AREA TO FRESH AIR IMMEDIATELY. IF BREATHING HAS STOPPED, PERFORM ARTIFICIAL RESPIRATION. KEEP PERSON WARM AND AT REST. TREAT SYMPTOMATICALLY AND SUPPORTIVELY. GET MEDICAL ATTENTION IMMEDIATELY.

SKIN CONTACT:
ETHYLENE GLYCOL:
IRRITANT.
ACUTE EXPOSURE- LIQUID MAY DEFAT THE SKIN AND CAUSE MINOR IRRITATION. ANIMAL STUDIES INDICATE THAT LETHAL AMOUNTS MAY BE ABSORBED THROUGH INTACT SKIN. ONE CASE HAS BEEN REPORTED OF COMA ACCOMPANIED BY MIOSIS AND SLOWED PULSE 4 HOURS AFTER MASSIVE APPLICATION OF AN ECZEMA REMEDY CONTAINING ETHYLENE GLYCOL. SENSITIZATION REACTIONS MAY OCCUR IN PREVIOUSLY EXPOSED PERSONS.
CHRONIC EXPOSURE- A SLIGHT MACERATING ACTION ON THE SKIN MAY RESULT FROM VERY SEVERE, PROLONGED EXPOSURE. REPEATED OR PROLONGED CONTACT MAY RESULT IN SENSITIZATION.

FIRST AID- REMOVE CONTAMINATED CLOTHING AND SHOES IMMEDIATELY. WASH AFFECTED AREA WITH SOAP OR MILD DETERGENT AND LARGE AMOUNTS OF WATER UNTIL NO EVIDENCE OF CHEMICAL REMAINS (APPROXIMATELY 15-20 MINUTES). GET MEDICAL ATTENTION IMMEDIATELY.

EYE CONTACT:

WHETHER THE SEVERITY OF POISONING REQUIRES ADMINISTRATION OF ANY ANTIDOTE AND ACTUAL DOSE REQUIRED SHOULD BE MADE BY QUALIFIED MEDICAL PERSONNEL.

ETHYLENE GLYCOL POISONING:
GIVE ETHANOL, 50% (100 PROOF), 1.5 ML/KG ORALLY INITIALLY, DILUTED TO NOT MORE THAN 5% SOLUTION, FOLLOWED BY 0.5-1.0 ML/KG EVERY 3 HOURS ORALLY OR INTRAVENOUSLY FOR 4 DAYS TO PREVENT METABOLISM OF INGESTED ETHYLENE GLYCOL TO OXALATE. BLOOD ETHANOL LEVEL SHOULD BE IN THE RANGE 1-1.5 MG/ML. GIVE CALCIUM GLUCONATE, 10 ML OF 10% SOLUTION DILUTED IN 1 LITER OF 5% GLUCOSE, INTRAVENOUSLY AS NECESSARY TO MAINTAIN NORMAL SERUM CALCIUM LEVELS. CALCIUM ADMINISTRATION MAY CAUSE ANURIA DUE TO PRECIPITATION OF CALCIUM OXALATE IN THE KIDNEYS (DREISBACH, HANDBOOK OF POISONING, 11TH ED.). IN THE ABSENCE OF RENAL IMPAIRMENT, FORCE FLUIDS TO 4 LITERS DAILY TO INCREASE EXCRETION OR PERFORM HEMODIALYSIS. ANTIDOTE SHOULD BE ADMINISTERED BY QUALIFIED MEDICAL PERSONNEL.

ORAL OR INTRAVENOUS ADMINISTRATION OF 4-METHYLPYRAZOLE INHIBITS ALCOHOL DEHYDROGENASE AND HAS BEEN USED EFFECTIVELY AS AN ANTIDOTE FOR METHANOL OR ETHYLENE GLYCOL POISONING (ELLENHORN AND BARCELOUX, MEDICAL TOXICOLOGY).

REACTIVITY SECTION

REACTIVITY:
STABLE UNDER NORMAL TEMPERATURES AND PRESSURES.

INCOMPATIBILITIES:
ETHYLENE GLYCOL:
- AMMONIUM DICHROMATE: IGNITES @ 100 C.
- CHLOROSULFONIC ACID: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
- CHROMIUM TRIOXIDE: IGNITES ON CONTACT.
- DIMETHYL TEREPHTHALATE + TITANIUM BUTOXIDE: POSSIBLE IGNITION.
- OLEUM: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
- OXIDIZERS (STRONG): FIRE AND EXPLOSION HAZARD.
- PERCHLORIC ACID: VIOLENT DECOMPOSITION.
- PHOSPHORUS(V) SULFIDE: EXPLOSIVE REACTION ON HEATING.
- POTASSIUM DICHROMATE: VIGOROUS EXOTHERMIC REACTION @ 100 C.
- POTASSIUM PERMANGANATE: IGNITES ON CONTACT.
- SILVER CHLORATE: IGNITES @ 100 C.
- SILVERED COPPER WIRE: IGNITES.
- SODIUM CHLORITE: IGNITES @ 100 C.
- SODIUM HYDROXIDE: EXPLOSION HAZARD.
- SODIUM PEROXIDE: IGNITES ON CONTACT.
- SULFURIC ACID: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
- URANYL NITRATE: IGNITES @ 100 C.

DECOMPOSITION:
THERMAL DECOMPOSITION PRODUCTS MAY INCLUDE TOXIC OXIDES OF CARBON.

POLYMERIZATION:
HAZARDOUS POLYMERIZATION HAS NOT BEEN REPORTED TO OCCUR UNDER NORMAL TEMPERATURES AND PRESSURES.

STORAGE-DISPOSAL

SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACEPIECE OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE.

FOR FIREFIGHTING AND OTHER IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONDITIONS:

SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE.

SUPPLIED-AIR RESPIRATOR WITH FULL FACEPIECE AND OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE IN COMBINATION WITH AN AUXILIARY SELF-CONTAINED BREATHING APPARATUS OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE.

CLOTHING:
EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE (IMPERVIOUS) CLOTHING AND EQUIPMENT TO PREVENT REPEATED OR PROLONGED SKIN CONTACT WITH THIS SUBSTANCE.

GLOVES:
EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE GLOVES TO PREVENT CONTACT WITH THIS SUBSTANCE.

EYE PROTECTION:
EMPLOYEE MUST WEAR SPLASH-PROOF OR DUST-RESISTANT SAFETY GOGGLES TO PREVENT EYE CONTACT WITH THIS SUBSTANCE.

EMERGENCY EYE WASH: WHERE THERE IS ANY POSSIBILITY THAT AN EMPLOYEE'S EYES MAY BE EXPOSED TO THIS SUBSTANCE, THE EMPLOYER SHOULD PROVIDE AN EYE WASH FOUNTAIN WITHIN THE IMMEDIATE WORK AREA FOR EMERGENCY USE.

AUTHORIZED BY- OCCUPATIONAL HEALTH SERVICES. INC.

CREATION DATE: 04/24/85 REVISION DATE: 10/09/90

USED OIL

MATERIAL SAFETY DATA SHEET

SECTION I -- PRODUCT INFORMATION

Safety-Kleen Corporation - 777 Big Timber Road - Elgin, IL 60123
For Product/Sales Information Call 708/697-8460

EMERGENCY TELEPHONE	*MEDICAL:*	*TRANSPORTATION:*
These numbers are for emergency use only. If you desire non-emergency information about this product, please call the telephone number listed above.	800/942-5969 or 312/942-5969 RUSH POISON CONTROL CENTER CHICAGO, ILLINOIS (24 HOURS)	800/424-9300 CHEMTREC

IDENTITY (TRADE NAME): USED OIL

SK PART NUMBER:

FAMILY/CHEMICAL NAME: MIXED WASTE OILS

PRODUCT USAGE: SUPPLEMENTAL FUEL

DRAFT

SECTION II -- HAZARDOUS COMPONENTS

NAME	SYNONYM	%	CAS NO.	OSHA PEL (mg/m^3)	ACGIH TLV (mg/m^3)
Waste Oil	Waste Mineral Oils	85-100	N/E	5 (Mineral Oil)	5 (Mineral Oil) 10 STEL
Mainly a mixture of aromatic, paraffinic, olefinic, naphthenic hydrocarbons. May contain chlorinated compounds as impurities.					
Water/Solids	N/E	0-15	N/E	N/E	N/E
May contain metals as impurities.					

N/E = Not Established
* See Section X - Other Regulatory Information

SECTION III -- PHYSICAL DATA

PHYSICAL STATE, APPEARANCE AND ODOR: Black liquid, mild petroleum odor.

BOILING POINT: > 500° F

MELTING POINT: Not Applicable

EVAPORATION RATE: Not Established

PERCENT VOLATILE: Majority

VAPOR DENSITY: Not Established

VAPOR PRESSURE: Not Established

SOLUBILITY IN WATER: Not Established

pH: Not Established

SPECIFIC GRAVITY: Less Than 1.0

CHRONIC: Prolonged and/or repeated contact may cause drying and cracking of the skin or dermatitis.

DRAFT

OTHER POTENTIAL HEALTH HAZARDS:

The impurities that may be present are not expected to add significantly to the effects of exposure.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:

Individuals with pre-existing central nervous system dysfunction may have increased susceptibility to the effects of exposure. Contact with skin may aggravate pre-existing dermatitis.

CARCINOGENICITY: Used motor oils are listed by IARC as suspected carcinogens.

SECTION VII -- EMERGENCY AND FIRST AID PROCEDURES

EYES: For direct contact, flush eyes with water for 15 minutes lifting upper and lower lids occasionally. Consult physician if irritation or pain persists. If irritation or redness from exposure to vapors or mists develop, move victim away from exposure into fresh air.

SKIN: Remove contaminated clothing. Wash skin twice with soap and water. If irritation develops and persists, consult a physician.

INGESTION: If conscious, dilute with 4 to 8 ounces of water and seek immediate medical attention. DO NOT induce vomiting.

INHALATION: Remove to fresh air immediately. Use oxygen if there is difficulty breathing or artificial respiration if respiration has stopped. Do not leave victim unattended. Seek immediate medical attention if necessary.

SECTION VIII -- PRECAUTIONS FOR SAFE USE AND HANDLING

SPILL PROCEDURES: Remove all ignition sources. Ventilate area and avoid breathing vapors. For large spills, isolate area and deny entry. If possible, contain as a liquid for possible re-refining. Absorb onto sand or other absorbent material. Shovel into closable container for disposal. Wear protective equipment specified below. Contain away from surface waters and sewers.

WASTE DISPOSAL METHODS: Dispose in accordance with Federal, State, and local regulations. Contact Safety-Kleen regarding recycling.

HANDLING PRECAUTIONS: Avoid contact with eyes, skin or clothing. Use in well ventilated area and avoid breathing vapors or mists. Keep away from heat, sparks and open flames.

SHIPPING AND STORING PRECAUTIONS: Empty product containers may contain product residue. Do not pressurize, cut, heat, weld, grind or expose containers to flame or other sources of ignition. Keep container tightly closed when not in use and during transport.

PERSONAL HYGIENE: Use good personal hygiene. Wash thoroughly with soap and water after handling and before eating, drinking or using tobacco products. Launder contaminated clothing and clean protective equipment before reuse.

MATERIAL SAFETY DATA SHEET
BASE OILS

SECTION I -- IDENTITY INFORMATION

BRESLUBE
DIVISION OF SAFETY KLEEN CANADA INC.
REGIONAL ROAD #17
P. O. BOX 130
BRESLAU, ONTARIO, CANADA
EMERGENCY PHONE NUMBERS:
519-648-2291
519-648-2204 (24 HOURS)
1-800-265-2444 (ONTARIO)
1-800-265-2792 (U.S.A.)
PRODUCT IDENTIFIER: BresLube - B85HT - B500HT Base Oils
Family/Chemical Name: Re-refined lubricating oil; Hydrocarbon
SYNONYMS: HVI paraffinic petroleum oil
PRODUCT USAGE: A base oil which does not contain additives. Used for certain lubrication activities and as a base oil which may be blended with additives.
This Material Safety Data Sheet is prepared as a generic sheet for the family of products listed in the Identity section above.

SECTION II -- HAZARDOUS INGREDIENTS

These products are not hazardous in their normal intended usage. However if these products are to be used in applications where oil mists are generated, please refer to the section of this sheet entitled Other Information.

SECTION III -- PHYSICAL DATA

PHYSICAL STATE: Liquid
APPEARANCE AND ODOUR: Amber viscous liquid with a characteristic petroleum odour.
Odour threshold: Not determined
BOILING POINT: Wide range. Generally > 260°C (500°F)
FREEZING POINT: Not applicable

EVAPORATION RATE: Very slow at room temperature. Approx. 1000X slower than ethyl ether.
PERCENT VOLATILE: Negligible
VAPOUR DENSITY: Not determined. Heavier than air.
VAPOUR PRESSURE: At 25°C, <1 x 10^{-3} mm Hg estimate from similar product
SOLUBILITY IN WATER: At 20°C, insoluble
PH: Not determined.
SPECIFIC GRAVITY: Approx. 0.85 - 0.88 @ 15.5°C (60°F) (H_2O = 1)
COEFFICIENT OF WATER/OIL DISTRIBUTION: Not determined.

SECTION IV -- FIRE AND EXPLOSION HAZARD DATA

FLASH POINT: 171°C (340°F) minimum. Cleveland Open Cup.
FIRE POINT: Not determined; Estimated to be 10 - 20 C° (18 - 36 F°) higher than flash point.
CONDITIONS OF FLAMMABILITY: Mu[illegible] be heated to sustain flames.
FLAMMABLE LIMITS IN AIR - LOWER: Not determined. (1% typical for petroleum product mists)
FLAMMABLE LIMITS IN AIR - UPPER: Not determined. (10% typical for petroleum product mists)
EXTINGUISHING MEDIA: Carbon Dioxide, Foam, Dry Chemical, Water Spray. Water jets or foam may cause frothing and cause material to spread.
FIRE FIGHTING PROCEDURES -- SPECIAL: Use self-contained breathing apparatus. Keep storage tanks cool using water spray.
UNUSUAL FIRE AND EXPLOSION HAZARDS: Decomposition and combustion products may be toxic. Heated tanks and drums may rupture, explode or be thrown into the air.
HAZARDOUS COMBUSTION PRODUCTS: Thermal decomposition and burning may produce carbon monoxide, carbon dioxide,

SECTION VII -- FIRST AID MEASURES

EMERGENCY AND FIRST AID PROCEDURES -- EYES: Flush eyes with water for 15 minutes or until irritation subsides. Get medical attention if irritation persists.
EMERGENCY AND FIRST AID PROCEDURES -- SKIN: Promptly remove from skin with dry cloth followed by thorough washing with mild soap and water. Treat burns from hot oil by running under cold water. Get medical attention if burns are serious.
EMERGENCY AND FIRST AID PROCEDURES -- INGESTION: Do not induce vomiting because of danger of aspirating liquid into lungs. If conscious, give large quantities of water or milk to dilute stomach contents. Do not attempt to give anything by mouth to an unconscious person. Get medical attention.
EMERGENCY AND FIRST AID PROCEDURES -- INHALATION: Remove to fresh air. Administer artificial respiration if breathing is stopped. Get medical attention.
EMERGENCY AND FIRST AID PROCEDURES -- OTHER: Remove and wash non-impervious contaminated clothing prior to reuse.

SECTION VIII -- PREVENTIVE MEASURES

SECTION VIII (a) -- SPILL OR LEAK PROCEDURES

SPILL PROCEDURES: If possible, contain as a liquid for possible re-refining. Absorb onto sand or other absorbent material. Shovel into closeable container for disposal. Wear protective equipment specified below. Contain away from surface waters and sewers.

WASTE DISPOSAL METHODS: Dispose in accordance with Federal, State, Provincial and local regulations. Contact manufacturer regarding recycling.

SECTION VIII (b) -- SPECIAL PROTECTION INFORMATION

VENTILATION: Local exhaust recommended where oil mist concentration exceeds TLV. Mechanical exhaust acceptable.
PROTECTIVE GLOVES: Wear impervious gloves. Neoprene or nitrile rubber recommended.
EYE PROTECTION: In cases where there is likelihood of eye contact, wear splashproof goggles.
RESPIRATORY PROTECTION: None required for normal conditions. Use approved equipment when exposed to oil mist concentrations above the personal exposure limit.
OTHER PROTECTIVE EQUIPMENT: Wear gauntlets and apron, especially for transfer of bulk quantities of product.

SECTION VIII (c) -- SPECIAL PRECAUTIONS

HANDLING PRECAUTIONS: Do not get in eyes, on skin or clothing. Do not inhale mists or heated vapors. Do not taste or swallow. Use with adequate ventilation. Wait for hot oil to cool before handling.
SHIPPING AND STORING PRECAUTIONS: Empty product containers may contain product residue. Do not reuse containers. Do not pressurize, cut, heat, weld, grind or expose containers to flame or other sources of ignition. Keep container tightly closed when not in use and during transport.

MATERIAL SAFETY DATA SHEET
DIESEL ENGINE OILS

BRESLUBE
DIESEL ENGINE OIL HD-2

SECTION I -- IDENTITY INFORMATION

BRESLUBE
DIVISION OF SAFETY-KLEEN CANADA, INC.
REGIONAL ROAD #17
P.O. BOX 130
BRESLAU,ONTARIO,CANADA
NOB 1MO
EMERGENCY PHONE NUMBERS:
519-648-2291
519-648-2204 (24 HOURS)
1-800-265-2444 (ONTARIO)
1-800-265-2792 (U.S.A.)
PRODUCT IDENTIFIER:

SAE 10W
SAE 20W20
SAE 30
SAE 40

Family/Chemical Name: Re-refined lubricating oil; Hydrocarbon
SYNONYMS:

HD-2 10W
HD-2 20W20
HD-2 30
HD-2 40

PRODUCT USAGE: Engine oils used for the lubrication of diesel engines.
This Material Safety Data Sheet is prepared as a generic sheet for the family of products listed in the Identity section above.

SECTION II -- HAZARDOUS INGREDIENTS

These products are not hazardous in their normal intended usage. However if these products are to be used in applications where oil mists are generated, please refer to the section of this sheet entitled Other Information.

SECTION III -- PHYSICAL DATA

PHYSICAL STATE: Liquid.
APPEARANCE AND ODOUR: Amber viscous liquid with a characteristic petroleum odour.
Odour threshold: Not determined
BOILING POINT: Wide range. Generally > 260°C (500°F)
FREEZING POINT: Not applicable.
EVAPORATION RATE: Very slow at room temperature. Approx. 1000X slower than ethyl ether.
PERCENT VOLATILE: Negligible.
VAPOUR DENSITY: Not determined. Heavier than air.
VAPOUR PRESSURE: At 25°C, <1 x 10^{-3}mm Hg estimate from similar product.
SOLUBILITY IN WATER: At 20°C, insoluble.
PH: Not determined.
SPECIFIC GRAVITY: Approx. 0.85 - 0.88 @ 15.5°C (60°F) (H_2O = 1)
COEFFICIENT OF WATER/OIL DISTRIBUTION: Not determined.

SECTION IV -- FIRE AND EXPLOSION HAZARD DATA

FLASH POINT: 171°C (340°F) minimum. Cleveland Open Cup.
FIRE POINT: Not determined; Estimated to be 10 - 20 C° (18 - 36 F°) higher than flash point.
CONDITIONS OF FLAMMABILITY: Must be heated to sustain flames.
FLAMMABLE LIMITS IN AIR - LOWER: Not determined (1% typical for petroleum product mists).
FLAMMABLE LIMITS IN AIR - UPPER: Not determined (10% typical for petroleum product mists).
EXTINGUISHING MEDIA: Carbon Dioxide, Foam, Dry Chemical, Water Spray. Water jets or foam may cause frothing and cause material to spread.
FIRE FIGHTING PROCEDURES -- SPECIAL: Use self-contained breathing apparatus. Keep storage tanks cool using water spray.

SECTION VI -- HEALTH HAZARD DATA CONTINUED...

MUTAGENICITY: This product has been tested by the Modified Salmonella Mutagenicity Assay and is predicted to be non-mutagenic.
TOXICOLOGICALLY SYNERGISTIC PRODUCTS: Not determined.

SECTION VII -- FIRST AID MEASURES

EMERGENCY AND FIRST AID PROCEDURES -- EYES: Flush eyes with water for 15 minutes or until irritation subsides. Get medical attention if irritation persists.
EMERGENCY AND FIRST AID PROCEDURES -- SKIN: Promptly remove from skin with dry cloth followed by thorough washing with mild soap and water. Treat burns from hot oil by running under cold water. Get medical attention if burns are serious.
EMERGENCY AND FIRST AID PROCEDURES -- INGESTION: Do not induce vomiting because of danger of aspirating liquid into lungs. If conscious, give large quantities of water or milk to dilute stomach contents. Do not attempt to give anything by mouth to an unconscious person. Get medical attention.
EMERGENCY AND FIRST AID PROCEDURES -- INHALATION: Remove to-fresh air. Administer artificial respiration if breathing is stopped. Get medical attention.
EMERGENCY AND FIRST AID PROCEDURES -- OTHER: Remove and wash non-impervious contaminated clothing prior to reuse.

SECTION VIII -- PREVENTIVE MEASURES

SECTION VIII (a) -- SPILL OR LEAK PROCEDURES

SPILL PROCEDURES: If possible, contain as a liquid for possible re-refining. Absorb onto sand or other absorbent material. Shovel into closeable container for disposal. Wear protective equipment specified below. Contain away from surface waters and sewers.
WASTE DISPOSAL METHODS: Dispose in accordance with Federal, State, Provincial and local regulations. Contact manufacturer regarding recycling.

SECTION VIII (b) -- SPECIAL PROTECTION INFORMATION

VENTILATION: Local exhaust recommended where oil mist concentration exceeds TLV. Mechanical exhaust acceptable.
PROTECTIVE GLOVES: Wear impervious gloves. Neoprene or nitrile rubber recommended.
EYE PROTECTION: In cases where there is likelihood of eye contact, wear splashproof goggles.
RESPIRATORY PROTECTION: None required for normal conditions. Use approved equipment when exposed to oil mist concentrations above the personal exposure limit.
OTHER PROTECTIVE EQUIPMENT: Wear gauntlets and apron, especially for transfer of bulk quantities of product.

MATERIAL SAFETY DATA SHEET
DIESEL ENGINE OILS

SECTION I -- IDENTITY INFORMATION

BRESLUBE
DIVISION OF SAFETY-KLEEN CANADA, INC.
REGIONAL ROAD # 17
P. O. BOX 130
BRESLAU,ONTARIO,CANADA
NOB 1MO
EMERGENCY PHONE NUMBERS:
519-648-2291
519-648-2204 (24 HOURS)
1-800-265-2444 (ONTARIO)
1-800-265-2792 (U.S.A.)
PRODUCT IDENTIFIER:

SAE 5W30	SAE 10W
SAE 10W30	SAE 20W20
SAE 10W40	SAE 30
SAE 15W40	SAE 40
	SAE 50

Family/Chemical Name: Re-refined lubricating oil; Hydrocarbon
SYNONYMS:

SHD 5W30	SHD 10W
SHD 10W30	SHD 20W20
SHD 10W40	SHD 30
SHD 15W40	SHD 40
	SHD 50

PRODUCT USAGE: Engine oils used for the lubrication of diesel engines.
This Material Safety Data Sheet is prepared as a generic sheet for the family of products listed in the Identity section above.

SECTION II -- HAZARDOUS INGREDIENTS

These products are not hazardous in their normal intended usage. However if these products are to be used in applications where oil mists are generated, please refer to the section of this sheet entitled Other Information.

SECTION III -- PHYSICAL DATA

PHYSICAL STATE: Liquid.
APPEARANCE AND ODOUR: Amber viscous liquid with a characteristic petroleum odour.
Odour threshold: Not determined.
BOILING POINT: Wide range. Generally > 260°C (500°F)
FREEZING POINT: Not applicable.
EVAPORATION RATE: Very slow at room temperature. Approx. 1000X slower than ethyl ether.
PERCENT VOLATILE: Negligible.
VAPOUR DENSITY: Not determined. Heavier than air.
VAPOUR PRESSURE: At 25°C, <1 x 10^{-3}mm Hg estimate from similar product.
SOLUBILITY IN WATER: At 20°C, insoluble.
PH: Not determined.
SPECIFIC GRAVITY: Approx. 0.85 - 0.88 @ 15.5°C (60°F) (H_2O = 1)
COEFFICIENT OF WATER/OIL DISTRIBUTION: Not determined.

SECTION IV -- FIRE AND EXPLOSION HAZARD DATA

FLASH POINT: 171°C (340°F) minimum. Cleveland Open Cup.
FIRE POINT: Not determined; Estimated to be 10 - 20 C° (18 - 36 F°) higher than flash point.
CONDITIONS OF FLAMMABILITY: Must be heated to sustain flames.
FLAMMABLE LIMITS IN AIR - LOWER: Not determined (1% typical for petroleum product mists).
FLAMMABLE LIMITS IN AIR - UPPER: Not determined (10% typical for petroleum product mists).
EXTINGUISHING MEDIA: Carbon Dioxide, Foam, Dry Chemical, Water Spray. Water jets or foam may cause frothing and cause material to spread.
FIRE FIGHTING PROCEDURES -- SPECIAL: Use self-contained breathing apparatus. Keep storage tanks cool using water spray.

SECTION VI -- HEALTH HAZARD DATA CONTINUED...

MUTAGENICITY: This product has been tested by the Modified Salmonella Mutagenicity Assay and is predicted to be non-mutagenic.
TOXICOLOGICALLY SYNERGISTIC PRODUCTS: Not determined.

SECTION VII -- FIRST AID MEASURES

EMERGENCY AND FIRST AID PROCEDURES -- EYES: Flush eyes with water for 15 minutes or until irritation subsides. Get medical attention if irritation persists.
EMERGENCY AND FIRST AID PROCEDURES -- SKIN: Promptly remove from skin with dry cloth followed by thorough washing with mild soap and water. Treat burns from hot oil by running under cold water. Get medical attention if burns are serious.
EMERGENCY AND FIRST AID PROCEDURES -- INGESTION: Do not induce vomiting because of danger of aspirating liquid into lungs. If conscious, give large quantities of water or milk to dilute stomach contents. Do not attempt to give anything by mouth to an unconscious person. Get medical attention.
EMERGENCY AND FIRST AID PROCEDURES -- INHALATION: Remove to fresh air. Administer artificial respiration if breathing is stopped. Get medical attention.
EMERGENCY AND FIRST AID PROCEDURES -- OTHER: Remove and wash non-impervious contaminated clothing prior to reuse.

SECTION VIII -- PREVENTIVE MEASURES

SECTION VIII (a) -- SPILL OR LEAK PROCEDURES

SPILL PROCEDURES: If possible, contain as a liquid for possible re-refining. Absorb onto sand or other absorbent material. Shovel into closeable container for disposal. Wear protective equipment specified below. Contain away from surface waters and sewers.
WASTE DISPOSAL METHODS: Dispose in accordance with Federal, State, Provincial and local regulations. Contact manufacturer regarding recycling.

SECTION VIII (b) -- SPECIAL PROTECTION INFORMATION

VENTILATION: Local exhaust recommended where oil mist concentration exceeds TLV. Mechanical exhaust acceptable.
PROTECTIVE GLOVES: Wear impervious gloves. Neoprene or nitrile rubber recommended.
EYE PROTECTION: In cases where there is likelihood of eye contact, wear splashproof goggles.
RESPIRATORY PROTECTION: None required for normal conditions. Use approved equipment when exposed to oil mist concentrations above the personal exposure limit.
OTHER PROTECTIVE EQUIPMENT: Wear gauntlets and apron, especially for transfer of bulk quantities of product.

MATERIAL SAFETY DATA SHEET
FUEL OILS

SECTION I -- IDENTITY INFORMATION

BRESLUBE
DIVISION OF SAFETY-KLEEN CANADA, INC.
REGIONAL ROAD #17
P. O. BOX 130
BRESLAU, ONTARIO, CANADA
EMERGENCY PHONE NUMBERS:
519-648-2291
519-648-2204 (24 HOURS)
1-800-265-2444 (ONTARIO)
1-800-265-2792 (U.S.A.)
PRODUCT IDENTIFIER:

BresLube # 2 Fuel Oil.

Family/Chemical Name: Hydrocarbon.
SYNONYMS: Diesel Fuel: Fuel Oil.
PRODUCT USAGE: A #2 Fuel oil equivalent used in large boilers or furnaces.
This Material Safety Data Sheet is prepared as a generic sheet for the family of products listed in the Identity section above.

SECTION II -- HAZARDOUS INGREDIENTS

SPECIFIC CHEMICAL NAME: Fuel Oil #2
PERCENT: 100%
CAS REGISTRY: 68476-30-2
HAZARD: Toxic Material; Combustible Liquid.

SECTION III -- PHYSICAL DATA

PHYSICAL STATE: Liquid.
APPEARANCE AND ODOUR: Amber liquid with a characteristic odour. Odour threshold: Not determined.
BOILING POINT: Wide range.
FREEZING POINT: Not applicable.

EVAPORATION RATE: Slow at room temperature. Approx. 1000X slower than ethyl ether.
PERCENT VOLATILE: Negligible.
VAPOUR DENSITY: Not determined. Heavier than air.
VAPOUR PRESSURE: At 25°C, <1 x 10^{-3} mm Hg estimate from similar product.
SOLUBILITY IN WATER: At 20°C, insoluble.
PH: Not determined.
SPECIFIC GRAVITY: Approx. 0.84 - 0.86 @ 15.5°C (60°F) (H_2O = 1)
COEFFICIENT OF WATER/OIL DISTRIBUTION: Not determined.

SECTION IV -- FIRE AND EXPLOSION HAZARD DATA

FLASH POINT: 50°C (132°F) minimum. Cleveland Open Cup.
FIRE POINT: Not determined; Estimated to be 10 - 20 C° (18 - 36 F°) higher than flash point.
CONDITIONS OF FLAMMABILITY: Must be heated to sustain flames.
FLAMMABLE LIMITS IN AIR - LOWER: Not determined (1% typical for petroleum product mists).
FLAMMABLE LIMITS IN AIR - UPPER: Not determined (10% typical for petroleum product mists).
EXTINGUISHING MEDIA: Carbon Dioxide, Foam, Dry Chemical, Water Spray. Water jets or foam may cause frothing and cause material to spread.
FIRE FIGHTING PROCEDURES -- SPECIAL: Use self-contained breathing apparatus. Keep storage tanks cool using water spray.
UNUSUAL FIRE AND EXPLOSION HAZARDS: Decomposition and combustion products may be toxic. Heated tanks and drums may rupture, explode or be thrown into the air.

SECTION VII -- FIRST AID MEASURES

EMERGENCY AND FIRST AID PROCEDURES -- EYES: Flush eyes with water for 15 minutes or until irritation subsides. Get medical attention if irritation persists.
EMERGENCY AND FIRST AID PROCEDURES -- SKIN: Promptly remove from skin with dry cloth followed by thorough washing with mild soap and water. Treat burns from hot oil by running under cold water. Get medical attention if burns are serious.
EMERGENCY AND FIRST AID PROCEDURES -- INGESTION: Do not induce vomiting because of danger of aspirating liquid into lungs. If conscious, give large quantities of water or milk to dilute stomach contents. Do not attempt to give anything by mouth to an unconscious person. Get medical attention.

EMERGENCY AND FIRST AID PROCEDURES -- INHALATION: Remove to fresh air. Administer artificial respiration if breathing is stopped. Get medical attention.
EMERGENCY AND FIRST AID PROCEDURES -- OTHER: Remove and wash non-impervious contaminated clothing prior to reuse.

SECTION VIII -- PREVENTIVE MEASURES

SECTION VIII (a) -- SPILL OR LEAK PROCEDURES

SPILL PROCEDURES: If possible, contain as a liquid for possible re-refining. Absorb onto sand or other absorbent material. Shovel into closeable container for disposal. Wear protective equipment specified below. Contain away from surface waters and sewers.
WASTE DISPOSAL METHODS: Dispose in accordance with Federal, State, Provincial and local regulations. Contact manufacturer regarding recycling.

SECTION VIII (b) -- SPECIAL PROTECTION INFORMATION

VENTILATION: Local exhaust recommended where oil mist concentration exceeds TLV. Mechanical exhaust acceptable.
PROTECTIVE GLOVES: Wear impervious gloves. Neoprene or nitrile rubber recommended.
EYE PROTECTION: In cases where there is likelihood of eye contact, wear splashproof goggles.
RESPIRATORY PROTECTION: None required for normal conditions. Use approved equipment when exposed to oil mist concentrations above the personal exposure limit.
OTHER PROTECTIVE EQUIPMENT: Wear gauntlets and apron, especially for transfer of bulk quantities of product.

SECTION VIII (c) -- SPECIAL PRECAUTIONS

HANDLING PRECAUTIONS: Do not use mouth to suction liquid due to aspiration hazard. Do not get in eyes, on skin or clothing. Do not inhale mists or heated vapors. Do not taste or swallow. Use with adequate ventilation.

MATERIAL SAFETY DATA SHEET
BRESLUBE FUEL OILS

SECTION I -- IDENTITY INFORMATION

PETROCON
DIVISION OF SAFETY-KLEEN CANADA INC.
UNION STREET
MODENA, PENSYLVANIA
EMERGENCY PHONE NUMBERS:
215-383-5262
519-648-2204 (24 HOURS)
1-800-265-2444 (ONTARIO)
1-800-265-2792 (U.S.A.)
PRODUCT IDENTIFIER: PETROCON # 4 Low Sulfur Fuel Oil
Family/Chemical Name: Hydrocarbon.
SYNONYMS: Fuel oil,Blended processed motor, hydraulic, chain oils with # 2 oil.
PRODUCT USAGE: A #4 Fuel oil equivalent used in large boilers or furnaces.
This Material Safety Data Sheet is prepared as a generic sheet for the family of products listed in the Identity section above.

SECTION II -- HAZARDOUS INGREDIENTS

SPECIFIC CHEMICAL NAME: Fuel Oil #4.
PERCENT: 100%
CAS REGISTRY: 68476-30-2.
HAZARD: Toxic Material; Combustible Liquid.

SECTION III -- PHYSICAL DATA

PHYSICAL STATE: Liquid.
APPEARANCE AND ODOUR: Black petroleum with a characteristic odour. Odour threshold: Not determined.
BOILING POINT: Wide range, >149^{0}C. (300^{0}F).

FREEZING POINT: Not applicable.
EVAPORATION RATE: Slow at room temperature. Approx. 1000X slower than ethyl ether.
PERCENT VOLATILE: Negligible.
VAPOUR DENSITY: Not determined. Heavier than air.
VAPOUR PRESSURE: At 25°C, <1 x 10^{-3} mm Hg estimate from similar product.
SOLUBILITY IN WATER: At 20°C, insoluble.
PH: Not determined.
SPECIFIC GRAVITY: Approx. 0.84 - 0.86 @ 15.5^{o}C (60°F) (H_2O = 1)
COEFFICIENT OF WATER/OIL DISTRIBUTION: Not determined.

SECTION IV -- FIRE AND EXPLOSION HAZARD DATA

FLASH POINT: 99°C (210°F). minimum. Cleveland Open Cup.
FIRE POINT: Not determined; Estimated to be 10 - 20 C^{o} (18 - 36 F^{o}) higher than flash point.
CONDITIONS OF FLAMMABILITY: Must be heated to sustain flames.
FLAMMABLE LIMITS IN AIR - LOWER: Not determined (1% typical for petroleum product mists).
FLAMMABLE LIMITS IN AIR - UPPER: Not determined (10% typical for petroleum product mists).
EXTINGUISHING MEDIA: Carbon Dioxide, Foam, Dry Chemical, Water Spray. Water jets or foam may cause frothing and cause material to spread.
FIRE FIGHTING PROCEDURES -- SPECIAL: Use self-contained breathing apparatus. Keep storage tanks cool using water spray.
UNUSUAL FIRE AND EXPLOSION HAZARDS: Decomposition and combustion products may be toxic. Heated tanks and drums may rupture, explode or be thrown into the air.

SECTION VII -- FIRST AID MEASURES

EMERGENCY AND FIRST AID PROCEDURES -- EYES: Flush eyes with water for 15 minutes or until irritation subsides. Get medical attention if irritation persists.
EMERGENCY AND FIRST AID PROCEDURES -- SKIN: Promptly remove from skin with dry cloth followed by thorough washing with mild soap and water. Treat burns from hot oil by running under cold water. Get medical attention if burns are serious.
EMERGENCY AND FIRST AID PROCEDURES -- INGESTION: Do not induce vomiting because of danger of aspirating liquid into lungs. If conscious, give large quantities of water or milk to dilute stomach contents. Do not attempt to give anything by mouth to an unconscious person. Get medical attention.
EMERGENCY AND FIRST AID PROCEDURES -- INHALATION: Remove to fresh air. Administer artificial respiration if breathing is stopped. Get medical attention.
EMERGENCY AND FIRST AID PROCEDURES -- OTHER: Remove and wash non-impervious contaminated clothing prior to reuse.

SECTION VIII -- PREVENTIVE MEASURES

SECTION VIII (a) -- SPILL OR LEAK PROCEDURES

SPILL PROCEDURES: If possible, contain as a liquid for possible re-refining. Absorb onto sand or other absorbent material. Shovel into closeable container for disposal. Wear protective equipment specified below. Contain away from surface waters and sewers.
WASTE DISPOSAL METHODS: Dispose in accordance with Federal, State, Provincial and local regulations. Contact manufacturer regarding recycling.

SECTION VIII (b) -- SPECIAL PROTECTION INFORMATION

VENTILATION: Local exhaust recommended where oil mist concentration exceeds TLV. Mechanical exhaust acceptable.
PROTECTIVE GLOVES: Wear impervious gloves. Neoprene or nitrile rubber recommended.
EYE PROTECTION: In cases where there is likelihood of eye contact, wear splashproof goggles.
RESPIRATORY PROTECTION: None required for normal conditions. Use approved equipment when exposed to oil mist concentrations above the personal exposure limit.
OTHER PROTECTIVE EQUIPMENT: Wear gauntlets and apron, especially for transfer of bulk quantities of product.

SECTION VIII (c) -- SPECIAL PRECAUTIONS

HANDLING PRECAUTIONS: Do not use mouth to suction liquid due to aspiration hazard. Do not get in eyes, on skin or clothing. Do not inhale mists or heated vapors. Do not taste or swallow. Use with adequate ventilation.

MATERIAL SAFETY DATA SHEET
BRESLUBE FUEL OILS

SECTION I -- IDENTITY INFORMATION

PETROCON
DIVISION OF SAFETY-KLEEN CANADA INC.
UNION STREET
MODENA, PENSYLVANIA
EMERGENCY PHONE NUMBERS:
215-383-5262
519-648-2204 (24 HOURS)
1-800-265-2444 (ONTARIO)
1-800-265-2792 (U.S.A.)
PRODUCT IDENTIFIER: PETROCON # 5 Low Sulfur Fuel Oil.
Family/Chemical Name: Hydrocarbon.
SYNONYMS: Fuel oil, blended processed motor, hydraulic, chain oils with # 2 oil.
PRODUCT USAGE: A # 5 Fuel oil equivalent used in large boilers or furnaces.
This Material Safety Data Sheet is prepared as a generic sheet for the family of products listed in the Identity section above.

SECTION II -- HAZARDOUS INGREDIENTS

SPECIFIC CHEMICAL NAME: Fuel Oil # 5.
PERCENT: 100%
CAS REGISTRY: 68476-30-2.
HAZARD: Toxic Material; Combustible Liquid.

SECTION III -- PHYSICAL DATA

PHYSICAL STATE: Liquid.
APPEARANCE AND ODOUR: Black petroleum with a characteristic odour. Odour threshold: Not determined.
BOILING POINT: Wide range, >149^{0}C (300^{0}F).
FREEZING POINT: Not applicable.
EVAPORATION RATE: Slow at room temperature. Approx. 1000X slower than ethyl ether.
PERCENT VOLATILE: Negligible.
VAPOUR DENSITY: Not determined. Heavier than air.
VAPOUR PRESSURE: At 25°C, <1 x 10^{-3} mm Hg estimate from similar product.
SOLUBILITY IN WATER: At 20°C, insoluble.
PH: Not determined.
SPECIFIC GRAVITY: Approx. 0.84 - 0.86 @ 15.5^{o}C (60°F) (H_2O = 1).
COEFFICIENT OF WATER/OIL DISTRIBUTION: Not determined.

SECTION IV -- FIRE AND EXPLOSION HAZARD DATA

FLASH POINT: 99°C (210°F). minimum. Cleveland Open Cup.
FIRE POINT: Not determined; Estimated to be 10 - 20 C^{o} (18 - 36 F^{o}) higher than flash point.
CONDITIONS OF FLAMMABILITY: Must be heated to sustain flames.
FLAMMABLE LIMITS IN AIR - LOWER: Not determined (1% typical for petroleum product mists).
FLAMMABLE LIMITS IN AIR - UPPER: Not determined (10% typical for petroleum product mists).
EXTINGUISHING MEDIA: Carbon Dioxide, Foam, Dry Chemical, Water Spray. Water jets or foam may cause frothing and cause material to spread.
FIRE FIGHTING PROCEDURES -- SPECIAL: Use self-contained breathing apparatus. Keep storage tanks cool using water spray.
UNUSUAL FIRE AND EXPLOSION HAZARDS: Decomposition and combustion products may be toxic. Heated tanks and drums may rupture, explode or be thrown into the air.

SECTION VII -- FIRST AID MEASURES

EMERGENCY AND FIRST AID PROCEDURES -- EYES: Flush eyes with water for 15 minutes or until irritation subsides. Get medical attention if irritation persists.
EMERGENCY AND FIRST AID PROCEDURES -- SKIN: Promptly remove from skin with dry cloth followed by thorough washing with mild soap and water. Treat burns from hot oil by running under cold water. Get medical attention if burns are serious.
EMERGENCY AND FIRST AID PROCEDURES -- INGESTION: Do not induce vomiting because of danger of aspirating liquid into lungs. If conscious, give large quantities of water or milk to dilute stomach contents. Do not attempt to give anything by mouth to an unconscious person. Get medical attention.
EMERGENCY AND FIRST AID PROCEDURES -- INHALATION: Remove to fresh air. Administer artificial respiration if breathing is stopped. Get medical attention.
EMERGENCY AND FIRST AID PROCEDURES -- OTHER: Remove and wash non-impervious contaminated clothing prior to reuse.

SECTION VIII -- PREVENTIVE MEASURES

SECTION VIII (a) -- SPILL OR LEAK PROCEDURES

SPILL PROCEDURES: If possible, contain as a liquid for possible re-refining. Absorb onto sand or other absorbent material. Shovel into closeable container for disposal. Wear protective equipment specified below. Contain away from surface waters and sewers.
WASTE DISPOSAL METHODS: Dispose in accordance with Federal, State, Provincial and local regulations. Contact manufacturer regarding recycling.

SECTION VIII (b) -- SPECIAL PROTECTION INFORMATION

VENTILATION: Local exhaust recommended where oil mist concentration exceeds TLV. Mechanical exhaust acceptable.
PROTECTIVE GLOVES: Wear impervious gloves. Neoprene or nitrile rubber recommended.
EYE PROTECTION: In cases where there is likelihood of eye contact, wear splashproof goggles.
RESPIRATORY PROTECTION: None required for normal conditions. Use approved equipment when exposed to oil mist concentrations above the personal exposure limit.
OTHER PROTECTIVE EQUIPMENT: Wear gauntlets and apron, especially for transfer of bulk quantities of product.

SECTION VIII (c) -- SPECIAL PRECAUTIONS

HANDLING PRECAUTIONS: Do not use mouth to suction liquid due to aspiration hazard. Do not get in eyes, on skin or clothing. Do not inhale mists or heated vapors. Do not taste or swallow. Use with adequate ventilation.

MATERIAL SAFETY DATA SHEET
HYDRAULIC OILS

SECTION I -- IDENTITY INFORMATION

BRESLUBE
DIVISION OF SAFETY-KLEEN CANADA INC.
REGIONAL ROAD #17
P. O. BOX 130
BRESLAU, ONTARIO, CANADA
NOB 1MO
EMERGENCY PHONE NUMBERS:
519-648-2291
519-648-2204 (24 HOURS)
1-800-265-2444 (ONTARIO)
1-800-265-2792 (U.S.A.)
PRODUCT IDENTIFIER:

AW 22H	AWD46H
AW 22HL	LT22
AW 32H	LT36
AW 46H	LT56
AW 68H	HYD30
AW 100H	
AW 150H	

Family/Chemical Name: Re-refined lubricating oil; Hydrocarbon.
SYNONYMS:
PRODUCT USAGE: Oils used for lubrication within hydraulic systems.
This Material Safety Data Sheet is prepared as a generic sheet for the family of products listed in the Identity section above.

SECTION II -- HAZARDOUS INGREDIENTS

These products are not hazardous in their normal intended usage. However if these products are to be used in applications where oil mists are generated, please refer to the section of this sheet entitled Other Information.

SECTION III -- PHYSICAL DATA

PHYSICAL STATE: Liquid.
APPEARANCE AND ODOUR: Amber viscous liquid with a characteristic petroleum odour.
Odour threshold: Not determined.

BOILING POINT: Wide range. Generally > 260°C (500°F)
FREEZING POINT: Not applicable.
EVAPORATION RATE: Very slow at room temperature. Approx. 1000X slower than ethyl ether.
PERCENT VOLATILE: Negligible.
VAPOUR DENSITY: Not determined. Heavier than air.
VAPOUR PRESSURE: At 25°C, <1 x 10^{-3} mm Hg estimate from similar product.
SOLUBILITY IN WATER: At 20°C, insoluble.
PH: Not determined.
SPECIFIC GRAVITY: Approx. 0.85 - 0.88 @ 15.5°C (60°F) (H_2O = 1)
COEFFICIENT OF WATER/OIL DISTRIBUTION: Not determined.

SECTION IV -- FIRE AND EXPLOSION HAZARD DATA

FLASH POINT: 171°C (340°F) minimum. Cleveland Open Cup.
FIRE POINT: Not determined; Estimated to be 10 - 20 C° (18 - 36 F°) higher than flash point.
CONDITIONS OF FLAMMABILITY: Must be heated to sustain flames.
FLAMMABLE LIMITS IN AIR - LOWER: Not determined (1% typical for petroleum product mists).
FLAMMABLE LIMITS IN AIR - UPPER: Not determined (10% typical for petroleum product mists).
EXTINGUISHING MEDIA: Carbon Dioxide, Foam, Dry Chemical, Water Spray. Water jets or foam may cause frothing and cause material to spread.
FIRE FIGHTING PROCEDURES -- SPECIAL: Use self-contained breathing apparatus. Keep storage tanks cool using water spray.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Decomposition and combustion products may be toxic. Heated tanks and drums may rupture, explode or be thrown into the air.

SECTION VII -- FIRST AID MEASURES

EMERGENCY AND FIRST AID PROCEDURES -- EYES: Flush eyes with water for 15 minutes or until irritation subsides. Get medical attention if irritation persists.
EMERGENCY AND FIRST AID PROCEDURES -- SKIN: Promptly remove from skin with dry cloth followed by thorough washing with mild soap and water. Treat burns from hot oil by running under cold water. Get medical attention if burns are serious.
EMERGENCY AND FIRST AID PROCEDURES -- INGESTION: Do not induce vomiting because of danger of aspirating liquid into lungs. If conscious, give large quantities of water or milk to dilute stomach contents. Do not attempt to give anything by mouth to an unconscious person. Get medical attention.
EMERGENCY AND FIRST AID PROCEDURES -- INHALATION: Remove to fresh air. Administer artificial respiration if breathing is stopped. Get medical attention.
EMERGENCY AND FIRST AID PROCEDURES -- OTHER: Remove and wash non-impervious contaminated clothing prior to reuse.

SECTION VIII -- PREVENTIVE MEASURES

SECTION VIII (a) -- SPILL OR LEAK PROCEDURES

SPILL PROCEDURES: If possible, contain as a liquid for possible re-refining. Absorb onto sand or other absorbent material. Shovel into closeable container for disposal. Wear protective equipment specified below.

Contain away from surface waters and sewers.
WASTE DISPOSAL METHODS: Dispose in accordance with Federal, State, Provincial and local regulations. Contact manufacturer regarding recycling.

SECTION VIII (b) -- SPECIAL PROTECTION INFORMATION

VENTILATION: Local exhaust recommended where oil mist concentration exceeds TLV. Mechanical exhaust acceptable.
PROTECTIVE GLOVES: Wear impervious gloves. Neoprene or nitrile rubber recommended.
EYE PROTECTION: In cases where there is likelihood of eye contact, wear splashproof goggles.
RESPIRATORY PROTECTION: None required for normal conditions. Use approved equipment when exposed to oil mist concentrations above the personal exposure limit.
OTHER PROTECTIVE EQUIPMENT: Wear gauntlets and apron, especially for transfer of bulk quantities of product.

SECTION VIII (c) -- SPECIAL PRECAUTIONS

HANDLING PRECAUTIONS: Do not get in eyes, on skin or clothing. Do not inhale mists or heated vapors. Do not taste or swallow. Use with adequate ventilation. Wait for hot oil to cool before handling.
SHIPPING AND STORING PRECAUTIONS: Empty product containers may contain product residue. Do not reuse. containers. Do not pressurize, cut, heat, weld, grind or expose containers to flame or other sources of ignition. Keep container tightly closed when not in use and during transport.

MATERIAL SAFETY DATA SHEET
PASSENGER CAR ENGINE OILS

SECTION I -- IDENTITY INFORMATION

BRESLUBE
DIVISION OF SAFETY-KLEEN CANADA INC.
REGIONAL ROAD #17
P. O. BOX 130
BRESLAU, ONTARIO, CANADA
NOB 1MO
EMERGENCY PHONE NUMBERS:
519-648-2291
519-648-2204 (24 HOURS)
1-800-265-2444 (ONTARIO)
1-800-265-2792 (U.S.A.)
PRODUCT IDENTIFIER:

SAE 5W30	SAE 10W
SAE 10W30	SAE 20W20
SAE 10W40	SAE 30
SAE 20W40	SAE 40
SAE 20W50	SAE 50

Family/Chemical Name: Re-refined lubricating oil; Hydrocarbon
SYNONYMS:
PRODUCT USAGE: Oils used for the lubrication in passenger motors. This Material Safety Data Sheet is prepared as a generic sheet for the family of products listed in the Identity section above.

SECTION II -- HAZARDOUS INGREDIENTS

These products are not hazardous in their normal intended usage. However if these products are to be used in applications where oil mists are generated, please refer to the section of this sheet entitled Other Information.

SECTION III -- PHYSICAL DATA

PHYSICAL STATE: Liquid
APPEARANCE AND ODOUR: Amber viscous liquid with a characteristic petroleum odour.
Odour threshold: Not determined
BOILING POINT: Wide range. Generally > 260°C (500°F)

FREEZING POINT: Not applicable.
EVAPORATION RATE: Very slow at room temperature. Approx. 1000X slower than ethyl ether.
PERCENT VOLATILE: Negligible.
VAPOUR DENSITY: Not determined. Heavier than air.
VAPOUR PRESSURE: At 25°C, <1 x 10^{-3} mm Hg estimate from similar product.
SOLUBILITY IN WATER: At 20°C, insoluble.
PH: Not determined.
SPECIFIC GRAVITY: Approx. 0.85 - 0.88 @ 15.5°C (60°F) (H_2O = 1)
COEFFICIENT OF WATER/OIL DISTRIBUTION: Not determined.

SECTION IV -- FIRE AND EXPLOSION HAZARD DATA

FLASH POINT: 171°C (340°F) minimum. Cleveland Open Cup.
FIRE POINT: Not determined; Estimated to be 10 - 20 C° (18 - 36 F°) higher than flash point.
CONDITIONS OF FLAMMABILITY: Must be heated to sustain flames.
FLAMMABLE LIMITS IN AIR - LOWER: Not determined (1% typical for petroleum product mists).
FLAMMABLE LIMITS IN AIR - UPPER: Not determined (10% typical for petroleum product mists).
EXTINGUISHING MEDIA: Carbon Dioxide, Foam, Dry Chemical, Water Spray. Water jets or foam may cause frothing and cause material to spread.
FIRE FIGHTING PROCEDURES -- SPECIAL: Use self-contained breathing apparatus. Keep storage tanks cool using water spray.
UNUSUAL FIRE AND EXPLOSION HAZARDS: Decomposition and combustion products may be toxic. Heated tanks and drums may rupture, explode or be thrown into the air.

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EMERGENCY AND FIRST AID PROCEDURES -- INGESTION: Do not induce vomiting because of danger of aspirating liquid into lungs. If conscious, give large quantities of water or milk to dilute stomach contents. Do not attempt to give anything by mouth to an unconscious person. Get medical attention.
EMERGENCY AND FIRST AID PROCEDURES -- INHALATION: Remove to fresh air. Administer artificial respiration if breathing is stopped. Get medical attention.
EMERGENCY AND FIRST AID PROCEDURES -- OTHER: Remove and wash non-impervious contaminated clothing prior to reuse.

SECTION VIII -- PREVENTIVE MEASURES

SECTION VIII (a) -- SPILL OR LEAK PROCEDURES

SPILL PROCEDURES: If possible, contain as a liquid for possible re-refining. Absorb onto sand or other absorbent material. Shovel into closeable container for disposal. Wear protective equipment specified below. Contain away from surface waters and sewers.

WASTE DISPOSAL METHODS: Dispose in accordance with Federal, State, Provincial and local regulations. Contact manufacturer regarding recycling.

SECTION VIII (b) -- SPECIAL PROTECTION INFORMATION

VENTILATION: Local exhaust recommended where oil mist concentration exceeds TLV. Mechanical exhaust acceptable.
PROTECTIVE GLOVES: Wear impervious gloves. Neoprene or nitrile rubber recommended.
EYE PROTECTION: In cases where there is likelihood of eye contact, wear splashproof goggles.
RESPIRATORY PROTECTION: None required for normal conditions. Use approved equipment when exposed to oil mist concentrations above the personal exposure limit.
OTHER PROTECTIVE EQUIPMENT: Wear gauntlets and aprón, especially for transfer of bulk quantities of product.

SECTION VIII (c) -- SPECIAL PRECAUTIONS

HANDLING PRECAUTIONS: Do not get in eyes, on skin or clothing. Do not inhale mists or heated vapors. Do not taste or swallow. Use with adequate ventilation. Wait for hot oil to cool before handling.
SHIPPING AND STORING PRECAUTIONS: Empty product containers may contain product residue. Do not reuse containers. Do not pressurize, cut, heat, weld, grind or expose containers to flame or other sources of ignition. Keep container tightly closed when not in use and during transport.

APPENDIX D

PHASE I RFI DATA MANAGEMENT PLAN
PART VI OF PHASE I RELEASE ASSESSMENT WORKPLAN
SAFETY-KLEEN CORP. RECYCLE CENTER
DOLTON, ILLINOIS
DATED MARCH 4, 1995

PROJECT: 815

PART VI

DATA MANAGEMENT PLAN

RCRA FACILITY INVESTIGATION
PHASE I RELEASE ASSESSMENT WORKPLAN
DOLTON RECYCLE CENTER

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PART VI

DATA MANAGEMENT PLAN

The Data Management Plan presents the procedures to be used to document and track investigation data and results. The objective of this plan is to organize and present the Phase I data and results in an understandable format that will permit decision-makers to 1) determine the need for and scope of a Phase II investigation, and 2) evaluate the need for and scope of corrective action to protect human health and the environment.

Data Record

The information sources for the Phase I Release Assessment will be field observations during soil and ground-water sampling and laboratory analyses of soil and ground-water samples collected at background and solid waste management unit locations. Procedures to organize and present these raw data are described below.

Field Data

The sampling team will record field observations during sampling in a field log book. The types of field observations to be recorded are listed in a section of Part IV entitled "Field Documentation." A copy of the field notes will be included as an appendix in the RFI Phase I Report.

Field observations are critical to the verification and interpretation of the laboratory data. During the quality assurance process (Part VII), the quality assurance officer will evaluate the validity of the laboratory data in part on the basis of apparent soil and ground-water quality observed by the project site manager during sampling. The quality assurance officer may request that the laboratory reanalyze certain samples for certain constituents with data that appear inconsistent with field observations.

The only quantitative data collected during soil sampling will be measurements of combustible gas and total organic vapors (TOV) as part of health and safety procedures (Part V) and field screening procedures (Part IV). The remainder of the field observations will be qualitative or descriptive. Graphical and/or tabular displays of TOV data are planned. A summary of qualitative and descriptive field observations will

be presented in the text of the report, and consistencies and contrasts between field observations and laboratory data will be noted.

Laboratory Data

A laboratory data report will be prepared by S-K Tech Center. This laboratory report will contain all laboratory data on the soil and ground-water samples as well as the quality assurance data. The laboratory data report will also include copies of the completed chain-of-custody/sample-analysis-request forms. A copy of the laboratory data report will be included as an appendix in the RFI Phase I Report. The laboratory data record will contain:

- A unique sample code which can be related to a sampling location shown on a map in the RFI Phase I Report
- Sample type (i.e., soil or water sample)
- Laboratory analysis identification number
- Constituent measured
- Analytical method
- Result of the analysis (e.g., concentration)
- The method detection limit

Data Reduction

Data reduction covers the handling of blind duplicates and internal laboratory replicates, outliers, data below method detection limits and quality assurance data. Blind duplicate data will be listed in the data summary tables, and not averaged. Internal laboratory replicate data will be averaged during data reduction, and the averages will be presented in the data summary tables of the RFI Phase I Report with a notation that the values represent internal laboratory replicate averages. Individual internal replicate data will be shown in the laboratory data report, and discussed under a quality assurance section in the RFI Phase I Report (Part VII).

Any program of environmental measurement can produce outlier numbers that lie outside the "expected" range of values. Outlier values may be the result of:

1. A catastrophic unnatural (but real) occurrence, such as a spill;

2. Inconsistent sampling or analytical chemistry methodology;

3. Errors in the transcription of data values or decimal points; and

4. True but extreme concentration measurements.

Documentation and validation of the cause of outliers will accompany any attempt to correct or delete data values, because true but extreme values will not be altered. Outlier values will not be omitted from the raw data reported to the regulatory agency, but will be identified as outliers within the data summary tables. Reasons for the outlying behavior will be provided in the data summary tables or in the text of the RFI Phase I report.

Data below detection limits will be expressed as "ND (method detection limit)," where "ND" means not detected and "method detection limit" is the quantitative value determined by the laboratory.

Quality assurance data will be discussed in detail in the quality assurance chapter of the Phase I Report. Quality assurance information will be included in other chapters to the extent that it affects the interpretation of sample data. In particular, constituents detected in the quality assurance samples and the samples collected from background sites may be included in the data summary tables, so that the reader can factor out background and sampling- or laboratory-introduced contaminants.

Tabular Displays

One objective of the Phase I Release Assessment is to identify if releases of hazardous waste or hazardous constituents from solid waste management units (SWMUs) has occurred, is occurring, or could occur. To accommodate that objective, the sample data from background and SWMU sites will be presented in data summary tables within the text. The tables will identify the sampling location and the concentration in milligrams per kilogram (parts per million) for each constituent detected in one or more samples. Background data will be listed under a tabular heading "Background Sites," and soil data from each SWMU will be listed under the appropriate tabular heading for that SWMU, such as "West Tank Farm." Ground-water data will not segregated by SWMU. If relevant,

data will be further sorted by stratification factor (location, soil layer, topography) and aquifer.

Constituents not detected in any sample will be grouped under a heading "All Other Constituents (number of other constituents)," and the data entry will be ND. Names of these other constituents and the method detection limits can be found in the appendix containing the laboratory data report. This grouping of "non-detect" data permit the report reader to focus more easily on the "detect" data of potential environmental significance.

The depth at which all soil samples were collected will be in a column on the soil data summary tables giving the depth in feet below ground surface (ft-bgs) at which the sample was collected. The aquifer from which ground-water samples were collected will be entered into the ground-water data summary tables. Constituents which are not hazardous constituents (40 CFR Part 261, Appendix VIII) will be identified in the data summary tables. Other information critical to the interpretation of the data will also be included as table footnotes for easy reference.

The second objective of Phase I is to evaluate whether any releases of hazardous constituents represent a hazard to human health and the environment. The U.S. Environmental Protection Agency (EPA) has proposed limits which represent a hazard to human health and the environment (55 FR 30798-30884, July 27, 1990). These limits or successors will be listed in the data summary tables for the hazardous constituents detected in one or more samples. Concentrations which exceed the limits will be highlighted in boldface type in the data summary tables. A footnote to the tables will explain the meaning of the boldface type.

Graphical Displays

Graphical displays will be used to highlight the most critical information collected during the Phase I investigation. The following figures will be included in the RFI Phase I report, if appropriate:

- A facility location map (Figure I-2-1 of Part I or similar)
- Sampling site location maps
- Facility plot plans with additional information that shows the SWMU or background sampling location, constituent, and concentrations for all con-

stituents which exceed background (unless too numerous) and/or which exceed the EPA limits indicating possible hazard to human health and the environment.

- Features which affect intramedia transport and potential receptors

- Areas where more data are required.

Air Quality Evaluation

Screening level mass loading calculations will be performed to determine whether air emissions from solid waste management units (SWMUs) will pose a threat to human health or the environment. Screening calculations will be conservatively based on methods presented by the U.S. Environmental Protection Agency for the calculations of volatilization of chemicals released directly onto surface soils (U.S. Environmental Protection Agency, 1988). Safety-Kleen Corp. will use the soil and ground-water quality data collected from the shallowest depth during the Phase I Release Assessment to perform these calculations. The calculated loading rates from SWMUs will be compared to the regulatory limits on air emissions from all process vents at the facility to determine if the SWMU loadings pose a threat to human health or the environment.

Reporting

Three types of reports will be prepared during Phase I. The RFI Phase I Release Assessment Workplan will clearly define the objectives of the investigation and the procedures to achieve those objectives. A final report will be submitted to the decision makers (Safety-Kleen Corp. and the Illinois Environmental Protection Agency), and will include the information necessary to determine the need for and scope of a Phase II investigation and the need for and scope of corrective action. Quarterly progress reports will keep the decision makers informed of the progress of the Phase I investigation.

Workplan

This RFI Phase I Workplan describes the objectives, personnel, time schedule, and procedures to be implemented

during the Phase I investigation. The Phase I release assessment investigation will not commence until concurrence is achieved on this Workplan.

Quarterly Progress Reports

Quarterly progress reports will be submitted to summarize information regarding percentage of the project completed, activities completed during the reporting period, changes in the implementation of the Workplan, problems encountered during the reporting period, proposed corrections to these problems, projected work for the next reporting period, and any other pertinent information.

Final Report

An RFI Phase I Release Assessment Report will be submitted to the agencies at the completion of the project. The report will include:

- Sampling locations and sampling procedures;
- Appendices containing field observations made during sampling and the laboratory data report;
- Tabular summaries of the Phase I laboratory data with highlights of data exceeding background and/or EPA limits indicating potential impacts to human health and the environment; and
- Graphical displays of sampling locations with a listing of concentrations exceeding background (unless too numerous) and exceeding EPA limits indicating potential impacts to human health and the environment.

The report will be revised and resubmitted if errors are found in the report which significantly affect the decision-making process.

If a significant release of hazardous constituents from a SWMU or AOC is identified during Phase I, Safety-Kleen Corp. will prepare an RFI Phase II Workplan to conduct additional investigations of impacts from the facility SWMUs on ground water, surface water, soils, and air. The content of the Workplan will be directed by the results collected during Phase I.

References

U.S. Environmental Protection Agency, 1988. Superfund Exposure Assessment Manual, Office of Remedial Response, Washington, D.C.

APPENDIX E

PHASE I RFI QUALITY ASSURANCE PLAN
PART VII OF PHASE I RELEASE ASSESSMENT WORKPLAN
SAFETY-KLEEN CORP. RECYCLE CENTER
DOLTON, ILLINOIS
DATED MARCH 4, 1995

PART VII

QUALITY ASSURANCE PROJECT PLAN

RCRA FACILITY INVESTIGATION
PHASE I RELEASE ASSESSMENT WORKPLAN
DOLTON RECYCLE CENTER
DOLTON, ILLINOIS
ILD980613913

_____ Illinois Environmental Protection Agency Project Coordinator

_____ Safety-Kleen Corp. Project Manager

_____ TriHydro Corporation Project Manager and/or Quality Assurance Officer

_____ S-K Environmental Laboratory Quality Assurance Officer

Note: To be reviewed and signed prior to sampling event.

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PART VII - QUALITY ASSURANCE PROJECT PLAN

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PART VII - QUALITY ASSURANCE PROJECT PLAN

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SECTION VII-3

PROJECT DESCRIPTION

This Quality Assurance Project Plan (QAPjP) contains the procedures that will be used by Safety-Kleen Corp. (S-K) to ensure that data collected during the RCRA Facility Investigation (RFI) Phase I Release Assessment are complete, representative, comparable, accurate, and precise. The QAPjP presents the management organization, project and quality assurance objectives, and quality assurance and quality control (QA/QC) activities. It also describes the specific protocols which will be followed for sampling, sample handling and storage, chain of custody, and laboratory analysis to promote quality assurance and quality control.

The analytical laboratory (S-K Environmental Laboratory) plays a particularly important role in QA/QC. For that reason, a special section on laboratory QA/QC protocol is included as Appendix VII-A. Sections of the laboratory QA/QC are referenced where appropriate in the text of this QAPjP.

RFI Objectives

Safety-Kleen Corp. (S-K) owns and operates a recycling facility (SIC 2851) in Dolton, Illinois. S-K has owned and operated the facility since March 1987. The Dolton Recycle Center occupies a 30-acre site in an industrialized area about 20 miles south of downtown Chicago, Illinois (Figure VII-3-1). The address of the facility is:

Safety-Kleen Corp.
633 East 138th Street
Dolton, IL 60419

The Dolton Recycle Center is a reclamation and recycling facility that accepts organic chemicals and solvent wastes from S-K service centers and other S-K recycle centers, and from industrial and commercial facilities. Spent materials brought to the facility are regenerated into product or blended for use as a fuel in cement kilns. Principal wastes managed at the facility are paint waste, lacquer thinner, mineral spirits, and waste oil.

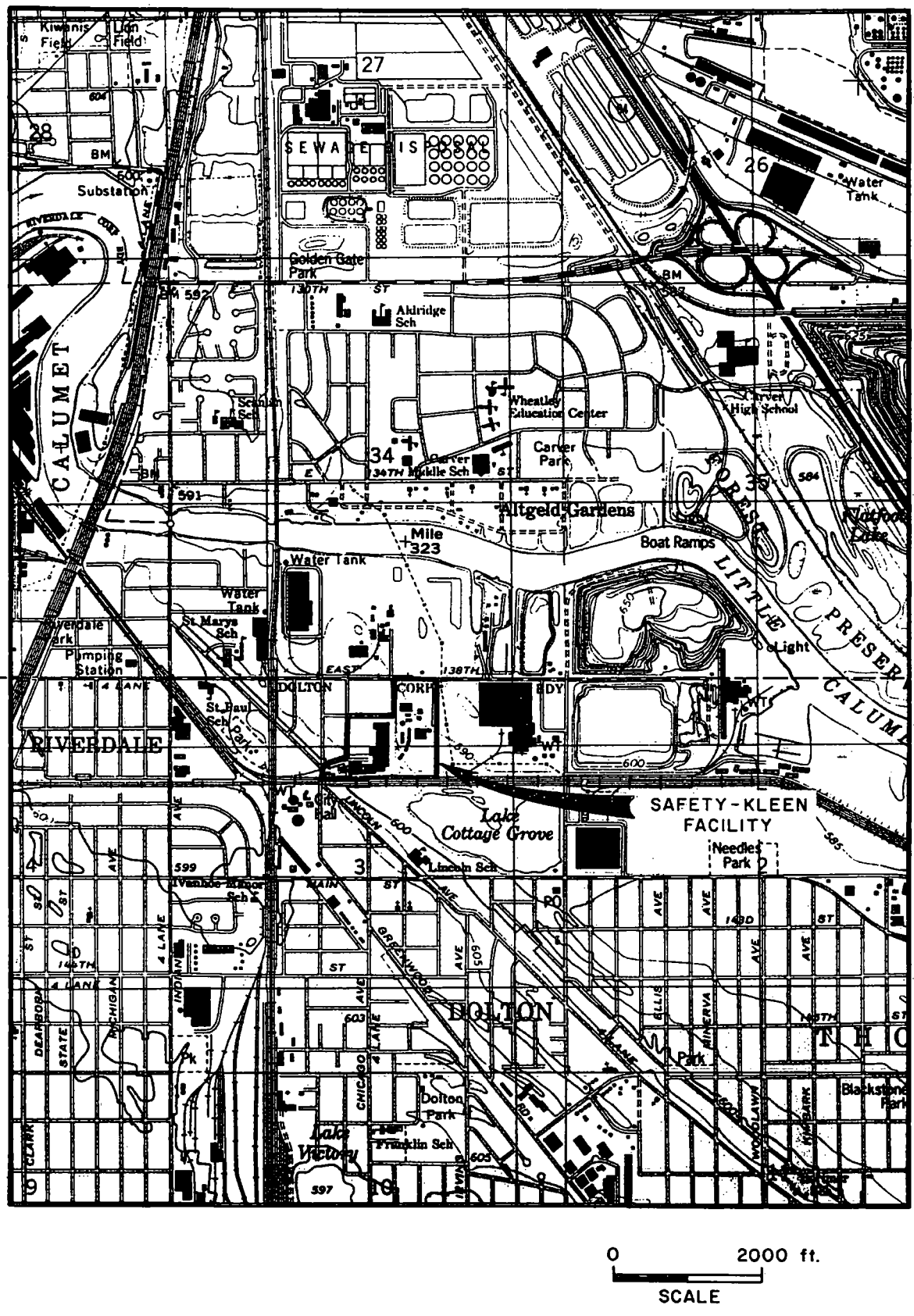


FIGURE VII-3-1 :VICINITY MAP, SAFETY–KLEEN CORP. RECYCLE CENTER, DOLTON, ILLINOIS (ILD980613913)

The Dolton Recycle Center is permitted to store and treat RCRA hazardous wastes (ILD980613913). As a condition of the RCRA permit, the Illinois Environmental Protection Agency (IEPA) requires S-K to conduct a RCRA Facility Investigation (RFI). The purpose of the RFI is to determine the nature and extent of releases of hazardous wastes and hazardous constituents from certain solid waste management units (SWMUs) and areas of concern (AOC) at the facility.

In order to achieve the RFI objective, Illinois Environmental Protection Agency (IEPA) designed a three-phase process and incorporated it into the Part B Permit:

- Phase I - Release Assessment - Phase I is designed to provide information on the characteristics and integrity of each SWMU and to determine if a SWMU has released, is currently releasing, or has the potential to release hazardous waste and/or hazardous constituents to the soil or air.

- Phase II - Extent of Release Assessment - Phase II is designed to define the extent of releases (if any) to soil from these subject SWMUs.

- Phase III - Ground-Water Release Assessment - Phase III is designed to define the extent of releases to the ground water (if any) from SWMUs identified in Phase I or II to have potentially released hazardous waste or hazardous constituents to the ground water.

Regional Setting

The Dolton Recycle Center is located in the Village of Dolton approximately 20 miles south of downtown Chicago. The site occupies 30 acres in an area zoned M-5 (Industrial), which is the heaviest classification of industrial zoning in Cook County. The site and surrounding area have historically been devoted to light to heavy industrial users.

The site slopes very gently from south to north, and has about 5 feet of relief. The facility is not located in areas prone to flooding during a 100-year flood, based on information from the Illinois Department of Transportation, Division of Water Resources.

The surface water features are the Little Calumet River, associated man-made marinas, and Lake Cottage Grove. The river flows east into Lake Michigan. The water level in the river is approximately 10 feet below the land surface elevation at the facility. The water level in Lake Cottage Grove is approximately 5 feet below the land surface at the facility.

Stormwater at the facility is routed by onsite sewers to the municipal sanitary sewer system. Therefore, no surface water from the site is discharged to either the Little Calumet River or Lake Cottage Grove.

Property use immediately surrounding the Center are open land to the north and east, a railroad corridor to the south, and a residential area to the west. The Stauffer Chemical/ Rhone-Poulenc Basic Chemical Plant is located northwest of the Dolton Recycle Center. Fertilizer is produced at the plant. The plant has underground storage tanks, and is a large quantity generator of RCRA hazardous ignitable (D001), corrosive (D002), and reactive (D003) wastes.

Site Subsurface Conditions

Considerable information regarding subsurface conditions has been collected during previous investigations at the Dolton Recycle Center. Subsurface data have been collected at 63 locations on the facility during previous investigations. These previous investigations include:

- A 1979 geotechnical investigation to support plant expansion.
- A 1981 geotechnical investigation to support plant expansion.
- A 1983 environmental investigation in the vicinity of former underground storage tanks (USTs).
- A 1988 due diligence environmental investigation associated with property ownership transfer.
- A 1990 due diligence environmental investigation associated with property ownership transfer.
- A 1990-1991 environmental investigation to document clean closure of two fuel oil UST areas.

These data collected during the six previous investigations have led to the identification of three impacted areas at the facility as well as site-specific conditions which limit the extent of impacts. This information has satisfied the objectives of Phase I of the RCRA Facility Investigation (RFI) to a large extent.

Soils Conditions

The sediment in the area consists of low permeability lake silts and clays, with a few interbedded sand lenses. Under the low permeability silts and clays is the Silurian-age Niagaran Dolomite Series. The formation is underlain progressively by the Maquoqueta Shale and the Galena-Platteville Series (mostly carbonates).

The lithology is consistent across the site. At the surface is a layer of topsoil (silty clay loam) or fill which is 1 to 4 feet thick. The fill consists of clay, silt, sand, gravel and rubble.

Under the topsoil or fill are silts and fine sands of the Carmi Member of the Equality Formation. This member consists of local discontinuous lenses of clay and medium to coarse-grained sand interbedded in the silt and fine sand matrix. The thickness of the silts and fine sands varies from up to 15 feet in the southeastern corner of the site to absent in the northeastern part of the site.

Under the silts and fine sands is the Wadsworth Member of the Wedron Formation, which is the dominant soil unit underlying the entire site. These deposits are low permeability, gray to brown silty clays and clayey silts. The clays are 35 to 40 feet thick across the entire site, and extend to bedrock. The composition of the clays changes from stiff at shallow depths to very stiff and hard near bedrock.

Bedrock was encountered at approximately 45 feet below ground surface. The uppermost bedrock is a hard, gray dolomite which is moderately fractured in the upper several feet, but less fractured with depth. No open voids were encountered in the bedrock during drilling.

Soil quality data indicate three areas of current or former soil impacts:

- East Field. Xylenes, toluene, and ethylbenzenes were measured at concentrations greater than 10 ppm.

These constituents are principal components of mineral spirits. Only two chlorinated compounds were detected (1,1,2-trichloroethane at 0.4 ppm and methylene chloride at 0.25 ppm) at concentrations near the detection limit. Eight inorganic constituents were analyzed, and concentrations were at expected background levels.

- West Tank Farm. Just as at the East Field, xylenes, toluene, and ethylbenzene were measured at concentrations greater than 10 ppm in samples collected to 5 feet below ground surface. No other VOCs (including no chlorinated VOCs) were detected at the West Tank Farm. VOC concentrations attenuated to below detection limits at 10 feet. Concentrations of inorganic constituents were at expected background levels.

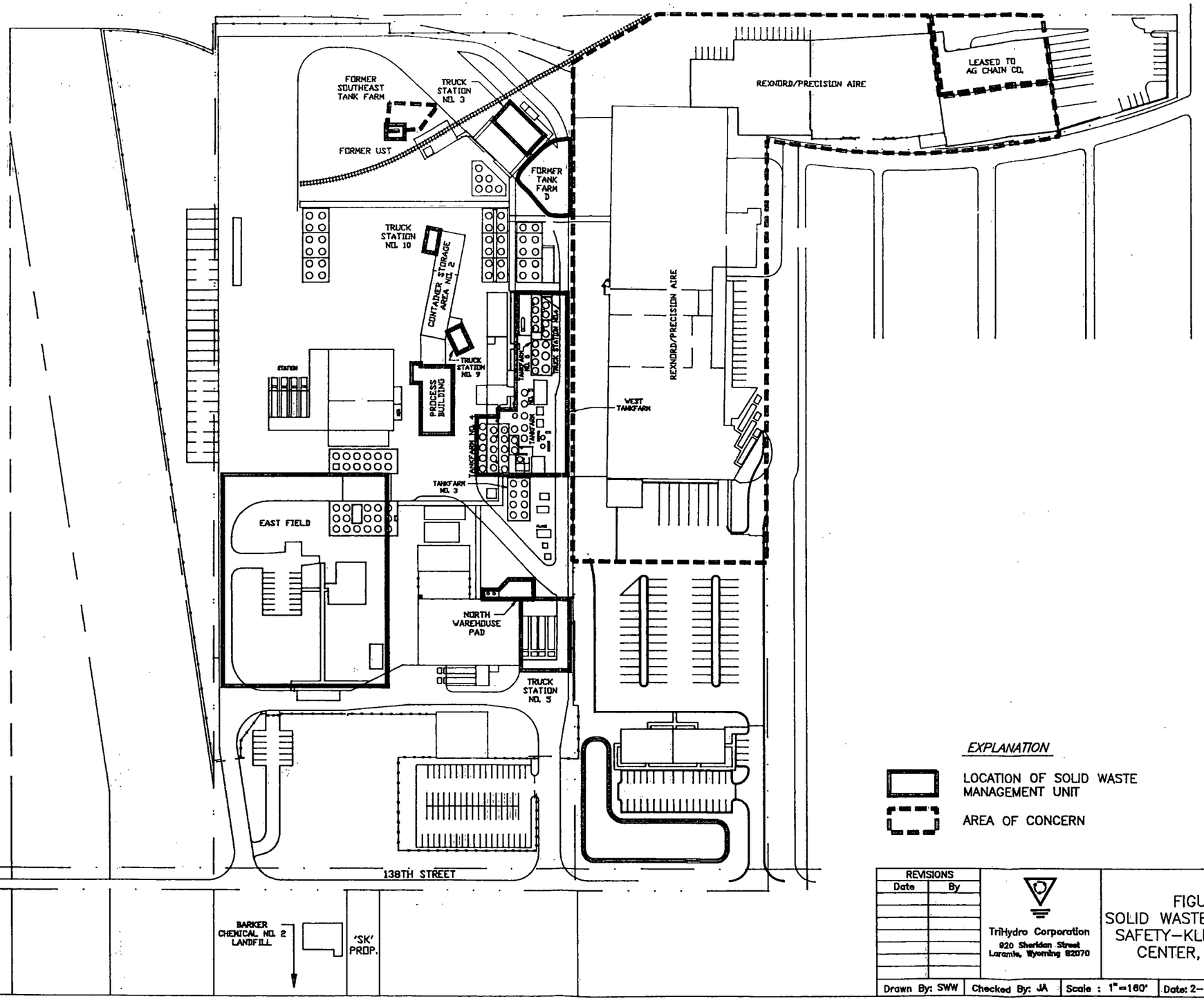
- Former Tank Farm D. Just as at the other two SWMUs, xylenes, toluene, and ethylbenzene were measured at concentrations greater than 10 ppm. In addition, acetone and methyl isobutyl ketone (4-methyl 1,2-pentanone), which are principal components of lacquer thinner, were measured at concentrations greater than 10 ppm. Methylene chloride (0.1 ppm) was the only chlorinated VOC detected. Concentrations of inorganic constituents were at expected background levels.

The locations of the three solid waste management units (SWMUs) mentioned above are shown on Figure VII-3-2.

Ground-Water Conditions

The regional hydrogeology includes two shallow, water-bearing zones: a near-surface water-bearing zone perched on low permeability clays and silts and the Niagaran Dolomite aquifer. The shallow perched water-bearing zone was encountered at depths of 1 to 5 feet below ground surface. The shallow zone is present where permeable materials (fill and fine sand) are present. The shallow zone reaches its maximum thickness in the southeastern part at 15 feet. The shallow zone has been absent in the northeast corner.

A clay aquitard at least 30 feet thick underlies the entire facility. Based on a low permeability (2.7 to 5.5×10^{-8} cm/sec) and thicknesses greater than 30 feet across the entire site, the clay layer serves as a effective aquitard to prevent downward



REVISIONS	
Date	By

TriHydro Corporation
920 Sheridan Street
Laramie, Wyoming 82070

FIGURE VII-3-2
SOLID WASTE MANAGEMENT UNITS,
SAFETY-KLEEN CORP. RECYCLE CENTER, DOLTON, ILLINOIS

Drawn By: SWW	Checked By: JA	Scale : 1"=160'	Date: 2-14-94	Disk Reference: SKDISWMU

migration of constituents in the perched zone to the dolomite aquifer.

Underlying the clay aquitard is the dolomite aquifer at 45 feet below ground surface. Water was encountered near the bedrock surface in the three shallow bedrock monitoring wells installed at the site. Water supply wells at and near the facility are completed considerably deeper in bedrock; total depths of the water supply wells are a minimum of 210 feet below ground surface.

Ground water in the perched zone tends to flow from the southwestern corner toward the east and west property boundaries. The perched water-bearing zone was absent in the northeastern part of the facility in 1988 and 1993. The gradient is flat through much of the facility, and thus flow rates will be low in those areas.

Ground-water flow in the dolomite aquifer at the site is toward the southwest, based on 1988 data. Regionally, ground water in the dolomite aquifer is reported to flow eastward toward Lake Michigan. The difference between local and regional flow directions in the bedrock aquifer may be due to local pumping of water supply wells.

Ground-water quality was monitored in October-November 1983 and in October 1988. Ground-water quality impacts were identified in the East Field, at the West Tank Farm and east of Former Tank Farm D. Volatile organic constituents (VOCs) and metals were not detected at the other ground-water monitoring locations. The following VOCs exceeded Illinois Class II standards:

- Benzene, toluene, and trichloroethene in the West Tank Farm.
- 1,1,1-Trichloroethane near Former Tank Farm D.
- Tetrachloroethene in the East Field.

Metals concentrations were consistently at or below detection limits in the East Field and West Tank Farm.

Solid Waste Management Units

The locations of solid waste management units (SWMUs) and areas of concern (AOCs) covered by the RFI are shown on Figure VII-3-2. Several of the SWMUs have been combined into Corrective Action Management Units (CAMUs) because of their proximity and similarity of wastes managed. SWMUs, CAMUs, and AOCs addressed in this Workplan are:

- Barker Chemical No. 2
- East Field
- Truck Station No. 3
- Truck Station No. 5
- North Warehouse Pad (Former Truck Station No. 6)
- Truck Station No. 9
- Truck Station No. 10
- Process Area in the South Warehouse (including Drum Emptying Unit Vat 1, Automated Drum Handling Unit Vat 2, Ballmill and Ballmill Sump)
- West Tank Farm [including Driveway to the Facility, Tank Farm No. 4, Tank Farm No. 5 (in-process storage tanks, Solvent Dryers #1 through #4, Pot Stills #1 and #2, Distillation Column, Thin Film Evaporator and Vapor Recovery Systems), Tank Farm No. 6, and Truck Station No. 4]
- Former Tank Farm D
- Former Southeast Tank Farm
- Rexnord/Precision Aire
- TriStamp/Agri-Chain

After discussions between S-K and IEPA, the other SWMUs listed in the Part B Permit (Container Storage Areas 1 and 2) were considered to be covered by other sections of the permit, and thus are not included in this Workplan (Illinois Environmental Protection Agency, 1994).

Phase I Technical Approach

The Phase I technical approach has been designed to achieve the Phase I objective and to be consistent with the IEPA guidance in Attachment F of the Part B Permit for the Dolton Recycle Center. The technical approach accommodates the physical and chemical conditions present at the facility, which are detailed in Parts I and II of this Workplan.

Phase I Scope

In order to achieve the Phase I objectives, the specific goals of the SAP are to:

- Collect soil samples from those accessible locations and depths which are most likely to permit identification and proper characterization of a SWMU-related release of hazardous wastes or hazardous constituents, if a release has occurred.

- Analyze the soil samples for the SWMU-related hazardous constituents which permit the identification, characterization, and hazard evaluation of a release.

- Implement sampling and analysis procedures which promote the quality assurance goals of completeness, representativeness, comparability, accuracy, and precision.

The soils data will also be used to determine the potential for a release to air, as described in the Data Management Plan (Part VI of the Workplan).

Although not required for Phase I by the Part B Permit, Safety-Kleen Corp. (S-K) intends to conduct voluntary ground-water assessment during Phase I to identify and characterize ground-water quality impacts and further evaluate ground-water flow directions in the shallow perched zone. This information will be used to design appropriate activities during subsequent phases of the RCRA Facility Investigation (RFI).

Sampling Locations

Sampling locations have been selected to provide an evaluation of worst-case conditions caused by a release or potential release of hazardous wastes or hazardous constituents.

Sampling will take place in areas of known releases, in areas where previous field screening data indicate releases have occurred, and in areas where experience from similar sites indicates releases are most likely to occur.

The background sampling locations are shown on Figure VII-3-3. The four background locations have been selected to satisfy the following criteria:

1. Located on Dolton facility property to minimize uncertainties about prior uses in the background areas.

2. Located at least 50 feet from any SWMUs listed in the Part B Permit as modified by IEPA and S-K.

3. Located at least 50 feet from any current or past industrial activity, based on review of aerial photos.

4. Spatial distribution across facility.

5. Same soil textures as encountered in SWMU soil samples (because natural inorganic constituent concentrations are a function in part of soil texture).

Background locations will be sampled first to minimize the potential for cross-contamination. If the onsite geologist determines that background soil samples are of a different soil texture than SWMU soil samples, he/she will collect samples from other background locations in order to satisfy the five background selection criteria listed above.

Twenty-three locations south of 138th Street will be sampled to identify and characterize releases to soils and shallow perched ground water. Criteria used to select sampling locations are:

1. Within or adjacent to SWMUs. For areas with secondary containment (truck stations and West Tank Farm), sampling is planned next to the containment, because of access problems at several locations and concerns about damaging containment integrity at all locations.

2. In areas of known impact, based on previous soil data and ground-water data.

3. In areas of suspected impact, based on information presented in Part II.

4. Areas where releases are more likely, which include valve locations where wastes are transferred between tank and tanker.

The 23 SWMU sampling locations south of 138th Street are shown on Figure VII-3-3 along with much of the rationale used for selecting the locations.

Three locations will be investigated in the vicinity of the disturbed area on S-K property (Barker Chemical No. 2 Area) north of 138th Street to determine whether a SWMU is or was present on S-K property. Sampling locations are shown on Figure VII-3-4. Two locations will be within the possible area of disturbance on an April 1980 aerial photo and along the eastern boundary of S-K property. The third location will be outside the apparent area of disturbance on an April 1980 aerial photo. The purpose for sampling this location will be to define native soil conditions in order to determine whether the other two locations are sited in backfill (possibly indicative of a SWMU) or native soil conditions. If a SWMU is present on S-K property (Barker Chemical No. 2 Area), soil samples will be collected and chemically analyzed from the disturbed area.

Soil Sampling Depths

At the Barker Chemical No. 2 Area, soil samples will be collected at 5-foot intervals from ground surface to 20 feet below ground surface. The onsite geologist will evaluate soil texture and field-screen the samples according to the procedures in Chapter IV-2. Based on this information, the geologist will determine if there is evidence that the SWMU is on S-K property, and subject to the soil sampling procedures described below.

After the determination whether a SWMU is present on S-K property in the Barker Chemical No. 2 Area, soil sampling will occur to identify and characterize releases from Dolton facility SWMUs. In addition, soil sampling and analysis will be conducted to define the vertical extent of impacts.

Soil samples for chemical analysis will be collected at about 2 feet and 20 feet below ground surface. Data from the shallow depth will be used to identify soil impacts, and data from the greater depth will be used to define extent. The deep sample at each location will be field screened, and a deeper

sample will be collected if necessary to define the vertical extent of impacts.

During the sampling program, the onsite geologist will evaluate the range of soil textures from the background locations to ensure that they match the range of soil textures encountered in soil samples underlying the SWMUs. If they do not match, additional background intervals and/or locations may be sampled to ensure a match.

Ground-Water Sampling Depths

A ground-water level will be measured and a water sample collected at all background and SWMU locations south of 138th Street where ground water is present in the perched zone (historically 1 to 5 feet below ground surface). Ground-water samples will be collected from the perched zone at a depth of approximately 5 to 10 feet below ground surface. At the Barker Chemical No. 2 Area north of 138th, ground-water levels will be measured and water samples collected only if perched ground water is present and if the SWMU is determined to be on S-K property. Fluid level and ground-water collection procedures are described in Section VII-6.

Laboratory Analysis

Samples will be submitted to S-K Environmental Laboratory for chemical analysis. The laboratory is located in Elk Grove Village, Illinois. The samples will be analyzed for the 107 constituents described in Table VII-3-1.

Intended Data Usage

The information sources for the Phase I Release Assessment will be field observations during soil and ground-water sampling, laboratory analyses of eight background and up to 50 SWMU soil samples, and laboratory analyses of four background and up to 25 ground-water samples.

The sampling team will record field observations during sampling in a field log book. Field observations are critical to the verification and interpretation of the laboratory data. During the quality assurance process, the quality assurance officer will evaluate the validity of the laboratory data in part on the basis of apparent soil and water quality observed during sampling. The quality assurance officer may request that

Table VII-3-1. Constituent List, RFI Phase I Release Assessment, Dolton Recycle Center.

Constituent	Method (from SW-846)	Method Detection Limit (mg/kg)
Inorganics		
Arsenic	7060	1.25
Barium	6010	2.0
Cadmium	6010	2.0
Chromium	6010	4.0
Lead	6010	11.0
Mercury	7471	0.04
Selenium	7740	0.9
Silver	6010	3.0
Organics*		
Volatile Organic Compounds (37)	8240	0.005-0.100
Semi-Volatile Organic Compounds (62)	8270	0.33-3.3

* A complete list of organic compounds and method detection limits for individual compounds are presented in Appendix IV-B.

the laboratory re-analyze certain samples for certain constituents with data that appear inconsistent with field observations.

A laboratory data report will be prepared by S-K Environmental Laboratory. This laboratory report will contain all laboratory data on the soil samples as well as the quality assurance data. The laboratory data report will also include copies of the completed chain-of-custody/sample-analysis-request forms.

One objective of the Phase I investigation is to identify releases of hazardous constituents from solid waste management units (SWMUs). To accommodate that objective, the laboratory data from background and SWMU sites will be presented in data summary tables within the text. The tables will identify the sampling location and the concentration in milligrams per kilogram (parts per million) for soils and milligrams per liter (mg/L) for ground water for each constituent detected in one or more samples. Background data will be listed under a tabular heading "Background Sites," and soil data from each SWMU will be listed under the appropriate tabular heading for that SWMU, such as "Truck Station No. 5." Ground-water data will not be sorted by SWMU. If relevant, data will be further sorted by stratification factor (soil layer, topography, aquifer).

The second objective of Phase I is to evaluate whether any releases of hazardous constituents represent a hazard to human health and the environment. The U.S. Environmental Protection Agency (EPA) has proposed limits which represent a hazard to human health and the environment (55 FR 30798-30884, July 27, 1990). These limits or successors will be listed in the data summary tables for the hazardous constituents detected in one or more samples. Concentrations which exceed the limits will be highlighted in boldface type in the data summary tables. A footnote to the tables will explain the meaning of the boldface type.

Graphical displays will be used to highlight the most critical information collected during the Phase I Release Assessment. The following figures will be included in the RFI Phase I report:

- A facility location map (Figure VII-3-1 or similar)
- Sampling site location maps (figures VII-3-3 and VII-3-4 or similar)
- Facility plot plans with additional information that shows the SWMU or background sampling location,

constituent, and concentration for all constituents which exceed background (unless too numerous) and/or which exceed the EPA limits indicating possible hazard to human health and the environment.

- Features which affect intramedia transport, and potential receptors

- Areas where more data are required.

Phase I Reporting

Phase I includes a single, extensive sampling and analysis event. A report on this event, including all field observations, laboratory data, and quality assurance evaluations, will be submitted to IEPA within 90 days of receipt of the complete set of soil and ground-water quality data. The Phase I report will provide a summary of the Phase I investigation, problems and responses, staffing changes, and a schedule of upcoming activities.

Quarterly progress reports will be submitted to summarize information regarding percentage of the project completed, activities completed during the reporting period, changes in the implementation of the Workplan, problems encountered during the reporting period, proposed corrections to these problems, project work for the next reporting period, and any other necessary information.

Data Quality Objectives

Data Quality Objectives (DQOs) are qualitative and quantitative statements which specify the quality of the data required to support decisions made during RFI activities and are based on the end uses of the data to be collected. As such, different data uses may require different levels of data quality. There are five analytical levels which address various data uses and the QA/QC effort and methods required to achieve the desired level of quality. These levels are:

- Screening (DQO Level 1): This level provides the lowest data quality but the most rapid results. It is often used for health and safety monitoring at the site, preliminary comparison to ARARs, initial site characterization to locate areas for subsequent and

more accurate analyses, and for engineering screening of alternatives (bench-scale tests). Screening data on this project include the health-and-safety data generated onsite through the use of a photoionization detector (PID) and explosimeter, and the screening of soils for total organic vapors (TOV) using the PID.

- Field Analyses (DQO Level 2): This level provides rapid results and better quality than in Level 1. This level may include sampling site and mobile lab generated data depending on the level of quality control exercised. No field analyses are scheduled for this project.

- Engineering (DQO Level 3): This level provides an intermediate level of data quality and is used for site characterization. Engineering and analyses include laboratory data used for screening but without full quality control (i.e., cannot satisfy the precision and accuracy objectives in Section 5). No engineering data are scheduled for this project.

- Confirmational (DQO Level 4): This level provides the highest level of data quality and is used for purposes of risk assessment and evaluation of remedial alternatives. These analyses require full RCRA analytical and data validation procedures in accordance with EPA recognized protocol in SW-846. Soil and ground-water samples collected on this project will be routinely analyzed for the target compound list at the confirmational level.

- Non-Standard (DQO Level 5): This level refers to analyses by non-standard protocols, for example, when exacting detection limits or analysis of an unusual chemical compound is required. These analyses often require method development or adaptation. The level of quality control is usually similar to DQO Level 4 data. No non-standard analyses are scheduled on this project.

Project Time Schedule

The project time schedule for Phase I of the RFI is shown on Figure VII-3-5.

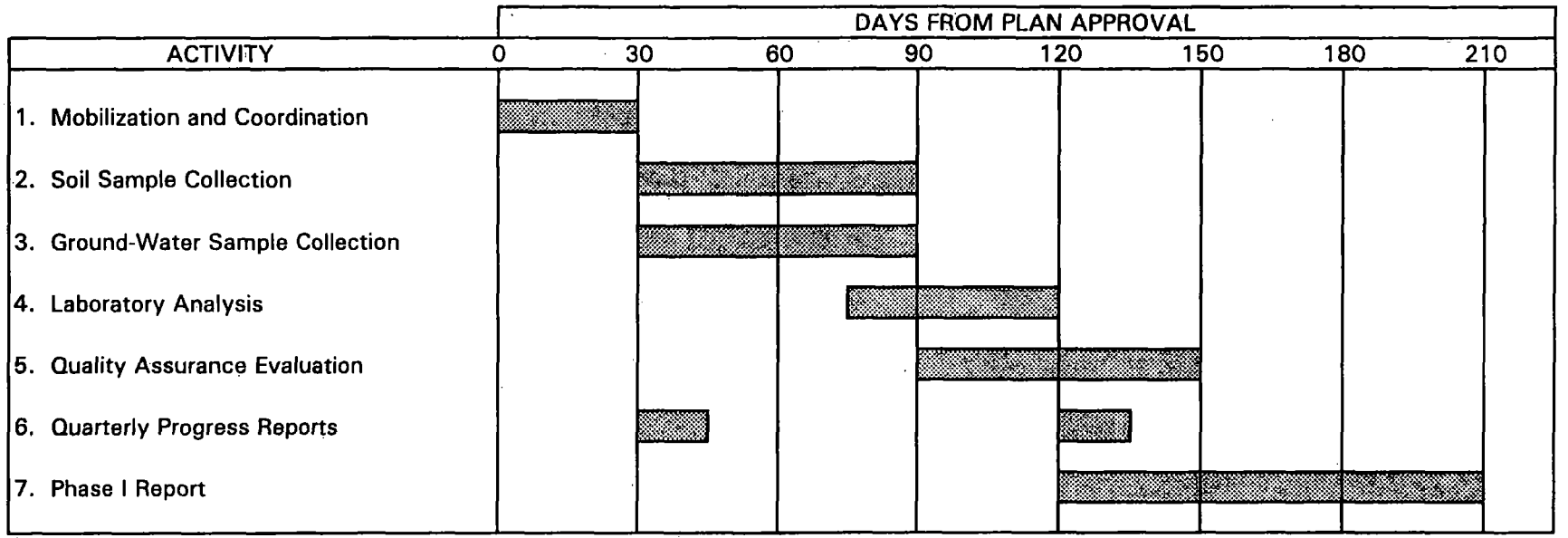


FIGURE VII-3-5 :TIME SCHEDULE, PHASE I RELEASE ASSESSMENT, DOLTON RECYCLE CENTER

SECTION VII-4

MANAGEMENT ORGANIZATION

Figure VII-4-1 presents the proposed project management structure for the implementation of the RFI. The project will be directed by Mr. Scott Davies, Senior Project Manager - Remediation for Safety-Kleen Corp. (S-K). Mr. Davies has 8 years of experience in the environmental field and is responsible for cleanups and closures of S-K recycle centers throughout the United States and Puerto Rico.

Mr. Davies will be assisted by John Valerius, the Facility Manager at the Dolton Recycle Center. Mr. Valerius has more than 15 years of experience in waste management.

The IEPA Project Coordinator (Eric Minder) will ensure that the RFI project is conducted in accordance with the RCRA regulations and in general accordance with RFI guidance documents. The IEPA Project Coordinator will modify the RFI Workplan as needed, make site visits, and critically review the final report to ensure that the quality assurance objectives have been achieved.

The IEPA Project Coordinator and the S-K Project Director may conduct audits of field and laboratory activities.

S-K has developed an experienced project team in order to promote quality assurance during the RFI process. All team members have worked together on RFIs at other petroleum-impacted sites. The principal team members are:

- TriHydro Corporation will function as the prime contractor. TriHydro will be responsible for the proper implementation of the Phase I Workplan, collecting soil samples and submitting them to the laboratory, auditing laboratory performance, and preparation of the RFI report. In addition to working with S-K at the Dolton site, TriHydro is conducting assessment and/or remediation projects at 40 other S-K sites throughout the central and western United States.

- GEO Corporation will perform the drilling services. GEO Corporation has the specialized equipment to enter and drill in tight locations and has experience in drilling at petroleum-impacted sites.

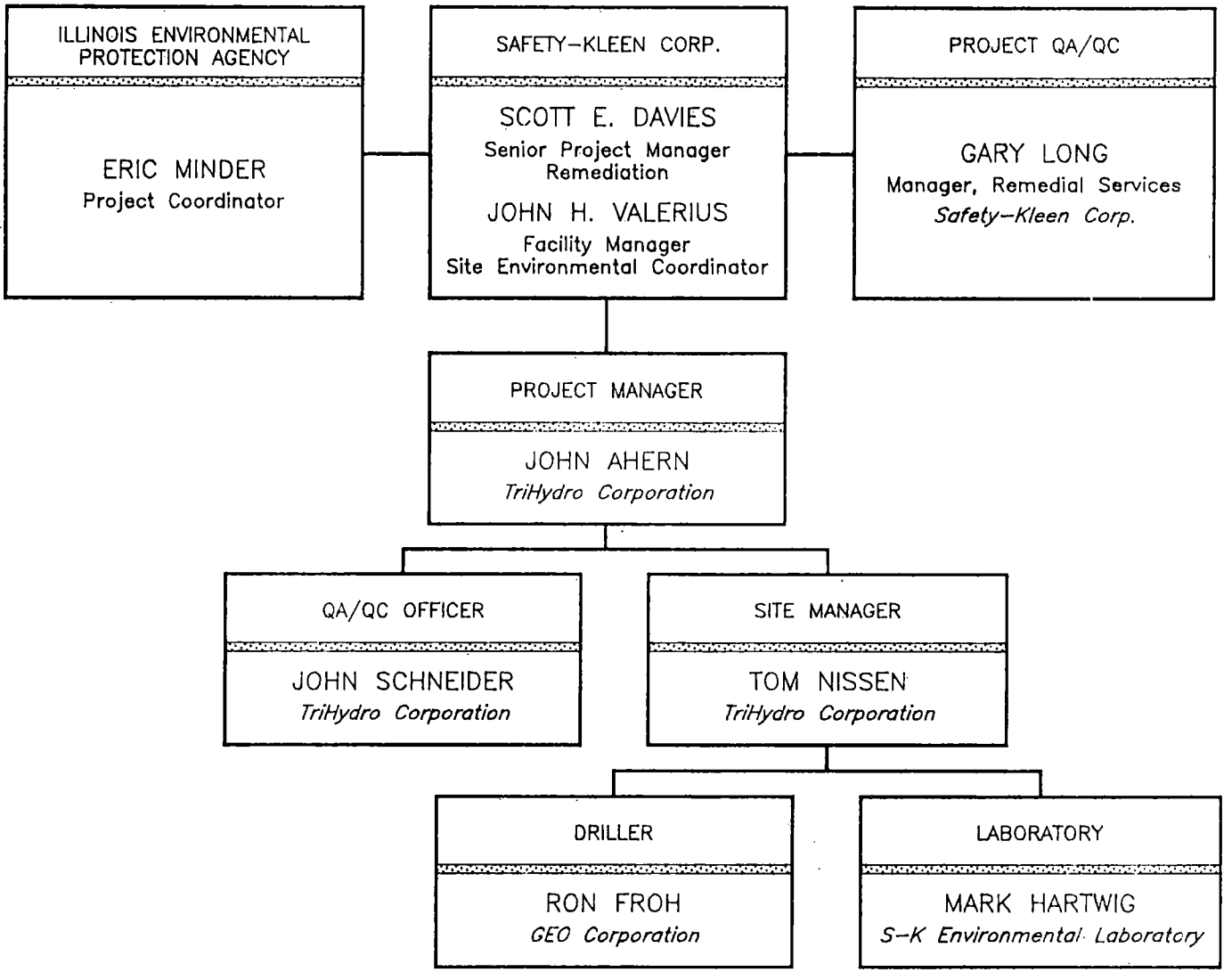


FIGURE VII - 4 - 1 :PROJECT MANAGEMENT TEAM, PHASE I RELEASE ASSESSMENT, SAFETY–KLEEN CORP. RECYCLE CENTER, DOLTON, ILLINOIS

SK:MGNT

- S-K Environmental Laboratory will perform all laboratory analytical services. S-K Environmental Laboratory is performing the analytical services on many of S-K's monitoring, assessment, and remediation projects in the region.

TriHydro Corporation

John Ahern, President of TriHydro Corporation, will be TriHydro's project manager for the RFI Phase I project. Mr. Ahern has 20 years of experience in assessment and remediation at petroleum-impacted sites. He has served as project manager and/or QA/QC officer on 25 Safety-Kleen projects over the previous two years. Mr. Ahern is located at the TriHydro Corporation office in Laramie, Wyoming, and will provide all onsite project personnel from this office.

Activities to be performed by the Project Manager during the RFI include:

- Select, coordinate, and schedule staff for the work assignments.
- Control budgets and schedules.
- Prepare bimonthly progress reports.
- Monitor the subcontractor.
- Implement quality assurance measures and any corrective action requirements.
- Attend review meetings.
- Perform final data assessment.
- Supervise the preparation of the RFI report and provide technical peer review.

Under the direct supervision of the project manager is the QA/QC officer and the site manager. Mr. John Schneider will serve as the project QA/QC officer. The activities presented below will be completed by the project QA/QC officer:

- Audit field memoranda prepared by field personnel to assure that the procedures for sample collection and sample custody are strictly adhered to.

- Review laboratory reports to assure that adequate QA/QC procedures are imposed on the laboratory analytical results.

- Interface with IEPA's QA Officer and Project Manager, when necessary.

- Organize the final evidence file, and turn over the custody of this evidence file to S-K's Project Manager at the end of the project.

Mr. Tom Nissen will serve as the project's site manager. Mr. Nissen has six years of experience directing field activities for environmental assessment and remediation at RCRA facilities. Mr. Nissen will be responsible for all onsite activities including scheduling, direction of the subcontractors, and maintaining the sampling procedures in accordance with the Quality Assurance Project Plan (Part VII) and the Sampling and Analysis Plan (Part IV).

GEO Corporation

GEO Corporation will conduct the soil and ground water sample collection required during the RCRA Facility Investigation. Geo Corporation has custom-designed equipment for field sampling and can match the field sampling equipment to the particular task, type of sample needed, and site conditions. During the Phase I investigation, a Scorpion Series ATV Hydraulic Probing Rig will most likely be used to allow access to the warehouse SWMUs. A detailed explanation of soil and ground-water sample collection is described in the Sampling and Analysis Plan (Part IV).

S-K Environmental Laboratory

S-K Environmental Laboratory will conduct the laboratory services required during the RCRA Facility Investigation. The laboratory organization structure and internal responsibilities are described in detail in Appendix VII-A.

SECTION VII-5

QUALITY ASSURANCE OBJECTIVES

The quality assurance objectives provide quantitative and qualitative measures of the ability to produce high-quality results through a properly designed sampling and analysis program. The objectives of the overall quality assurance/quality control (QA/QC) program are to:

- Ensure that all procedures are documented, including any changes from the Workplan protocol.
- Ensure that all sampling and analytical procedures are conducted according to sound scientific principles.
- Monitor the performance of the field sampling team and laboratory with a systematic audit program and provide for corrective action necessary to assure quality.
- Evaluate the quality of the analytical data through a system of quantitative and qualitative criteria.
- Ensure that all data and observations are properly recorded and archived.

This chapter addresses the qualitative and quantitative criteria which will be used to evaluate the quality of the analytical data.

Level of Quality Control Effort

The level of quality control effort will be consistent with that required under SW-846 for a RCRA investigation. The level of effort for each quality assurance sample type is described in detail in Section 5.0 of Appendix VII-A, and summarized below:

1. Background Samples. Eight soil samples and four ground-water samples to establish background conditions created by natural concentrations of the constituents as well as by sampling and laboratory interferences in the medium matrix, if any.

2. Blind Duplicate Samples. One for every 10 investigation samples received.

3. Trip Blanks. One for each cooler of aqueous samples.

4. Equipment Blanks. One for every 10 investigative aqueous samples received.

5. Matrix Spike/Matrix Duplicate. One for every 20 investigative samples received.

6. Surrogate Spiking. Added to all samples prior to extraction and analysis.

Quantitative Measures

Four quantitative measures of quality will be employed during the RFI Phase I Release Assessment:

- Method Detection Limits (MDLs)
- Precision
- Accuracy
- Completeness

The quality assurance objectives for these criteria and procedures to compare calculated values to the objectives are described in Section VII-14. The measures are defined below.

Method Detection Limits

Method detection limits (MDLs) are the lowest concentrations of analytes in the environmental samples that can be reliably determined within specified limits of precision and accuracy by specified analytical methods under routine laboratory operating conditions. MDLs are a function of sample type (soil or water), analytical method, and matrix interferences.

Precision

Precision is the degree of agreement between the numerical values of a set of replicate samples performed in an identical fashion. Precision will be based on the analytical data from the internal laboratory replicate analyses. Precision will be reported as relative percent difference as expressed by the following formula:

$$RPD = \frac{(C_1-C_2)}{(C_1+C_2)/2} \times 100\%$$

C_1 and C_2 are the concentrations of duplicate samples.

Accuracy

Accuracy is the measure of a result to the accepted (or true) value. Errors may arise from personal, instrumental, or methods factors. Accuracy is assessed by means of referenced samples, percent recoveries on matrix spikes and surrogate spikes, and method blanks. Analytical accuracy is expressed as the percent recovery of an analyte that has been added to the sample or laboratory-prepared blank at a known concentration before analysis, and is expressed by the following formula:

$$\text{Accuracy} = \%\text{Recovery} = \frac{A^T-A^0}{A^F} \times 100\%$$

Where:

A^T = Concentration of spiked sample
A^O = Concentration of sample
A^F = Concentration of spike

The spiked concentration is specified by laboratory quality control requirements.

Completeness

Completeness is a measure of the percentage of analytical data points that meet all the acceptance criteria for method detection limit, precision, and accuracy. Completeness is the ratio of the number of validated sample analyses to the total number of sample results required by the Workplan:

$$\text{Completeness} = \frac{\text{Number of Validated Sample Analyses}}{\text{Number of Sample Results Required by Workplan}}$$

The ability to meet or exceed a completeness objective is dependent on the nature of samples submitted for analysis. If data cannot be reported without qualifications, project completeness goals may still be met if the qualified data, i.e., data of known quality even if not perfect, are suitable for specified project goals.

Qualitative Measures

Two qualitative measures of quality will be employed during the RFI Phase I Release Assessment:

- Representativeness
- Comparability

These terms are defined below, and procedures to achieve representativeness and comparability are described.

Representativeness

Representativeness expresses the degree to which data accurately and precisely represent 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 worst-case site conditions at each solid waste management unit. During development of this network, consideration was given to areas of known releases, areas where previous field screening data indicated impacts, and areas where experience from similar sites indicates releases of hazardous waste and hazardous constituents are most likely to occur. The rationale of the sampling network is discussed in detail in the Sampling and Analysis Plan (SAP), presented in Part IV of the Workplan.

Representativeness will be satisfied by ensuring that the SAP 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 compliance with the Workplan protocol and by the analysis of the blind duplicate samples.

Comparability

Comparability expresses the confidence with which one data set can be compared with another. Data from background sites and SWMUs will be comparable, because the same standardized procedures will be used to collect and analyze samples. These procedures, described in this Quality Assurance Project Plan, are based on the industry standards expressed in SW-846. Comparability will be judged by compliance with the Workplan protocol.

The extent to which previous, existing, and planned analytical data will be comparable depends on the similarity of past, current, and future sampling and analytical methods. Past and future analytical data may not be directly comparable to data to be collected under this Workplan because of differences in procedures and quality assurance objectives.

SECTION VII-6

SAMPLING PROCEDURES

The soil and ground-water samples to be analyzed are shown in Table VII-6-1. Safety-Kleen Corp. intends to collect four background soil samples of each soil texture encountered, 46 to 50 solid waste management unit (SWMU) soil samples, 23 to 25 SWMU ground-water samples, five blind duplicate soil samples, three blind duplicate ground-water samples, three trip blanks, and three equipment blanks during the Phase I RFI Release Assessment. The procedures to collect soil and ground-water samples are described in this section. The field procedures include:

- Pre-field coordination and preparation activities
- Equipment decontamination
- Sample collection
- Field screening
- Field documentation
- Post-field activities.

Pre-Field Activities

Several activities will be conducted prior to departure for the project site. A project team is assigned and the members will begin coordinating the sample collection event with the Dolton facility, the laboratory, and regulatory agencies. Field equipment will be checked and organized. Pertinent health and safety criteria will be reviewed along with the Health and Safety Plan (Part V). Site access will be checked with John Valerius (Dolton facility site representative), and provisions will be made to pack the necessary equipment for delivery to the project site.

Table VII-6-1. Sampling and Analysis Matrix, RFI Phase I Workplan, Dolton Recycle Center.

			Investigative Samples				Field Quality Control Samples		
Sample Matrix	Field Parameters	Lab Parameters	Type	No. of Sites	No. per Site	Total	Trip Blanks	Equipment Blanks	Field Duplicates
Soil	Physical Descriptions								
	Total Organic Vapors		BG SWMU	4 23-25	2 2	8 46-50	0	0	5
		Volatile Organic Compounds Semi-Volatile Organic Compounds Inorganic Compounds, Total	BG SWMU	4 23-25	2 2	8 46-50	0	0	5
Ground Water	Water Levels		BG SWMU	4 23-25	1 1	4 23-25	0	0	3
	Physical Descriptions								
		Volatile Organic Compounds Semi-Volatile Organic Compounds Inorganic Compounds, Dissolved	BG SWMU	4 23-25	1 1	4 23-25	3	3	3

Notes:

1. The number of sites depends on whether a SWMU is present in the Barker Chemical No. 2 Area on S-K property, and thus is subject to this investigation.

2. Laboratory control samples are described in Appendix VII-A.

3. BG means background, and SWMU means solid waste management unit.

Project Team

The sampling project team will consist of the project manager, the site manager, and field team (if necessary). The qualifications and responsibilities of individual project team personnel with respect to the field activities are:

1. Project Manager

   a. Schedule the sampling event;

   b. Assign qualified personnel to the field team;

   c. Monitor sampling activities to ensure compliance with the Workplan (calls from field personnel, etc.); and

   d. Review field data and chain-of-custody/sample-analysis-request records to ensure compliance with the Workplan.

2. Site Manager

   a. Knowledgeable in sampling techniques;

   b. Knowledgeable in operation and maintenance of instruments;

   c. Knowledgeable about project health and safety plan and procedures; and

   d. Responsible for:

      i. Ensuring compliance with the Workplan;

      ii. Preparations for sampling event;

      iii. Ensuring the proper equipment is available and operating;

      iv. Assigning field team members' responsibilities and overall supervision (if necessary);

      v. Onsite client contacts;

      vi. Logging field data;

      vii. Shipping or transporting samples;

viii. Chain-of-custody/sample-analysis-request forms; and

ix. Laboratory contact.

3. Field Team Members

a. Knowledgeable in sampling techniques;

b. Knowledgeable about the project health and safety plan;

c. Able to calibrate and operate instruments properly;

d. Log data acquired during sampling; and

e. Assist the sampling supervisor as necessary.

Preparation

The project site manager will review the RFI Phase I Workplan and related correspondence to determine if any plans or reports need to be brought to the site during monitoring, if any changes have been made to the sampling and analytical procedures, and if any groups need to be contacted about sampling observation or split sampling. At a minimum, the Illinois Environmental Protection Agency (Eric Minder) will be contacted seven to 14 days prior to sampling about the sampling schedule.

Dolton facility (John Valerius or designate) will be contacted to confirm the expected arrival time at the site and expected departure time. The laboratory will be informed when sample coolers are expected to arrive and the method and location of arrival.

All sampling and monitoring equipment will be inspected prior to departure to ensure that it is in proper working order. The necessary health and safety monitoring equipment is described in detail in the Health and Safety Plan (Part V).

Equipment Inventory

The following equipment and supplies may be used for soil sampling:

- Soil Sampling
  - Concrete cutter or electric rotary hammer drill and bits
  - Brass rings, teflon sheets, and plastic caps
  - Glass jars (2 or 4 ounce and 32 ounce) with teflon-lined lids
  - Photoionization detector
  - Soil sample extruder
  - Bentonite
  - Asphalt and concrete patch
  - Marking pen, labels
  - Hexane
  - Non-phosphate detergent and scrub brush
  - Decontamination containers and brushes ash, rinse, rinse)
  - Distilled or deionized water
  - Protective gloves
  - Plastic sheeting
  - Coolers with ice
  - Plastic bags for sample containers and ice
- Ground-Water Sampling
  - Manometer for fluid levels
  - Sampling pump
  - Tarps
  - Filtration unit, nitrogen tank, regulator, filters
  - Disposal gloves

- Buckets for water disposal
- Sample bottles with preservatives
- Coolers with ice
- Distilled water

o Health and Safety

- Photoionization detector
- Combustible gas meter
- Benzene detector tubes
- Respirators with organic cartridges
- Dust protection masks
- Hard hats and safety glasses
- Tyvek suits
- Appropriate shoes or boots

Safety Procedures

The project site manager will review the Health and Safety Plan (Part V), and make copies of the Plan available to all field team members. The project site manager will inform all field team members immediately before monitoring of the kinds of contaminants found or expected to be found at the site, and the possible hazards.

The project site manager will be responsible for bringing the appropriate safety equipment to the sampling site. All field team members will be knowledgeable in the operation of necessary safety equipment. Each field team member is responsible for 1) bringing appropriate safety equipment to each sampling site during monitoring, 2) making the equipment immediately available for use, 3) recognizing safety or health hazards, and 4) undertaking the appropriate safety precautions.

The field team will consist of a minimum of two people at or in the general vicinity of the sampling site. If a field team member will be out of visual contact with the other member(s) of the sampling party, he or she will inform the

project site manager of his/her location before heading to the sampling site.

Access Control

Protective measures will be employed for limiting access to the sampling sites during sampling. The project site manager (or designate) will be present at each sampling site during the entire sampling period. The project site manager will be responsible for controlling any activities that might influence the integrity of the soil collection procedures.

Sample Collection Procedures

The project site manager will implement the monitoring required under the Health and Safety Plan (Part V of the Workplan). Soil and ground-water sampling devices are described in Appendix IV-A. Sampling procedures are described below.

Soil Sampling

Concrete or asphalt will be removed (if appropriate), and soil sample collection will commence with GeoProbe or equivalent equipment using the following procedure:

1. A new or decontaminated brass liner assembly will be placed into a stainless steel sampler (called a Kansas sampler). Samplers are 1 to 2 feet in length.

2. The sample (decontaminated) will be attached to drive rods which are 3 feet in length.

3. The sampling tool will be hydraulically advanced to the sampling depth.

4. The tool will be opened and driven 1 to 2 feet to fill the liner with a soil sample.

5. The tool will be hydraulically withdrawn to the surface.

6. The brass liner will be broken manually into sections by a field team member wearing sterile gloves.

7. The uppermost section will be discarded, because it may contain borehole slough.

8. Two sections will be capped with Teflon sheets and slip-on plastic caps, marked with a sample number, and placed in an opaque cooler on ice immediately upon collection. Care will be taken to minimize headspace during this procedure. Sample collection will adhere to IEPA "Soil Volatile Sampling Procedures" (Appendix IV-B), except that Teflon sheeting rather than aluminum foil will be used to seal the brass rings.

8. The soil in the remaining section will be subjected to field screening procedures described in a subsequent section.

One soil sample, consisting of three to four brass rings (or more, if necessary), or two to three 2- or 4-ounce glass jars if soil lacks sufficient cohesion, will be collected from each sampling interval. In addition, blind duplicate samples will be collected from five of the SWMU sites for quality assurance analyses. The brass rings or glass jars will be used for analysis of volatile organic compounds, semi-volatile organic compounds, and eight inorganic constituents.

Ground-Water Sampling

Phase I ground-water sampling will be conducted using a GEO Environmental ATV/Geoprobe hydraulic sampling rig or equivalent. In this method, an expendable point will be driven into the ground water within the perched zone, and the probe rods will be extracted to expose a dedicated perforated 3/8-inch teflon tube. The depth to ground water in the tube will be measured with a manometer. The elevation of the top of the tubing will be surveyed to the nearest 0.1 foot by a licensed land surveyor to convert depth to water to a ground-water elevation in feet above mean sea level.

Ground water will be sampled using a peristaltic or inertia pump. Three volumes of water column in the tubing will be purged, and the required sample taken. Ground-water samples will be collected in order of decreasing volatility: volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and inorganic constituents. Water to be analyzed for VOCs will be pumped with minimal agitation into a 40-milliliter VOA glass bottle, and all headspace will be eliminated. Water to be analyzed for SVOCs will be pumped with minimal agitation

into liter glass bottles filled as completely as possible. Water to be analyzed for inorganic constituents will be pumped into the filtration chamber, and then filtered with pressurized nitrogen into a 500-milliliter plastic bottle containing preservatives.

Hole Patching

Soil and concrete will be stockpiled with other demolition debris from the facility, and hauled to a suitable offsite disposal facility. Sampling locations will be plugged by pouring bentonite granules down the hole and hydrating in approximately 1- to 2-foot lifts to the surface. The surface will be repaired to matching grade. A concrete patch will be placed over the sampling location in areas where concrete is present and asphalt patch will be placed over the sampling location in areas where asphalt is present.

Field Screening

One aliquot of soil from each sampling interval will be screened in the field to evaluate the nature and degree of impact. Field screening includes physical descriptions by the onsite geologist and measurements of total organic vapors (TOV) with the photoionization detector (PID).

Soil from each sampling depth will be extracted from one brass liner into a ziplock bag and brought to room temperature. The PID probe will be inserted into the bag, and the highest TOV reading measured by the PID will be recorded. A Thermo Environmental Model 580B PID equipped with a 10.0 eV lamp (or equivalent) will be used during field screening. The PID will be calibrated with a 100 parts per million (ppm) isobutylene standard at the beginning of each day and periodically during the day. The soil will also be described by the onsite geologist in terms of texture (per ASTM Method D-2488), moisture content, staining, and any other pertinent information.

Capped samples from each interval will be held in a cooler or refrigerated at the site until it is determined which samples will be sent to the laboratory. The objectives of the soil sampling program are to define the nature, degree, and vertical extent of soil quality degradation in the unsaturated zone. To achieve the soil sampling program objectives, Safety-Kleen will submit for laboratory analysis the following soil samples from

above and below the shallow perched saturated zone of each borehole:

1. A sample from immediately below the ground surface (1-3 feet) to define nature and degree.

2. A sample in the clay aquitard at a depth of ±20 feet below ground surface to define vertical extent.

3. If field screening indicates possible impact at the deep sample interval (based on field screening), a second sample may be submitted from the interval below the possible impact.

The laboratory samples will be packaged, placed on ice in a cooler (maintained at about 4°C), and delivered within 24 hours of sampling to the S-K Environmental Laboratory for analysis. Soil samples will not be composited. All samples will be accompanied by completed chain-of-custody/sample-analysis-request forms.

Decontamination Procedures

Brass rings will be decontaminated prior to sampling, either in the laboratory or in the field. Brass rings will be cleaned according to the procedures described below. Glass containers will be pre-cleaned and supplied by an independent supplier. The sampling devices will be decontaminated in the field immediately prior to and after sampling each site. Sampling equipment will be disassembled into component parts prior to washing.

Field decontamination will include washing the sampling devices and brass rings and caps in a warm non-phosphate detergent solution, rinsing the devices and containers with tap water, and then rinsing the devices with distilled or deionized water. In addition, the detergent solution and rinsewaters will be pumped through the ground-water sampling pump. Sampling devices and containers will be dried before use by air drying or with clean paper towels. If a hydrocarbon sheen becomes present on the rinse water during decontamination, the sampling devices and/or containers will be decontaminated again with hexane, fresh wash and rinse water. All washing fluids and rinse water will be containerized at the Dolton facility for proper processing by S-K.

The decontaminated sampling devices and brass rings will be stored in clean containers, plastic bags or ziplock-type bags until use. The brass rings and sample containers may be stored until use in coolers.

Field Documentation

Field observations are critical to the verification and interpretation of the laboratory data. Field observations during soil sampling will be recorded in the field log book. The following information will be recorded in the field notebook where appropriate:

- Date and name of observer
- Names and affiliations of sampling team members
- Names and affiliations of others present at the sampling sites
- Weather conditions
- Sampling location (with measured distances) and time of sampling
- Health and safety data on total organic vapors and combustible gas concentrations.
- Health and safety measures implemented (e.g., respirators)
- Sampling site condition upon arrival (concrete cover, standing water, erosion, etc.)
- Soil characteristics and texture
- Depth to ground water
- Volume purged from ground-water sampling device, and response of fluid levels to pumping
- Soil and ground-water observations, including discoloration, hydrocarbon sheens, moisture content, etc.
- Deviations from or clarifications of sampling procedures in the Workplan

- Miscellaneous conditions which the sampling team finds noteworthy

The project site manager will review and sign the field notes after each day of sampling.

Photographs will be taken of every sampling site. Photographs will also be taken of sampling procedures at one location.

Post-Field Activities

The project site manager and field team members are responsible for several activities after the samples have been shipped to the laboratory. The post-field responsibilities include laboratory contact, record filing, and equipment checks.

Continued Supervision

The project site manager will call the laboratory on the day the samples are due to arrive at the laboratory to ensure that they have in fact arrived. The project site manager will call the laboratory periodically to make sure that samples are being analyzed within the following holding times:

Volatile Organic Compounds	14 days
Semi-Volatile Organic Compounds	14 days until extraction, 40 days after extraction
Inorganic Constituents (except Mercury)	6 months
Mercury	28 days

Records

The project site manager will collect all pertinent field data (i.e., chain-of-custody, copies of field logbook records, etc.) and file it in the client job file immediately after returning from the field. Proper and efficient management of the sampling records will aid in reviewing and evaluating the laboratory analytical data. The project site manager will also ensure laboratory data are placed in the project file.

Equipment

Any equipment problems noted during sampling and not corrected in the field will be corrected upon return to the office. Broken or contaminated equipment will not be returned to storage for future use.

SECTION VII-7

SAMPLE CUSTODY

In this section are described the procedures to maintain custody of the samples from sample collection through laboratory analysis to the final evidence files. A sample or evidence file is in one's custody if it is:

- In one's physical possession
- In one's view, after being in one's possession
- In one's physical possession and placed in a secured location
- In a secured area restricted to authorized personnel only

As few people as practical will have custody of the samples to reduce the chance of mishandling.

Field Chain-of-Custody Procedures

Field chain-of-custody will be maintained through the use of field logbooks, sample labels, chain-of-custody/sample-analysis-request forms, and custody seals. The project site manager will be responsible for the successful implementation of these procedures.

Field logbooks will be bound field survey books and assigned to field personnel. Copies of the field observations will be made immediately upon return to the office and placed into the project file.

Each sample container will be identified with a label. The sample label will be the one shown on Figure VII-7-1 or equivalent. The information which will appear on the sample container label includes:

1. Sample identification number
2. Place of collection (or project number)

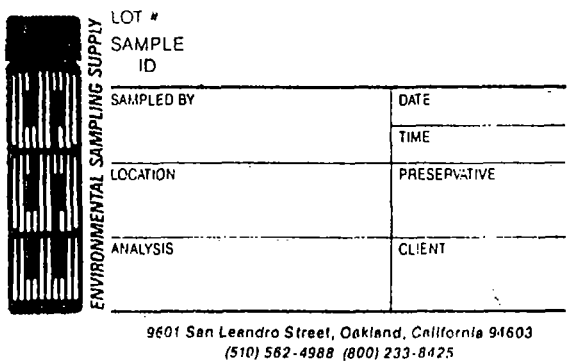


FIGURE VII-7-1 :SAMPLE LABEL FORM

3. Date and time of collection

4. Personnel collecting the sample

5. Preservative (none in the case of soil samples)

6. Analyses requested

7. Any special information, such as an estimate of the level of contamination

The brass rings or 2-4 ounce glass jars will be used for analysis of volatile organic compounds, semi-volatile organic compounds, and eight metals.

All samples will be accompanied by completed chain-of-custody/sample-analysis-request forms (Figure VII-7-2). The project site manager will keep a copy of this completed form, and another copy will be kept at the Dolton facility. The chain-of-custody part of the form provides documentation necessary to trace sample possession continuously from the time of collection until the time of receipt in the laboratory, and the condition of the samples and sample container upon receipt. The sample-analysis-request part of the form documents the analyses to be performed by the laboratory in addition to any special handling or preservation techniques carried out by the field personnel.

If and when the samples leave custody of the sampling team, the shipping container will be sealed with a custody seal to ensure that the samples have not been disturbed during transportation to the laboratory. The laboratory personnel receiving the coolers will note the condition of the seal and the sample containers within on the chain-of-custody/sample-analysis-request form.

Laboratory Chain-of-Custody Procedures

S-K Environmental Laboratory assumes responsibility for the integrity and security of the samples after proper custody transfer is completed from the sampling team or the transportation service (if appropriate) to the laboratory. The laboratory custody procedures are described in Section 7.1 of Appendix VII-A.

ENVIRONMENTAL CHAIN OF CUSTODY

DATE:

			PROJECT #
			AUTHORIZATION #
GENERATOR SITE & ADDRESS	PROJECT MANAGER(S)	PHONE & FAX	

SAMPLER'S NAME

FIELD SAMPLE ID #	SAMPLE MATRIX	DATE/TIME SAMPLED	# OF CONTAINERS	PRESERVATION METHOD	ANALYSIS REQUESTED: MINERAL SPIRITS (8015)	TARGET VOA (8240)	P-CRESOL 8040 ☐ 8270 ☐	CADMIUM (7131)	LEAD 7420 ☐ 7421 ☐ 6010 ☐	CHROMIUM (6010)	TOTAL ORGANIC CARBON (9060)	TCLP Metals ☐ VOA ☐ Semi-VOA ☐ Pest ☐ Herb ☐	OIL & GREASE 413.1 ☐ 413.2 ☐ SM-503 ☐	HYDROCARBONS GC/FID Gas ☐ Diesel ☐ Screen ☐	PCB (8080)	BTEX 602 ☐ 8020 ☐ with MTBE ☐	BTEX/Gas Hydrocarbons PID/FID ☐ with MTBE ☐	EPA 601 ☐ EPA 8010 ☐	EPA 602 ☐ EPA 8020 ☐	EPA 624/PPL ☐ 8240/TAL ☐ NBS (+15) ☐	EPA 625/PPL ☐ 8270/TAL ☐ NBS (+25) ☐	EPA Metals - Priority Pollutant ☐ TAL ☐ RCRA ☐	EPA 601 ☐ 8310 ☐

COMMENTS/REMARKS:

REQUESTED TAT

SAMPLE TRANSFER RECORD

RELINQUISHED BY	DATE	TIME	RECEIVED BY	DATE	TIME
SIGNATURE OF COLLECTOR:					

SK TCLP LAB USE ONLY

TEMPERATURE WHEN RECEIVED: ____ °C SHIPPED VIA: UPS ____ FED EX ____ OTHER ____

SAMPLE KIT OPENED AND CHECKED IN BY: ____ AT ____ ON ____

C.O.C. SEALS SIGNED, DATED, AND INTACT ON ALL SAMPLE JARS? YES ____ NO ____ IF NO, EXPLAIN

SHIPPING NOTES/LAB COMMENTS:

FIGURE VII-7-2 :CHAIN-OF-CUSTODY / SAMPLE ANALYSIS REQUEST FORM

Final Evidence Files

TriHydro Corporation is the custodian of the evidence file, and will maintain the contents of evidence files for the RFI Phase I investigation while it is being conducted. The evidence will be stored in the project file at the TriHydro office in Laramie, Wyoming. Evidence will include copies of the field logs (Section VII-6), photographs (Section VII-6), completed chain-of-custody/sample-analysis-request records (Section VII-7), and the laboratory data report (Section VII-11). All of this evidence will be included in the RFI Phase I Report.

SECTION VII-8

CALIBRATION PROCEDURES AND FREQUENCY

This section describes the procedures for maintaining the accuracy of all instruments and measuring equipment which will be used for conducting field tests and laboratory analyses. Instruments and equipment will be calibrated with sufficient frequency and in such a manner that accuracy of results is maintained.

Field Instruments and Equipment

The only field instruments or equipment requiring calibration are the combustible gas meter and the photoionization detector (PID). The combustible gas meter and PID will be used in health and safety monitoring (Part V), and the PID will be used for field screening. Each instrument will be calibrated at the beginning of each day of sampling with the following calibration gases:

1. A pentane gas standard for the combustible gas meter. The pentane standard provides an appropriate response in a petroleum-impacted area.

2. A 100-ppm isobutylene standard for the PID. Isobutylene provides a similar response to benzene, which is the target compound, but is less toxic and thus safer to handle in the field.

The instruments will be recalibrated as needed during the day if responses do not appear accurate.

Laboratory Instruments and Equipment

Most of the analytical work on this project will be performed by the laboratory. S-K Environmental Laboratory provides detailed information on calibration procedures and frequency in Section 8.0 of Appendix VII-A.

SECTION VII-9

ANALYTICAL PROCEDURES

Samples will be submitted to S-K Environmental Laboratory for chemical analysis. The laboratory is located in Elk Grove Village, Illinois. The S-K Environmental Laboratory is certified and qualified to perform the necessary analyses, as described in Part III.

Samples To Be Analyzed

The samples to be analyzed are shown in Table VII-9-1. The procedures to select soil samples for laboratory analysis are described in the previous chapter under "Field Screening." As shown in Table VII-9-1, duplicate soil and water samples, trip blanks, and equipment blanks will be collected and submitted to the laboratory for quality assurance. As discussed in Appendix VII-A, additional quality assurance samples will be prepared in the laboratory for chemical analysis quality control.

Constituent List

The samples will be analyzed for the 107 constituents described in Table VII-9-2. The full constituent list is presented in Appendix VII-B. The constituent list consists of eight inorganic constituents, 37 volatile organic compounds (VOCs), and 62 semi-volatile organic compounds (SVOCs). The constituent list includes:

- All hazardous constituents detected in soils and ground water during previous sampling events at the Dolton facility.
- All hazardous constituents and hazardous waste constituents detected in wastes managed at the Dolton facility.
- Other VOCs and SVOCs commonly analyzed by the S-K Environmental Laboratory using Methods 8240 and

Table VII-9-1. Sampling and Analysis Matrix, RFI Phase I Workplan, Dolton Recycle Center.

			Investigative Samples				Field Quality Control Samples		
Sample Matrix	Field Parameters	Lab Parameters	Type	No. of Sites	No. per Site	Total	Trip Blanks	Equipment Blanks	Field Duplicates
Soil	Physical Descriptions								
	Total Organic Vapors		BG SWMU	4 23-25	2 2	8 46-50	0	0	5
		Volatile Organic Compounds Semi-Volatile Organic Compounds Inorganic Compounds, Total	BG SWMU	4 23-25	2 2	8 46-50	0	0	5
Ground Water	Water Levels		BG SWMU	4 23-25	1 1	4 23-25	0	0	3
	Physical Descriptions								
		Volatile Organic Compounds Semi-Volatile Organic Compounds Inorganic Compounds, Dissolved	BG SWMU	4 23-25	1 1	4 23-25	3	3	3

Notes:

1. The number of sites depends on whether a SWMU is present in the Barker Chemical No. 2 Area on S-K property, and thus is subject to this investigation.

2. Laboratory control samples are described in Appendix VII-A.

3. BG means background, and SWMU means solid waste management unit.

Table VII-9-2. Constituent List, RFI Phase I Release Assessment, Dolton Recycle Center.

Constituent	Method (from SW-846)	Method Detection Limit (mg/kg)
Inorganics		
Arsenic	7060	1.25
Barium	6010	2.0
Cadmium	6010	2.0
Chromium	6010	4.0
Lead	6010	11.0
Mercury	7471	0.04
Selenium	7740	0.9
Silver	6010	3.0
Organics*		
Volatile Organic Compounds (37)	8240	0.005-0.100
Semi-Volatile Organic Compounds (62)	8270	0.33-3.3

* A complete list of organic compounds and method detection limits for individual compounds are presented in Appendix IV-B.

8270 (gas chromatography/mass spectroscopy), respectively.

Analytical Methods

All analyses will be conducted for the total concentration of each constituent, except that inorganic constituents in ground-water samples will be analyzed for the dissolved fraction because of the high silt content expected in the samples. Analytical methods are referenced in Table VII-9-2, and contained in Appendix VII-C.

The laboratory will attempt through these standardized analytical methods to achieve the method detection limits (MDLs) listed in Table VII-9-2 and Appendix IV-B. However, MDLs are highly matrix dependent. Because Phase I focuses on the most impacted soils (and ground water), matrix interferences are anticipated. EPA's SW-846 lists modified MDLs for certain methods given matrix interferences (see Table VII-9-3). These modified MDLs will be used to determine completeness.

Holding Times

The laboratory will be instructed to meet the following holding times:

Constituent	Maximum Holding Time
Metals	6 months, excluding mercury (28 days)
VOCs	14 days
SVOCs	14 days until extraction, 40 days after extraction

The laboratory will be requested to provide a laboratory data report within 45 days of sample receipt.

Table VII-9-3. Revised Method Detection Limits Due to Matrix Interferences, RFI Phase I Release Assessment, Dolton Recycle Center.

Analytical Method	Matrix	Method Detection Limits
8240 (VOCs)	Clean and low-level soils	See MDLs in Appendix IV-B
	High-level soils	Multiply MDLs by 125
	Clean and low-level ground water	See MDLs in Appendix IV-B
	Medium-level and high-level ground water	Multiply MDLs by 50
8270 (SVOCs)	Clean and low-level soils	See MDLs in Appendix IV-B
	Medium-level and high-level soils by sonication	Multiply MDLs by 7.5
	Ground water	See MDLs in Appendix IV-B

Note: These revised method detection limits are based on information in SW-846.

Quality Assurance Procedures

Background samples, blind duplicate samples, aqueous trip and equipment blanks, and laboratory-prepared quality assurance samples will be analyzed by the laboratory during the Phase I Release Assessment to evaluate quality control. The quality assurance procedures are described in detail in Part VII of this Workplan.

SECTION VII-10

INTERNAL QUALITY CONTROL CHECKS

Internal quality control checks are inserted into the quality assurance process to enhance the precision and accuracy of the data. Field and laboratory internal quality control checks are described below.

Field Checks

Field checks include calibration to evaluate the accuracy of the data, and blind duplicate samples to evaluate the precision and representativeness of the data. Field calibration procedures are described in Section VII-8 of this Part.

Blind duplicate soil samples will be collected from five SWMU sampling locations. The duplicates will be handled in the same manner and analyzed for the same constituents as the SWMU samples. Data from the blind duplicates will be used to evaluate the representativeness of the data.

Laboratory Checks

Laboratory checks are described in detail in Section 11.0 of Appendix VII-A. For inorganic analyses, these internal checks include calibration curves, calibration blanks, continuing calibration verification, ICP interference check sample analysis, preparation blank analysis, sample spike analysis, sample duplicate analysis, laboratory control sample analysis, and ICP serial dilution analysis.

For organic analyses, internal checks include duplicate matrix spikes and reagent water blanks. Performance goals for organic constituents are established in Sections 11.4 and 11.5 of Appendix VII-A.

SECTION VII-11

DATA REDUCTION, VALIDATION, AND REPORTING

This section covers procedures to compile, validate, and report the data collected during the RFI Phase I release assessment. Both field and laboratory procedures are discussed.

Data Reduction

The field data collected will be field observations (see Section VII-6 of this Part) and health and safety data (see Part V). Data and observations will be recorded in the field logbook. No data reduction will be necessary.

Laboratory data reduction procedures are described in Section 10.0 of Appendix VII-A. Data reduction is performed by the individual analysts and consists of calculating concentrations in samples from the raw data obtained from the measuring instruments.

Data Validation

The site manager will review and sign the field notes after each day of sampling. The objectives of this review are to identify and correct errors in the field notes before the recollection of the field observations becomes dimmed by time. The project manager will review the field audit and field notes, and determine whether the samples were collected and handled according to this RFI Workplan.

Data validation procedures in the laboratory are described in Sections 10.3 through 10.5 of Appendix VII-A. Data validation is a three-step process in the laboratory. The analyst checks the data to verify that the precision and accuracy objectives are satisfied; if not, a corrective action report is filled out and corrective action taken. The QA/QC personnel check the data package to ensure that it is complete and that deviations in protocols are accounted for. The laboratory manager verifies that the final report is printed cor-

rectly. The contents of the laboratory data package are described under "Data Reporting."

The project manager will conduct a systematic review of the data for compliance with the established quality control criteria based on the spike, duplicate and blank results provided by the laboratory. An evaluation of method detection limits, data precision, accuracy and completeness, based on criteria in Section VII-14, will be performed and presented in the final report.

The project manager will identify any out-of-control data points and data omissions, and interact with the laboratory to correct data deficiencies. Decisions to repeat sample collection and analysis will be made by the project manager based on the extent of the deficiencies and their importance in the overall context of the project.

Data Reporting

A copy of the field notes will be included as an appendix in the RFI Phase I Report. The laboratory data are reported through the laboratory information management system (see Section 10.6 of Appendix VII-A). A copy of the laboratory data report will be included as an appendix in the RFI Phase I Report. The laboratory data report will include:

Inorganics

- Cover letter with laboratory manager/project manager sign-off
- Data qualifiers
- Chain of custody
- Lab chronicle, describing client ID/analysis, matrix, prep number, collection date, extraction/prep date, analysis date, and section manager sign-off
- Case narrative if any technical problems occurred
- Client data report

- Quality control summary reports, including date of analyses, parameters determined, sample duplicates and control samples, IEC factors for the ICAP analyses, method blank detection report, and laboratory control standards report.

Organics

- Cover letter with laboratory manager/project manager sign-off
- Data qualifiers
- Chain of custody
- Lab chronicle, describing client ID/analysis, RFW number, prep number, collection date, extraction/prep date, analysis date, and section manager sign-off
- Case narrative if any technical problems occurred
- Sample data report
- Quality control summary report (spread-sheet), including date of analyses, parameters determined, sample duplicates and control samples, surrogate spike recoveries, matrix spike and matrix spike duplicate results, chromatograms and mass spectra.
- Raw data package for GC/MS volatiles and semivolatiles

Data reporting also covers the handling of blind duplicates and internal laboratory replicates, outliers, data below method detection limits and quality assurance data. Data from blind duplicates will be individually recorded in the data summary tables of the RFI Phase I Report; these data will be used to evaluate the representativeness of the results.

Internal laboratory replicate data will be averaged during data reduction, and the averages will be presented in the data summary tables of the RFI Phase I Report with a notation that the values represent internal laboratory replicate averages. Individual replicate data will be shown in the labora-

tory data report, and discussed under precision and accuracy evaluations in the quality assurance part of the RFI Phase I Report.

Any program of environmental measurement can produce outlier numbers that lie outside the "expected" range of values. Outlier values may be the result of:

1. A catastrophic unnatural (but real) occurrence, such as a spill;

2. Inconsistent sampling or analytical chemistry methodology;

3. Errors in the transcription of data values or decimal points; and

4. True but extreme concentration measurements.

Documentation and validation of the cause of outliers will accompany any attempt to correct or delete data values, because true but extreme values will not be altered. Outlier values will not be omitted from the raw data reported to the regulatory agency, but will be identified as outliers within the data summary tables. Reasons for the outlying behavior will be provided in the data summary tables or in the text of the RFI Phase I report.

Data below detection limits will be expressed as "ND (method detection limit)," where "ND" means not detected and "method detection limit" is the quantitative value determined by the laboratory.

Quality assurance data will be discussed in detail in a quality assurance section of the Phase I Report. Quality assurance information will be included in other chapters to the extent that it affects the interpretation of sample data.

SECTION VII-12

PERFORMANCE AND SYSTEM AUDITS

Performance and system audits of field and laboratory activities will be conducted to verify that sampling and analysis are performed in accordance with the procedures established in this Workplan. This section describes the external audits that will be conducted by Safety-Kleen Corp. (S-K), and the internal field, laboratory, and office audits that will be conducted by S-K contractors.

External Audits

External audits will be conducted by S-K. John Valerius, who is Dolton's Facility Manager, or his designate, will audit the field activities to evaluate whether they are being conducted in accordance with the procedures in this Workplan. Mr. Valerius and/or Scott Davies of S-K will provide peer review of the RFI Final Report.

The IEPA Project Coordinator may conduct audits of field activities. S-K's management personnel or designates will accompany the IEPA personnel during the audits if so desired by the IEPA.

Field Audits

The site manager will schedule audits of field activities at various times to evaluate the execution of sampling operations and field documentation. The evaluation is directed toward the extent to which the Workplan procedures are being followed.

Sampling operations will be evaluated to determine if they are performed as stated in this Workplan. The site manager will perform spot checks to determine that the appropriate number of samples are being collected, samples are placed in proper containers, and proper preservation, packaging, and shipment protocols are being followed.

The site manager will check to see that chain-of-custody procedures are being followed, and that samples are being kept in custody at all times.

Field documents pertaining to sample identification and control will be examined daily for completeness and accuracy. Field notebooks and field data forms will be reviewed by the site manager to see that all entries are dated and signed and the contents are legible, written in indelible material, and contain accurate and inclusive documentation of project activities.

Safety-Kleen Corp. or the TriHydro project manager will visit the site on at least one occasion during the sampling event to audit compliance with the Workplan protocol. The auditor will complete the form shown as Figure VII-12-1. The completed form will be included in the final report. If deficiencies are identified during the audit, the auditor will make a decision whether to repeat sample collection and analysis based on the extent of the deficiencies and their importance in the overall context of the project.

Laboratory Audits

Laboratory raw data audit procedures are described in Section 12.1 of Appendix VII-A. S-K Environmental Laboratory also conducts periodic evaluations of all quality control data which are not project-specific, but promote a high-quality level of performance by the laboratory on all projects.

Office Audits

Prior to the production of the draft document, the quality assurance officer will review the laboratory data report for apparent errors or inconsistencies. He will work with the project manager to determine whether the laboratory will be asked to reanalyze certain samples for certain constituents.

The preliminary draft report will undergo peer review by TriHydro senior professional staff not involved in the preparation of the report. Errors will be corrected, and a draft report issued to Safety-Kleen Corp. The client will provide

Figure VII-12-1. Field Audit Form, RCRA Facility Investigation, Dolton Recycle Center.

FIELD AUDIT

Auditor: _____

Date: _____

Location: _____

Project: _____

Activity: _____

Field Personnel

Site Manager: _____

Site Health and Safety Officer:

_____

Field Staff: _____

_____

_____

Health and Safety

PID: Precision Check (±30%) _____

Accuracy Check (±5%) _____

Explosimeter: Precision Check (±30%) _____

Accuracy Check (±5%) _____

Draeger Tubes: _____

Personnel Protection Equipment: _____

Incidents: _____

_____

Responses: _____

_____

Noncompliances with Plan: _____

_____

Monitoring Procedures

Sampling Procedure Noncompliance: _____

_____

Decontamination Procedure Noncompliance: _____

_____

Field Documentation Noncompliance: _____

_____

Label Noncompliance: _____

_____

Chain-of-Custody/Sample-Analysis-Request: _____

Noncompliance: _____

Completeness

SWMU Samples: _____

Background Samples: _____

Field Duplicate (1/10): _____

Equipment Blank (1/10): _____

Trip Blank (1/cooler): _____

Noncompliances with Plan: _____

_____

_____
Site Manager, Company, Date

_____
Auditor, Company, Date

peer review comments, the draft will be revised, and a final report submitted to the regulatory agencies.

SECTION VII-13

PREVENTATIVE MAINTENANCE

Instruments and equipment will be maintained in order to promote the generation of precise and accurate data, and to permit the project to proceed on schedule. Preventative maintenance procedures for field and laboratory equipment are described below.

Field Procedures

The cornerstones of the field preventative maintenance program are the checking and calibration of field instruments before they are shipped or carried to the field, and the provision for backup instruments and equipment. The combustible gas meter and photoionization detector (PID) will be checked and calibrated immediately before going to the field. Instruments which cannot be properly operated or calibrated will not be taken to the project site.

Backup duplicate instruments and equipment will be available onsite or within one-day shipment to avoid delays in the field schedule. Critical spare parts will be kept onsite to minimize instrument downtime.

Routine calibration will be conducted according to the procedures in Section VII-8 of this Part. Routine calibration will minimize the potential for inaccurate field measurements.

Laboratory Procedures

Preventative maintenance procedures in the laboratory are described in Section 13.0 of Appendix VII-A. These procedures include a calendar of routine equipment maintenance, instrument maintenance logbooks which document non-routine repair or maintenance, and an inventory of critical spare parts in the laboratory.

SECTION VII-14

PROCEDURES TO ASSESS DATA DETECTION LIMITS, PRECISION, ACCURACY, AND COMPLETENESS

As discussed in Section VII-5, there are four quantitative measures of data quality:

- Method detection limits
- Precision
- Accuracy
- Completeness

Procedures to assess these measures are discussed below.

Method Detection Limits

Analytical methods are referenced in Table VII-3-1 and contained in EPA's SW-846. The laboratory will attempt through these standardized analytical methods to achieve the method detection limits (MDLs) listed in Table VII-3-1 and Appendix VII-A. However, MDLs are highly matrix dependent. Because Phase I focuses on defining if a release has occurred, is occurring, or could occur, matrix interferences are possible. EPA's SW-846 lists modified MDLs for certain methods given matrix interferences (see Table VII-9-3). These modified MDLs will be used to determine completeness.

In addition to MDLs, the laboratory routinely evaluates instrument detection limits (IDLs) on laboratory-prepared standards. Quality assurance objectives for IDLs are discussed in Section 14.0 of Appendix VII-A.

Precision

Precision will be measured on internal laboratory duplicates by the procedure discussed in Section VII-5. Precision quality assurance objectives are listed in Table 5-2 of Appen-

dix VII-A. These objectives are based on a large number of quality assurance analyses conducted by S-K Environmental Laboratory on previous RCRA-level projects.

Accuracy

Accuracy in the field will be evaluated by calibration data on the field equipment. Limits are shown on Figure VII-12-1.

Accuracy will be assessed by means of laboratory internal reference samples and percent recoveries. Accuracy quality assurance objectives are listed in Table 5-2 of Appendix VII-A. Accuracy objectives are discussed further in Section 5.1 and of Appendix VII-A. As with precision, the accuracy objectives are based on a large number of quality assurance analyses conducted by S-K Environmental Laboratory on previous RCRA-level projects.

Completeness

Completeness is based on compliance of the sampling program with the Workplan protocol and the analytical program with the MDLs, precision and accuracy objectives. The completeness objective is 95% for the sampling program and for the analytical program. Audits (see Section VII-12) will ensure that the sampling program satisfies the completeness quality assurance objective.

The overall laboratory objective for completeness is to have 95 percent of the data usable without qualification. The ability to meet or exceed this completeness objective is dependent on the nature of samples submitted for analysis. If data cannot be reported without qualifications, project completion goals may still be met if the qualified data, i.e., data of known quality even if not perfect, are suitable for specified project goals.

SECTION VII-15

CORRECTIVE ACTION

Corrective action may be required for two classes of problems: instrument and equipment problems and noncompliance problems. The problems will be identified by field team members during sampling and by laboratory analysts during the chemical analyses, or by the project managers and quality assurance officers during the audit procedures described in Section VII-12 of this Part. Corrective actions are described below.

Instrument and Equipment Problems

Instrument and equipment problems may occur during sampling and analysis. They will be remediated by:

- Repair or recalibration
- Replacement with backup duplicate instruments or equipment

Nonconformance Problems

Two types of nonconformance problems may arise: deviation from the approved Workplan procedures or inability to achieve the quality assurance objectives discussed in Sections VII-5 and VII-14 of this Part. Deviations from the approved Workplan procedures will be handled in one of two ways:

1. Conducting the work again in accordance with the approved Workplan procedures; or
2. Demonstrating to IEPA's satisfaction that the noncompliance does not compromise the successful achievement of the Workplan objectives or the quality assurance objectives.

Deviations and corrective actions will be discussed in the RFI Phase I Report.

The second potential nonconformance problem is the inability of the laboratory to achieve the quantitative quality assurance objectives. A detailed description of laboratory responses to correct these deficiencies is presented in Section 15.0 of Appendix VII-A. If the laboratory cannot correct the deficiencies, they will be handled in one of three ways:

1. The laboratory will be asked to re-analyze the analyses in question, if sample holding times have not been exceeded;

2. Safety-Kleen Corp. will demonstrate to IEPA's satisfaction that the noncompliance does not compromise the successful achievement of the Workplan objectives; or

3. Additional samples will be collected and analyzed to eliminate the noncompliance.

Laboratory noncompliance and corrective actions will be discussed in the RFI Phase I Report.

SECTION VII-16

QUALITY ASSURANCE REPORTS TO MANAGEMENT

A RFI Phase I Report will be submitted to the Illinois Environmental Protection Agency which addresses quality assurance problems, if any. The RFI Phase I Report will describe the quality assurance problems and the responses proposed or implemented to resolve these problems.

The laboratory quality assurance officer will prepare a package at the completion of the analytical work which covers the following information:

- Data accuracy and precision
- Completeness
- Results of any performance or system audits conducted during the project

The package will include a comparison of the laboratory quality assurance data to the quality assurance objectives, identify noncompliance with the quality assurance objectives, and describe actions to eliminate or accommodate the noncompliance. This laboratory quality assurance report will be included as an appendix to the RFI Phase I Report.

The RFI Phase I Report will include a section on quality assurance. This section will contain a description of any field or laboratory noncompliance with the Phase I or quality assurance objectives stated in Section VII-5, and a discussion of the actions taken to eliminate or accommodate the noncompliance.

SECTION VII-17

REFERENCES

U.S. Environmental Protection Agency, 1987. Test Methods for Evaluating Solid Waste, Revision 1 (SW-846).

APPENDIX VII-A

S-K ENVIRONMENTAL LABORATORY
QUALITY ASSURANCE PROJECT PLAN

SAFETY-KLEEN QUALITY ASSURANCE PLAN

for

ENVIRONMENTAL ANALYSES

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Appendix A - Standard Operating Procedures

3.0 QUALITY ASSURANCE POLICY

The following document provides a summary of the quality assurance program maintained by Safety-Kleen's Environmental Laboratory. This program was prepared in accordance with "Model Quality Assurance Project Plan Region 5 Office of Super Fund, May 91" to ensure the delivery of complete and accurate data of known quality.

An effective quality assurance program is built on a foundation of quality derived Standard Operating Procedures. This approach ensures that each link in the chain of analysis is sound. Safety-Kleen's chain-linked approach affords a means of verifying and documenting performance quality as required by each SOP employed. Analytical quality is further ensured by rigorous periodic Quality Audits conducted by Safety-Kleen's laboratory Quality Assurance Department which is entirely separate and independent of laboratory operations.

Project specific Quality Assurance objectives are addressed on a project by project basis to satisfy client or end user needs. As such, Safety-Kleen endeavors to discuss and define these objectives with each client at the earliest possible stage.

The objective of Safety-Kleen's Environmental Laboratory QA Program is to ensure that all data reported is complete, accurate and of known quality. These three components form the foundation of Safety-Kleen's Environmental Laboratory QA program.

4.0 ORGANIZATION AND RESPONSIBILITY

It is the objective of Safety-Kleen Corp. to provide an organizational structure that can enhance the attainment of Corporate goals. Quality services, cost competitiveness, client satisfaction, employee gratification and profitable operations are primary Safety-Kleen goals.

4.1 DESCRIPTION OF LABORATORY PERSONNEL RESPONSIBILITIES

Safety-Kleen's Environmental Laboratory , located in Elk Grove Village, Illinois, is a full-service environmental analytical laboratory. A total staff of 2[illegible]eople, consisting of laboratory personnel and/or support personnel managed by Mr. Mark A. Har[illegible]ig provide environmental services to industrial and internal clients. The Environmental Laboratory has state certifications for the analysis of soils, waste water and/or drinking water in Connecticut, California, Illinois, Kansas, New York and Wisconsin. Also, all those states that recognize any of the previous mentioned states in reciprocity. We are accredited by the American Association for Laboratory Accreditation (A2LA). This enables the Environmental Laboratory to conduct analyses for internal and client projects throughout much of the country.

4.1.1 PROJECT MANAGEMENT

Safety-Kleen's Environmental Laboratory uses a system of lab managers and project managers to plan, coordinate, execute and monitor project activities. Efficient and effective project management is of prime importance to the successful execution of project establishing and maintaining credibility and lasting value. Project management at Safety-Kleen is the coordinated and cooperative effort of a team, in which each member actively participates in successful project planning and execution. Project Managers are involved from the start in planning the project and time tables. When the client proposal is accepted by the client, the lab project manager will schedule with the client the arrangements for supplying sample containers and a schedule for sampling.

When samples are received at Safety-Kleen's Environmental Laboratory, the sample custodian will verify that all sample container seals are intact, and if so, will sign the chain-of-custody statement accordingly. In the event that it appears chain-of-custody has been broken, the sample custodian will immediately bring it to the attention of the Project Manager who will in turn contact the client for consultation and resolution. Written documentation of the event will be furnished.

The sample custodian will also verify information on the sample labels is the same as that appearing on the chain-of-custody. Any inconsistencies will also be brought to the attention of the Project Manager for immediate resolution with the client. The resolution will be documented in a memorandum to the project file and a copy provided to the client. After log-in, the samples are stored at 4°C in storage refrigerators until analysis.

The sample identification information and analyses requested are then logged into the laboratory computer and entered onto the laboratory backlog. The laboratory backlog serves as a guide to the Laboratory Manager, Group Leaders and Project Managers to identify the status of all samples in the laboratory, and is used to ensure that project deliverable requirements are met. The backlog contains the laboratory sample work order number, client name, number of samples received by matrix, number of samples to be analyzed for each requested parameter, due date, type of QC and report requested.

Backlogs are updated daily and reviewed by the Environmental Laboratory Project Manager and group leaders. The responsibility of the Project Manager is to monitor the status of samples using the backlog report, daily status meetings and through status updates from the Laboratory Manager. Use of the backlog allows the Project Manager to track the progress of samples through the various steps of the analytical process and assure timely completion of each task. If for any reason the backlog indicates that sample analyses are not completed within seven days of the due date, the Project Manager will work with the Laboratory Manager and Group Leaders to reassess laboratory priorities to enable timely delivery of the analytical report. The laboratory manager and group leaders have a commitment to maintain project schedules with a goal of 100% on-time delivery of quality data packages. If at any time, a delay in the required project turnaround time is anticipated, the Project Manager will immediately contact the client and inform them of the nature of the problem, the corrective action taken and a revised delivery date for the analytical data report.

A flexible capacity helps the laboratories meet project commitments. The Environmental Laboratory operates two shifts, 5 days per week in many of the service areas. The shifts are 8 hours shifts. Capacity is expanded by using autosamplers on many of the instruments. As demand for specific analytical requirements grows, the Environmental Laboratory has added equipment and full time staff as analytical backlog is identified.

4.1.3 KEY PERSONNEL

The Environmental Laboratory provides ongoing training to maintain the quality of its personnel. The highly trained staff of experienced professional chemists and technicians is the key element in the lab's credibility as a provider of quality environmental testing service. A strong base of experience, organized and managed effectively, results in a value added service product appreciated by our clients. The accompanying Skills Matrix of Key Personnel summarizes the education and experience of the laboratory personnel. The Laboratory personnel assigned to this project have an excellent record of satisfying project requirements. The Group Leaders provide guidance and direction enabling their staff to routinely provide quality test results.

Table 4-1 provides the skills matrix of key laboratory personnel.

Table 4 - 1

Skills Matrix of Key Personnel
SAFETY-KLEEN CORP.
February 14, 1994

	DEGREE	YRS LAB EXP	PROJ MNGT	QA/ QC	DATA MNGT	CLP EXP	SW846 EXP	EPA 600 EXP	DOD EXP	A.F. IRP EXP	INDST HYG EXP
Laboratory Manager Mark Hartwig	BS Chem	20	X		X	X	X	X			X
VP Technical James Breece	Ph.D. Chem	31	X	X	X		X				
QA/QC Manager Dave Reese	BS Chem	15	X	X	X	X	X	X	X		
Inorganic Group Leader Rita Shah	BS Chem	11	X	X		X	X				X
Organic Group Leader Rick Cook	MS Chem	14	X	X	X	X	X	X			X
Project Manager Matt Schweik	BS Economics										
Chemist Pravin Patel	MS Chem	11		X			X				
Chemist Atul Shah	BS Chem	23				X	X	X			X
Chemist Mark Scheuer	MS Chem	8				X	X				X

4.2 ANALYST TRAINING

Refer to Appendix A.

5.0 QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC) OBJECTIVES

5.1 GENERAL

The specific QA/QC objectives for this project are summarized in Tables 5-1 and 5-2. The objectives are divided into two groups briefly described below:

5.1.1 PRECISION

The degree of agreement between the numerical values or determinations of a set of duplicate samples performed in an identical fashion constitutes the precision of the measurement. Precision will be reported as relative percent difference as expressed by the following formula:

$$RPD = \frac{(C_1 - C_2)}{(C_1 + C_2)/2} \times 100\%$$

where:

C_1 = Numerical value #1

C_2 = Numerical value #2

5.1.2 ACCURACY

Accuracy is the measure of a result to the accepted (or true) value. Accuracy is assessed by means of reference samples and percent recoveries. Error may arise from personal, instrumental, or methods factors. 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 and is expressed by the following formula:

$$\text{Accuracy} = \% \text{ Recovery} = \frac{A^T - A^O}{A^F} \times 100\%$$

Where:

A^T = Total amount found in fortified sample.
A^O = Amount found in unfortified sample.
A^F = Amount added to sample.

The fortified concentration may be specified as part of the project requirement or laboratory quality control requirements, (matrix spike). In the case of matrix spikes, the fortified concentration should be different enough (two to five times higher) from the background concentration to permit a reliable recovery calculation.

Table 5-1

Target Compound List

Parameter	Method	Extraction	Soil mg/Kg	Water mg/L
Arsenic	6010	3050	8.0	
	7060	3050	1.25	
	6010	3010		0.08
	7060	3020		0.013
Barium	6010	3050	2.0	
	6010	3010		0.02
Cadmium	6010	3050	2.0	
	7131	3050	0.1	
	6010	3010		0.02
	7131	3020		1.0
Chromium	6010	3050	4.0	
	7191	3050	0.83	
	6010	3010		0.04
	7191	3020		0.008
Lead	6010	3050	11.0	
	7421	3050	0.78	
	6010	3010		0.11
	7421	3020		0.008
Selenium	6010	3050	15.0	
	7740	3050	0.9	
	6010	3010		0.15
	7740	3020		0.009
Silver	6010	3050	3.0	
	7761	3050	0.44	
	6010	3010		0.03
	7761	3020		0.004
Mercury	7471	N/A	0.04	
	7470	N/A		0.002
Methyl Ethyl Ketone	8240	N/A	0.1	0.1
Trichlorofluoromethane		N/A	0.01	0.01
Vinyl Chloride		N/A	0.01	0.01
Toluene		N/A	0.005	0.005
Benzene		N/A	0.005	0.005
Acetone		N/A	0.1	0.1
Bromodichloromethane		N/A	0.005	0.005
Bromoform		N/A	0.005	0.005
Chloroethane		N/A	0.01	0.01
Chloroform		N/A	0.005	0.005
Dibromochloromethane		N/A	0.005	0.005
1,1-Dichloroethane		N/A	0.005	0.005
1,2-Dichloroethane		N/A	0.005	0.005
trans 1,2-Dichloroethylene		N/A	0.005	0.005
1,2-Dichloropropane		N/A	0.005	0.005

Table 5-1
(continued)

Target Compound List

Parameter	Method	Extraction	Soil mg/Kg	Water mg/L
cis-1,3-Dichloropropene		N/A	0.005	0.005
trans-1,3-Dichloropropene		N/A	0.005	0.005
Ethylbenzene		N/A	0.005	0.005
2-Hexanone		N/A	0.05	0.05
4-Methyl-2-pentanone		N/A	0.05	0.05
Styrene		N/A	0.005	0.005
1,1,2,2-Tetrachloroethane		N/A	0.005	0.005
1,1,2-Trichloroethane		N/A	0.005	0.005
Vinyl Acetate		N/A	0.05	0.05
Xylene (total)		N/A	0.005	0.005
Chloromethane		N/A	0.01	0.01
Bromomethane		N/A	0.01	0.01
Tetrachloroethene		N/A	0.005	0.005
Trichloroethene		N/A	0.005	0.005
Methylene Chloride		N/A	0.005	0.005
1,1,1-Trichloroethane		N/A	0.005	0.005
Carbon Disulfide		N/A	0.1	0.1
Carbon Tetrachloride		N/A	0.005	0.005
Chlorobenzene		N/A	0.005	0.005
1,1,2-Trichloro-1,2,2-Trifluoroethane		N/A	0.005	0.005
1,1-Dichloroethylene		N/A	0.005	0.005
cis-1,2-Dichloroethylene		N/A	0.005	0.005
Bis(2-ethylhexyl)phthalate	8270	3550 3510	0.66	0.01
4-Bromophenol phenyl Ether		3550 3510	0.66	0.01
Butyl benzyl phthalate		3550 3510	0.66	0.01
p-Chloroaniline		3550 3510	1.30	0.02
p-Chloro-m-cresol		3550 3510	0.66	0.01
2-Chloronaphthalene		3550 3510	0.66	0.01
2-Chlorophenol		3550 3510	0.66	0.01
4-Chlorophenyl phenyl ether		3550 3510	0.66	0.01
Chrysene		3550 3510	0.66	0.01
Dibenz(a,h)anthracene		3550 3510	0.66	0.01
Dibenzofuran		3550 3510	0.66	0.01

Table 5-1
(continued)

Target Compound List

Parameter	Method	Extraction	Soil mg/Kg	Water mg/L
3,3'-Dichloro-benzidine		3550 3510	1.30	0.02
Indeno(1,2,3-c,d)pyrene		3550 3510	0.66	0.01
Isophorone		3550 3510	0.66	0.01
2-Methylnaphthalene		3550 3510	0.66	0.01
Naphthalene		3550 3510	0.66	0.01
Di-n-butylphthalate		3550 3510	0.66	0.01
2-methyl-4,6-dinitrophenol		3550 3510	1.30	0.02
o-Nitroaniline		3550 3510	3.30	0.05
m-Nitroaniline		3550 3510	3.30	0.05
p-Nitroaniline		3550 3510	ND	0.02
Nitrobenzene		3550 3510	0.66	0.01
o-Nitrophenol		3550 3510	0.66	0.01
p-Nitrophenol		3550 3510	3.30	0.05
Pentachlorophenol		3550 3510	3.30	0.05
Phenanthrene		3550 3510	0.66	0.01
Phenol		3550 3510	0.66	0.01
Pyrene		3550 3510	0.66	0.01
1,2,4-Trichlorobenzene		3550 3510	0.66	0.01
2,4,5-Trichlorophenol		3550 3510	0.66	0.01
2,4,6-Trichlorophenol		3550 3510	0.66	0.01
m-Dichlorobenzene		3550 3510	0.66	0.01
o-Dichlorobenzene		3550 3510	0.66	0.01

Table 5-1
(continued)

Target Compound List

Parameter	Method	Extraction	Soil mg/Kg	Water mg/L
p-Dichlorobenzene		3550 3510	0.66	0.01
m-Cresol		3550 3510	0.66	0.01
o-Cresol		3550 3510	0.66	0.01
p-Cresol		3550 3510	0.33	0.005
Acenaphthene		3550 3510	0.66	0.01
Acenaphthylene		3550 3510	0.66	0.01
Anthracene		3550 3510	0.66	0.01
Benzo(a)anthracene		3550 3510	0.66	0.01
Benzo(b)fluoranthene		3550 3510	0.66	0.01
Benzo(k)fluoranthene		3550 3510	0.66	0.01
Benzo(ghi)perylene		3550 3510	0.66	0.01
Benzo(a)pyrene		3550 3510	0.66	0.01
Benzyl alcohol		3550 3510	1.30	0.02
Bis(2-chloroethyoxy)methane		3550 3510	0.66	0.01
Bis(2-chloroethyl)ether		3550 3510	0.66	0.01
2,4-Dichlorophenol		3550 3510	0.66	0.01
Diethyl phthalate		3550 3510	0.66	0.01
2,4-Dimethylphenol		3550 3510	0.66	0.01
Dimethyl phthalate		3550 3510	0.66	0.01
2,4-Dinitrophenol		3550 3510	3.3	0.05
2,4-Dinitrotoluene		3550 3510	0.66	0.01
2,6-Dinitrotoluene		3550 3510	0.66	0.01

Table 5-1
(continued)

Target Compound List

Parameter	Method	Extraction	Soil mg/Kg	Water mg/L
Di-n-octyl phthalate		3550 3510	0.66	0.01
Fluoranthene		3550 3510	0.66	0.01
Fluorene		3550 3510	0.66	0.01
Hexachlorobenzene		3550 3510	0.66	0.01
Hexachlorobutadiene		3550 3510	0.66	0.01
Hexachlorocyclopentadiene		3550 3510	0.66	0.01
Hexachloroethane		3550 3510	0.66	0.01

Table 5-2

Summary of Precision and Accuracy Objectives

Metals EPA Method 6010 and 7000 Series

Parameters	Matrix	Precision (Relative % Difference)	Accuracy (% Recovery)
Arsenic	Soil	30	75 - 125
	Water	20	80 - 120
Barium	Soil	30	75 - 125
	Water	20	80 - 120
Cadmium	Soil	30	75 - 125
	Water	20	80 - 120
Chromium	Soil	30	75 - 125
	Water	20	80 - 120
Lead	Soil	30	75 - 125
	Water	20	80 - 120
Selenium	Soil	30	75 - 125
	Water	20	80 - 120
Silver	Soil	30	75 - 125
	Water	20	80 - 120
Mercury	Soil	30	75 - 125
	Water	20	80 - 120

Volatiles EPA Method 8240

Parameters	Matrix	Precision (Relative % Difference)	Accuracy (% Recovery)
Chlorobenzene	Soil	20	75 - 110
	Water	20	75 - 110
Toluene	Soil	20	76 - 125
	Water	20	76 - 125
Benzene	Soil	20	76 - 127
	Water	20	76 - 127
1,1-Dichloroethene	Soil	20	61 - 145
	Water	20	61 - 145
Trichloroethene	Soil	20	71 - 120
	Water	20	71 - 120

Table 5-2
(continued)

Summary of Precision and Accuracy Objectives

Semi-Volatiles EPA Method 8270

Parameters	Matrix	Precision (Relative % Difference)	Accuracy (% Recovery)
Phenol	Soil	35	26 - 115
	Water	42	12 - 110
2-Chlorophenol	Soil	50	25 - 115
	Water	40	27 - 123
1,4-Dichlorobenzene	Soil	27	28 - 115
	Water	28	36 - 115
N-Nitroso-di-n-propylamine	Soil	38	41 - 126
	Water	38	41 - 116
1,2,4-Trichlorobenzene	Soil	25	38 - 115
	Water	28	39 - 115
4-Chloro-3-methylphenol	Soil	33	26 - 115
	Water	42	23 - 115
Acenaphthene	Soil	25	31 - 137
	Water	31	46 - 118
4-Nitrophenol	Soil	50	11 - 114
	Water	50	10 - 115
2,4-Dinitrotoluene	Soil	47	28 - 115
	Water	38	24 - 115
Pentachlorophenol	Soil	47	17 - 115
	Water	50	9 - 115
Pyrene	Soil	36	35 - 142
	Water	31	26 - 127

5.2 FIELD AND LABORATORY QUALITY CONTROL SAMPLES

Standard analytical quality control checks to be instituted by field and laboratory personnel include but are not limited to:

5.2.1 EQUIPMENT BLANKS

Samples are prepared using analyte-free water. Equipment blanks are routed through decontaminated sampling equipment prior to collection. Preservatives or additives are added as required and the blank sample is then sealed. The equipment blank will then be shipped with real samples collected for the same parameter group. During field sampling an equipment blank will be collected and analyzed from each group of aqueous samples for each 10 samples received daily.

5.2.2 TRIP BLANKS

Volatile organic sample containers prepared in the laboratory using analyte-free water. The trip blanks accompany the field samples during transport to the site, during collection, packaging, and transport to the lab, during analysis, and will be contained in the same type of sample container as those used in the current sampling effort. One trip blank sample will be included for each cooler of aqueous VOA samples.

5.2.3 DUPLICATE SAMPLES

Samples collected from the same sampling location at the same time. At least one duplicate sample will be analyzed from each group of samples of a similar matrix type for every 10 samples received.

5.2.4 MATRIX SPIKE/MATRIX DUPLICATE (MS/MSD)

Samples in which compounds are added before extraction and analyses. The recoveries for spiked compounds can be used to assess how well the method used for analysis recovers target compounds (i.e., a measure of matrix interference in the sample). when reviewed in conjunction with other QC data, MS/MSD may indicate reanalysis using a more appropriate method. At least one spiked sample analysis will be performed on each group of samples of a similar matrix type and concentration for each batch of samples or for every 20 samples received, whichever is more frequent.

5.2.5 SURROGATE SPIKING

Samples in which surrogate compounds are added before sample preparation for organics. The review for spiked surrogate compounds can be used to assess method accuracy for each sample matrix.

6.0 SAMPLING PROCEDURES

Refer to Section 6.0 of the main text of the Quality Assurance Project Plan.

Table 6-1

Sample Containers, Preservation and Hold Times for Waters & Soils

						CONTAINER TYPE (EP Rec.)		
PARAMETERS	SOLID WASTE METHOD *	WATER/WASTEWATER METHOD **	SAMPLE WEIGHT *	SAMPLE VOLUME **	HOLDING TIME	SOLID	LIQUID	PRESERVATIVE FOR LIQUI SAMPLES
Metals (Excluding Chromium VI & Hg)	7000 Series/6010	200 Series/200.7	2 grams	200 mL	6 months	4 oz. CWM	500 mL HDPE	pH <2 HNO3
Semi-Volatiles	8270	625, 1625	30 grams	1 Liter	7 Days Ext./40 days after Ext.	8 oz. CWM	2 1/2 Liters A.J.	(1) Cool 4°C, .008% Na2S2
Volatiles	8204	624, 1624	5 grams	5 mL	14 Days	4 oz. CWM	40 mL Glass Vial	(1) 4 Drops HCl, Cool 4°C .008% Na2S2O3

7.0 FIELD CUSTODY

Definition of custody - A sample is in one's custody if:

- It is in one's physical possession.
- It is in one's view, after being in one's physical possession.
- It is in one's physical possession and secured so that no one can tamper with it.
- It is kept in a secured area restricted to authorized personnel only.

7.1 CUSTODY PROCEDURES

All custody records should be originated by the supplier of sampling containers or by field personnel. The sample record contains the following information.

- Sample Identification
- Date and time of collection
- Source of the sample (include sample type and name of firm)
- Preservative
- Analysis requested
- Name of person collecting sample
- Any Special Information - including potential level of contamination

The shipping container is sealed to prevent the sample tag from being removed and the container opened without authorization. The tags and seals should be filled out in legible handwriting.

When transferring the possession of samples, the transferee should sign and record the date and time the transfer took place.

The log-in personnel shall receive and verify the integrity of the samples. Samples not properly passed are not to be received until the client is notified of the specific problems and corrective action is specified. Photographs can be taken of damaged coolers and sample containers as evidence that samples were not received "in-tact".

7.2 LABORATORY CUSTODY PROCEDURES

Safety-Kleen's Environmental Laboratory assumes the responsibility for the integrity and security of the samples after proper custody transfer is completed.

- Safety-Kleen Technical Center's facility is securely locked 24 hours/day except the main entrance to the lab. The main entrance is locked from 7:00 pm to 6:00 am. The receptionists monitors the entrance of all visitors during 8:00 am to 5:00 pm. All nonemployed personnel sign an entrance logbook and then they are guided by facility personnel. The building has 24 hour security service.

- Log-in personnel, under supervision of the analytical project coordinator, receive the samples and provide a work order number for each sample received. Then they log samples into a bound sample log book by documenting appropriate information.

- Log-in personnel coordinate sample bottle information, log book information, chain-of-custody records, and all pertinent information associated with the sample to assure that all information is correct.

- Persons designated by the analytical project coordinator or sample custodian are responsible for securing the samples in the appropriate storage areas within the secured laboratory facility.

  All sample manipulation/preparation will be documented by the analyst/technician in the appropriate log i.e.) sample extraction log, sample digestion log, or sample distillation log.

- Internal chain-of-custody for samples is maintained by the Sample Custodian on the Sample Control Record Internal Chain-of-Custody. All samples and extracts must be signed for by the person from each lab retaining custody of these items. On completion of all analyses, these custody sheets will be placed in our data packet.

- All samples will be held until the results have been reported and accepted by the client, until litigation has been completed, or requested. All hazardous samples will be disposed of properly.

- When samples are transferred from the lab to any other destination chain-of-custody protocols are followed.

ENVIRONMENTAL CHAIN OF CUSTODY

DATE:

			PROJECT #
			AUTHORIZATION #
GENERATOR SITE & ADDRESS	PROJECT MANAGER(S)	PHONE & FAX	

SAMPLER'S NAME

ANALYSIS REQUESTED

FIELD SAMPLE ID #	SAMPLE MATRIX	DATE/TIME SAMPLED	# OF CONTAINERS	PRESERVATION METHOD	MINERAL SPIRITS (8015)	TARGET VOA (8240)	P-CRESOL 8040 ☐ 8270 ☐	CADMIUM (7131)	LEAD 7420 ☐ 7421 ☐ 6010 ☐	CHROMIUM (6010)	TOTAL ORGANIC CARBON (9060)	TCLP Metals ☐ VOA ☐ Semi-VOA ☐ Pest ☐ Herb ☐	OIL & GREASE 413.1 ☐ 413.2 ☐ SM-503 ☐	HYDROCARBONS GC/FID Gas ☐ Diesel ☐ Screen ☐	PCB (8080)	BTEX 602 ☐ 8020 ☐ with MTBE ☐	BTEX/Gas Hydrocarbons PID/FID ☐ with MTBE ☐	EPA 601 ☐ EPA 8010 ☐	EPA 602 ☐ EPA 8020 ☐	EPA 624/PPL ☐ 8240/TAL ☐ NBS(+15) ☐	EPA 625/PPL ☐ 8270/TAL ☐ NBS (+25) ☐	EPA Metals - Priority Pollutant ☐ TAL ☐ RCRA ☐	EPA 601 ☐ 8310 ☐

COMMENTS/REMARKS:

REQUESTED TAT

SAMPLE TRANSFER RECORD

RELINQUISHED BY	DATE	TIME	RECEIVED BY	DATE	TIME
SIGNATURE OF COLLECTOR:					

SK TCLP LAB USE ONLY

TEMPERATURE WHEN RECEIVED ____ °C ____ SHIPPED VIA ____ UPS ____ FED EX ____ OTHER ____

SAMPLE KIT OPENED AND CHECKED IN BY ____ AT ____ ON ____

C.O.C. SEALS SIGNED, DATED AND INTACT ON ALL SAMPLE JARS? YES ____ NO ____ IF NO, EXPLAIN ____

SHIPPING NOTES/LAB COMMENTS:

FIGURE 7-1

FIGURE 7-2

SAMPLE CONTROL RECORD
INTERNAL CHAIN-OF-CUSTODY

Sample Custodian Signature: _____ Date/Time: _____

Custody Seal: present/absent
intact/not intact

Chain-of-Custody: present/absent

Samples Intact Yes / No

Samples within Holding Times Yes / No

Samples Properly Preserved Yes / No

Work Order #: _____ **Sample #:** _____

REFRIG #	REMOVED BY	DATE/TIME REMOVED	REASON	DATE/TIME RETURNED

8.0 CALIBRATION PROCEDURES AND FREQUENCY

This section describes the basic protocols used for calibration of instruments used for AA metals, ICP metals, other inorganic parameters and organics. These protocols provide assurance of optimization of each procedure prior to the analysis of samples. Continuing calibration verification is also discussed in Section 11 "Internal Quality Control Checks".

Before an analytical method is performed, and annually there after, method detection level studies (MDLs) are performed. Method detection level studies are performed in accordance to the procedures described in the "Code of Federal Regulations, Section 40, part 136, Appendix B".

Instrument calibration typically consists of two types: initial calibration and continuing calibration. Initial calibration procedures establish the calibration range of the instrument and determine instrument response over that range. Typically, three to five analyte concentrations are used to establish instrument response over a concentration range. The instrument response over the range is generally absorbance, peak area, etc., which can be expressed as a linear model with a correlation coefficient (e.g. for Atomic Absorption, Inductively Coupled Plasma, UV-Visible-Infrared Spectrophotometry, Ion Chromatography) or as a response factor or amount vs response plot (e.g. for Gas Chromatography, Gas Chromatograph/Mass Spectrometry, High Performance Liquid Chromatography).

Continuing calibration includes measurement of the instrument response to fewer calibration standards and requires instrument response to compare with certain limits (e.g. + 10%) of the initial measured instrument response. Continuing calibration may be used within an analytical sequence to verify stable calibration throughout the sequence, and/or to demonstrate that instrument response did not drift during a period of non-use.

Specific instrument calibration procedures for various instruments are detailed further in this section and in the laboratories standard operating procedures.

8.1 METALS

The H.C. lamp and flame position are adjusted for maximum optimization. A standard calibration curve consisting of a calibration blank and three standards are analyzed and absorbance readings are recorded. An initial calibration verification sample will be analyzed and be within 90 - 110% of the true value. (Mercury range is 80 - 120%.) A continuing calibration standard will be analyzed every ten samples to verify the continual instrument optimization.

If the standard does not fall within 10% of original curve, the instrument will be recalibrated and the samples in the previous set reanalyzed.

An initial calibration verification (ICV) is performed at the beginning of the analysis of samples by analyzing an independent standard. The ICV must be 90 - 110% recovery of the known concentration. The ICV is an independently prepared standard from an alternate source from the Calibration standards. It is analyzed at a concentration at the midrange of the calibration curve.

A continuing calibration verification (CCV) sample is analyzed every ten samples during an analytical run. The CCV must be 90 - 110% recovery of the known concentration. The CCV is an independently prepared standard from an alternate source from the Calibration standards.

8.2 ICP METALS

Calibration using a calibration blank and three standards is performed after a period of time sufficient to warm up the instrument. The standard curve must show a correlation coefficient of 0.995 - 1.000. All samples above the ICP linear range are diluted and analyzed.

ICP Interference Check Sample: Certified ICP Interference Check Sample is obtained for outside sources. Control limit is $\pm$ 20% of the true value for analytes included in the ICS. If results for the check sample do not fall within the control limit, terminate the analysis, correct the problem, recalibrate, reverify the calibration, and reanalyze the samples.

8.3 INORGANIC COLORIMETRIC METHODS

Standard calibration curves are prepared for all analyses on a daily basis or a standard curve is analyzed whenever new reagents are used, or when changes in the procedure are introduced. For each batch of analyses a midrange and high range standard will be analyzed and must be within 10% of the original curve. If it is not within 10% of the original curve, a new curve will be developed or reanalysis of the standards will be done to verify they do not fit the curve. The standard curve is composed of a reagent blank, three to five standards and must have a correlation coefficient of 0.995 - 1.000.

For procedures that require pretreatment steps, a minimum of one standard shall be prepared with the pretreatment. If the pretreated standard is within 20% of the standard curve the curve will be used. If the pretreated sample is not within 20% of the curve the reason will be determined. If it is determined that the difference between the curves is inherent in the procedure, the curve will be based on the standards prepared and carried through the pretreatment.

8.4 VOLATILE ORGANICS AND ACID BASE/NEUTRALS BY GC/MS

Initial demonstration of acceptable precision and accuracy will be accomplished by analyzing three replicate spiked samples according to the applicable waste water method. The average concentration and standard deviation for each component must meet quality control acceptance criteria in the applicable waste water method. Alternatively, historical data generated with USEPA CLP protocols may be submitted. Data from spiked blanks, USEPA quality control samples, or USEPA performance evaluation samples is acceptable.

When using capillary columns, the Environmental Laboratory obtains less than 6% relative standard deviation (RSD) between replicate injections and less than 15% RSD between replicate purge for each instrument. RSD of surrogate response, calculated by internal standard technique, is measured in blank samples or standards.

Initial calibration curves are generated for each compound on the attached target lists for the method being calibrated. The standards used to generate the curves must start at or near the Practical Quantitation Limit (PQL) and cover the entire working range of the instrument. Any sample concentrate must be diluted so that all components present above the contract required detection level fall within the range of the initial calibration curve. When dilution of a sample or sample extract is necessary, the analyst will quantify the lower level components from the initial undiluted analysis.

For GC/MS analyses, calibration is performed on five points by the internal standard technique. Calculate Response Factors (RF) according to:

$RF = Ax/Ais \times Cis/Cx$

Ax = Area of the characteristic ion of compound to be measured

Ais = Area of the characteristic ion of the specific internal standard used to calculate the compound to be measured.

Cis = Concentration of the internal standard (ng/µL).

Cx = Concentration of the compound to be measured (ng/µL).

Response factor and average response factor must be calculated for each component.

The minimum acceptable average RF for the volatile compounds; chloromethane, 1,1-dichloroethane, 1,1,2,2-tetrachloroethane and chlorobenzene is 0.300.

The minimum acceptable average RF for bromoform is 0.250.

The minimum acceptable average RF for the semivolatile compounds; N-nitroso-di-n-propylamine, hexachlorocyclopentadiene, 2,4-dinitrophenol and 4-nitrophenol is 0.050.

The Percent Relative Standard Deviation (% RSD) must be calculated for all target compounds.

For the following Calibration Check Compounds (CCC), (% RSD) critera apply:

Base / Neutral CCC	Acid / CCC	Volatile / CCC
Acenaphthene	4-Chloro-3-Methylphenol	1,1-Dichloroethene
1,4-Dichlorobenzene	2,4-Dichlorophenol	Chloroform
Hexachlorobutadiene	2-Nitrophenol	1,2-Dichloropropane
N-Nitrosodiphenylamine	Phenol	Toluene
Di-n-Octylphthalate	Pentachlorophenol	Ethylbenzene
Fluoranthene	2,4,6-Trichlorophenol	Vinyl Chloride
Benzo(a)pyrene		

Calculate percent RSD by: % RSD = (SD / average RF) x 100

SD = Standard Deviation of initial 5 response factors (per compound)

For the initial calibration to be valid, the percent RSD for these compounds must be less than 30%.

For each 12-hour period, before any samples or standards are run on the GC/MS, the tuning must be verified by comparing the spectrum of BFB (p-bromo-fluorobenzene) for volatile analysis or DFTPP (decafluoro-triphenylphosphine) for base/neutral or acid extractable (BNA) analysis to the ion abundance criteria in Table 8.1 or (BFB) or Table 8.2 (DFTPP). For each tuning verification compound, the mass labeled as the base peak in the appropriate table must be 100% relative abundance.

Elution of the sample component will be at the same GC relative retention time (RRT) as the standard of that component. For establishing correspondence of the RRT, the sample component RRT must compare within $\pm$ 0.06 RRT units of the RRT of the standard component. For reference, the standard must be run within 12 hours of the sample. If coelution of interfering components prohibits accurate assignment of the sample component RRT from the total ion chromatogram, the RRT should be assigned by using extracted ion current profiles for ions unique to the component of interest.

Correspondence of the sample component mass spectrum and the standard component mass spectrum must be established. For comparison of standard and sample component mass spectra, mass spectra obtained on the GC/MS are required. Once obtained, these standard spectra may be used only if the GC/MS meets the daily tuning requirements for the analysis being performed. The standard spectra may be obtained from the run used to obtain reference RRTs. All ions present in the standard mass spectrum at a relative intensity greater than 10% must be present in the sample spectrum and their relative intensities must agree within $\pm$ 20%. Ions present in the sample spectrum, at greater than 10% relative abundance, which are not present in the standard spectrum must be considered and accounted for by the analyst.

8.5 STANDARDS SOURCES, TRACEABILITY AND DOCUMENTATION

Standard solutions used to prepare standard curves, matrix spikes, or quality control check solutions are traceable to one of the following: 1) A certified compound and supplier lot # 2) An EPA reference standard 3) NITS (National Institute of Technology and Standards formerly the National Bureau of Standards). Log books are used for standards traceability.

Each section in the laboratory has their own source of standard reference materials and tracking and documentation systems. Although the sections will be slightly different from each other, the basic essential elements exist, including:

- On receipt, each standard is recorded in a bound log book. The manufacturer, lot #, date received, expiration date and the initials of the recording analyst are documented in the log book.

All information tracking the traceability for standards is recorded, including the preparation of standard solutions, spike solutions, and all other reference sources used in routine analytical procedures.

The documentation of traceability is recorded in the analysts notebook or lab data so that each analytical result can be linked to the appropriate reference material.

The sources, preparation and storage of standards is specified in each analytical procedure.

Table 8-1
Bromofluorobenzene
(BFB) Tuning Verification Limits

Mass	Ion Abundance Criteria
50	15.0 - 40.0% of the base peak
75	30.0 - 60.0% of the base peak
95	Base peak, 100% relative abundance
96	5.0 - 9.0% of the base peak
173	Less than 2.0% of the base peak
174	Greater than 50.0% of the base peak
175	5.0 - 9.0% of mass 174
176	Greater than 95.0% but less than 101.0% of mass 174
177	5.0 - 9.0% of mass 176

Table 8-2
Decafluorotriphenylphosphine
(DFTPP) Tuning Verification Limits

Mass	Ion Abundance Criteria
51	30.0 - 60.0% of mass 198
68	Less than 2.0% of mass 69
70	Less than 2.0% of mass 69
127	40.0 - 60.0% of mass 198
197	Less than 1.0% of mass 198
198	Base peak, 100% relative abundance
199	5.0 - 9.0% of mass 198
275	10.0 - 30.0% of mass 198
365	Greater than 1.0% of mass 198
441	Present but less than mass 443
442	Greater than 40.0% of mass 198
443	17.0 - 23.0% of mass 442

9.0 ANALYTICAL PROCEDURES

Analytical services can be provided for additional parameters not targeted in this plan. Since numerous methods and analytical techniques are available, continued communication between the client and laboratory is imperative to assure the correct methods are utilized.

Additional methodology used by Safety-Kleen's Environmental Laboratory are as follows:

- American Public Health Association, Standard Methods for the Examination of Water and Wastewater, 18th ed., Washington D.C.: American Public Health Association, 1992.

- Environmental Protection Agency. Environmental Monitoring and Support Laboratory. Office of Research and Development. Methods for Chemical Analysis of Water and Wastes. Cincinnati: U.S. Environmental Protection Agency. Environmental Monitoring and Support Laboratory. Office of Research and Development, 1983.

- Environmental Protection Agency. Office of Solid Waste and Emergency Response. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846). 3rd ed. 4 vols. Washington, D.C.: U.S. Government Printing Office, 1986.

10.0 DATA REDUCTION, VALIDATION AND REPORTING

10.1 FIELD AND TECHNICAL DATA

The field and technical (non-laboratory) data that will be collected can generally be characterized as either "objective" or "subjective" data.

Objective data include all direct measurements of field data, such as field screening/analytical parameters and water level measurements. Subjective data include descriptions and observations. Soil borings and well logs include both subjective and objective data in that the data recorded in the field are descriptive but can be reduced using a standardized lithologic coding system.

All data collection activities performed at a site will be documented either in a field log or on appropriate forms. Entries will be as detailed and descriptive as possible so that a particular situation can be recalled without reliance on the collector's memory. All field log entries will be dated. Field notebooks will be bound books and will be assigned to individual field personnel for the duration of their stay in the field. All field log forms will be kept in ring binders assigned to individual field personnel.

The cover of each log or ring binder will contain the following information:

- Person to whom the book is assigned
- Project name
- Start date
- End date

10.1.1 DATA REDUCTION

As described in Subsection 10.1, all field data will be recorded by field personnel in bound field logs and on the appropriate forms in ring binders. For example, during drilling activities, the field team member supervising a rig will keep a chronological log of drilling activities, a descriptive log of lithologies encountered, other pertinent drilling information (staining, odors, field screening, atmospheric measurements, water levels, geotechnical data). Upon completion of each test boring or monitor well, a form will be completed that will include lithologic codes along with descriptive data.

After checking the data in the field notes and forms (see Subsection 10.1.2), the Field Team Leader will reduce the data to tabular form, wherever possible, by entering it in data files. Where appropriate, the data files will be set up for direct input into a database. For example, the form for a test boring or well log will be checked against the field notes and then key punched directly to the database. Other objective data may be set up in spreadsheet-type tabular files (e.g., water level data). Subjective data will be filed as hard copies for later review by the Technical Leader and for incorporation into technical reports, as appropriate.

10.1.2 DATA VALIDATION

Validation of objective field and technical data will be performed at the Field Team Leader level. The team leader makes all data entries into the field notebook. After data reduction into tables or arrays, the Field Team Leader will make a second review of the data sets for anomalous values. Any inconsistencies or anomalies discovered will be resolved immediately. The completion and verification of paperwork and reports is the responsibility of the team leader.

Subjective field and technical data will be validated by the Project Manager, who will review field reports for reasonableness and completeness. In addition, random checks of sampling and field conditions will be made by the Field Supervisor, who will check recorded data at that time to confirm the recorded observations. Whenever possible, peer review will also be incorporated into the data validation process, particularly for subjective data, in order to maximize consistency between field personnel.

10.2 LABORATORY DATA INTERNAL PROCEDURES

10.2.1 DATA LOGGING

The sample custodian, upon receipt of samples for analysis accompanied by a completed request for analysis and/or Chain-of-Custody form, will do the following:

- Verify completeness of submitted documents, including the Chain-of-Custody forms.
- Log-in samples, assign unique work order numbers, and attach the numbers to the sample container(s).
- Open the project file and enter data on the laboratory computer.
- Store samples in refrigerated sample bank.

10.2.2 DATA COLLECTION

In addition to the data collected in the field and recorded on the Chain-of-Custody forms, data describing the processing of samples will be accumulated in the laboratory and recorded. Laboratory QA folders will contain the following:

- Date of processing
- Sample numbers
- Client (optional)
- Analyses or operation performed
- Calibration data
- Quality control samples included
- Concentrations/dilutions required
- Instrument readings
- Special observations (optional)
- Analyst's signature

10.2.3 DATA REDUCTION

Data reduction is performed by the individual analysts and consists of calculating concentrations in samples from the raw data obtained from the measuring instruments. The complexity of the data reduction will be dependent on the specific analytical method and the number of discrete operations (extractions, dilutions, and concentrations) involved in obtaining a sample that can be measured.

For those methods using a calibration curve, sample response will be applied to the linear regression line to obtain an initial raw result, which is then factored into equations to obtain the estimate of the concentration in the original sample. Rounding will not be performed until after the final result is obtained to minimize rounding errors, and results will not normally be expressed in more than two significant figures.

Copies of all raw data and the calculations used to generate the final results will be retained on file to allow reconstruction of the data reduction process at a later date.

10.2.4 DATA REVIEW/VALIDATION

System reviews are performed at all levels. The individual analyst constantly reviews the quality of data through calibration checks, quality control sample results, and performance evaluation samples. These reviews are performed prior to submission to the Group Leaders or the Analytical Project Coordinator.

The Group Leaders and/or the Analytical Project Coordinator review data for the consistency and reasonableness with other generated data and determine if program requirements have been satisfied. Selected hard copy output of data (chromatograms, spectra, etc.) will be reviewed to ensure that results are interpreted correctly. Unusual or unexpected results will be reviewed, and a resolution will be made as to whether the analysis should be repeated.

The final routine review is performed by the Laboratory Manager prior to reporting the results to the client. Non-routine audits are performed by regulatory agencies and client representatives. The level of detail and the areas of concern during these reviews are dependent on the specific program requirements.

10.2.5 DATA REPORTING

Reports will contain final results (uncorrected for blanks and recoveries), methods of analysis, levels of detection, surrogate recovery data, and method blank data. In addition, special analytical problems and/or any modifications of referenced methods will be noted. The number of significant figures reported will be consistent with the limits of uncertainty inherent in the analytical method. Consequently, most analytical results will be reported to no more than two (2) significant figures. Data are normally reported in units commonly used for the analyses performed. Concentrations in liquids are expressed in terms of weight per unit volume (e.g., milligrams per liter). Concentrations in solid or semisolid matrices are expressed in terms of weight per unit weight of sample (e.g., micrograms per gram).

Reported detection limits will be the concentration in the original matrix corresponding to the low level instrument calibration standard after concentration, dilution, and/or extraction factors are accounted for, unless otherwise specified by program requirements.

The final data report provided by the laboratory will be a Standard Client Report. This report contains a transmittal letter and the following information:

Inorganics

- Cover letter with Laboratory Manager sign-off
- Data Qualifiers
- Chain-of-Custody
- Lab Chronicle describing: Client ID/Analysis, Matrix, Preparation #, Collection Date, Extraction/Preparation Date, Analysis Date, and Group Leader sign-off
- Case narrative if any technical problems occurred
- Client Data Report
- Quality Control Summary Reports: Method Blank Data Report and Laboratory Control Standards Report (LCS)

Note: MS/MSD may be performed on other clients samples within the analytical batch.

Organics (GC/MS)

- Cover letter with Laboratory Manager sign-off
- Data Qualifiers
- Chain-of-Custody
- Lab Chronicle describing: Client ID/Analysis, Preparation #, Collection Date, Extraction/Preparation Date, Analysis Date, and Group Leader sign-off
- Case narrative if any technical problems occurred
- Sample Data Report
- Quality Control Summary Report (spreadsheet)
- Raw data package for GC/MS Volatiles and Semivolatiles

Note: MS/MSD may be performed on other clients samples within the analytical batch.

10.2.6 LABORATORY DATA ARCHIVING

The laboratories will maintain on file all of the raw data, laboratory notebooks, and other documentation pertinent to the work on a given project. This file will be maintained by the laboratory.

Data retrieval from archives will be handled in a similar fashion as a request for analysis. Specifically, a written work request to include a quotation must be submitted for retrieval of data. Client confidentiality will be maintained with retrieved data. Consequently, the laboratory can honor only those requests for data authorized by the original client.

10.3 DATA VALIDATION/USABILITY REVIEW

Separate from the laboratory's internal data review/data validation, a review of the final data package will be performed to validate results and to determine usability. Criteria to assess usability will be taken from U.S. EPA's Functional Guidelines on Data Validation. The depth of review will depend on the data deliverable package. Guideline criteria will be applied to available documentation. For example, in a Level II package, since standards data are not submitted, sections of the guidelines applicable to review of standards will not be done. However, blank data, surrogate and MS/MSD recovery, and sample chromatograms will be reviewed in light of the guidelines.

10.4 VALIDATING ANALYTICAL PERFORMANCE

All raw data will be examined by the analyst to verify that the documentation is correct. Control charts or tables are used by the analyst to evaluate the daily analytical performance and to determine that valid data was generated. It is the analyst's responsibility to confirm that the goals for precision and accuracy on duplicates, spiked samples and reference samples are met using the proper control charts or tables.

The Quality Assurance/Quality Control personnel's responsibility is to review the control charts to assure that deviations from acceptance criteria is noted and audits are performed quarterly to assure raw data meets criteria.

10.5 VERIFICATION OF DATA

Analytical data is verified in a three step review process. Initially the analyst reviews the analytical raw data prior to the reporting of results. Precision and accuracy of results are checked to verify they meet quality assurance/quality control limits. If results are not within quality assurance/quality control objectives corrective action is taken. A corrective action report (C.A.R.) is filled out. The deviations and the correction action taken are documented on the C.A.R. form.

Prior to shipping an analytical report the data package is reviewed by the laboratory group leaders and project coordinator. The group leaders and project coordinator verify the package is complete and deviations in protocols are accounted for.

The Laboratory Manager verifies the final report is printed correctly and completely.

10.6 RAW DATA REPORTING

Final results of samples are reported through the Laboratory Information Management System (LIMS). LIMS is used for data review, data reporting, and archiving. The Laboratory Manager, group leaders, and project management personnel review and sign all data packages before they are sent to the client. The sample reports are then filed by work order number in a secured area for future reference and kept on file per Safety-Kleen's Record Retention Policy.

11.0 INTERNAL QUALITY CONTROL CHECKS

The Quality Control department systematically checks control charts to assure the precision and accuracy of all methods meet the objectives listed in Section 5. Our quality control program provides confidence in the accuracy of analytical results and provides information to detect determinant sources of error. Precision is monitored and controlled by replicate analyses. Precision can be estimated by statistical techniques (listed in Section 14) and can control indeterminate errors inherent in a procedure.

11.1 QUALITY CONTROL INORGANICS

The minimum QC requirements of the inorganic program consist of both an initial and ongoing demonstration the Laboratories capability to generate acceptable precision and accuracy, using approved methods in the analysis of samples from various matrices. If any QC measurement fails to meet criteria the analytical measurement may be repeated only once prior to taking the appropriate corrective action. These include, but are not limited to, the following:

- Calibration Curve and Initial Calibration Verification
- Calibration Blank
- Continuing Calibration Verification
- ICP Interference Check Sample analysis
- Preparation Blank analysis
- Sample Spike analysis
- Spike Duplicate analysis
- Laboratory Control Sample analysis

11.2 METALS QC

11.2.1 CALIBRATION CURVE

For atomic absorption systems & ICP, calibration curves are composed of a minimum of a calibration blank and three standards. The calibration curve is prepared fresh each time an analysis is to be performed. If the AA instrument configuration prevents the required 4-point calibration, we calibrate according to instrument manufacturer's recommendations, and analyze the remaining required standards. The Method of Standard Addition (MSA) is used for samples that suffer from matrix interferences.

11.2.2 INITIAL CALIBRATION VERIFICATION

Initial calibration verification for metals is performed at the beginning of the analysis of samples by analyzing an independent standard. The independent standard is prepared from a different stock standard source than that used in the preparation of standards for the calibration curve. The independent standard concentration must fall within the calibration range.

11.2.3 CALIBRATION BLANK

A calibration blank is analyzed each time the instrument is calibrated, at the beginning of the run, and once every 10 analytical samples during the run.

11.2.4 CONTINUING CALIBRATION VERIFICATION

These checks determine that the analytical system is meeting QC criteria specified in SW-846 6000/7000. A midrange standard is analyzed every 10 analytical samples. The standard is also analyzed for each analyte after the last analytical sample. The standard is prepared from a different stock standard source than that used in the preparation of standards for the calibration curve.

11.2.5 ICP INTERFERENCE CHECK SAMPLE

ICP interference check sample analyses must be performed at the beginning and end of each sample analysis run (or a minimum of twice per eight-hour shift) to verify interelemental and background correction factors.

11.2.6 PREPARATION BLANK

Preparation blank analyses must be performed for each batch of samples, or for each set of 20 samples, to ascertain whether sample concentrations reflect contamination.

11.2.7 SAMPLE SPIKES

Spiked sample analyses must be performed for each matrix within a batch of samples or for each set of 20 samples of a similar matrix within a batch. This provides information on analytical accuracy, and the effect of the sample matrix on the digestion and measurement methodology.

11.2.8 SAMPLE SPIKE DUPLICATES

Duplicate spikes must be performed for each set of 20 samples. This provides information concerning analytical precision.

11.2.9 LABORATORY CONTROL STANDARD

The "laboratory control standard" is a standard carried through sample preparation and analytical methods to document the performance of the entire sample process. The laboratory control sample is analyzed for each batch of samples taken through the sample process or for each set of 20 samples. The LCS is used to control method accuracy results for metals. The control samples are blanks spiked with the appropriate concentration of metals to be determined so that at the time of analysis the final concentration should fall on the calibration curve. Percent recovery is then determined.

11.3 OTHER INORGANIC PARAMETERS

For all other inorganic parameters the frequency of QC stated below is required.

11.3.1 PREPARATION BLANK

Every 20 samples if distillation or digestion is required by the analytical method.

11.3.2 SAMPLE DUPLICATE

Every 20 samples.

11.3.3 SAMPLE SPIKE

Every 20 samples.

11.3.4 LABORATORY CONTROL SAMPLE

Every 20 samples. If the method calls for sample preparation (i.e., Distillation, Digestion, etc.), the lab control sample shall be subject to the entire procedure. The laboratory control sample is being used to validate the calibration curve and determine the level of analytical accuracy.

11.4 ORGANICS QC

In order to monitor method precision and accuracy, duplicate matrix spikes will be analyzed every 20 samples, or once per batch of samples of a similar matrix, for each method. Matrix spike compounds for each type of analysis and limits for percent recovery and relative percent difference, are given in Table 5.6.

Reagent water blanks, field blanks, and equipment blanks are analyzed to monitor sample integrity. Surrogate spike compounds are added to every sample to monitor method quality control. A reagent water blank will be analyzed every day that semivolatiles are extracted. A reagent water blank will be analyzed each day before volatile analysis is performed.

11.5 LIMITS FOR CONTAMINANTS IN BLANKS

11.5.1 BNA AND VOA

Any compound, except common phthalate esters, on the attached target compounds list present in a blank must be below the Practical Quantitation Limit (PQL). Common phthalate esters must be below five times the PQL.

All contaminants except the common laboratory solvents, methylene chloride, acetone and toluene, in the daily reagent water blank must be below the PQL before analysis of samples may proceed. Target compounds, except common laboratory solvents, in the field blank must be below the PQL. Common laboratory solvents in the field blank must be below five times PQL.

If the limits for contaminants are exceeded in a blank and any of the associated samples contain that compound at reportable levels, corrective action must be taken and documented. The samples associated with the suspect blank must be reanalyzed if sufficient sample volume is available. If sufficient sample volume is not available, the problem and corrective actions taken must be discussed in the Quality Assurance summary narrative.

Surrogate spike compounds will be added to each sample analyzed for acid and base/neutral extractables and volatile organics.

If any surrogate compound recovery in a volatile (VOA) or any two base-neutral/acid (BNA) surrogates in the reagent water blank is outside the above criteria, the source of the error will be determined and corrected. The reagent water blank and all associated samples will be reanalyzed.

If any VOA surrogate compound is outside the above criteria the sample will be reanalyzed. If any 2 BNA surrogate compounds are outside the above criteria for any sample, the sample will be reanalyzed. If the percent recovery of any one surrogate in a BNA sample is below ten percent the sample will be reanalyzed. If the reanalyzed sample is also outside the limits, then both results will be reported and the situation will be documented in a case narrative provided to the client. If the reanalysis is within the limits, then the results of the reanalysis only are reported to the client. When the surrogate recoveries are outside the limits for a matrix spike and matrix spike duplicate they will not be reanalyzed, however, the similarity in poor recoveries will be documented in the case narrative reported to the client.

12.0 INTERNAL PERFORMANCE AND SYSTEM AUDITS

All quality control results are reviewed by the analyst and group leaders before reports are released to report generation. Quarterly evaluations of all quality control data are reviewed by the quality control personnel to examine long term trends in the quality control data such as continual low recoveries with a certain procedure.

Routine system audits are performed to check for compliance with provisions set forth in this QAP. This includes checking analyst's lab books and raw analytical data. Corrective actions are taken to alleviate problem situations identified during the audit. This continued evaluation ensures the production of high quality data.

At a minimum, quarterly external reference samples are used to provide performance evaluation of wet chemical analyses, metals and organic analyses. The results of the reference sample are used to evaluate the accuracy of the procedures and to assure the quality control objectives are met.

12.1 RAW DATA AUDIT

All lab notebooks are issued a sequential number to assure document control. Each time a new notebook is issued it is assigned a number and the information is recorded in a reference book. The date issued, date completed, analyst's name, and/or the description of the lab book will be noted in the reference.

In developing a working data validation system, all active laboratory lab books and quality control files are subject to periodic audits. The evaluation will be based on the following:

- Information

The following information should be present when applicable. The parameter tested, method used, instrument used, date of analysis, analyst signature, wavelength, filter setting, cell path length, and all other pertinent data that validates the analytical results.

- Standard Evaluation

A blank and three to five levels of standards shall be used. The unit of measure of the standards should be shown. All samples must fall within the working range of the standards. The percent goodness of fit or correlation coefficient, and any other such data showing the linearity of the standard curve should be recorded. Correlation coefficient of standard curves must be between 0.995 and 1.00.

- Quality Control Evaluation

All quality assurance/quality control data with the amount spiked, percent recovery and all calculation, etc. must be reported in lab books. Duplicates, method blanks, matrix spikes, spike blanks, known quality control should be present at a specified frequency. The quality control data should also be reported on a DAILY basis.

- Neatness and Ease of Data Interpretation

A good format should be used and should be kept neat. No scratching out, no soluble marker, no pencil, and no "white out" should appear. All unused portions of the page are to be "Z'd" out and the page signed by the analyst after the data has been reviewed.

12.2 EXTERNAL PERFORMANCE AND SYSTEMS AUDITS

As part of Safety-Kleen's effort to assure project compliance is satisfied, on -site systems audits by the client or regulatory agencies are permitted. Full cooperation by Safety-Kleen's staff will be provided. A response to all deficiencies determined during the on-site will be addressed within a timely manner.

13.0 PREVENTIVE MAINTENANCE

Maintenance of equipment is an important part of every laboratory operation. The responsibility of routine care lies with the analysts using the instruments. Every manufacturer furnishes an instrument maintenance manual. These are kept on file for reference. Each instrument has a logbook in which daily preventive maintenance is recorded. Repairs that can not be performed by laboratory staff are contracted to the manufacturer's service department or under maintenance agreements. All laboratory balances are checked annually under service contracts.

The elements of the maintenance program are discussed in the following sections. Table 13-1 is a synopsis of the minimum equipment checks and a calendar of equipment maintenance schedule.

13.1 INSTRUMENT MAINTENANCE LOG BOOKS

Each analytical instrument is assigned a instrument log book. All maintenance activities are recorded in the instrument log. The information entered in the instrument log includes:

- date of service or maintenance,
- person performing service or maintenance,
- type of service performed and reason for service,
- replacement parts installed (if appropriate), and
- miscellaneous information.

If service is performed by the manufacturer, a copy of the service record is filed.

13.2 SPARE PARTS

The Environmental Laboratory maintains an inventory of routinely required spare parts (for example, spare sources, vacuum pumps and filaments for GC/MS, spare torches, burner heads for AA-ICP). The instrument operators have the responsibility, with the appropriate Group Leader, to ensure that an acceptable inventory of spare parts is maintained.

Table 13-1

Calendar of Equipment Maintenance

Parameter	Procedure	Frequency
Gas Chromatograph	Check response with standard mixture, compare to previous day and file chromatograph.	Daily
	Check temperature of detector, inlet, column oven and document in instrument log.	Daily
	Verify linearity.	Daily
	Septum replacement.	Daily
	Evaluate performance of each column with special standard mixture.	Monthly
	Column Temperature verification.	Monthly
	Pump oil-level check.	Monthly
	Pump oil changing.	Semi-annually
Hewlett Packard GC/MS	Mechanical pump turbo.	Semi-annually or when bakeout does not adequately reduce background.
GC/MS	Analyzer cleaning.	Dirty or contaminated analyzer components may also produce poor peak shape and require excessive ion energy to obtain reasonable sensitivity.

Table 13-1
(continued)

Calendar of Equipment Maintenance

Parameter	Procedure	Frequency
ICP-Plasma	Check condition of pump winding.	Daily
	Check liquid argon supply.	Weekly
	Check condition of torch.	Weekly
	Check sample spray chamber for debris.	As required
	Clean and align nebulizer	As required
	Clean or replace air filters.	Monthly
	Replace vacuum pump oil.	Quarterly
GF-AA	Clean windows and graphite electrodes.	Daily
	Prime autosampler syringe and clean sample tip.	Daily
	Check graphite tube and replace if necessary.	Daily
	Replace graphite electrode.	As required
	Replace autosampler syringe.	As required
	Replace lamp.	As required

14.0 QUALITY CONTROL DATA ASSESSMENT

14.1 FREQUENCY OF INTERNAL QUALITY CONTROL CHECKS

The frequency of quality checks is based on the type of analysis. Regularly scheduled analysis of known duplicates, standards, and spiked samples are a routine aspect of the data reduction, validation, and reporting procedures. Specific frequency criteria for the internal quality assurance checks cited below are presented in the SOPs for various methods.

14.1.1 GAS CHROMATOGRAPH/MASS SPECTROSCOPY (GC/MS) METHOD PERFORMANCE DOCUMENTATION

During each operating shift, a midpoint calibration standard is analyzed to verify that the instrument responses are still within the initial calibration determinations. The calibration check compounds will be those analytes specified in SW-846 methods.

The response factor drift (percent D, i.e., percent difference compared to the average response factor from the initial calibration) will be calculated and recorded. If significant (>20 percent) response factor drift is observed, appropriate corrective actions will be taken to restore confidence in the instrumental measurements.

All GC/MS analyses will include analysis of a method blank, a matrix spike, and a matrix spike duplicate in each lot of twenty (20) or fewer samples. Matrix spike solutions containing components of interest will be used for both matrix spikes and blank spikes. In addition, appropriate surrogate compounds specified in EPA SW-846 methods will be spiked into each sample. Recovery criteria for surrogate compounds will be evaluated as specified in the SOPs.

14.1.2 GC/MS DETECTION LIMITS

The PQLs as prescribed by SW-846 Chapter One are used for reporting GC/MS data. These detection limits are compared with laboratory-determined instrument detection limits to ensure that the reported values are attainable. Instrument detection limits are determined from seven replicate analyses of target compounds measured at three to five times the MDL. The calculated instrument detection limit is the standard deviation of the measured values times the students test value.

14.2 INORGANIC - INDUCTIVELY COUPLED PLASMA SPECTROSCOPY (ICP) & ATOMIC ABSORPTION (AA)

14.2.1 ICP AND AA QUALITY CONTROL

At least one method blank and one method blank spike (Laboratory Control Sample (LCS)) will be included in each batch of samples. Regardless of the matrix being processed, the LCSs and blanks will be in aqueous media.

The method blanks will be examined to determine if contamination is being introduced in the laboratory.

The LCS results will be examined to determine accuracy. Accuracy will be measured by the percent recovery (percent R) of the spikes. The recovery must be within the range of 80 to 120 percent to be considered acceptable.

Sample spike results will be examined to determine both precision and accuracy. Accuracy will be measured by the percent recovery of the spikes. Precision will be measured by percent difference.

14.2.2 ICP AND AA DETECTION LIMITS

The laboratory routinely provides Practical Quantitation Limits which are 5 to 10 times method detection limits. MDLs are determined by multiplying appropriate one-sided 99% t-statistic by the Standard Deviation obtained from minimum of seven analysis of a matrix spike containing the analytes of interest at a concentration three to five times the estimated MDL.

14.3 QUALITY CONTROL DATA ASSESSMENT

For each method used, a quality control data file exists.

14.3.1 QUALITY CONTROL DATA ENTRY

The in-house quality control results, matrix spike percent recovery results, and the blank spike results are computer analyzed. Each test's information is stored in the QA folder by department.

Quality control data is electronically transferred to a spreadsheet for Control Charts. Upper and lower control limits are given in appropriate SW-846 methods.

The program also warns the operator of out-of-control data. All out-of-control data is flagged.

14.3.2 QUALITY CONTROL ANALYTICAL CALCULATIONS

The following calculations are used for the quality control assessment by the computer. These calculations were verified manually.

The mean, x, of a series of replicate measurements of a known quantity calculation:

$$\text{Mean} = \frac{\text{sum of sample measurements}}{\text{Number of sample measurements}}$$

The standard deviation, s, of a series of measurements to set control limits.

$$s = \text{The square root of } \frac{\text{The sum of squared results - (sum of results squared/number of results)}}{\text{Number of results minus one}}$$

$$\text{Recovery Percent} = \frac{\text{Total analyte found - analyte originally present}}{\text{Analyte added}} \times 100\%$$

Coefficient of variation c.v.:

$$\text{c.v.} = \frac{s}{x}$$

s = standard deviation
x = mean of result

Precision in the laboratory is analyzed by performing duplicates at a 5 percent frequency and analyzing the duplicate data by of the following method:

- Precision is calculated by relative percent difference (RPD) between the duplicate samples.

Must fall within the quality control limits. If the lab control is outside limits the following corrective actions must be taken:

- Check the data and recovery calculations.
- Check the reference standard for standard verification.
- If above is acceptable repeat analyses.
- All samples associated with a laboratory control sample which do not meet criteria in Section 5 must be reanalyzed.

- Spike Blank

Must fall within the quality control limits, if the spike blank is outside the limits the following corrective actions must be taken:

- Check the data and recovery calculations
- Check the reference standard for standard verification
- If above is okay repeat analyses

- Quality Control Matrix Spike

Must fall within the quality control limits (refer to Section 5) established for each methodology. The corrective actions should be as follows:

- Check the data and recovery calculations
- Check if the blank spike and reference are within range
- If the matrix spike is out, check other analytes present for possible sample matrix interference
- If sample matrix is identified as the problem this must be footnoted. If the matrix spikes are consistently outside for a particular parameter another methodology may have to be suggested for sample analyses.
- If matrix spike is out, check for presence of that parameter at a high value which may be greater than the amount of spike, causing invalid spike recovery.

- Replicates

Replicates must be within the range specified by the quality control limits. If reproducibility can not be achieved, and sample matrix interferences are not apparent, batch reanalyses should occur. Calculations, dilutions, etc. should be checked prior to reanalyses.

- General Quality Control

Quality Control problems or symptoms should be brought to the attention of a group leader for appropriate corrective action.

All samples should be diluted within working range of standards.

15.0 CORRECTIVE ACTION

All problems associated with an analytical data package are documented on a Corrective Action Report (C.A.R.). The analyst describes the problem in detail on the C.A.R. and reports the corrective action that was followed. The Group Leader will review the action, assuring it is sufficient to meet project requirements.

The corrective action report (C.A.R.) is used to describe problems associated with the analysis of a sample. The problem is identified in detail and the steps taken to alleviate it are recorded. The problem and corrective action are summarized in the analytical notebook or it can be recorded on a separate report form.

When an out-of-control situation occurs the analysts must use their best judgment and available resources when determining the action to be taken. The out-of-control situation may be caused by more than one problem. The analyst should seek the help of his or her immediate supervisor, QA/QC personnel, or other experienced staff if the cause is not known. The test must not be resumed until the source of the problem and an in-control status is attained. All samples associated with the out-of-control situation should be reanalyzed.

Listed below are steps to be taken when an out-of-control situation occurs. The analyst must:

- demonstrate that all the problems creating the situation were addressed
- document the problem and the action that was taken to correct the problem on a corrective action report form
- document on the corrective action report that control has been achieved
- receive approval (signature) of the group leader or the laboratory manager prior to the release of analytical data associated with the problem are then filed.

When a systematic problem is identified, a systematic solution can be employed to correct the recurring problem. If a systematic solution is not attainable, awareness that the problem exists can be communicated to everyone involved. This can then help solve or prevent the random problem.

15.1.2 SUPERVISOR RESPONSIBILITIES

- Should follow all of the guidelines above checking for completeness, as well as, quality control limits.

- Will review all quality control measurements prior to data being reported including a review of calculations, correct dilution factors, etc .

- Historical data may be referenced to assist in identifying possible errors in calculations, dilutions, etc.

15.1.3 DATA CHALLENGES

All data challenges directed to the lab should be handled in the following fashion:

- Check historical data.
- Check raw data for dilution or transcription errors.
- Check the appropriate batch QC for anomalies and confirmed matrix effects.
- Sample reanalyses are necessary if none of the above procedures resolve the problem.

15.2 QUALITY CONTROL DATA RESPONSIBILITY

- Method blank acceptance (analyst).

- Spike blank acceptance (analyst) by control limits to be maintained and updated by Group Leaders.

- Precision of method evaluated by R charts maintained and updated (analyst).

- Accuracy evaluated by:

    - Traceable, external reference within EPA acceptance criteria (metals daily, conventionals quarterly).
    - Percent recovery control charts maintained and updated (analyst).

- Final review of data submitted for checks:

    - Completions
    - Accuracy of reporting
    - Calculations
    - Historical review of data

15.3 SUGGESTED CORRECTIVE ACTION MEASURES FOR SPECIFIC PROBLEMS

Calibration curve does not have a 0.995 - 1.00 correlation coefficient:

- Plot curve to verify values were plotted correctly.
- Replot curve if necessary to check data entry error.
- If curve range still does not fit acceptance limits, batch reanalysis must occur.

When initial instrument calibration verification is out-of-control limits:

- Check instrument maintenance log and note if any changes have been made which would affect calibration verification.
- Check reagent reference log to verify that reagents have been properly prepared and/or meet specifications.
- Rerun new standards if above have not changed.
- If continued out-of-control, tune instrument according to manufacturer's specified procedure.
- Call for service if problem can not be resolved.

When initial instrument standard verification is out-of-control limits:

- Check reagent reference log to verify that reagents have been properly prepared and/or meet specification.
- Rerun new standard if above have not changed.
- If continued out-of-control prepare new reagents.

When initial GC/MS tuning standard is out-of-control limits:

- Check instrument tune log.
- Check instrument maintenance log and note if any changes have been made which would affect calibration verification.
- Check reagent reference log to verify that reagents have been properly prepared and/or meet specifications.
- Rerun new standards if above have not changed.
- If continued out-of-control, tune instrument according to manufacturer's specified procedure.
- Call for service if problem can not be resolved.

- When Method of Standard Additions slope is not acceptable:

When continuing calibration standard is outside control limits (refer to Section 8):

- Rerun standard to verify outside control.
- If continued out-of-control rerun the initial calibration and rerun previous set.

16.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT

The Laboratory Manager will prepare a report for the QA Manager addressing any audit deficiencies. Areas may include:

- Safety
- General laboratory overview
- Sample Control
- Method SOPs
- Standards preparation
- Analytical records
- Training files
- Data accuracy
- Data precision

Comprehensive QA records will be maintained to provide evidence of the quality assurance activities. Records of the quality assurance program implementation will be written and retained on file. Quality assurance documents will be archived in the project file along with raw data, laboratory notebooks, and other information pertinent to the project.

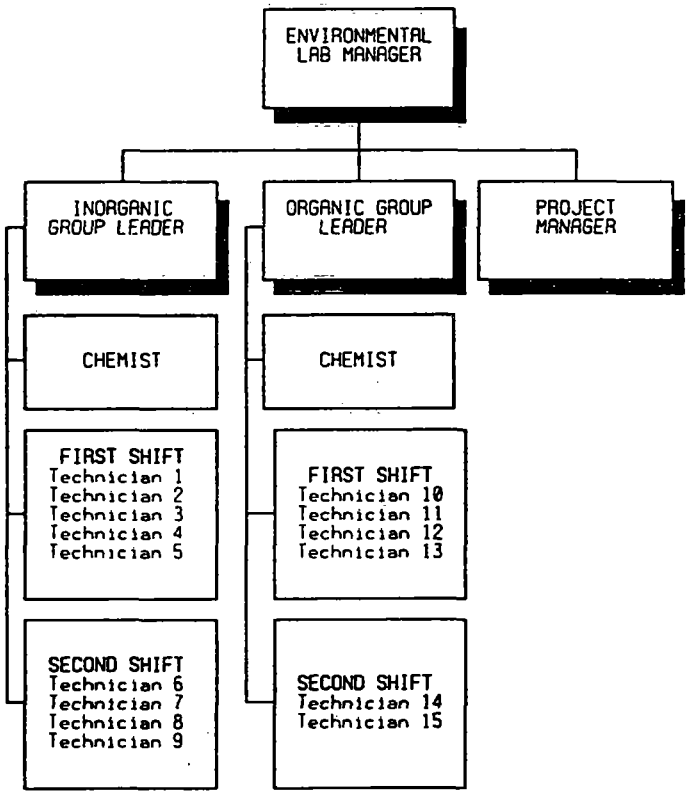
The retention of quality assurance records is essential to provide support in evidentiary proceedings. The original quality assurance records, including the front pages of the chain-of-custody forms for the Dolton and Pekin, IL sites, will be retained in the project file. Long term storage of these documents in archives is described in Subsection 10.4.

The Laboratory Manager will be responsible for ensuring that quality assurance records are properly filed and stored and that they can be readily retrieved.

FIGURE 16-1

ENVIRONMENTAL LABORATORY ORGANIZATIONAL CHART

1994



17.0 PRIMARY PROJECT PERSONNEL

APPENDIX A

STANDARD OPERATING PROCEDURES

SAFETY-KLEEN CORP.

ENVIRONMENTAL LABORATORY

RESUME

Mark A. Hartwig
Manager
TCLP/Environmental Laboratory

EDUCATION:

Eastern Michigan University
Ypsilanti, Michigan
B.S. Major - Chemistry
Minor - Math, Business

PROFESSIONAL AFFILIATIONS:

American Chemical Society
American Society for Mass Spectrometry
MCM Local Mass Spectrometry Discussion Group

EMPLOYMENT HISTORY:

October 1991 - Present
Safety-Kleen Corp.
12555 W. Old Higgins Road
Elk Grove Village, IL 60007
Position: TCLP Manager
Responsibilities:

1. Manage operation of environmental laboratory.
2. Prepare annual business plans and operational budgets.
3. Develop staff and departmental functions.
4. Prioritize and monitor laboratory production to ensure timely completion of reports.
5. Ensure implementation of analytical testing capabilities.

December 1990 - April 1991
IEA, Inc.
126 West Center Court
Schaumburg, IL 60195
Position: Director of Operations - Illinois
Responsibilities:

1. P & L of laboratory.
2. Business development.
3. Ensure professional growth and development of staff.
4. Prepare and review capital equipment authorization for expenditure.

April 1991 - October 1991
IEA, Inc.
126 West Center Court
Schaumburg, IL 60195
Position: Director of Midwest Region Business Development
Responsibilities:

1. Develop and maintain high level business relationships with Fortune 500 accounts.
2. Prepare and deliver sales presentations to major accounts.
3. Development of new product and service offerings.
4. Strategic market review and assessment.

RESUME

Mark A. Hartwig
(continued)

"Writing Procedure Files for the HP-1000 RTE VI GC/MS Data System", a Workshop, Mark A. Hartwig, Hewlett-Packard Company, ASMS Annual Conference, Cincinnati, Ohio (June 1986).

"Interpretation of Toxic Organic Data", Mark A. Hartwig, Annual Meeting-Academy of Certified Hazardous Materials Managers, July 1989.

"Running a Successful Environmental Laboratory", Mark A. Hartwig, Hewlett-Packard Seminar Series "ENVIRO-90", Cleveland, Cincinnati, St. Paul, Lansing, Michigan (November 1989).

"Productivity Gains through Quality Control", Mark A. Hartwig, HAZMAT-CENTRAL, Rosemont, Illinois (March 14, 1990).

RESUME

Atul Shah
GC/MS Chemist
TCLP/Environmental Laboratory

EDUCATION:

Bombay University
Bombay, India
B.S. Major - Chemistry
Minor - Botany

PROFESSIONAL AFFILIATIONS:

American Chemical Society

EMPLOYMENT HISTORY:

June 1991 - Present
Safety-Kleen Corp.
P.O. Box 92050
Elk Grove Village, IL 60009-2050
Position: GC/MS Chemist
Responsibilities:

1. Scheduling work for TCLP/VOA analysis.
2. Preventive maintenance on GC/MS, Tekmar & Data System.
3. Data Review/reporting.
4. Training to new operator/technicians.
5. PE/QC samples - data reporting.
6. Purchasing routine/new items.
7. Communicating to lab manager/group leader.
8. Learning new system/software (target).

March 1990 - May 1991
I.E.A. Illinois Inc.
Schaumburg, IL 60195
Responsibilities:

1. TCLP/VOCs analysis by using:
   a. EPA methods 8240/524.2/624
   b. H.P. GC/MSD with RTE-A System
   c. Tekmar's 5000 and ALS 2016
2. Also familiar with BASE - NEUTRAL/ACID analysis by GC/MS.

1989 - March 1990
Responsibilities:

1. Working with Finnigan ITD 700 using EPA 524.2 method.
2. As a back-up Operator for INCOS 50.
3. Familiar with FORMASTER and HPs MSD.

1985 - 1988
Responsibilities:

1. Initiated, organized and established an efficient GC section for analysis of VOCs, PCBs, Pesticides, Herbicides, PAH, etc. by EPA methods.
2. Trained and supervised three technicians.
3. Automated the GCs operation by adding Autosamplers and a multitasking PC based software.
4. Troubleshooting and routine maintenance.
5. Familiar with industrial hygiene samples with NIOSH methods.

RESUME

Matthew Schweik
Project Coordinator
TCLP/Environmental Laboratory

EDUCATION:

Illinois State University
Normal, Illinois
B.S. in Economics

EMPLOYMENT HISTORY:

June 1993 - Present

Safety-Kleen Corp.
12555 W. Old Higgins Rd.
Elk Grove Village, IL 60007
Position: Project Coordinator
Responsiblities:

1. Handle analytical services duties for projects requiring analyses of groundwater and soil samples.
2. Primary contact to discuss the analytical requirements and dimensions of a project including prescheduling of analyses, current lab certifications, status reports on samples, reporting requirements for projects, ordering of sample container kits, and explanation of analytical data shown on reports.

August 1992 - March 1993

First Brands Corporation
Danbury, CT
Position: Field Manager
Responsibilities:

1. Responsible for implementing sales programs through Retail Broker.
2. Conduct sales presentations for broker management and personnel.
3. Supervise, instruct and train broker personnel on their sales calls.
4. Develop sales information for Broker Management.

February 1990 - June 1992

Ideal Industries, Inc.
Sycamore, IL
Position: Area Manager
Responsibilities:

1. Responsible for all sales functions in Eastern Pennsylvania and Western New Jersey, including open house, trade shows, seminars, distributor calls and end-user calls.
2. Establishing and maintaining business relationships with Authorized Electrical Wholesale Distributors and Electrical Contractors.
3. Plan and prepare promotional activities with distributor/contractors by use of direct mailing, local newspapers and discount flyers.
4. Conduct product and sales presentations meeting for distributor personnel.
5. Collect data, prepare presentations for annual and quarterly business reviews for senior management of each authorized distributor.

RESUME

Rita Shah
Inorganic Group Leader
TCLP/Environmental Laboratory

EDUCATION:

University of Bombay
Bombay, India
B.S. in Chemistry and Biology

PROFESSIONAL AFFILIATIONS:

American Chemical Society

EMPLOYMENT HISTORY:

March 1991 - Present
Safety-Kleen Corp.
12555 W. Old Higgins Rd.
Elk Grove Village, IL 60009-2050
Position: Inorganic Group Leader
Responsibilities:

1. Supervise TCLP extraction and metals analysis area.
2. Troubleshoot difficult to handle filter wastes.
3. Train staff in sample prep and metals analysis.
4. Order and maintain supplies necessary for prep and metals analysis.
5. Maintain and troubleshoot ICAP and AA.

1987 - March 1991
Caremark Inc., Baxter
Buffalo Grove, IL
Position: Sr. Analytical Chemist
Responsibilities:

1. Performance of stability studies and collection and documentation of data.
2. Coordinator for various testing protocols for stability studies.
3. Responsible for methods development and assay troubleshooting.
4. Training and supervision of new personnel

1982 - 1987
Chemical Waste Management
Riverdale, IL
Position: Analytical Chemist
Responsibilities:

1. Analysis of hazardous waste according to CLP protocol using ICP and AA.
2. Trained and supervised others in operation of ICP and AA. Familiar with QA/QC in the laboratory.

1976 - 1981
Haffkine Bio-Pharm
Bombay, India
Position: Quality Control Chemist
Responsibilities:

1. Performed analysis of raw materials, intermediates and packed products according to Pharmacopeia. Performed stability testing of packed products.

HONORS:

Published paper on interferences in graphite furnace at Pittsburgh Conference in March 1986.

RESUME

Richard H. Cook
Organic Group Leader
TCLP/Environmental Laboratory

EDUCATION:

Indiana State University
M.A. in Analytical Chemistry
B.S. in Biology

EMPLOYMENT HISTORY:

May 1992 - Present

Safety-Kleen Corp.
12555 W. Old Higgins Rd.
Elk Grove Village, IL 60007
Position: Organic Group Leader
Responsibilities:

1. Supervise Volatile analysis, Semi-Volatile Extraction and Semi-Volatile analysis area.
2. Train staff in Volatile analysis, Semi-Volatile Extraction and Semi-Volatile analysis.
3. Order and maintain supplies necessary for Volatile analysis, Semi-Volatile Extraction and Semi-Volatile analysis.

1988 - 1992

Pitman-Moore, Inc.
Terre Haute, IN
Position: Manager, Gas Chromatography
Responsibilities:

1. Responsible for managing the gas chromatography section.
2. Direct the method development for identifying trace levels of various chemicals in products, process streams, soil, water and air using gas chromatography, high performance thin-layer chromatography, ion chromatography, thermal analysis, supercritical fluid chromatography and mass spectroscopy.
3. Prepares environmental assessments including the design of studies and the writing of documents.

1987 - 1988

Pitman-Moore, Inc.
Terre Haute, IN
Position: Research Scientist
Responsibilities:

1. Responsible for developing methods to detect products or other chemicals in various matrices and to supervise sample tracking and the data archive.

1985 - 1987

Pitman-Moore, Inc.
Terre Haute, IN
Position: Senior Associate Research Scientist
Responsibilities:

1. Responsible for modernizing the gas chromatography laboratory and developing methods for the determination of company products in various matrices.
2. Supervised technicians.

1980 - 1984

Ashland Chemical Company
Dublin, OH
Position: Chemist
Responsibilities:

1. Responsible for developing methods using gas chromatography or other analytical techniques to detect compounds of interest in air and water samples for industrial hygiene or environmental purposes.

David R. Reese
QA/QC Manager

Mr. Reese has over 15 years of laboratory experience with nine years in the environmental field. Focusing primarily on organic analysis of air, drinking water, petroleum products, soil, waste water and other wastes using ASTM, EPA 500, 600 and 8000 methods on the following instrumentation:

Volatiles by GC/FID, GC/PID and GC/MS
Semivolatiles:
BNA, PCBs, Pesticides by GC/ECD and GC/MS
Herbicides by GC/ECD
Organophosphorus Pesticides by GC/NPD
Polynuclear Aromatics by HPLC with UV and Fluorescence detectors.

He has experience in the analysis of Dioxins, BNA, VOA and Pesticide/PCB by EPA/CLP protocols.

Being instrumental in the design and startup of two commercial environmental laboratories, he has been responsible for certifications in over twenty-six states and several private firms. He has also conducted over sixty laboratory audits in the United States, Canada, Puerto Rico and England following both USEPA and ISO 9000 guidelines. In addition, he is a trainer for several laboratories in organic and inorganic methods, good laboratory practices, quality assurance and data review.

He performed the data validation of a 550 sample superfund site and coordinated the resampling and reanalysis with both the consulting engineering firm and the contract laboratory.

He has extensive experience in methods development, writing of SOPs and implementation of quality assurance programs. Recent interests include ICAP and ICAP/MS with automated reporting of QA/QC data by tabulation and quality control charts.

RESUME

James L. Breece
Vice-President, Technical

EDUCATION:

Georgia Institute of Technology
Atlanta, GA
Ph.D. in Chemistry

Western Carolina College
Cullowhee, NC
B.S. in Chemistry

EMPLOYMENT HISTORY:

May 1979 - Present

Safety-Kleen Corp.
12555 W. Old Higgins Rd.
Elk Grove Village, IL 60007
Position: Vice-President, Technical
Responsibilities:

1. Responsible for Process/Product Development, General Analytical (Prequal Lab), Environmental Laboratory, Corporate QA/QC, and Methods Development.

1979 - 1980 Chemical Engineer

1980 - 1983 Mgr. of R & D

1983 - 1985 Tech Director

1985 - 1987 General Sales Mgr. Industrial Solvents

1987 - 1990 General Mgr. Tech Services

Responsibilities include process development, product development, and waste characterization using all modern analytical instrumentations. Significant developments include fractional distillation equipment for separation of mixed chlorinated solvents, design and development of drying equipment for waste organic sludges.

RESUME

Pravin Patel
Senior Metals Chemist
TCLP/Environmental Laboratory

EDUCATION:

Gujarat University
India
M.S. in Chemistry
B.S. in Chemistry

EMPLOYMENT HISTORY:

May 1992 - Present

Safety-Kleen Corp.
12555 W. Old Higgins Rd.
Elk Grove Village, IL 60007
Position: Senior Metals Chemist
Responsibilities:

1. Responsible for metals analysis.

1990 - 1992

I.E.A., Inc. of Illinois
Schaumburg, IL
Position: Environmental Analytical Chemist
Responsibilities:

Integral participation in set-up of inorganic laboratory. Initial duties included installation of instrumentation and validation of appropriate methods for each within metals and classical chemistry labs. Methods were developed for all parameters within the two labs. Method were developed for all parameters within the two labs. Instrumentation included: Perkin-Elmer Graphite Furnace 5100 PC, Thermo Jarrell Ash ICP 61E, Bacharach MAS-50b Mercury Analyzer, Lachat Auto analyzer. Instrumental in developing SOPs, GLPs, training programs, and compliance standards for EPA, NPDES, OSHA, and other regulatory agencies requirements.

1987 - 1990

Suburban Laboratories
Hillside, IL
Position: Environmental Analytical Chemist
Responsibilities:

EPA approved Environmental laboratories dealing with wastes and waste water analysis. Major responsibilities includes analytical and instrumental analysis quantitative and qualitative analysis and wet analysis of wastes, water foods, pharmaceutical, herbicides and pesticides. Usage of analytical instruments such as Atomic Absorption, Spectrometer Inductively ,coupled Plasma (ICP), Gas Chromatographs with ECD, FID and TCD detectors, IR, HPLC, HPLC with Anion Detector, HGA Graphite furnace for inorganic elemental analysis, TOC, TOX, etc. Well aware with EPA, FDA, and OSHA standards and regulations.

1983 - 1987

P.M.S. Consolidated
Elk Grove Village, IL
Position: Lab Chemist
Responsibilities:

Involved in analytical and instrumental analysis of Polymers qualitatively and quantitatively including wet analysis methods. Usage of analytical instruments includes Melt Flow Index, Brook Field viscometer, Perkin-Elmer Infra red Spectrometer, etc. Also involved in matching colors and making formulations for plastics by using sophisticated ACS color computer systems.

RESUME

Mark Scheuer
Senior GC/MS Chemist
TCLP/Environmental Laboratory

EDUCATION:

University of Kentucky
Lexington, KY
M.S. in Analytical Chemistry

Central Michigan University
Mt. Pleasant, MI
B.S. in Chemistry

EMPLOYMENT HISTORY:

April 1992 - Present

Safety-Kleen Corp.
12555 W. Old Higgins Rd.
Elk Grove Village, IL 60007
Position: Senior GC/MS Chemist
Responsibilities:

Responsible for the analysis of samples for VOA and BNA constituents using EPA 8240 and 8270 methodology. Also involved in automation of the GC/MS data systems using an INGRES database and C-programming.

May 1990 - 1992

Martin Marietta Energy Systems
Oak Ridge, TN
Position: Plasma Emission Laboratory Supervisor
Responsibilities:

Some of the responsibilities of this position include writing standard operating procedures, employee training, methods development, and instrument maintenance for two Inductively Coupled Argon Plasma instruments. Water, soil, wastestream, filter, and urine samples are analyzed for up to 35 elements. Assisted in creating a computer program to simplify data management in order to handle the increasing number of samples received. the program designed incorporates QA/QC requirements set by the Environmental Protection Agencies (EPA) Statement of Work (SW-846), 3rd Edition 11/90. Also responsible for defining roles and assisting in setting goals of the six analysts within the lab in order to produce the most efficient environment.

November 1988 - May 1990

Martin Marietta Energy Systems
Oak Ridge, TN
Position: Gas Chromatography Mass Spectroscopist (GC/MS)
Responsibilities:

Volatile and Semivolatile analyses were performed following EPA Certified Laboratory Protocol (CLP) procedures. Several types of samples were analyzed on a routine basis including groundwaters, soils, and wastestreams. Developed experience with RTE-6 and RTE-A computer systems by designing computer programs to streamline data handling. As a GC/MS operator I was also responsible for maintenance of the Hewlett Packard HP-5985 and HP-5970 MSD GC/MS units.

July 1986 - November 1988

International Technology Corp.
Knoxville, TN
Position: Inorganic Technical Specialist
Responsibilities:

Performed instrument maintenance for a Jarrell-Ash Inductively Coupled Argon Plasma and Atomic Absorption units. Conducted routine analyses on groundwaters, soils and process waste samples using EPA procedures. some of the methods utilized were obtained from EPA CLP and EPA SW-846.

APPENDIX VII-B

PROJECT CONSTITUENT LIST
DOLTON RECYCLE CENTER

Table VII-B-1. Inorganic Constituents, RFI Phase I, Dolton Recycle Center.

Constituent	Method	Method Detection Limit (mg/kg)
Arsenic	SW-846 7060	1.25
Barium	SW-846 6010	2.0
Cadmium	SW-846 6010	2.0
Chromium	SW-846 6010	4.0
Lead	SW-846 6010	11.0
Mercury	SW-846 7471	0.04
Selenium	SW-846 7740	0.9
Silver	SW-846 6010	3.0

Table VII-B-2. Volatile Organic Compounds, RFI Phase I, Dolton Recycle Center.

Constituent	Method	Method Detection Limit (mg/kg)
Acetone	SW-846 8240	0.100
Benzene	SW-846 8240	0.005
Bromodichloromethane	SW-846 8240	0.005
Bromoform	SW-846 8240	0.005
Bromomethane	SW-846 8240	0.010
Carbon disulfide	SW-846 8240	0.100
Carbon tetrachloride	SW-846 8240	0.005
Chlorobenzene	SW-846 8240	0.005
Chloroethane	SW-846 8240	0.010
Chloroform	SW-846 8240	0.005
Chloromethane	SW-846 8240	0.010
Dibromochloromethane	SW-846 8240	0.005
1,1-Dichloroethane	SW-846 8240	0.005
1,2-Dichloroethane	SW-846 8240	0.005
1,1-Dichloroethylene	SW-846 8240	0.005
cis-1,2-Dichloro-ethylene	SW-846 8240	0.005
trans-1,2-Dichloro-ethylene	SW-846 8240	0.005
1,2-Dichloropropane	SW-846 8240	0.005
cis-1,3-Dichloro-propene	SW-846 8240	0.005
trans-1,3-Dichloro-propene	SW-846 8240	0.005
Ethylbenzene	SW-846 8240	0.005
2-Hexanone	SW-846 8240	0.050
Methylene chloride	SW-846 8240	0.005
Methyl ethyl ketone	SW-846 8240	0.100
4-Methyl-2-pentanone	SW-846 8240	0.050
Styrene	SW-846 8240	0.005
1,1,2,2-Tetrachloro-ethane	SW-846 8240	0.005
Tetrachloroethylene	SW-846 8240	0.005
Toluene	SW-846 8240	0.005
1,1,1-Trichloro ethane	SW-846 8240	0.005
1,1,2-Trichloro-ethane	SW-846 8240	0.005
Trichloroethylene	SW-846 8240	0.005
Trichlorofluoro-methane	SW-846 8240	0.010
Trichlorotri-fluoroethane	SW-846 8240	0.005
Vinyl Acetate	SW-846 8240	0.050
Vinyl Chloride	SW-846 8240	0.010
Xylene (total)	SW-846 8240	0.005

Table VII-B-3. Semi-Volatile Organic Compounds, RFI Phase I, Dolton Recycle Center.

Constituent	Method	Method Detection Limit (mg/kg)
Acenaphthene	SW-846 8270	0.660
Acenaphthylene	SW-846 8270	0.660
Anthracene	SW-846 8270	0.660
Benzo(a)anthracene	SW-846 8270	0.660
Benzo(b)fluoranthene	SW-846 8270	0.660
Benzo(k)fluoranthene	SW-846 8270	0.660
Benzo(ghi)perylene	SW-846 8270	0.660
Benzo(a)pyrene	SW-846 8270	0.660
Benzyl alcohol	SW-846 8270	1.300
Bis(2-chloroethoxy) methane	SW-846 8270	0.660
Bis(2-chloroethyl) ether	SW-846 8270	0.660
Bis(2-ethylhexyl) phthalate	SW-846 8270	0.660
4-Bromophenyl phenyl ether	SW-846 8270	0.660
Butyl benzyl phthalate	SW-846 8270	0.660
p-Chloroaniline	SW-846 8270	1.300
p-Chloro-m-cresol	SW-846 8270	0.660
2-Chloronaphthalene	SW-846 8270	0.660
2-Chlorophenol	SW-846 8270	0.660
4-Chlorophenyl phenyl ether	SW-846 8270	0.660
Chrysene	SW-846 8270	0.660
m-cresol	SW-846 8270	0.660
o-cresol	SW-846 8270	0.660
p-cresol	SW-846 8270	0.330
Dibenz(a,h)anthracene	SW-846 8270	0.660
Dibenzofuran	SW-846 8270	0.660
Di-n-butyl phthalate	SW-846 8270	0.660
o-Dichlorobenzene	SW-846 8270	0.660
m-Dichlorobenzene	SW-846 8270	0.660
p-Dichlorobenzene	SW-846 8270	0.660
3,3'-Dichloro- benzidine	SW-846 8270	1.300
2,4-Dichlorophenol	SW-846 8270	0.660
Diethyl phthalate	SW-846 8270	0.660
2,4-Dimethylphenol	SW-846 8270	0.660
Dimethyl phthalate	SW-846 8270	0.660
2,4-Dinitrophenol	SW-846 8270	3.300
2,4-Dinitrotoluene	SW-846 8270	0.660
2,6-Dinitrotoluene	SW-846 8270	0.660
Di-n-octyl phthalate	SW-846 8270	0.660
Fluoranthene	SW-846 8270	0.660

Table VII-B-3. Semi-Volatile Organic Compounds, RFI Phase I, Dolton Recycle Center (continued).

Constituent	Method	Method Detection Limit (mg/kg)
Fluorene	SW-846 8270	0.660
Hexachlorobenzene	SW-846 8270	0.660
Hexachlorobutadiene	SW-846 8270	0.660
Hexachlorocyclo-pentadiene	SW-846 8270	0.660
Hexachloroethane	SW-846 8270	0.660
Indeno(1,2,3-c,d) pyrene	SW-846 8270	0.660
Isophorone	SW-846 8270	0.660
2-Methyl-4,6-dinitrophenol	SW-846 8270	1.300
2-Methylnaphthalene	SW-846 8270	0.660
Naphthalene	SW-846 8270	0.660
o-Nitroaniline	SW-846 8270	3.300
m-Nitroaniline	SW-846 8270	3.300
p-Nitroaniline	SW-846 8270	ND
Nitrobenzene	SW-846 8270	0.660
o-Nitrophenol	SW-846 8270	0.660
p-Nitrophenol	SW-846 8270	3.300
Pentachlorophenol	SW-846 8270	3.300
Phenanthrene	SW-846 8270	0.660
Phenol	SW-846 8270	0.660
Pyrene	SW-846 8270	0.660
1,2,4-Trichlorobenzene	SW-846 8270	0.660
2,4,5-Trichlorophenol	SW-846 8270	0.660
2,4,6-Trichlorophenol	SW-846 8270	0.660

ND = Not Determined

APPENDIX VII-C

STANDARD OPERATING PROCEDURES
S-K ENVIRONMENTAL LABORATORY

C-1 INORGANIC ANALYSIS PROTOCOL, METALS BY ICAP EMISSION SPECTROMETRY

C-2 INORGANIC ANALYSIS PROTOCOL, METALS BY GRAPHITE FURNACE ATOMIC ABSORPTION SPECTROMETRY

C-3 ORGANIC ANALYSES PROTOCOL, GAS CHROMATOGRAPHY/ MASS SPECTROMETRY (GC/MS) ANALYSIS OF VOLATILE ORGANIC COMPOUNDS

C-4 ORGANIC ANALYSES PROTOCOL, GAS CHROMATOGRAPHY/ MASS SPECTROMETRY (GC/MS) ANALYSIS OF SEMI-VOLATILES

C-5 ANALYST TRAINING PROTOCOL

APPENDIX VII-C-1

INORGANIC ANALYSIS PROTOCOL
METALS BY ICAP EMISSION SPECTROMETRY

TITLE: STANDARD OPERATING PROCEDURE FOR THE ANALYSIS OF METALS IN ACID DIGESTED WASTE MATERIALS BY INDUCTIVELY COUPLED ARGON PLASMA -- ATOMIC EMISSION SPECTROMETER
(BASED ON: USEPA 6010)
(KEYWORDS: ICAP, EMISSION SPECTROMETRY, METALS)

1. SCOPE AND APPLICATION

1.1 The inductively coupled argon plasma spectrometer is used for multiple and simultaneous metal content quantitation of acid digested waste samples.

1.2 Samples must be solubilized or digested using the Method 3050, 3010 or 3020 and are analyzed by Inductively Coupled Plasma Spectrometry.

1.3 Table 1 lists metals for which this method applies along with recommended wavelengths and typical estimated instrumental detection limits using cross-flow pneumatic nebulization.

1.4. The measurement of metal content is used to characterize the waste sample for TCLP.

2. SAFETY AND WASTE HANDLING

2.1 FIRE - Do not open samples containing flammable material near the spectrometer. The fumes and vapors released may migrate to the plasma of the torch of the spectrometer.

SPILL - If any spill occurs, wipe with an absorbent wipe. Used wipes and plastic pipets must be placed in a metal container lined with a plastic trash bag.

The metal top must be kept on the container at all times except when adding or removing contents. In the event of a fire, the top should quickly smoother it. Any fire involving these materials must be treated as Class A fires. The contents must be removed daily and may be disposed of in the regular trash.

2.2 EYE CONTACT - Safety glasses with side shields are mandatory. Any eye contact with a chemical must be removed by thorough washing and follow-up action, as detailed in the Safety Plan.

2.3 **HAND CONTACT** - Samples may contain toxic metals. Use of disposable vinyl or latex gloves provides adequate protection from contact with the samples. All skin contact must be washed off immediately.

2.4 **RESPIRATORY** - Exposure to the vapors is harmful. Make sure the exhaust system over the spectrometer is working properly during the operation of the plasma torch.

2.5 **WASTE DISPOSAL** - The end of the drain tube must be submerged in the waste container behind the unit to collect spent sample from the spectrometer. The container must be kept a minimum of 40% and a maximum of 80% full with aqueous solution.

Standard and digested spent samples should be neutralized and then returned to storage for later disposal.

3. SUMMARY OF METHOD

3.1 The method describes a technique for the simultaneous multi-element determination of metals in aqueous solution. The basis of the method is the measurement of atomic emission by an optical spectroscopic technique. Samples are nebulized and the aerosol produced is transported to the inductively coupled argon plasma (ICAP) torch where excitation occurs. The characteristic emissions produced are dispersed by a grating and the intensities of the spectral lines are monitored by photomultiplier tubes.

The currents from the photomultiplier tubes are processed and controlled by a computer system. Computerization of the ICAP procedure includes automatic matrix matching of samples and standards.

In those cases where such matching is inadequate to adjust for background variation, wavelength specific corrections are incorporated into the automated procedure after the electronic signal has been adjusted.

4. SAMPLE HANDLING AND PRESERVATION

4.1 All the samples are aqueous solutions of acid-digested samples and are stable under ambient conditions.

4.2 The ICAP analysis requires, minimally, a 25 mL sample in a polyethylene or glass container (if hydrofluoric acid is not used).

5. INTERFERENCES

5.1 SPECTRAL INTERFERENCES can be categorized as (1) overlap of a spectral line from another element.; (2) unresolved overlap of molecular band spectra; (3) background contribution from continuous or recombination phenomena; and (4) background contribution from stray light from the line emissions of high concentration elements. The first of these effects can be compensated by utilizing a computer correction of the raw data, requiring the monitoring and measurement of the interfering element. The second effect may require selection of an alternate wavelength.

The third and fourth effects can usually be compensated for by a background correction adjacent to the analyte line.

In addition, when using simultaneous multi-element instruments the analyst must verify the absence of spectral interference from an element that could occur in a sample but for which there is no channel in the instrument array. Table II indicates the potential spectral interferences for the recommended wavelengths. The interference is expressed as analyte concentration equivalents of 1 mg/L or more, (i.e. false analyte concentrations) arising from 100 mg/L of the interference element. For example, assume that Antimony is to be determined (@ 206.83 nm) in a sample containing 100 mg/L of Chromium. From Table II, , 100 mg/L of Cr would yield a false signal for Antimony equivalent to 2.9 mg/L. The interference effects must be evaluated for each instrument since intensities will vary with operating conditions, power, viewing height, argon flow rate, and other factors.

The following are example spectral interferences, some of which are not listed in Table II.

Element	Interferent
As	Al, Fe, Cr, Co, Mo, Pt, Si, V
Be	Fe, Mo
Cd	Al, Cr, Fe, Ni, Pt, Tl
Mo	Cr, Fe, Ni, Pt, V
Pb	Al, Co, Cu, Fe, Mo, Ni, Pt, Si, Tl, V
Se	Co, Fe, Mo, Pt, V
Tl	Ca, Cr, Mo, Ni, V

5.2 PHYSICAL INTERFERENCES are generally considered to be effects associated with the sample nebulization and transport processes. Such properties, such as changes in viscosity of the sample being nebulized, can cause inaccuracies, especially in samples containing metals in very high concentrations. The use of a peristaltic pump may lessen these interferences. If these types of interferences are operative, they must be reduced by dilution of the sample and/or utilization of standard addition techniques. Another problem which can occur from high dissolved solids is salt buildup at the tip of the nebulizer. This affects aerosol flow rate, causing instrumental drift.

Wetting the argon prior to nebulization, using a tip washer, diluting the sample, and changing the sample injection tube eliminate this problem.

5.3 CHEMICAL INTERFERENCES are characterized by molecular compound formation, ionization effects, and solute vaporization effects. They can be minimized by carefully selecting the operating conditions (such as, incident power, observation position, and so forth), buffering the sample, matrix matching, and by using standard addition procedures. These types of interferences can be highly dependent on matrix type and the specific analyte element.

6. APPARATUS

6.1 Inductively Coupled Argon Plasma Simultaneous Emission Spectrometer (ICAP)

Thermo Jarrell Ash 590 Lincoln Street, P.O. Box 9036, Waltham, MA 02254-9036 (TJA) Model 61

6.2 Peristaltic pump - Gilson Minipulse 1 - supplied with spectrometer

6.3 Computer - A 286 or better PC with at least 40 MB hard drive with a color monitor.

6.4 Replacement Parts: An inventory of spare parts for emergency use should be kept.

Plasma torch, TJA Part No. 190-400-54
Chamber, TJA Part No. 190-400-65
Fixed cross flow nebulizer, TJA Part No. 90-790

6.5 Exhaust for torch - contract locally

6.6 Disposable gloves -

VINYL - Prepowdered (VWR Cat. Nos. 32915-461, 32915-483, 32915-483, 32915-508)

LATEX - (VWR Cat. Nos. 32917-875, 32917-897)

6.7 Disposable paper wipes, 4.5" x 8.5" (Kimwipes, VWR Cat. No. 21905-025)

6.8 Polypropylene narrow mouth Boston round bottles, 125 mL and 1000 mL (Nalgene, VWR Cat. Nos. 16067-066, 16067-124)

6.9 Wash bottle, wide mouth unitary, 500 mL (Nalgene, VWR Cat. No. 16651-595)

6.10 Centrifuge Tubes, disposable, graduated, optical polypropylene, 50 mL, (Baxter Cat. No. C3978-50)

6.11 Rack, Centrifuge tube (Nalgene, Part No. 5930-0030, Fisher Cat. No. 14-8090)

6.12 Disposable pipets

6.13 Adjustable micro-pipette and tips, 10 to 1000 µL (VWR Cat. Nos. 53499-398, 53511-904)

6.14 Goggles (Baxter Cat. No. G7507)

7. REAGENTS/STANDARDS

All reagents must have the following clearly identified either on the container or in a notebook: name, source, lot#, purity, date of receipt, date opened.

7.1 Nitric acid, concentrated, reagent grade.(VWR Cat. No. 4815-3)

7.2 Deionized Water.

7.3 Sodium carbonate, crystalline powder. (VWR Cat. No. EM-SX0405-5)

7.4 INSTRUMENT BLANK Prepare 5% HNO_3 solution with DI water.

Let stand until the solution cools to room temperature.

> NOTE: The instrument blank should be used as the standby wash solution between analysis as opposed to DI water. This reduces the vapor pressure difference in the nebulizer between water and acidic solutions.

7.5 MULTI-ELEMENT PLASMA STANDARD STOCK SOLUTIONS, 1000 mg/L, Inorganic Ventures. Duplicate sets are needed, one each from two different lots. The newer (date received) of the sets should be used for the **CALIBRATION CHECK STANDARD, CCS**, and the older should be used for the **INSTRUMENT CALIBRATION STANDARDS.**

SK-CAL-1	1,000 µg/mL	Sb
SK-CAL-2	1,000 µg/mL	B, Mo, Sn, Ti
SK-CAL-3	10,000 µg/mL	Ca, Mg, K, Na
SK-CAL-4	1,000 µg/mL	Al, As, Ba, Be, Cd, Cu, Cr, Co, Fe, Pb, Mn, Ni, Se, Sr, Tl, V, Zn
	100 µg/mL	Ag

> NOTE: If problems arise with silver use single element Ag standard. All standards have a one year expiration date.

7.7 CALIBRATION STANDARDS

7.7.1 To each of 7 volumetric flasks, add 60 mL deionized water, and 5 mL HNO_3. Mix the reagent well before adding the standard solutions. The standards may be combined for the low and mid-point concentrations.

7.7.2 Pipette the following into each corresponding flask:

STD	Stock Standard	Conc. ppm	Volume Added	Final Volume
BLANK 5% HNO_3	Conc HNO_3	--	5 mL	100 mL
CAL-4 - 1 ppm	SK-CAL-4	1000	0.10 mL	100 mL
CAL-4 - 5 ppm	SK-CAL-4	1000	0.50 mL	100 mL
CAL-4 - 10 ppm	SK-CAL-4	1000	1.0 mL	100 mL
CAL-3 - 10 ppm	SK-CAL-3	10000	0.1 mL	100 mL
CAL-3 - 20 ppm	SK-CAL-3	10000	0.2 mL	100 mL
CAL-3 - 30 ppm	SK-CAL-3	10000	0.3 mL	100 mL

Let standards cool to room temperature. Then, dilute to the 100 mL mark with deionized water and shake well.

If Sb is required for analysis mix SK-CAL-1 with SK-CAL-4. If B, Mo, Sn, or Ti required for analysis, prepare standards as follows:

STDS	STOCK STD	CONC PPM	VOLUME ADDED	FINAL VOLUME
CAL-2 1 ppm	SK-CAL-2	1000	0.10 mL	100 mL
CAL-2 5 ppm	SK-CAL-2	1000	0.50 mL	100 mL
CAL-2 10 ppm	SK-CAL-2	1000	1.0 mL	100 mL

7.8 CALIBRATION CHECK STANDARD (CAL CHK) To prepare, add to a 100 mL volumetric flask, 60 mL of deionized water and 5 mLs of concentrated nitric acid.

Pipet the following standards into 100 mL Vol. flask:

0.50 mL of SK-CAL-4 and SK-CAL-1 (SK-CAL-2 if required)

NOTE: All these standards must be from a different source than calibration standard.

Let the standard solution cool to room temperature and dilute to the 100 mL mark with deionized water and shake well.

7.9 INTER-ELEMENT CHECK STANDARD (IECS) - The IECS is prepared to contain known concentrations of interfering elements that will provide an adequate test of the correction factors. The elements and their concentrations are:

Inorganic Ventures, Inc.

Interference Std ICSA:	Interference Std. ICSB:
5000 µg/mL: Al, Ca, Mg	100 µg/mL each: Ag, Cd, Ni, Pb, Zn
2000 µg/mL: Fe	50 µg/mL each: Ba, Be, Co, Cr, Cu, Mn, V

ICSA and ICSB are diluted to 1/10 and 1/100 respectively in the acidic matrix and then analyzed. All elements that are reported must be within ±20% of the true value.

7.10 MATRIX SPIKE STANDARD - The matrix spiking solution is a custom mix solution SK-TCLP mixture which contains the following elements at a final concentration of TCLP Regulatory Limit.

Barium	1000 ppm	Lead	500 ppm
Arsenic	500 ppm	Selenium	100 ppm
Silver	500 ppm	Cadmium	100 ppm
Chromium	500 ppm		

Use of 0.2 mL of above matrix spike standard for 20 mL of sample (final volume 100 mL) will result in the following concentration:

2.0 ppm Ba
1.0 ppm each: As, Ag, Cr, Pb
0.2 ppm each: Se, Cd

If Cu, Ni, Zn, Sb and Tl are the analytes, add 0.2 mL of 1000 ppm Cu, Ni and Zn; 0.10 mL 1000 ppm for Tl; and 0.20 mL of 100 ppm Sb.

7.11 Nitrogen gas (Zero Grade).

7.12 Liquid argon (Zero Grade). Zero grade compressed argon is acceptable as a reserve.

8. PREVENTIVE MAINTENANCE

8.1 A dirty torch may cause plasma ignition and stability problems, low sensitivity and bad reproducibility. The torch requires cleaning at least once a month. Whenever the torch has been touched or replaced, both horizontal and flow rate optimization should be performed. Whenever the torch has been replaced, the height of the torch should be adjusted.

8.2 The torch needs to be placed at the center of the copper coil and directly above the chamber. The plasma cannot be ignited if the torch is not properly aligned.

8.3 Clogging of sample delivery tubes or nebulizer may give low sensitivity. The joints of the stepdown tubes and the joint at the nebulizer inlet are especially susceptible to clogging. Sample delivery tubes should be checked daily for clogging.

8.4 DAILY - Check/replace sample delivery tubes.

8.5 BIWEEKLY - Prepare new sets of **CALIBRATION and INSTRUMENT CONTROL STANDARDS.**

8.6 **ROUTINELY** - Back up data from hard disk and then purge data to maintain enough disk space for storing data.

8.7 **BIWEEKLY** - Check the water level in the coolant system and add distilled water if necessary.

8.8 Clean generator and controller filters in back of the instrument. This is done as needed.

8.9 Clean torch, spray chamber and nebulizer. Replace sample delivery tubes. This is done as needed.

8.10 Clean the autosampler rods daily, also lubricate them with silicone grease to assure proper operation.

8.11 **SEMI ANNUALLY** - Change vacuum pump oil. If operating conditions are abnormal, change oil more frequently.

8.12 **ANNUALLY** - Nothing scheduled.

8.13 All maintenance work must be documented in the maintenance log book.

9. TROUBLESHOOTING/CORRECTIVE ACTION

9.1 Low sensitivity may be due to (a) clogged tip of the torch; (b) dirty torch;(c) clogged sample delivery tubes or (d) clogged nebulizer.

For cleaning, the sapphire tip, or the quartz torch may be submerged in 1:1 concentrated hydrochloric-nitric acid.

> Note: Never use HYDROFLUORIC ACID for cleaning the quartz torch as that would cause permanent damage to the torch.

Clogged sample delivery tubes should be cut or replaced.

The O-ring and the sample carrier gas screw should be removed and then the nebulizer sonicated in 10% conc. nitric acid (v/v) for 5 minutes, rinsed with DEIONIZED water and then sonicated in methanol for 3 minutes.

9.2 Ignition problems might be caused by improper torch alignment or dirt in the torch tip..

9.3 Occasionally the capillary in the nebulizer becomes plugged with lint dust or suspended solids causing a decrease in analytical sensitivity or no signal at all. This can be checked by measuring the sample uptake rate (mL/min.)

Disconnect the nebulizer from the mixing chamber and clean it in an ultrasonic cleaner as recommended.

Sometimes the peristaltic pump tubing through which the sample is nebulized is similarly plugged causing a decrease in analytical sensitivity or no signal at all. Hence, the tubing should be changed at least once every two weeks and if necessary more often.

9.4 Failure in initialization of the analysis may be caused by sudden power failure or frequency change. Resetting the HV power (at the back of the instrument) can remedy this problem.

9.5 Streams in the torch can be caused due to air leaks. Check all the tubing connections on torch to make sure thereis no leak problem.

9.6 **SERIAL DILUTION** - If the analyte concentration is higher than 10% above the highest calibration level, a serial dilution of the sample must be made and analyzed. The dilution analysis should be within $\pm$10 percent of the original determination. If it is not, a chemical or physical interference effect should be suspected.

9.7 **SPIKE ADDITION** - The recovery of a spike addition at a minimum level of 10X the instrumental detection limit (maximum 100X) should fall within the established control limit for that matrix. If not, a matrix effect should be suspected. The use of a standard addition analytical procedure can usually compensate for this effect.

9.8 **STANDARD ADDITION** - The standard-addition technique involves adding known amounts of standard to one or more aliquots of the processed sample solution. This technique compensates for a sample constituent that enhances or depresses the analyte signal, thus producing a different slope from that of the calibration standards. It will not correct for additive interferences which cause a baseline shift.

The simplest version of this technique is the single-addition method, in which two identical aliquots of the sample solution, each of Volume V_x, are taken. To the first (labeled A) is added a small volume V_s of a standard analyte solution of concentration C_s. To the second (labeled B) is added the same volume V_s of the solvent. The analytical signals of A and B are measured and corrected for non-analyte signals. The unknown sample concentration C_x is calculated:

$$C_x = \frac{S_b V_s C_s}{(S_a - S_b)\ V_x}$$

where S_a and S_b are the analytical signals (corrected for the blank) of solutions A and B, respectively. V_s and C_s should be chosen so that S_a is roughly twice S_b on the average. It is best if V_s is made much less than V_x, thus C_s is much greater than C_x, to avoid excess dilution of the sample matrix. If a separation or concentration step is used, the additions are best made first and carried through the entire procedure. For the results of this technique to be valid, the following limitations must be taken into consideration:

1. The analytical curve must be linear.
2. The chemical form of the analyte added must respond the same way as the analyte in the sample.
3. The interference effect must be constant over the working range of concern.
4. The signal must be corrected for any additive interference.

The absorbance of each solution is determined and then plotted on the vertical axis of a graph, with the concentrations of the know standards plotted on the horizontal axis. When the resulting line is extrapolated back to zero absorbance, the point of interception of the abscissa is the concentration of the unknown. The abscissa on the left of the ordinate is scaled the same as on the right side, but in the opposite direction from the ordinate.

> NOTE: The standard addition technique does not detect coincident spectral overlap. If suspected, use of computerized compensation, an alternate wavelength, or comparison with an alternate method is recommended.

9.9 COMPARISON WITH ALTERNATE METHOD OF ANALYSIS - When investigating a new sample matrix, comparison tests may be performed with other analytical techniques such as atomic absorption spectrometry or other approved methodology.

10. QUALITY CONTROL

10.1 INITIAL SETUP - Prior to instrument calibration all metals must be run individually to determine the inter-element correction factors. Table II provide guidelines of interfering elements and approximate amounts. This is only done during instrument setup or when the IEC standards fail to meet the criteria. This should be well documented.

10.2 CALIBRATION - Analyze an instrument blank before the Calibration standards as the first point in a four point calibration curve. The next three levels of standards are run establishing a calibration curve. **The curve must have a correlation coefficient of 0.995 or greater.**

The high level standards must be run after the 3 point calibration curve with results being ± 5% of the true value for all elements.

10.3 DAILY: INTER-ELEMENT CHECK STANDARDS - The inter-element check standard (IECS) is to be run at the beginning and end of each analytical batch or twice during every 8-hour work shift, which ever is more frequent. Results of all elements must be within ± 20% of the expected value. The IECS provides verification of inter-element and background correction factors.

10.4 DAILY: CALIBRATION CHECK STANDARD - Run ICV and ICB after high level standards. Run CCV and CCB after every ten samples. Values must be within ± 10% of the true value. If ICV or CCV is out of control reanalyze ten samples prior to bad QC.

10.5 DAILY: MATRIX SPIKES (MS) - Every sample matrix analyzed must be matrix spiked or for TCLP extract run spike every 10 samples.

Results for samples with excessive native material that are out of control must be reviewed and documented.

The percent recovery is calculated as follows:

$$\% \text{ Recovery} = 100\% * [(A-B)/T]$$

Where:
A = Concentration of Spiked Sample
B = Background Concentration
T = Known True Value of the Spike

The spike recovery should fall within the established control limits. If spike recovery is outside the established limit rerun sample. If recovery still out of control redigest the sample. If spike recovery is below 50% use method of standard addition with the exception of Ag and Ba where presence of chloride and sulfate can cause low spike recovery. If spike recovery is above 50% but below established limits, a confirmative remark must accompany with the report e.g. "The low spike recovery is confirmed due to sample matrix.".

10.6 DAILY MATRIX SPIKE DUPLICATE (MSD) - Every 20 samples, analyze a matrix spiked sample. Percent recovery is to be calculated for the MSD in order to calculate the relative percent difference (RPD). The RPD is calculated as follows:

$$R = \frac{MSR-SR}{MA} * 100\%$$

where: R = % recovery
MSR = matrix spike result
SR = sample result
MA = matrix spike amount

Relative percent difference should be $\pm$ 20%. If % RSD is out of acceptance range rerun the sample, if still out of control redigest the sample.

10.7 If concentration of the analyte is within $\pm$ 20% of the regulatory limit, analyze that element by Method of Standard Addition procedure.

11. PROCEDURE

NOTE: For daily standardization and autosampler set up, refer to the Instrument Manuals.

11.1 STARTUP:

11.1.1 Make sure that the standby (SB) and fatigue (FAT) lights on front panel are lit and the HV power switch (back of instrument) is ON. If the lights are not on, then perform a cold start (see TJA OPERATOR'S MANUAL manual).

11.1.2 Make sure the argon and nitrogen tanks are not empty. Turn their main valves ON. Cue set as follows:

Nitrogen	15 psi
Argon	70 psi

11.1.3 Turn ON the plasma work coil coolant water.

11.1.4 Make sure the BLUE R.F. OFF lamp on the generator control panel is lit. If not, check water and argon for adequate supply pressure and make sure that the plasma chamber door is properly closed.

11.1.5 Correctly position the sample tubing in the peristaltic pump. Use the white clamp for this tubing. Set pump at an optimized rate of delivery 1.6 - 1.8 mL/min. Turn the flow switch in the direction so as to aspirate the rinse solution (deionized water) into the nebulizer.

11.1.6 Turn ON the TORCH, AUXILIARY and SAMPLE gas toggle switches. In the ON position, the bottom of each ball should be at the following setting or within the figures in parentheses as a guideline:

TORCH	16	(16-18)
AUXILIARY	0.4	(0.4-0.6)
SAMPLE (Aqueous)	0.7	

11.1.7 Wait 3 minutes.

11.1.8 Make sure the instrument is operating under the following conditions:

Vacuum Meter	
Red Needle	Approx. 20 mTorr
Black Needle	10 or < 10 mTorr
Power Control	Manual
Power & Forward Power	On
Load Control Turning	Automatic
Power Knob (all the way, counterclockwise)	0
Blue R.F. light	Illuminated
Automatic Power Control	Locked
Automatic Forward Power Control Set at	585

NOTE: NOW, PLASMA IS READY TO BE IGNITED.

11.1.9 Turn OFF the SAMPLE gas toggle switch.

11.1.10 Press the red R.F. ON button.

11.1.11 To ignite, slowly turn the POWER knob clockwise until the FORWARD R.F. POWER meter reads 0.5 kW.

NOTE:	**NEVER LOOK DIRECTLY AT THE PLASMA PLUME. ONLY LOOK THROUGH THE VIEW PORT.**

11.1.12 Press the IGNITOR button on the front panel of the generator. When a faint filamentary plasma is swirling in the outer tube of the torch, gradually increase the FORWARD R.F. POWER until the plasma ignites. This should occur before the power level reaches 1.5 kW.

STOP if the plasma ignites with a pop, if the FORWARD R.F. POWER reaches 1.5 kW., the yellow OL (Overload) reset light is lit, or the FORWARD R.F. POWER meter reading drops to zero. **IN THE EVENT ANY OF THESE OCCUR:**

a. Return POWER knob to zero.

b. If the OL Reset light is lit, turn the POWER knob counterclockwise and press the OL button. Then turn up FORWARD POWER to 0.5 kW, and try to re-ignite.

11.1.13 Once the plasma is lit, turn the AUTOMATIC POWER CONTROL switch to the AUTOMATIC position (upward).

11.1.14 Turn the POWER knob clockwise to yield a power greater than the Automatic set point.

11.1.15 Make sure the AUTOMATIC POWER CONTROL is set at 5.08 and the POWER METER READING is 1.1 kW.

11.1.16 Introduce the Deionized water into the plasma by turning the SAMPLE gas toggle switch back ON, slowly.

11.1.17 Allow the instrument to warm up for 45 to 60 minutes before optimizing the plasma conditions. (profiling)

11.2 PROFILING

11.2.1. Manual or automatic profile must be done after the spectrometer warms up.

NOTE: AUTOMATIC PROFILE SHOULD BE USED FIRST. IF THERE IS A POSITION SHIFT OR A PEAK POSITION WHICH IS NOT BETWEEN -0.2 AND +0.2, THEN A MANUAL PROFILE SHOULD BE PERFORMED.

11.2.2 For Automatic Profile: on the computer, start from <Main Menu>. If you are not in <Main Menu>, press simultaneously <Ctrl> and <F9>.

11.2.3. Press <O> for operation, then <P> for profile. This will bring up the automatic profile menu.

11.2.4 Press <F3> for automatic profile. You will see the following as shown below:

Profile line: Hg 5460.74

Flush Time: 0 seconds

Preintegration Time: 0 seconds

Integration Time: 0.2 seconds

11.2.5 Open the access door (See TJA OPERATOR'S MANUAL Figure 7-4) and move the shutter control to the LEFT position (marked "Hg").

11.2.6 While holding the shutter open, press <F1> to run. The upper left corner of the screen will display the word <scanning>.

11.2.7 When the <scanning> is done, close the shutter. The shutter must stay open during the scanning.

11.2.8 If the shift is zero and peak position is between -0.2 and +0.2, press <F9> to end, as per Section IV in TJA OPERATOR'S MANUAL. If not, press <F1> - Calc SS the <ENTER> to get new vernian position. Set the vernian to that number and repeat the Profile and <F9> twice to save.

11.2.9 For manual profile: press <F1> to run. Full directions will be displayed on the screen for carrying out the profiling function. Open the "Hg" shutter and keep it open while adjusting the micrometer. Carefully turn the micrometer screw in the direction as specified in the instructions which appear on the screen. The micrometers used on the air and vacuum systems are shown schematically in TJA OPERATOR'S MANUAL Figure 7-4.

11.2.10 After completing the screen instructions, press <F9> to end.

11.2.11 Press <P> and repeat Steps for "automatic profile."

11.3 DAILY SHUTOFF

11.3.1 Push RF OFF button.

11.3.2 Turn POWER knob all the way counterclockwise.

11.3.3 Turn POWER CONTROL switch from AUTOMATIC to MANUAL.

11.3.4 Turn peristaltic pump OFF. Take tubing out of pump and also out of solvent.

11.3.5 Turn AUXILIARY and SAMPLE gas toggle switches OFF.

11.3.6 Wait for 3 minutes to let the torch cool and then turn TORCH switch OFF.

11.3.7 Turn the main valves for the nitrogen and argon OFF.

11.3.8 Turn coolant water OFF.

11.4 SHUTOFF FOR POWER OUTAGE

11.4.1 Perform normal shut-off procedure.

11.4.2 Turn high voltage switch located on the back of instrument to the OFF position.

11.4.3 Turn CONTROL and BREAKER switches OFF.

11.5 OPTIMIZATION

This is a trial and error method to determine the best physical parameters of torch height, torch horizontal position, sample gas flow rates, argon gas flow, and R.F. Generator power. Optimization is focused on the entrance slit with minimum noise. The resultant signal will thus give you the best possible analytical data.

11.5.1 HORIZONTAL OPTIMIZATION

NOTE:	For optimization, intensity is used so there is no need to standardize.

First, perform a regular profile. Use any element except Hg. The recommended element is Cd at a concentration of approximately 1 ppm. (It gives a sharp peak.)

Aspirate metal standard into the plasma.

Enter <Profile> and select the optimization element and wavelength as the Profile Element. Select <MANUAL PROFILE> to connect the element channel to the spectrometer front panel meter. Using the HORIZONTAL adjustment micrometer (the bottom knob at the side door, shown in TJA OPERATOR'S MANUAL Figure 8-4, move the image across the entrance slit to produce the maximum reading on the Profile Meter.

Press <Esc> to exit from profile.

11.5.2 FLOW RATE OPTIMIZATION -

NOTE:	The flow rate is not required to be readjusted often. It is related to the observation height. In this method, readjustment is necessary only after the height of the torch has been changed.

a. Create a simple method in the method development selecting the Cd element, if you do not already have a optimization method. Change the concentration to intensity during the method setup.

b. Profile the instrument and standardize with the new method.

c. Using the sample flow controller adjust the flow with the flow meter ball at 0.5 LPM and aspirate the 1 ppm Cd solution. Run like a normal sample. Record the signal and %RSD (should be around 1%). In the same way analyze a blank and record the background reading and %RSD.

d. Determine the signal to background ratio (SBR) by dividing the result of Cd by the blank.

e. Increase the flow to 0.55 LPM and run both the Cd and blank again recording the results. Calculate the SBR again.

f. Keep on increasing the flow and analyzing the Cd and blank until the SBR begins to drop. The purpose is to determine the maximum SBR.

g. This same procedure can be used for the other parameters listed above in the general information on optimization.

11.5.3 **OPTIMIZATION OF YITRIUM TONGUE** - Set the forward power to 1.1 KW. Aspirate 1000 ppm of yttrium and observe the plasma. Adjust the gas flow to the nebulizer using the knob below the flowmeter marked "Sample" until the tip of the red yttrium oxide emission is between 1 and 2 mm above the top of the torch, and the blue ionic/atomic emission is above the torch. The following figure illustrates this.

12. CALCULATION

12.1 The results are automatically calculated and the final report is printed by the computer.

If for any reason a different sample weight and dilution factor have to be used and not entered into the sample information table, then ppm can be calculated as follows:

$$\text{mg/L of each metal} = \frac{\text{Concentration} \times \text{Final Volume}}{\text{Sample Weight}}$$

13. REFERENCES

13.1 Thermo Jarrell Ash ICAP 61 Operator's Manual.

13.2 Inductively Coupled Plasma - Atomic Emission Spectrometric Method for Trace Element Analysis of Water and Wastes Methods 200.7 (EPA)

13.3 Inductively Coupled Plasma-Atomic Emission Spectroscopy, Method 6010, EPA Test Methods for Evaluating Solid Waste, Volume 1A: Laboratory Manual Physical/Chemical Methods

TABLE 1

LIST OF ELEMENTS ANALYZED BY THIS METHOD
ALONG WITH WAVELENGTHS AND ESTIMATED
INSTRUMENTAL PERFORMANCE LIMITS

Element	Wavelength (nm)	Low Limit (ppm) (2)	High Limit (ppm) (1)	Analytical Range Low 50 X Dil. (ppm) (2,3)	Analytical Range High 50 X Dil. (ppm) (1)(3)	MDL
Ag	328.07	0.003	300	0.15	15,000	
Al	308.22	0.025	1000	1.25	50,000	
As	193.70	0.050	1000	2.50	50,000	
Ba	493.41	0.001	200	0.05	10,000	
Be	313.04	0.001	150	0.05	7,500	
Ca	393.37	0.001	50	0.05	2,500	
Ca	317.93	0.010	1000	0.50	50,000	
Cd	226.50	0.004	250	0.20	12,500	
Cr	267.72	0.005	500	0.25	25,000	
Cu	324.75	0.002	300	0.10	15,000	
Fe	259.94	0.005	500	0.25	25,000	
Hg	184.96	0.020	1000	1.00	50,000	
K	766.49	0.40	1500	20.0	75,000	
Mg	279.08	0.015	1000	0.75	50,000	
Mn	257.61	0.001	200	0.05	10,000	
Mo	202.03	0.005	750	0.25	37,500	
Na	589.00	0.010	500	0.50	25,000	
Ni	231.60	0.010	750	0.50	37,500	
Pb	220.35	0.025	1000	1.25	50,000	
Sb	206.83	0.050	1000	2.50	50,000	
Se	196.03	0.050	1000	2.50	50,000	
Sn	189.99	0.015	1000	0.75	50,000	
Ti	337.28	0.001	500	0.05	25,000	
Tl	377.57	0.100	1500	5.0	75,000	
V	292.40	0.002	500	0.10	25,000	
Zn	213.86	0.004	200	0.20	10,000	

[1]High limit is the upper linear limit of the instrument.
[2]Low limit is the lowest report value of the microwave digested samples.
[3]In the sample digestate.

TABLE II

ANALYTE CONCENTRATION EQUIVALENTS ARISING FROM INTERFERENCE AT THE 100-mg/L LEVEL

Analyte	Wavelength (nm)	Interferent									
		Al	Ca	Cr	Cu	Fe	Mg	Mn	Ni	Tl	V
Aluminum	308.215	--	--	--	--	--	--	0.21	--	--	1.4
Antimony	206.833	0.47	--	2.9	--	0.08	--	--	--	0.25	0.45
Arsenic	193.696	1.3	--	0.44	--	--	--	--	--	--	1.1
Barium	455.403	--	--	--	--	--	--	--	---	--	--
Beryllium	313.042	--	--	--	--	--	--	--	--	0.04	0.05
Cadmium	226.502	--	--	--	--	0.03	--	--	0.02	--	--
Calcium	317.933	--	--	0.08	--	0.01	0.01	0.04	--	0.03	0.03
Chromium	267.716	--	--	--	--	0.003	--	0.04	--	--	0.04
Cobalt	228.616	--	--	0.03	--	0.005	--	--	0.03	0.15	--
Copper	324.754	--	--	--	--	0.003	--	--	--	0.05	0.02
Iron	259.940	--	--	--	--	--	--	0.12	--	--	--
Lead	220.353	0.17	--	--	--	--	--	--	--	--	--
Magnesium	279.079	--	0.02	0.11	--	0.13	--	0.25	--	0.07	[illegible]
Manganese	257.610	0.005	--	0.01	--	0.002	0.002	--	--	--	
Molybdenum	202.030	0.05	--	--	--	0.03	--	--	--	--	--
Nickel	231.604	--	--	--	--	--	--	--	--	--	--
Selenium	196.026	0.23	--	--	--	0.09	--	--	--	--	--
Sodium	588.995	--	--	--	--	--	--	--	--	0.08	--
Thallium	190.864	0.30	--	--	--	--	--	--	--	--	--
Vanadium	292.402	--	--	0.05	--	0.005	--	--	--	0.02	--
Zinc	213.856	--	--	--	0.14	--	--	--	0.29	--	--

Dashes indicate that no interferences was observed even when interferents were introduced at the following levels:

Al - 1000 mg/L
Ca - 1000 mg/L
Cr - 200 mg/L
Cu - 200 mg/L
Fe - 1000 mg/L
Mg - 1000 mg/L
Mn - 200 mg/L
Tl - 200 mg/L
V - 200 mg/L

The figures recorded as analyte concentrations are not the actual observed concentrations; to obtain those figures, to obtain those figures, add the listed concentration to the interferent figure.

A P P E N D I X A

DILUTION

HOW TO PRINT
"SPECTROGRAPHIC LAB REPORT"
FOR METAL CONTENT FROM ICAP SPECTROPHOTOMETER

After the microwave acid digestion (refer to Method #9501, SOP for **MICROWAVE ACID DIGESTION OF WASTE MATERIALS FOR TOTAL METAL ANALYSIS**) prepare a 50 x dilution and proceed as follows:

1. "Start-up" the spectrometer per normal procedure. (Refer to SOP #9711, **ANALYSIS OF METALS IN ACID DIGESTED WASTE MATERIALS INDUCTIVELY COUPLED ARGON PLASMA-ATOMIC EMISSION SPECTROMETER**).

2. Aspirate and excite the sample. Soon after the excitation the results in ppm will be displayed on the monitor screen.

   NOTE: THE 50 X DILUTION "FACTOR" IS ALREADY IN THE COMPUTER PROGRAM. THE PPM VALUES WILL BE MULTIPLIED BY THE COMPUTER AND THE RESULTS ON THE REPORTS WILL BE THE CALCULATED FINAL RESULTS. (ONLY IF THE SAMPLES DO NOT HAVE TO BE DILUTED).

3. On the monitor, when a letter H (for high) or S (for saturated) does not appear along with the ppm, the Spectrographic Lab Reports could be used as such. If H or S appears along with any element, record the sample number and the element(s) in the log book. THESE SAMPLES MUST BE FURTHER DILUTED TO OBTAIN ACTUAL ppm RESULTS. Continue running the samples until all the samples are run within the calibrated range for each element.

4. When the letter H or S appears along with the ppm value for elements, <u>OTHER THAN</u> in the instances mentioned in paragraph 3, immediately, write down the sample number in the log book and the "Maximum Limit Value" for that element displayed at the bottom of the screen.

   NOTE: THESE SAMPLES DO NOT HAVE TO BE DILUTED

5. After all the samples have been run, print the "Spectrographic Lab Reports" for each sample. The reports for samples where H or S had appeared will have blank spaces.

6. If the blank space is for element(s) OTHER THAN mentioned in paragraph 3, fill in the blank with "Maximum Limit Value" from paragraph 4 with a sign ">" (greater than); for example, >1000.

7. When the blank space is due to the elements mentioned in paragraph 3, that sample has to be further diluted.

8. The dilution could be prepared by using the first 50 X dilution which was prepared after Microwave Acid Digestion, for example:

   An 8 X 50 dilution is (8 X 50) = 400 X dilution

9. The original computer program is for 50 X dilution. to change the macro program to 400, press simultaneously CONTROL and F3 and 400. Than follow paragraph 2.

10. If H or S does not appear on the screen with the µg/mL, print the report and use the µg/mL values to fill in the blanks in the reports from paragraph 5. Otherwise, prepare another 8 X dilution (8 X 400 = 3200 X dilution) and repeat as in paragraph 9.

11. Continue analyzing the sample as in paragraph 7, 8, 9 and 10 until neither letters "H" nor "S" appear.

12. A data report (not the Spectrographic Lab Report) could also be printed for each sample, with H or S µg/mL.

A P P E N D I X B

FLOWCHART

ANALYST TRAINING FORM

Trainee_____ Trainer_____

Date:_____

Analysis: ICAP Method: SK#9711

1. The following sections of the method were explained by the trainer and understood by the trainee:

	Trainer	Trainee
Scope & Application	_____	_____
Safety & Waste Handling	_____	_____
Summary of Method	_____	_____
Sample Handling & Pres.	_____	_____
Interferences	_____	_____
Apparatus	_____	_____
Reagents	_____	_____
Preventive Maint.	_____	_____
Trouble Shooting / Corrective Action	_____	_____
Quality Control	_____	_____
Procedure	_____	_____
Calculations	_____	_____
References	_____	_____
Attachments	_____	_____

2. Trainee observed analysis performed by Trainer:

_____ _____

3. Trainee repeats analysis. Comparative results:

Sample ID	Trainer Results	Trainee Results
	_____	_____
	_____	_____
	_____	_____
OTHER	_____	_____

Analyst certified to perform method: (by/on)_____

Additional training recommended: (by/on)_____

(Attach additional comparative results)

APPENDIX VII-C-2

INORGANIC ANALYSIS PROTOCOL
METALS BY GRAPHITE FURNACE
ATOMIC ABSORPTION SPECTROMETRY

SAFETY-KLEEN CORP.
TECHNICAL CENTER

TITLE: STANDARD OPERATING PROCEDURE FOR THE ANALYSIS OF METALS BY ZEEMAN GFAA.
(KEY WORDS: METALS, FLAME AA, DIGESTED)
(BASED ON: USEPA 7000)

1. SCOPE AND APPLICATION

1.1 This method is designed to determine metals in aqueous acid solutions using a Zeeman Graphite Furnace Atomic Absorption.

1.2 The metals covered in this method include:

Arsenic	- As	Thallium	- Tl
Cadmium	- Cd	Beryllium	- Be
Chromium	- Cr	Antimony	- Sb
Lead	- Pb	Titanium	- Ti
Silver	- Ag		

1.3 Other metals may be added if associated Quality Control requirements are established.

2. SAFETY AND WASTE HANDLING

2.1 **EYE CONTACT** - Handle concentrated acids in a fume hood with goggles.

EYE CONTACT - Goggles must be worn when working with the concentrated acids and the digested samples. Regular safety glasses with side shields **do not** provide adequate protection from an accidental sample splash.

2.2 **HAND CONTACT** - Handle concentrated acids in a fume hood with gloves.

HAND CONTACT - Use of disposable vinyl or latex gloves provide adequate protection from contact with the samples. All skin contact must be washed off immediately.

2.3 **RESPIRATORY** - Exposure to the vapors from the sample should be kept to a minimum by working in a well-ventilated area.

RESPIRATORY - Check the exhaust system to assure that it is working during the operation of the AA.

2.4 The energized source lamps and hot graphite furnace emits harmful ultraviolet and visible radiation. Care must be taken to avoid eye contact with such radiation.

2.5 Analyst must be aware of MSDS for all the chemicals used in the lab.

2.6 **WASTE DISPOSAL** - The remainder of the sample in the original container must be returned to sample storage for future testing or later disposal.

WASTE DISPOSAL - The AA waste collection container must be made of plastic. If the waste solution has a pH of less than 5, neutralize it with 20% sodium carbonate solution.

WASTE DISPOSAL - Standards and aqueous samples are to be disposed of in the same manner as the AA waste.

WASTE DISPOSAL - Contaminated wipes must be placed in a metal container that has been lined with a plastic trash bag. A metal top must be kept on the container at all time except to add to or remove the contents.

2.7 **TOXICS** - Beryllium, cadmium, mercury, nickel, and lead are toxic and should be handled with care.

3. SUMMARY OF METHOD

3.1 The metals content of digested samples is determined by atomic absorption using Zeeman Graphite Furnace after digestion with Nitric Acid.

3.2 The analytical method used follows the SW-846 guidelines for the analysis of solid wastes.

3.3 A representative aliquot of a sample is placed in the graphite tube in the furnace, evaporated to dryness, charred, and atomized. As a greater percentage of available analyte atoms is vaporized and dissociated for absorption in the tube rather than the flame, the use of smaller sample volumes or detection of lower concentrations of elements is possible. The principle is essentially the same as with direct aspiration atomic absorption, except that a furnace, rather than a flame, is used to atomize the sample. Radiation from a given excited element is passed through the vapor containing ground-state atoms of that element. The intensity of the transmitted radiation decreases in proportion to the amount of the ground-state element in the vapor. The metal atoms to be measured are placed in the beam of radiation by increasing the temperature of the furnace, thereby causing the injected specimen to be volatilized. A monochromator isolates the characteristic radiation from the hollow cathode lamp or electrodeless discharge lamp, and a photosensitive device measures the attenuated transmitted radiation.

4. SAMPLE HANDLING AND PRESERVATION

4.1 Samples are aqueous acid digestions.

The sample is collected and stored in a disposable plastic container.

All aqueous samples are preserved with nitric acid to a pH of 2 or less.

4.2 A 10 mL specimen is required for each analysis.

4.3 The holding time for samples collected for metals analysis is 180 days.

5. INTERFERENCES

Matrix interferences are encountered frequently in GFAA. Excessive anions, high dissolved solids and high organics are common interferents. To correct for these interferents, several techniques are utilized.

5.1 **MATRIX MODIFIERS** - Matrix modifiers are used for volatile elements to overcome matrix interference. See Attachment II for matrix modifiers used.

5.2 **ANALYTE SPIKE** - Sample is spiked with a known concentration of analyte to determine if matrix effects are masking spike recovery.

5.3 **BACKGROUND CORRECTION** - Varian GFAA utilizes Zeeman background correction technique to overcome matrix interference.

6. APPARATUS

6.1 Varian Atomic Absorption Spectrophotometer (See Attachment III)

6.2 Hollow Cathode Lamps (See Attachment III)

6.3 Exhaust hood.

6.4 Class A Volumetric flasks.

6.5 Eppendorf pipets.

6.6 Polyethylene wash bottles.

6.7 Glass volumetric pipettes.

6.8 Autosampler cups

6.9 Pyrocoated graphite tubes and platforms.

7. REAGENTS/STANDARDS

7.1 Reagents

7.1.1 **Nitric Acid** - Insta Analyzed (Trace Metal Grade)

7.1.2 **Phosporic Acid** - Reagent Grade

7.1.3 **Ammonium Dihydorgen Phosphate** - Reagent Grade

7.1.4 **$Ni(NO3)_2$ 1000 ppm** Solution

7.1.5 **Deionized water** - Type II or equivalent.

7.1.6 **Palladium 1000 ppm**

7.1.7 **Citric Acid**

7.1.8 **Ammonium Nitrate**

7.1.9 **Argon Commerical Grade**

7.2 Standards

7.2.1 **Stock Standard Solutions** - 1000 ppm certified single element standard solutions from two different sources used for calibration standard and calibration check standard expiration date one year.

7.2.2 **Intermediate Stock Standards** (primary standards) For all elements intermediate standards are prepared at 10 ppm. These standards are good for one week.

7.2.3 **WORKING STANDARD SOLUTIONS** - Working Standard Solutions may be mixed or individual standards. They are prepared daily. All the standards are prepared in 5% HNO3. See Attachment II.

8. PREVENTIVE MAINTENANCE

8.1 Quartz windows and graphite contacts should be cleaned every day using methanol.

8.2 Syringe pump should be primed to get rid of all air bubbles.

8.3 Sample capillary should be aligned to make sure it deposits sample in the graphite tube.

8.4 Fill the rinse bottle with water and 2 - 3 drops of concentrated HNO_3.

8.5 Check and empty AA waste bottle periodically.

8.6 Turn on the lamps and warm it for 30 minutes for Hollow Cathode lamp and 30 minutes for Super lamp.

8.7 Peak the HC lamp energy using two screws on the lamp. Peak the Super lamp energy using the power supply knob and 2 screws on the lamp.

8.8 Daily check the graphite tube and the platform.

8.9 Clean the outside of the capillary tip using 20% methanol everyday and rinse the inside of the capillary tip with aqua regia periodically.

9. TROUBLESHOOTING/CORRECTIVE ACTION

9.1 Low absorbance or no absorbance readings may be due to:

(a) bad graphite tube and or platform
(b) improper lamp alignment or bad lamp
(c) improper alignment of sample capillary tube

10. QUALITY CONTROL

10.1 **REAGENTS** - All materials used as standards or reagents used to prepare standards or samples must be logged in and evaluated for suitability.

10.2 **STANDARDS** - Standard preparations must be logged in and labeled as to contents and expiration date.

10.3 **CALIBRATION** - Calibration curve must be prepared daily with a minimum of a reagent blank and three standards (see Attachment I for std. concentrations for each element), verified by use of a reagent blank and calibration check standard near mid-range. Checks must be within 10% of the true value. Run continuing calibration check standard every 10 samples. If calibration check standard is out of limit, the analysis is stopped, instrument is restandardized and set of samples before the bad QC are rerun. Beryllium initial calibration check should be within $\pm$ 10% and continuing check should be within $\pm$ 20% of the true value. Quadratic fit method is applied for the calibration curve using Varian software.

10.4 Spike should be run with each matrix type to verify precision of the method. Spike duplicate should be run every twenty samples or per batch. Spike recovery should be within Safety-Kleen specified limits which is ± 3 SD of the mean % recovery value based on historical data. % RPD should be ± 20%. If spike recovery or % RPD are out of specified range rerun the sample. If still out of range redigest the sample and rerun. If spike recovery is below 50% run by method of standard addition. For oil samples if spike recovery is out of specified range rerun sample if recovery is still out of range run by standard addition.

10.5 Employ a minimum of one method blank per sample batch to determine any contamination from glasswares. Method blank values should be < PQL. If method blank shows analyte values above PQL, than all the samples in that batch showing analyte concentration above the reg limit should be redigested.

10.6 The method of standard additions shall be used if spike recoveries are below 50% and the concentration does not exceed the regulatory level or the concentration of the contaminant measured in the extract is within 20% of the regulatory level.

10.7 Dilute samples if they are more concentrated than the highest standard or if they fall on the plateau of a calibration curve.

10.8 Record the PMT volts and absorbance for daily run in the logbook.

11. PROCEDURE

START UP: Turn on the water recirculator, spectrAA-400 and Zeeman Unit. Turn on the Argon gas. Turn on the lamp by recalling the program for which analysis is required. Let it warm up for at least 15 - 30 minutes. Enter sample IDs for run sequence. Load the autosampler and start analysis.

SHUT DOWN: Turn off the Argon gas, Zeeman Unit, SpectrAA-400 Unit and water recirculator. Turn off the super lamp power supply if used for As/Se analysis.

11.1 **INSTRUMENT CONDITIONS** - Instrument parameters for each element can be found in Attachment 1.

11.2 For detailed information on instrument operation refer to the instrument manual.

12. CALCULATION

Results are calculated automatically based on standard curve. Final concentration is determined using this formula:

$$\text{Conc. (ppm)} = \frac{\text{Sample Conc. (ppb) x Final Volume (mL)}}{\text{Sample Wt. (g)}} \times \frac{1}{1000}$$

13. REFERENCES

1. Varian 300/400 Zeeman Operation Manual and Analytical Methods Manual.

2. Zeeman GFAA methods for environmental samples, Varian Instruments, June 1989, Number AA-90.

Attachment II

Element	SW-846 Method Reference	Wavelength (nm)	GFAA Method #	Modifier Used
As	7060	193.7	18,20 (low std) 17 (std add)	Ni (NO_3) 2 1000 ppm
Cd	7131	228.8	13,28 (std add)	NH_4 H_2 PO_4 - 1%
Cr	7191	520.8	24,25 (std add)	N/A
Pb	7421	283.3	9,12 (std add)	H_3 PO_4 - 1%
Se	7740	196.0	19,15 (std add) 16 (std add high)	Ni (NO_3) 2 1000 ppm
Ag	7761	328.1	3,2 (std add) 4 (low std) 30	N/A
Be	7091	234.9		N/A
Tl	7841	276.8	26,27 (std add)	500 ppm pd + 2% Citric Acid
Sb	7041	217.6	5,6 (std add)	N/A
Ti	N/A	364.3	7	Hydroxylamine Hydro Chloride 2%

Working Cal Std Conc. (ppb)	Cal Chk Std Conc. (ppb)	Std Add Std Conc.	Platform Used Yes/No
100	50	100	Y
10	5	10	Y
100	50	100	N
100	50	100	Y
100	50	100, 500	Y
50	25	50	Y
10	5	N/A	Y (forked tube)
50	25	50	Y
100	50	100	Y
500	250	N/A	N

Attachment III -

Atomic Absorption
Varian Spectra 400 spectrophotometer with Zeeman graphite tube atomizer.

Varian Autosampler PSD 95/96

Photron super lamp power supply
Hollow cathode lamps: bold phase

Arsenic	Varian Part No.: 56-101003-00
Cadmium	Varian Part No.: 56-101008-00
Chromium	Varian Part No.: 56-101012-00
Lead	Varian Part No.: 56-101029-00
Silver	Varian Part No.: 56-101052-00
Beryllium	Varian Part No.: 56-101224-00
Thallium	Varian Part No.: 56-101058-00
Antimony	Varian Part No.: 56-101221-00
Titanium	Varian Part No.: 56-101062-00

<u>Super Lamps</u>

Arsenic	Varian Part No.: 56-101298-00
Selenium	Varian Part No.: 56-101307-00

ATTACHMENT 1

TYPICAL PERFORMANCE

Optimum concentration ranges:
0.05 - 5.0 mg/L at 234.9 nm.

A standard containing 1.5 mg/L beryllium should typically give an absorbance of about 0.200 at 234.9 nm.

INTERFERENCES

High concentrations of aluminum will depress the beryllium sensitivity and is overcome by the addition of 1% hydrofluoric acid.

Higher concentration of silicon and magnesium will also depress the beryllium absorbance values. These interferences are overcome by the addition of oxime (8-hydroxyquinoline) solution

GENERAL INSTRUMENT PARAMETERS

Instrument: Perkin Elmer Model 5000 or 5100 PC.
Wavelength: 234.9 nm
Slit: 0.7 nm
Light source: Beryllium hollow cathode lamp.
Lamp current: _____
Fuel: Acetylene Pressure _____ Flow _____
Oxidant: Nitrous Oxide Pressure _____ Flow _____
Type of flame: Reducing (red feather)

Instrument: Varian
Wavelength: 234.9 nm
Slit: 1.0 nm
Light source: Beryllium hollow cathode lamp.
Lamp current: 5 ma
Fuel: Acetylene Pressure _____ Flow _____
Oxidant: Nitrous Oxide Pressure _____ Flow _____
Type of flame: Reducing (red feather)

TYPICAL PERFORMANCE

Optimum concentration range:
0.05-2 mg/L at 228.8 nm.
1 - 100 mg/L at 326.1 nm.

A standard containing 1.5 mg/L cadmium should typically give an absorbance of about 0.200 at 228.8 nm.

INTERFERENCES

High concentrations of silicate will interfere in cadmium determination.

An ionization interference may occur if the samples have a significantly higher alkali metal content than the standard. By addition of potassium chloride to both samples and standards, ionization interference can be overcome.

GENERAL INSTRUMENT PARAMETERS

Instrument: Perkin-Elmer Model 5000 or 5100 PC
Wavelength: 228.8 or 326.1 nm
Slit: 0.7 nm
Light Source: Cadmium hollow cathode lamp
Lamp current: _____
Fuel: Acetylene Pressure _____ Flow _____
Oxidant: Air Pressure _____ Flow _____
Type of flame: Oxidizing (lean, blue).

Instrument: Varian
Wavelength: 228.8 or 326.1 nm
Slit: 0.5 nm
Light Source: Cadmium hollow cathode lamp
Lamp current: 4 ma.
Fuel: Acetylene Pressure _____ Flow _____
Oxidant: Air Pressure _____ Flow _____
Type of flame: Oxidizing (lean, blue).

TYPICAL PERFORMANCE

Optimum concentration range:
0.5 - 5 mg/L (0.5- 10 mg/L if N_2O - C_2H_2 flame is used) at 357.9 nm.
1 - 100 mg/L at 428.9 nm.

A standard containing 4 mg/L chromium should typically give an absorbance of about 0.200 at 357.9 nm.

INTERFERENCES

Iron and nickel will suppress the absorption of chromium. By using a lean blue flame, the interference can be lessened, but the sensitivity will also be reduced. The addition of 2% ammonium chloride to both sample and standard controls the interference caused by iron.

Cr^{+6} and Cr^{+3} exhibit different sensitivities. If CR^{+3} is present in the sample, it is to be oxidized to CR^{+6}.

Presence of excess phosphate in the sample will depress the chromium response and can be overcome by the addition of calcium.

By using nitrous oxide-acetylene flame, many chemical and/or matrix interferences can be reduced.

GENERAL INSTRUMENT PARAMETERS

Instrument: Perkin Elmer Model 5000 or 5100 PC.
Wave length: 357.9 or 428.9 nm.
Slit: 0.7 nm
Light source: Chromium hollow cathode lamp.
Lamp current: _____
Fuel: Acetylene Pressure _____ Flow _____
Oxidant: Air Pressure _____ Flow _____
Type of flame: Oxidizing (lean, blue).

Instrument: Varian
Wave length: 357.9 or 428.9 nm
Slit: 0.5 nm.
Light source: Chromium hollow cathode lamp.
Lamp current: 7 ma.
Fuel: Acetylene Pressure _____ Flow _____
Oxidant: Air Pressure _____ Flow _____
Type of flame: Oxidizing (lean, blue).

TYPICAL PERFORMANCE

Optimum concentration range:
0.2 - 5.0 mg/L at 324.7 nm

A standard containing 4 mg/L copper should typically give an absorbance of about 0.200 at 324.7 nm.

INTERFERENCES

With multi-element lamps containing nickel or iron, a 0.2 nm slit will be used with the copper 324.7 nm line.

GENERAL INSTRUMENT PARAMETERS

Instrument: Perkin Elmer Model 5000 or 5100 PC.
Wave length: 324.7 nm
Slit: 0.7 nm
Light source: Copper hollow cathode lamp.
Lamp current: _____
Fuel: Acetylene Pressure _____ Flow _____
Oxidant: Air Pressure _____ Flow _____
Type of flame: Oxidizing (lean, blue).

Instrument: Varian
Wave length: 324.7 nm
Slit: 0.5 nm.
Light source: Copper hollow cathode lamp.
Lamp current: 4 ma.
Fuel: Acetylene Pressure _____ Flow _____
Oxidant: Air Pressure _____ Flow _____
Type of flame: Oxidizing (lean, blue).

TYPICAL PERFORMANCE

Optimum concentration range:
0.3 - 5.0 mg/L at 248.3 nm.

A standard containing 5 mg/L iron should typically give an absorbance of about 0.200.

INTERFERENCES

When iron is determined in the presence of cobalt, copper, or nickel, a reduction in sensitivity is observed. An excess of mineral acids will also reduce iron sensitivity, do to viscosity effects. These interferences can be controlled by using a very lean (blue) flame.

Silicon depresses the iron signal and can be overcome by the addition of 0.2% calcium chloride.

Some of the organic acids (particularly citric acid) may cause the reduction in the iron signal and can be eliminated by the addition of 0.5% phosphoric acid or sodium chloride.

By using nitrous oxide - acetylene flame, many of these interferences can be reduced or eliminated, but the sensitivity will be reduced.

GENERAL INSTRUMENT PARAMETERS

Instrument: Perkin Elmer Model 5000 or 5100 PC.
Wave length: 248.3 nm (primary)
248.8, 271.9, 302.1, 252.7, or 372.0 nm (alternative)
Slit: 0.2 nm
Light source: Iron hollow cathode lamp.
Lamp current: _____
Fuel: Acetylene Pressure _____ Flow _____
Oxidant: Air Pressure _____ Flow _____
Type of flame: Oxidizing (lean, blue).
Background correction: May be required.

Instrument: Varian.
Wave length: 248.3 nm (primary)
248.8, 271.9, 302.1, 252.7, or 372.0 nm (alternative)
Slit: 0.2 nm.
Light source: Iron hollow cathode lamp.
Lamp current: 5 ma.
Fuel: Acetylene Pressure _____ Flow _____
Oxidant: Air Pressure _____ Flow _____
Type of flame: Oxidizing (lean, blue).
Background correction: May be required.

TYPICAL PERFORMANCE

Optimum concentration range:
100 - 300 mg/L at 253.7 nm.

A standard containing 200 mg/L mercury should typically give an absorbance of about 0.200 at 253.7 nm.

INTERFERENCES

Large concentrations of cobalt will produce higher absorbance readings for mercury at the wave length line 253.7 nm.

Reducing agents like ascorbic acid, stannous chloride, etc., may reduce the mercury present to Hg^{+} or Hg^{0}. These give higher sensitivities than Hg^{++} and their presence can give erroneously high results.

GENERAL INSTRUMENT PARAMETERS

Instrument: Perkin Elmer Model 5000 or 5100 PC.
Wave length: 253.7 nm
Slit: 0.7 nm
Light source: Mercury Electrodeless Discharge Lamp (EDL)(The sensitivity of mercury is 25% less for hollow cathode lamps.)
Lamp current: _____
Fuel: Acetylene Pressure _____ Flow _____
Oxidant: Air Pressure _____ Flow _____
Type of flame: Oxidizing (lean, blue).

Instrument: Varian
Wave length: 253.7 nm
Slit: 0.5 nm
Light source: Mercury Electrodeless Discharge Lamp (EDL)(The sensitivity of mercury is 25% less for hollow cathode lamps.)
Lamp current: 4 ma.
Fuel: Acetylene Pressure _____ Flow _____
Oxidant: Air Pressure _____ Flow _____
Type of flame: Oxidizing (lean, blue).

TYPICAL PERFORMANCE

Optimum concentration range:
0.3 - 5.0 mg/L at 232.0 nm.

A standard containing 7 mg/L nickel should typically give an absorbance of about 0.200.

INTERFERENCES

The presence of iron, cobalt or chromium may increase the nickel signal. This interference can be eliminated by either matrix matching or use of nitrous oxide/acetylene flame. However, this flame will reduce the nickel sensitivity.

A non-resonance line of Ni at 232.14 nm causes non-linear calibration curves at moderate to high nickel concentrations, requiring sample dilution or use of the 252.4 nm line.

GENERAL INSTRUMENT PARAMETERS

Instrument: Perkin Elmer Model 5000 or 5100 PC.
Wave length: 232.0 nm (primary); 352.4,341.5 (alternates).
Slit: 0.2 nm.
Light source: Nickel hollow cathode lamp.
Lamp current: _____
Fuel: Acetylene Pressure _____ Flow _____
Oxidant: Air Pressure _____ Flow _____
Type of flame: Oxidizing (lean, blue).

Instrument: Varian.
Wave length: 232.0 nm (primary); 352.4,341.5 (alternates).
Slit: 0.2 nm.
Light source: Nickel hollow cathode lamp.
Lamp current: 4 ma.
Fuel: Acetylene Pressure _____
Flow _____
Oxidant: Air Pressure _____
Flow _____
Type of flame: Oxidizing (lean, blue).

TYPICAL PERFORMANCE

Optimum concentration range:
1 - 20 mg/L at 283.3 nm.

20 mg/L Pb should give an absorbance of about 0.200 at 283.3 nm.

INTERFERENCES

Large excess of other elements may interfere with lead signal. (e.g., 10,000 mg/L Fe enhances the lead signal.)

With multi-element lamps containing copper, the Cu 216.5 nm resonance line may interfere with lead determinations at the lead 217.0 nm line. The lead 283.3 nm line must be used when a multiple-element lamp containing copper is used.

If the sample solution were to have been made with sulfuric acid, lead may precipitate out of solution. Nitric or hydrochloric acid is added to keep lead in solution.

GENERAL INSTRUMENT PARAMETERS

Instrument: Perkin-Elmer Model 5000 or 5100 PC.
Wave length: 283.3 nm (alternate 217.0 nm)
Slit: 0.7 nm
Light source: lead hollow cathode lamp.
Lamp current: _____
Fuel: Acetylene Pressure _____ Flow _____
Oxidant: Air Pressure _____ Flow _____
Type of flame: Oxidizing (lean, blue).

Instrument: Varian.
Wave length: 283.3 nm (alternate 217.0 nm)
Slit: 0.5 nm (1.0 nm for 217.0)
Light source: lead hollow cathode lamp.
Lamp current: 5 ma.
Fuel: Acetylene Pressure _____ Flow _____
Oxidant: Air Pressure _____ Flow _____
Type of flame: Oxidizing (lean, blue).

TYPICAL PERFORMANCE

Optimum concentration range: 20-100 mg/L

A standard containing 80 mg/L titanium should typically give an absorbance of about 0.200 at 354.3 nm.

INTERFERENCES

The titanium absorption signal is increased by the presence of most metals (Al, Co, K, Mn, Na, Cu, Ca, Cr, Fe, Li, Mg, Mo, Cd, Sb, In, Ba, Ni, Sn, Sr, Pb, and V) P, F, and NH4+ at the concentrations above 500 mg/L.

Ionization of titanium should be controlled by the addition of an alkali salt (0.1% or more potassium as chloride) to samples and standards.

GENERAL INSTRUMENT PARAMETERS

Instrument: Perkin Elmer Model 5000 or 5100 PC.
Wave length: 364.3 nm
Slit: 0.7 nm
Light source: Titanium hollow cathode lamp.
Lamp current: _____
Fuel: Acetylene Pressure _____ Flow _____
Oxidant: Air Pressure _____ Flow _____
Type of flame: Oxidizing (lean, blue).

Instrument: Varian.
Wave length: 364.3 nm
Slit: 0.5 nm
Light source: Titanium hollow cathode lamp.
Lamp current: 20 ma.
Fuel: Acetylene Pressure _____ Flow _____
Oxidant: Air Pressure _____ Flow _____
Type of flame: Oxidizing (lean, blue).

TYPICAL PERFORMANCE

Optimum concentration range: 0.05 - 1.00 mg/L at 213.9 nm.

A standard containing 1.0 mg/L Zn should typically give an absorbance of about 0.200 at 213.9 nm.

INTERFERENCES

High levels of Si, Cu, or P04 may interfere. The addition of Strontium (1,500 mg/L) removes the copper and phosphate interference.

GENERAL INSTRUMENT PARAMETERS

Instrument: Perkin Elmer Model 5000 or 5100 PC.
Wave length: 213.9 nm
Slit: 0.7 nm
Light source: zinc hollow cathode lamp.
Lamp current: _____
Fuel: Acetylene Pressure _____ Flow _____
Oxidant: Air Pressure _____ Flow _____
Type of flame: Oxidizing (lean, blue).

Instrument: Varian.
Wave length: 213.9 nm
Slit: 1.0 nm
Light source: zinc hollow cathode lamp.
Lamp current: 5 ma.
Fuel: Acetylene Pressure _____ Flow _____
Oxidant: Air Pressure _____ Flow _____
Type of flame: Oxidizing (lean, blue).

ATTACHMENT 2

PERKIN-ELMER ATOMIC ABSORPTION SYSTEMS

Atomic Absorption Spectrophotometer -

Perkin-Elmer 5000 or 5100 PC.

Hollow Cathode Lamps:

Beryllium	P.E. Part No.
Cadmium	P.E. Part No. N066-1299
Chromium	P.E. Part No. N066-1297 for PE5100 or P.E. Part No. 303-6021 for PE5000
Copper	P.E. Part No. N066-1299
Iron	P.E. Part No. N066-1298 for PE5100 or P.E. Part No. 303-6037 for PE5000.
Nickle	P.E. Part No. N066-1299
Lead	P.E. Part No. N066-1299
Titanium	P.E. Part No.
Zinc	P.E. Part No. N066-1299

Electrodeless Discharge Lamp (EDL),

Mercury	P.E. Part No. N066-1299

EDL power supply.

ATTACHMENT 2

VARIAN ATOMIC ABSORPTION SYSTEMS

Atomic Absorption Spectrophotometer -

Hollow Cathode Lamps:

Beryllium	Varian Part No.
Cadmium	Varian Part No.
Chromium	Varian Part No.
Copper	Varian Part No.
Iron	Varian Part No.
Nickle	Varian Part No.
Lead	Varian Part No.
Titanium	Varian Part No.
Zinc	Varian Part No.

Electrodeless Discharge Lamp (EDL),

Mercury	Varian Part No.

EDL power supply.

DRAFT METHOD #: 9701

SAFETY-KLEEN CORP. REV: 10/91

TECHNICAL CENTER SUPERSEDES: NEW

ATTACHED IS A DOCUMENT FOR: CREATION DATE: 9-29-91

TITLE: STANDARD OPERATING PROCEDURE FOR THE ANALYSIS OF METALS IN AQUEOUS SOLUTIONS BY FLAME ATOMIC ABSORPTION SPECTROSCOPY
(KEY WORDS: METALS, FLAME AA, DIGESTED)
(BASED ON: USEPA 7000)

SERIES/SUBJECT

9000 Analytical Methods
9700

==========

COMMENTS:
INITIATOR -

DEPARTMENT MANAGER(S) -

VICE PRESIDENT - TECHNICAL

DARAFT METHOD #: 9701

SAFETY-KLEEN CORP. REV: 10/91

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9000 Analytical Methods
9700

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CONCURRENCES:

DEPARTMENT MANAGER(S)

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VICE PRESIDENT - TECHNICAL

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ANALYST TRAINING FORM

Trainee:_____

Trainer:_____ Date:_____

Analysis: Method:_ _____

1. The following sections of the method were explained by the trainer and understood by the trainee:

	Trainer	Trainee
Scope & Application	_____	_____
Safety & Waste Handling	_____	_____
Summary of Method	_____	_____
Sample Handling & Pres.	_____	_____
Interferences	_____	_____
Apparatus	_____	_____
Reagents	_____	_____
Preventive Maint. &	_____	_____
Trouble Shooting / Corrective Action	_____	_____
Quality Control	_____	_____
Procedure	_____	_____
Calculations	_____	_____
References	_____	_____
Attachments	_____	_____

2. Trainee observed analysis performed by Trainer:

_____ _____

3. Trainee repeats analysis. Comparative results:

Sample ID	TRAINER RESULTS	TRAINEE RESULTS
	_____	_____
	_____	_____
	_____	_____
	_____	_____
OTHER	_____	_____

Analyst certified to perform method: (by/on)_____

Additional training recommended: (by/on)_____

(Attach additional comparative results)

PROGRAM 12 Pb STDADD

INSTRUMENT MODE	ABSORBANCE
CALIBRATION MODE	STANDARD ADDITIONS
MEASUREMENT MODE	PEAK AREA
LAMP POSITION	4
LAMP CURRENT (mA)	5
SLIT WIDTH (nm)	0.5
SLIT HEIGHT	NORMAL
WAVELENGTH (nm)	283.3
SAMPLE INTRODUCTION	SAMPLER AUTOMIXING
TIME CONSTANT	0.05
MEASUREMENT TIME (sec)	1.0
REPLICATES	2
BACKGROUND CORRECTION	ON
MAXIMUM ABSORBANCE	1.40

FURNACE PARAMETERS

STEP NO.	TEMPERATURE (C)	TIME (sec)	GAS FLOW (L/min)	GAS TYPE	READ COMMAND
1	150	20.0	3.0	NORMAL	NO
2	450	10.0	3.0	NORMAL	NO
3	600	15.0	3.0	NORMAL	NO
4	600	20.0	3.0	NORMAL	NO
5	600	2.0	0.0	NORMAL	NO
6	2300	0.9	0.0	NORMAL	YES
7	2300	2.7	0.0	NORMAL	YES
8	2300	2.0	3.0	NORMAL	NO
9	40	11.6	3.0	NORMAL	NO

SAMPLER PARAMETERS
VOLUMES (μL)

	STANDARD	SAMPLE	BLANK	MODIFIER
BLANK	--	--	20	5
ADDITION 1	1	10	9	5
ADDITION 2	2	10	8	5
ADDITION 3	5	10	5	5
SAMPLE	--	10	20	5

RECALIBRATION RATE 1

MULTIPLE INJECT	NO	HOT INJECT	YES	PRE INJECT	NO
		TEMPERATURE	150		
		INJECT RATE	5		

QA PROTOCOL PARAMETERS

QC STANDARD RATE	0
QC INITIAL STANDARD POSITION	50
QC INITIAL BLANK POSITION	51
QC CONTINUING STANDARD POSITION	50
QC CONTINUING BLANK POSITION	51
QC STANDARD VOLUME (µL)	20
QC STANDARD CONCENTRATION	50.0 PPB
QC STANDARD LIMITS (%)	90 TO 110
QC SPIKE RATE	0
QC SPIKE VOLUME (µL)	5
QC SPIKE CONCENTRATION	1.0 PPB
MATRIX SPIKE CONCENTRATION	1.0 PPB
INSTRUMENT DETECTION LIMIT	0.1 PPB
REQUIRED DETECTION LIMIT	7.4 PPB

PROGRAM 12 Pb STDADD QC ZEEMAN
NO.1 BLANK REPLICATE 1
ABSORBANCE STANDARD ADDN'S SAMPLER AUTOMIX
PEAK AREA MAX.ABS. 1.40 BC ON

STANDARDS

ADDITION 1 10.0 PPB

ADDITION 2 20.0 PPB

ADDITION 3 50.0 PPB

ADDITION 4

ADDITION 5

PROGRAM 30 Be

INSTRUMENT MODE	ABSORBANCE
CALIBRATION MODE	CONCENTRATION
MEASUREMENT MODE	PEAK AREA
LAMP POSITION	5
LAMP CURRENT (mA)	6
SLIT WIDTH (nm)	1.0
SLIT HEIGHT	NORMAL
WAVELENGTH (nm)	234.9
SAMPLE INTRODUCTION	SAMPLER AUTOMIXING
TIME CONSTANT	0.05
MEASUREMENT TIME (sec)	1.0
REPLICATES	2
BACKGROUND CORRECTION	ON
MAXIMUM ABSORBANCE	0.70

FURNACE PARAMETERS

STEP NO.	TEMPERATURE (C)	TIME (sec)	GAS FLOW (L/min)	GAS TYPE	READ COMMAND
1	350	20.0	3.0	NORMAL	NO
2	1100	10.0	3.0	NORMAL	NO
3	1100	10.0	3.0	NORMAL	NO
4	1100	1.0	0.0	NORMAL	NO
5	2650	0.9	0.0	NORMAL	YES
6	2650	4.0	0.0	NORMAL	YES
7	2750	2.0	3.0	NORMAL	NO
8	40	13.6	3.0	NORMAL	NO

SAMPLER PARAMETERS
VOLUMES (μL)

	SOLUTION	BLANK	MODIFIER
BLANK	--	10	
ADDITION 1	2	8	
ADDITION 2	5	5	
ADDITION 3	10	0	
SAMPLE	10		

RECALIBRATION RATE	0
RESLOPE RATE	8

MULTIPLE INJECT	NO	HOT INJECT	YES	PRE INJECT	NO
		TEMPERATURE	135		
		INJECT RATE	10		

QA PROTOCOL PARAMETERS

QC STANDARD RATE	20
QC INITIAL STANDARD POSITION	50
QC INITIAL BLANK POSITION	51
QC CONTINUING STANDARD POSITION	50
QC CONTINUING BLANK POSITION	51
QC STANDARD VOLUME (µL)	10
QC STANDARD CONCENTRATION	5.00 PPB
QC STANDARD LIMITS (%)	80 TO 120
QC SPIKE RATE	0
QC SPIKE VOLUME (µL)	5
QC SPIKE CONCENTRATION	1.00 PPB
MATRIX SPIKE CONCENTRATION	1.00 PPB
INSTRUMENT DETECTION LIMIT	0.10 PPB
REQUIRED DETECTION LIMIT	0.26 PPB

PROGRAM 30 Be QC ZEEMAN
BLANK REPLICATE 1
ABSORBANCE CONCENTRATION SAMPLER AUTOMIX
PEAK AREA MAX.ABS. 0.70 BC ON

STANDARDS

STANDARD 1 2.00 PPB

STANDARD 2 5.00 PPB

STANDARD 3 10.00 PPB

STANDARD 4

STANDARD 5

RESLOPE STANDARD NO. 2

PROGRAM 28 Cd STDADD

INSTRUMENT MODE	ABSORBANCE
CALIBRATION MODE	STANDARD ADDITIONS
MEASUREMENT MODE	PEAK AREA
LAMP POSITION	7
LAMP CURRENT (mA)	4
SLIT WIDTH (nm)	0.5
SLIT HEIGHT	NORMAL
WAVELENGTH (nm)	228.8
SAMPLE INTRODUCTION	SAMPLER AUTOMIXING
TIME CONSTANT	0.05
MEASUREMENT TIME (sec)	1.0
REPLICATES	2
BACKGROUND CORRECTION	ON
MAXIMUM ABSORBANCE	0.70

FURNACE PARAMETERS

STEP NO.	TEMPERATURE (C)	TIME (sec)	GAS FLOW (L/min)	GAS TYPE	READ COMMAND
1	350	20.0	3.0	NORMAL	NO
2	800	15.0	3.0	NORMAL	NO
3	800	10.0	3.0	NORMAL	NO
4	800	2.0	0.2	NORMAL	NO
5	2000	0.9	0.2	NORMAL	YES
6	2000	2.0	0.2	NORMAL	YES
7	2200	2.0	3.0	NORMAL	NO
8	40	10.8	3.0	NORMAL	NO

SAMPLER PARAMETERS
VOLUMES (μL)

	STANDARD	SAMPLE	BLANK	MODIFIER
BLANK	--	--	20	6
ADDITION 1	1	10	9	6
ADDITION 2	2	10	8	6
ADDITION 3	5	10	5	6
SAMPLE	--	10	10	6

RECALIBRATION RATE 1

MULTIPLE INJECT	NO	HOT INJECT	YES	PRE INJECT	NO
		TEMPERATURE	150		
		INJECT RATE	7		

QA PROTOCOL PARAMETERS

QC STANDARD RATE	0
QC INITIAL STANDARD POSITION	50
QC INITIAL BLANK POSITION	51
QC CONTINUING STANDARD POSITION	50
QC CONTINUING BLANK POSITION	51
QC STANDARD VOLUME (µL)	20
QC STANDARD CONCENTRATION	5.00 PPB
QC STANDARD LIMITS (%)	90 TO 110
QC SPIKE RATE	0
QC SPIKE VOLUME (µL)	5
QC SPIKE CONCENTRATION	1.00 PPB
MATRIX SPIKE CONCENTRATION	1.00 PPB
INSTRUMENT DETECTION LIMIT	1.00 PPB
REQUIRED DETECTION LIMIT	1.30 PPB

PROGRAM 28 Cd STDADD QC ZEEMAN
NO.1 BLANK REPLICATE 1
ABSORBANCE STANDARD ADDN'S SAMPLER AUTOMIX
PEAK AREA MAX.ABS. 0.70 BC ON

STANDARDS

ADDITION 1 1.00 PPB

ADDITION 2 2.00 PPB

ADDITION 3 5.00 PPB

ADDITION 4

ADDITION 5

PROGRAM 6 Sb LOWSTD (FOR PE SAMPLES)

INSTRUMENT MODE	ABSORBANCE
CALIBRATION MODE	CONCENTRATION
MEASUREMENT MODE	PEAK AREA
LAMP POSITION	6
LAMP CURRENT (mA)	10
SLIT WIDTH (nm)	0.2
SLIT HEIGHT	NORMAL
WAVELENGTH (nm)	217.6
SAMPLE INTRODUCTION	SAMPLER AUTOMIXING
TIME CONSTANT	0.05
MEASUREMENT TIME (sec)	1.0
REPLICATES	2
BACKGROUND CORRECTION	ON
MAXIMUM ABSORBANCE	1.40

FURNACE PARAMETERS

STEP NO.	TEMPERATURE (C)	TIME (sec)	GAS FLOW (L/min)	GAS TYPE	READ COMMAND
1	200	25.0	3.0	NORMAL	NO
2	350	20.0	3.0	NORMAL	NO
3	800	15.0	3.0	NORMAL	NO
4	800	10.0	0.0	NORMAL	NO
5	800	1.0	0.0	NORMAL	NO
6	2400	0.9	0.0	NORMAL	YES
7	2400	2.0	0.0	NORMAL	YES
8	2400	2.0	3.0	NORMAL	NO

SAMPLER PARAMETERS
VOLUMES (μL)

	SOLUTION	BLANK	MODIFIER
BLANK	--	20	10
STANDARD 1	5	15	10
STANDARD 2	10	10	10
STANDARD 3	20	0	10
SAMPLE	20	0	10

RECALIBRATION RATE	0
RESLOPE RATE	0

MULTIPLE INJECT	NO	HOT INJECT	YES	PRE INJECT	NO
		TEMPERATURE	135		
		INJECT RATE	7		

PROGRAM 6 Sb LOWSTD (FOR PE SAMPLES) (continued)

QA PROTOCOL PARAMETERS

QC STANDARD RATE	20
QC INITIAL STANDARD POSITION	50
QC INITIAL BLANK POSITION	51
QC CONTINUING STANDARD POSITION	50
QC CONTINUING BLANK POSITION	51
QC STANDARD VOLUME (µL)	20
QC STANDARD CONCENTRATION	10.00 PPB
QC STANDARD LIMITS (%)	90 TO 110
QC SPIKE RATE	4
QC SPIKE VOLUME (µL)	5
QC SPIKE CONCENTRATION	20.00 PPB
MATRIX SPIKE CONCENTRATION	25.00 PPB
INSTRUMENT DETECTION LIMIT	0.10 PPB
REQUIRED DETECTION LIMIT	1.00 PPB

PROGRAM 6 Sb LOWSTD QC ZEEMAN
BLANK REPLICATE 1
ABSORBANCE CONCENTRATION SAMPLER AUTOMIX
PEAK AREA MAX.ABS. 1.40 BC ON

STANDARDS

STANDARD 1 5.00 PPB

STANDARD 2 10.00 PPB

STANDARD 3 20.00 PPB

STANDARD 4

STANDARD 5

RESLOPE STANDARD NO. 2

PROGRAM 5 Sb

INSTRUMENT MODE	ABSORBANCE
CALIBRATION MODE	CONCENTRATION
MEASUREMENT MODE	PEAK AREA
LAMP POSITION	6
LAMP CURRENT (mA)	10
SLIT WIDTH (nm)	0.2
SLIT HEIGHT	NORMAL
WAVELENGTH (nm)	217.6
SAMPLE INTRODUCTION	SAMPLER AUTOMIXING
TIME CONSTANT	0.05
MEASUREMENT TIME (sec)	1.0
REPLICATES	2
BACKGROUND CORRECTION	ON
MAXIMUM ABSORBANCE	1.40

FURNACE PARAMETERS

STEP NO.	TEMPERATURE (C)	TIME (sec)	GAS FLOW (L/min)	GAS TYPE	READ COMMAND
1	200	25.0	3.0	NORMAL	NO
2	350	20.0	3.0	NORMAL	NO
3	800	15.0	3.0	NORMAL	NO
4	800	10.0	0.0	NORMAL	NO
5	800	1.0	0.0	NORMAL	NO
6	2400	0.9	0.0	NORMAL	YES
7	2400	2.0	0.0	NORMAL	YES
8	2400	2.0	3.0	NORMAL	NO

SAMPLER PARAMETERS
VOLUMES (μL)

	SOLUTION	BLANK	MODIFIER
BLANK	--	20	10
STANDARD 1	4	16	10
STANDARD 2	10	10	10
STANDARD 3	20	0	10
SAMPLE	20	0	10

RECALIBRATION RATE	0
RESLOPE RATE	0

MULTIPLE INJECT	NO	HOT INJECT	YES	PRE INJECT	NO
		TEMPERATURE	135		
		INJECT RATE	7		

PROGRAM 5 Sb (continued)

QA PROTOCOL PARAMETERS

QC STANDARD RATE	20
QC INITIAL STANDARD POSITION	50
QC INITIAL BLANK POSITION	51
QC CONTINUING STANDARD POSITION	50
QC CONTINUING BLANK POSITION	51
QC STANDARD VOLUME (µL)	20
QC STANDARD CONCENTRATION	50.00 PPB
QC STANDARD LIMITS (%)	90 TO 110
QC SPIKE RATE	0
QC SPIKE VOLUME (µL)	5
QC SPIKE CONCENTRATION	100.00 PPB
MATRIX SPIKE CONCENTRATION	25.00 PPB
INSTRUMENT DETECTION LIMIT	0.1 PPB
REQUIRED DETECTION LIMIT	1.0 PPB

PROGRAM 5 Sb QC ZEEMAN
BLANK REPLICATE 1
ABSORBANCE CONCENTRATION SAMPLER AUTOMIX
PEAK AREA MAX.ABS. 1.40 BC ON

STANDARDS

STANDARD 1 20.0 PPB

STANDARD 2 50.0 PPB

STANDARD 3 100.0 PPB

STANDARD 4

STANDARD 5

RESLOPE STANDARD NO. 2

PROGRAM 3 Ag

INSTRUMENT MODE	ABSORBANCE
CALIBRATION MODE	CONCENTRATION
MEASUREMENT MODE	PEAK AREA
LAMP POSITION	3
LAMP CURRENT (mA)	4
SLIT WIDTH (nm)	0.5
SLIT HEIGHT	NORMAL
WAVELENGTH (nm)	328.1
SAMPLE INTRODUCTION	SAMPLER AUTOMIXING
TIME CONSTANT	0.05
MEASUREMENT TIME (sec)	1.0
REPLICATES	2
BACKGROUND CORRECTION	ON
MAXIMUM ABSORBANCE	1.30

FURNACE PARAMETERS

STEP NO.	TEMPERATURE (C)	TIME (sec)	GAS FLOW (L/min)	GAS TYPE	READ COMMAND
1	140	5.0	3.0	NORMAL	NO
2	220	50.0	3.0	NORMAL	NO
3	650	10.0	3.0	NORMAL	NO
4	650	20.0	3.0	NORMAL	NO
5	650	1.0	0.3	NORMAL	NO
6	2400	1.5	0.3	NORMAL	YES
7	2400	2.0	0.3	NORMAL	YES
8	2400	2.0	3.0	NORMAL	NO
9	40	12.3	3.0	NORMAL	NO

SAMPLER PARAMETERS
VOLUMES (μL)

	SOLUTION	BLANK	MODIFIER
BLANK	--	20	
STANDARD 1	4	16	
STANDARD 2	10	10	
STANDARD 3	20	0	
SAMPLE	20	0	

RECALIBRATION RATE	0
RESLOPE RATE	0

MULTIPLE INJECT	NO	HOT INJECT	YES	PRE INJECT	NO
		TEMPERATURE	135		
		INJECT RATE	7		

PROGRAM 3 Ag (continued)

QA PROTOCOL PARAMETERS

QC STANDARD RATE	20
QC INITIAL STANDARD POSITION	50
QC INITIAL BLANK POSITION	51
QC CONTINUING STANDARD POSITION	50
QC CONTINUING BLANK POSITION	51
QC STANDARD VOLUME (µL)	20
QC STANDARD CONCENTRATION	25.00 PPB
QC STANDARD LIMITS (%)	90 TO 110
QC SPIKE RATE	4
QC SPIKE VOLUME (µL)	5
QC SPIKE CONCENTRATION	50.00 PPB
MATRIX SPIKE CONCENTRATION	12.50 PPB
INSTRUMENT DETECTION LIMIT	0.10 PPB
REQUIRED DETECTION LIMIT	1.30 PPB

PROGRAM 3 Ag QC ZEEMAN
BLANK REPLICATE 1
ABSORBANCE CONCENTRATION SAMPLER AUTOMIX
PEAK AREA MAX.ABS. 1.30 BC ON

STANDARDS

STANDARD 1 10.00

STANDARD 2 25.00

STANDARD 3 50.00

STANDARD 4

STANDARD 5

RESLOPE STANDARD NO. 2

PROGRAM 4 Ag LOWSTD

INSTRUMENT MODE	ABSORBANCE
CALIBRATION MODE	CONCENTRATION
MEASUREMENT MODE	PEAK AREA
LAMP POSITION	3
LAMP CURRENT (mA)	4
SLIT WIDTH (nm)	0.5
SLIT HEIGHT	NORMAL
WAVELENGTH (nm)	328.1
SAMPLE INTRODUCTION	SAMPLER AUTOMIXING
TIME CONSTANT	0.05
MEASUREMENT TIME (sec)	1.0
REPLICATES	2
BACKGROUND CORRECTION	ON
MAXIMUM ABSORBANCE	1.30

FURNACE PARAMETERS

STEP NO.	TEMPERATURE (C)	TIME (sec)	GAS FLOW (L/min)	GAS TYPE	READ COMMAND
1	140	5.0	3.0	NORMAL	NO
2	220	50.0	3.0	NORMAL	NO
3	650	10.0	3.0	NORMAL	NO
4	650	20.0	3.0	NORMAL	NO
5	650	1.0	0.3	NORMAL	NO
6	2400	1.5	0.3	NORMAL	YES
7	2400	2.0	0.3	NORMAL	YES
8	2400	2.0	3.0	NORMAL	NO
9	40	12.3	3.0	NORMAL	NO

SAMPLER PARAMETERS
VOLUMES (μL)

	SOLUTION	BLANK	MODIFIER
BLANK	--	20	
STANDARD 1	5	15	
STANDARD 2	10	10	
STANDARD 3	20	0	
SAMPLE	20	0	

RECALIBRATION RATE	0
RESLOPE RATE	0

MULTIPLE INJECT	NO	HOT INJECT	YES	PRE INJECT	NO
		TEMPERATURE	135		
		INJECT RATE	7		

QA PROTOCOL PARAMETERS

QC STANDARD RATE	20
QC INITIAL STANDARD POSITION	50
QC INITIAL BLANK POSITION	51
QC CONTINUING STANDARD POSITION	50
QC CONTINUING BLANK POSITION	51
QC STANDARD VOLUME (µL)	20
QC STANDARD CONCENTRATION	10.00 PPB
QC STANDARD LIMITS (%)	90 TO 110
QC SPIKE RATE	0
QC SPIKE VOLUME (µL)	5
QC SPIKE CONCENTRATION	1.00 PPB
MATRIX SPIKE CONCENTRATION	0.00 PPB
INSTRUMENT DETECTION LIMIT	0.10 PPB
REQUIRED DETECTION LIMIT	0.10 PPB

PROGRAM 4 Ag LOWSTD QC ZEEMAN
BLANK REPLICATE 1
ABSORBANCE CONCENTRATION SAMPLER AUTOMIX
PEAK AREA MAX.ABS. 1.30 BC ON

STANDARDS

STANDARD 1 5.00

STANDARD 2 10.00

STANDARD 3 20.00

STANDARD 4

STANDARD 5

RESLOPE STANDARD NO. 2

PROGRAM 13 Cd

INSTRUMENT MODE	ABSORBANCE
CALIBRATION MODE	CONCENTRATION
MEASUREMENT MODE	PEAK AREA
LAMP POSITION	7
LAMP CURRENT (mA)	4
SLIT WIDTH (nm)	0.5
SLIT HEIGHT	NORMAL
WAVELENGTH (nm)	228.8
SAMPLE INTRODUCTION	SAMPLER AUTOMIXING
TIME CONSTANT	0.05
MEASUREMENT TIME (sec)	1.0
REPLICATES	2
BACKGROUND CORRECTION	ON
MAXIMUM ABSORBANCE	0.70

FURNACE PARAMETERS

STEP NO.	TEMPERATURE (C)	TIME (sec)	GAS FLOW (L/min)	GAS TYPE	READ COMMAND
1	350	20.0	3.0	NORMAL	NO
2	800	15.0	3.0	NORMAL	NO
3	800	10.0	3.0	NORMAL	NO
4	800	2.0	0.2	NORMAL	NO
5	2000	0.9	0.2	NORMAL	YES
6	2000	2.0	0.2	NORMAL	YES
7	2200	2.0	3.0	NORMAL	NO
8	40	10.8	3.0	NORMAL	NO

SAMPLER PARAMETERS
VOLUMES (μL)

	SOLUTION	BLANK	MODIFIER
BLANK	--	20	6
STANDARD 1	5	15	6
STANDARD 2	10	10	6
STANDARD 3	20	0	6
SAMPLE	20	0	6

RECALIBRATION RATE	0
RESLOPE RATE	0

MULTIPLE INJECT	NO	HOT INJECT	YES	PRE INJECT	NO
		TEMPERATURE	150		
		INJECT RATE	7		

QA PROTOCOL PARAMETERS

QC STANDARD RATE	20
QC INITIAL STANDARD POSITION	50
QC INITIAL BLANK POSITION	51
QC CONTINUING STANDARD POSITION	50
QC CONTINUING BLANK POSITION	51
QC STANDARD VOLUME (µL)	20
QC STANDARD CONCENTRATION	5.00
QC STANDARD LIMITS (%)	90 TO 110
QC SPIKE RATE	0
QC SPIKE VOLUME (µL)	5
QC SPIKE CONCENTRATION	10.00
MATRIX SPIKE CONCENTRATION	2.50
INSTRUMENT DETECTION LIMIT	0.10
REQUIRED DETECTION LIMIT	1.30

PROGRAM 13 Cd QC ZEEMAN
BLANK REPLICATE 1
ABSORBANCE CONCENTRATION SAMPLER AUTOMIX
PEAK AREA MAX.ABS. 0.70 BC ON

STANDARDS

STANDARD 1 2.50

STANDARD 2 5.00

STANDARD 3 10.00

STANDARD 4

STANDARD 5

RESLOPE STANDARD NO. 2

PROGRAM 7 Ti

INSTRUMENT MODE	ABSORBANCE
CALIBRATION MODE	CONCENTRATION
MEASUREMENT MODE	PEAK AREA
LAMP POSITION	6
LAMP CURRENT (mA)	20
SLIT WIDTH (nm)	0.5
SLIT HEIGHT	REDUCED
WAVELENGTH (nm)	364.3
SAMPLE INTRODUCTION	SAMPLER PREMIXED
TIME CONSTANT	0.05
MEASUREMENT TIME (sec)	1.0
REPLICATES	2
BACKGROUND CORRECTION	ON
MAXIMUM ABSORBANCE	1.90

FURNACE PARAMETERS

STEP NO.	TEMPERATURE (C)	TIME (sec)	GAS FLOW (L/min)	GAS TYPE	READ COMMAND
1	95	10.0	3.0	NORMAL	NO
2	120	5.0	3.0	NORMAL	NO
3	1500	20.0	3.0	NORMAL	NO
4	1500	3.0	3.0	NORMAL	NO
5	1500	1.0	0.0	NORMAL	NO
6	2900	0.9	0.0	NORMAL	YES
7	2900	2.0	0.0	NORMAL	YES
8	2900	3.0	3.0	NORMAL	NO

SAMPLER PARAMETERS
VOLUMES (μL)

	SOLUTION	BLANK	MODIFIER
BLANK	--	5	2
STANDARD 1	5	0	2
STANDARD 2	5	0	2
STANDARD 3	5	0	2
SAMPLE	5	0	2

RECALIBRATION RATE 0
RESLOPE RATE 0

MULTIPLE INJECT NO HOT INJECT NO PRE INJECT YES
LAST DRY STEP 2

PROGRAM 7 Ti (continued)

QA PROTOCOL PARAMETERS

QC STANDARD RATE	20
QC INITIAL STANDARD POSITION	50
QC INITIAL BLANK POSITION	51
QC CONTINUING STANDARD POSITION	50
QC CONTINUING BLANK POSITION	51
QC STANDARD VOLUME (µL)	5
QC STANDARD CONCENTRATION	100.0
QC STANDARD LIMITS (%)	80 TO 120
QC SPIKE RATE	0
QC SPIKE VOLUME (µL)	5
QC SPIKE CONCENTRATION	1.0
MATRIX SPIKE CONCENTRATION	1.0
INSTRUMENT DETECTION LIMIT	0.1
REQUIRED DETECTION LIMIT	1.0

PROGRAM 7 Ti QC ZEEMAN
BLANK REPLICATE 1
ABSORBANCE CONCENTRATION SAMPLER PREMIX
PEAK AREA MAX.ABS. 1.90 BC ON

STANDARDS

STANDARD 1 50.0

STANDARD 2 100.0

STANDARD 3 200.0

STANDARD 4

STANDARD 5

RESLOPE STANDARD NO. 2

PROGRAM 9 Pb

INSTRUMENT MODE	ABSORBANCE
CALIBRATION MODE	CONCENTRATION
MEASUREMENT MODE	PEAK AREA
LAMP POSITION	4
LAMP CURRENT (mA)	5
SLIT WIDTH (nm)	0.5
SLIT HEIGHT	NORMAL
WAVELENGTH (nm)	283.3
SAMPLE INTRODUCTION	SAMPLER AUTOMIXING
TIME CONSTANT	0.05
MEASUREMENT TIME (sec)	1.0
REPLICATES	2
BACKGROUND CORRECTION	ON
MAXIMUM ABSORBANCE	1.40

FURNACE PARAMETERS

STEP NO.	TEMPERATURE (C)	TIME (sec)	GAS FLOW (L/min)	GAS TYPE	READ COMMAND
1	150	20.0	3.0	NORMAL	NO
2	450	10.0	3.0	NORMAL	NO
3	600	15.0	3.0	NORMAL	NO
4	600	20.0	3.0	NORMAL	NO
5	600	2.0	0.0	NORMAL	NO
6	2300	0.9	0.0	NORMAL	YES
7	2300	2.7	0.0	NORMAL	YES
8	2300	2.0	3.0	NORMAL	NO
9	40	11.6	3.0	NORMAL	NO

SAMPLER PARAMETERS
VOLUMES (μL)

	SOLUTION	BLANK	MODIFIER
BLANK	--	20	6
STANDARD 1	2	18	6
STANDARD 2	10	10	6
STANDARD 3	20	0	6
SAMPLE	20	0	6

RECALIBRATION RATE	0
RESLOPE RATE	0

MULTIPLE INJECT	NO	HOT INJECT	YES	PRE INJECT	NO
		TEMPERATURE	150		
		INJECT RATE	5		

QA PROTOCOL PARAMETERS

QC STANDARD RATE	20
QC INITIAL STANDARD POSITION	50
QC INITIAL BLANK POSITION	51
QC CONTINUING STANDARD POSITION	50
QC CONTINUING BLANK POSITION	51
QC STANDARD VOLUME (µL)	20
QC STANDARD CONCENTRATION	50.0
QC STANDARD LIMITS (%)	90 TO 110
QC SPIKE RATE	0
QC SPIKE VOLUME (µL)	5
QC SPIKE CONCENTRATION	100.0
MATRIX SPIKE CONCENTRATION	25.0
INSTRUMENT DETECTION LIMIT	0.1
REQUIRED DETECTION LIMIT	7.4

PROGRAM 9 Pb QC ZEEMAN
BLANK REPLICATE 1
ABSORBANCE CONCENTRATION SAMPLER AUTOMIX
PEAK AREA MAX.ABS. 1.40 BC ON

STANDARDS

STANDARD 1 10.0

STANDARD 2 50.0

STANDARD 3 100.0

STANDARD 4

STANDARD 5

RESLOPE STANDARD NO. 2

PROGRAM 15 Se STDADD

INSTRUMENT MODE	ABSORBANCE
CALIBRATION MODE	STANDARD ADDITIONS
MEASUREMENT MODE	PEAK AREA
LAMP POSITION	1
LAMP CURRENT (mA)	6
SLIT WIDTH (nm)	1.0
SLIT HEIGHT	NORMAL
WAVELENGTH (nm)	196.0
SAMPLE INTRODUCTION	SAMPLER AUTOMIXING
TIME CONSTANT	0.05
MEASUREMENT TIME (sec)	1.0
REPLICATES	2
BACKGROUND CORRECTION	ON
MAXIMUM ABSORBANCE	1.20

FURNACE PARAMETERS

STEP NO.	TEMPERATURE (C)	TIME (sec)	GAS FLOW (L/min)	GAS TYPE	READ COMMAND
1	220	15.0	3.0	NORMAL	NO
2	220	10.0	3.0	NORMAL	NO
3	550	10.0	3.0	NORMAL	NO
4	1200	15.0	3.0	NORMAL	NO
5	1200	10.0	0.0	NORMAL	NO
6	2500	0.7	0.0	NORMAL	YES
7	2500	2.7	0.0	NORMAL	YES
8	2500	2.0	3.0	NORMAL	NO

SAMPLER PARAMETERS
VOLUMES (μL)

	STANDARD	SAMPLE	BLANK	MODIFIER
BLANK	--	--	20	12
ADDITION 1	2	10	8	12
ADDITION 2	5	10	5	12
ADDITION 3	10	10	0	12
SAMPLE	--	10	10	12

RECALIBRATION RATE 1

MULTIPLE INJECT	NO	HOT INJECT	YES	PRE INJECT	NO
		TEMPERATURE	135		
		INJECT RATE	10		

PROGRAM 15 Se STDADD (continued)

QA PROTOCOL PARAMETERS

QC STANDARD RATE	0
QC INITIAL STANDARD POSITION	50
QC INITIAL BLANK POSITION	51
QC CONTINUING STANDARD POSITION	50
QC CONTINUING BLANK POSITION	51
QC STANDARD VOLUME (µL)	20
QC STANDARD CONCENTRATION	50.0 PPB
QC STANDARD LIMITS (%)	90 TO 110
QC SPIKE RATE	0
QC SPIKE VOLUME (µL)	5
QC SPIKE CONCENTRATION	1.0 PPB
MATRIX SPIKE CONCENTRATION	1.0 PPB
INSTRUMENT DETECTION LIMIT	0.1 PPB
REQUIRED DETECTION LIMIT	7.2 PPB

PROGRAM 15 Se STDADD QC ZEEMAN
NO.1 BLANK REPLICATE 1
ABSORBANCE STANDARD ADDN'S SAMPLER AUTOMIX
PEAK AREA MAX.ABS. 1.20 BC ON

STANDARDS

ADDITION 1	20.0 PPB
ADDITION 2	50.0 PPB
ADDITION 3	100.0 PPB
ADDITION 4	
ADDITION 5	

PROGRAM 16 Se STDADD HIGH

INSTRUMENT MODE	ABSORBANCE
CALIBRATION MODE	STANDARD ADDITIONS
MEASUREMENT MODE	PEAK AREA
LAMP POSITION	1
LAMP CURRENT (mA)	6
SLIT WIDTH (nm)	1.0
SLIT HEIGHT	NORMAL
WAVELENGTH (nm)	196.0
SAMPLE INTRODUCTION	SAMPLER AUTOMIXING
TIME CONSTANT	0.05
MEASUREMENT TIME (sec)	1.0
REPLICATES	2
BACKGROUND CORRECTION	ON
MAXIMUM ABSORBANCE	1.20

FURNACE PARAMETERS

STEP NO.	TEMPERATURE (C)	TIME (sec)	GAS FLOW (L/min)	GAS TYPE	READ COMMAND
1	220	15.0	3.0	NORMAL	NO
2	220	30.0	3.0	NORMAL	NO
3	550	10.0	3.0	NORMAL	NO
4	1200	15.0	3.0	NORMAL	NO
5	1200	10.0	0.0	NORMAL	NO
6	2500	0.7	0.0	NORMAL	YES
7	2500	2.7	0.0	NORMAL	YES
8	2500	2.0	3.0	NORMAL	NO

SAMPLER PARAMETERS
VOLUMES (μL)

	STANDARD	SAMPLE	BLANK	MODIFIER
BLANK	--	--	20	12
ADDITION 1	2	10	8	12
ADDITION 2	5	10	5	12
ADDITION 3	10	10	0	12
SAMPLE	--	10	10	12

RECALIBRATION RATE 1

MULTIPLE INJECT	NO	HOT INJECT	YES	PRE INJECT	NO
		TEMPERATURE	135		
		INJECT RATE	10		

PROGRAM 16 Se STDADD HIGH (continued)

QA PROTOCOL PARAMETERS

QC STANDARD RATE	0
QC INITIAL STANDARD POSITION	50
QC INITIAL BLANK POSITION	51
QC CONTINUING STANDARD POSITION	50
QC CONTINUING BLANK POSITION	51
QC STANDARD VOLUME (µL)	20
QC STANDARD CONCENTRATION	50.0 PPB
QC STANDARD LIMITS (%)	90 TO 110
QC SPIKE RATE	0
QC SPIKE VOLUME (µL)	5
QC SPIKE CONCENTRATION	1.0 PPB
MATRIX SPIKE CONCENTRATION	1.0 PPB
INSTRUMENT DETECTION LIMIT	0.1 PPB
REQUIRED DETECTION LIMIT	7.2 PPB

PROGRAM 16	Se STDADD HIGH	QC ZEEMAN
NO.1 BLANK	REPLICATE 1	
ABSORBANCE	STANDARD ADDN'S SAMPLER AUTOMIX	
PEAK AREA	MAX.ABS. 1.20 BC ON	

STANDARDS

ADDITION 1	100.0 PPB
ADDITION 2	250.0 PPB
ADDITION 3	500.0 PPB
ADDITION 4	
ADDITION 5	

PROGRAM 17 As STDADD

INSTRUMENT MODE	ABSORBANCE
CALIBRATION MODE	STANDARD ADDITIONS
MEASUREMENT MODE	PEAK AREA
LAMP POSITION	1
LAMP CURRENT (mA)	10
SLIT WIDTH (nm)	0.2
SLIT HEIGHT	NORMAL
WAVELENGTH (nm)	193.7
SAMPLE INTRODUCTION	SAMPLER AUTOMIXING
TIME CONSTANT	0.05
MEASUREMENT TIME (sec)	1.0
REPLICATES	2
BACKGROUND CORRECTION	ON
MAXIMUM ABSORBANCE	0.95

FURNACE PARAMETERS

STEP NO.	TEMPERATURE (C)	TIME (sec)	GAS FLOW (L/min)	GAS TYPE	READ COMMAND
1	350	20.0	3.0	NORMAL	NO
2	600	15.0	3.0	NORMAL	NO
3	1300	10.0	3.0	NORMAL	NO
4	1300	10.0	3.0	NORMAL	NO
5	1300	1.0	0.0	NORMAL	NO
6	2600	0.7	0.0	NORMAL	YES
7	2600	2.7	0.0	NORMAL	YES
8	2600	2.0	3.0	NORMAL	NO

SAMPLER PARAMETERS
VOLUMES (μL)

	STANDARD	SAMPLE	BLANK	MODIFIER
BLANK	--	--	20	5
ADDITION 1	2	10	8	5
ADDITION 2	5	10	5	5
ADDITION 3	10	10	0	5
SAMPLE	--	10	10	5

RECALIBRATION RATE 1

MULTIPLE INJECT	NO	HOT INJECT	YES	PRE INJECT	NO
		TEMPERATURE	150		
		INJECT RATE	7		

PROGRAM 17 As STDADD (continued)

QA PROTOCOL PARAMETERS

QC STANDARD RATE	0
QC INITIAL STANDARD POSITION	50
QC INITIAL BLANK POSITION	51
QC CONTINUING STANDARD POSITION	50
QC CONTINUING BLANK POSITION	51
QC STANDARD VOLUME (µL)	5
QC STANDARD CONCENTRATION	1.0 PPB
QC STANDARD LIMITS (%)	90 TO 110
QC SPIKE RATE	0
QC SPIKE VOLUME (µL)	5
QC SPIKE CONCENTRATION	1.0 PPB
MATRIX SPIKE CONCENTRATION	1.0 PPB
INSTRUMENT DETECTION LIMIT	0.1 PPB
REQUIRED DETECTION LIMIT	1.0 PPB

PROGRAM 17 As STDADD QC ZEEMAN
NO.1 BLANK REPLICATE 1
ABSORBANCE STANDARD ADDN'S SAMPLER AUTOMIX
PEAK AREA MAX.ABS. 0.95 BC ON

STANDARDS

ADDITION 1 20.0 PPB

ADDITION 2 50.0 PPB

ADDITION 3 100.0 PPB

ADDITION 4

ADDITION 5

PROGRAM 18 As

INSTRUMENT MODE	ABSORBANCE
CALIBRATION MODE	CONCENTRATION
MEASUREMENT MODE	PEAK AREA
LAMP POSITION	1
LAMP CURRENT (mA)	15
SLIT WIDTH (nm)	0.5
SLIT HEIGHT	NORMAL
WAVELENGTH (nm)	193.7
SAMPLE INTRODUCTION	SAMPLER AUTOMIXING
TIME CONSTANT	0.05
MEASUREMENT TIME (sec)	1.0
REPLICATES	2
BACKGROUND CORRECTION	ON
MAXIMUM ABSORBANCE	0.95

FURNACE PARAMETERS

STEP NO.	TEMPERATURE (C)	TIME (sec)	GAS FLOW (L/min)	GAS TYPE	READ COMMAND
1	300	30.0	3.0	NORMAL	NO
2	600	15.0	3.0	NORMAL	NO
3	1300	10.0	3.0	NORMAL	NO
4	1300	10.0	3.0	NORMAL	NO
5	1300	2.0	0.0	NORMAL	NO
6	2600	0.7	0.0	NORMAL	YES
7	2600	2.7	0.0	NORMAL	YES
8	2600	2.0	3.0	NORMAL	NO

SAMPLER PARAMETERS
VOLUMES (μL)

	SOLUTION	BLANK	MODIFIER
BLANK	--	20	6
STANDARD 1	4	16	6
STANDARD 2	10	10	6
STANDARD 3	20	0	6
SAMPLE	20	0	6

RECALIBRATION RATE	0
RESLOPE RATE	0

MULTIPLE INJECT	NO	HOT INJECT	YES	PRE INJECT	NO
		TEMPERATURE	150		
		INJECT RATE	7		

QA PROTOCOL PARAMETERS

QC STANDARD RATE	20
QC INITIAL STANDARD POSITION	50
QC INITIAL BLANK POSITION	51
QC CONTINUING STANDARD POSITION	50
QC CONTINUING BLANK POSITION	51
QC STANDARD VOLUME (µL)	20
QC STANDARD CONCENTRATION	50.0
QC STANDARD LIMITS (%)	90 TO 110
QC SPIKE RATE	0
QC SPIKE VOLUME (µL)	5
QC SPIKE CONCENTRATION	100.0
MATRIX SPIKE CONCENTRATION	25.0
INSTRUMENT DETECTION LIMIT	0.1
REQUIRED DETECTION LIMIT	15.5

PROGRAM 18 As QC ZEEMAN
BLANK REPLICATE 1
ABSORBANCE CONCENTRATION SAMPLER AUTOMIX
PEAK AREA MAX.ABS. 0.95 BC ON

STANDARDS

STANDARD 1 20.0

STANDARD 2 50.0

STANDARD 3 100.0

STANDARD 4

STANDARD 5

RESLOPE STANDARD NO. 2

PROGRAM 19 Se

INSTRUMENT MODE	ABSORBANCE
CALIBRATION MODE	CONCENTRATION
MEASUREMENT MODE	PEAK AREA
LAMP POSITION	1
LAMP CURRENT (mA)	6
SLIT WIDTH (nm)	1.0
SLIT HEIGHT	NORMAL
WAVELENGTH (nm)	196.0
SAMPLE INTRODUCTION	SAMPLER AUTOMIXING
TIME CONSTANT	0.05
MEASUREMENT TIME (sec)	1.0
REPLICATES	2
BACKGROUND CORRECTION	ON
MAXIMUM ABSORBANCE	1.20

FURNACE PARAMETERS

STEP NO.	TEMPERATURE (C)	TIME (sec)	GAS FLOW (L/min)	GAS TYPE	READ COMMAND
1	220	15.0	3.0	NORMAL	NO
2	220	10.0	3.0	NORMAL	NO
3	550	10.0	3.0	NORMAL	NO
4	1200	15.0	3.0	NORMAL	NO
5	1200	1.0	0.0	NORMAL	NO
6	2500	0.7	0.0	NORMAL	YES
7	2500	2.7	0.0	NORMAL	YES
8	2500	2.0	3.0	NORMAL	NO

SAMPLER PARAMETERS
VOLUMES (μL)

	SOLUTION	BLANK	MODIFIER
BLANK	--	20	10
STANDARD 1	4	16	10
STANDARD 2	10	10	10
STANDARD 3	20	0	10
SAMPLE	20	0	10

RECALIBRATION RATE	0
RESLOPE RATE	0

MULTIPLE INJECT	NO	HOT INJECT	YES	PRE INJECT	NO
		TEMPERATURE	135		
		INJECT RATE	10		

QA PROTOCOL PARAMETERS

QC STANDARD RATE	20
QC INITIAL STANDARD POSITION	50
QC INITIAL BLANK POSITION	51
QC CONTINUING STANDARD POSITION	50
QC CONTINUING BLANK POSITION	51
QC STANDARD VOLUME (µL)	20
QC STANDARD CONCENTRATION	50.0
QC STANDARD LIMITS (%)	90 TO 110
QC SPIKE RATE	0
QC SPIKE VOLUME (µL)	5
QC SPIKE CONCENTRATION	100.0
MATRIX SPIKE CONCENTRATION	25.0
INSTRUMENT DETECTION LIMIT	1.0
REQUIRED DETECTION LIMIT	7.2

PROGRAM 19 Se QC ZEEMAN
BLANK REPLICATE 1
ABSORBANCE CONCENTRATION SAMPLER AUTOMIX
PEAK AREA MAX.ABS. 1.20 BC ON

STANDARDS

STANDARD 1 20.0

STANDARD 2 50.0

STANDARD 3 100.0

STANDARD 4

STANDARD 5

RESLOPE STANDARD NO. 2

PROGRAM 20 AsLOWSTD

INSTRUMENT MODE	ABSORBANCE
CALIBRATION MODE	CONCENTRATION
MEASUREMENT MODE	PEAK AREA
LAMP POSITION	1
LAMP CURRENT (mA)	15
SLIT WIDTH (nm)	0.5
SLIT HEIGHT	NORMAL
WAVELENGTH (nm)	193.7
SAMPLE INTRODUCTION	SAMPLER AUTOMIXING
TIME CONSTANT	0.05
MEASUREMENT TIME (sec)	1.0
REPLICATES	2
BACKGROUND CORRECTION	ON
MAXIMUM ABSORBANCE	0.95

FURNACE PARAMETERS

STEP NO.	TEMPERATURE (C)	TIME (sec)	GAS FLOW (L/min)	GAS TYPE	READ COMMAND
1	300	30.0	3.0	NORMAL	NO
2	600	15.0	3.0	NORMAL	NO
3	1300	10.0	3.0	NORMAL	NO
4	1300	10.0	3.0	NORMAL	NO
5	1300	2.0	0.0	NORMAL	NO
6	2600	0.7	0.0	NORMAL	YES
7	2600	2.7	0.0	NORMAL	YES
8	2600	2.0	3.0	NORMAL	NO

SAMPLER PARAMETERS
VOLUMES (μL)

	SOLUTION	BLANK	MODIFIER
BLANK	--	20	6
STANDARD 1	5	15	6
STANDARD 2	10	10	6
STANDARD 3	20	0	6
SAMPLE	20	0	6

RECALIBRATION RATE	0
RESLOPE RATE	0

MULTIPLE INJECT	NO	HOT INJECT	YES	PRE INJECT	NO
		TEMPERATURE	150		
		INJECT RATE	7		

QA PROTOCOL PARAMETERS

QC STANDARD RATE	20
QC INITIAL STANDARD POSITION	50
QC INITIAL BLANK POSITION	51
QC CONTINUING STANDARD POSITION	50
QC CONTINUING BLANK POSITION	51
QC STANDARD VOLUME (µL)	20
QC STANDARD CONCENTRATION	10.0
QC STANDARD LIMITS (%)	90 TO 110
QC SPIKE RATE	0
QC SPIKE VOLUME (µL)	5
QC SPIKE CONCENTRATION	100.0
MATRIX SPIKE CONCENTRATION	25.0
INSTRUMENT DETECTION LIMIT	0.1
REQUIRED DETECTION LIMIT	0.5

PROGRAM 20	As LOWSTD		QC ZEEMAN
BLANK	REPLICATE 1	MULTIPLE 1	
ABSORBANCE	CONCENTRATION	SAMPLER AUTOMIX	
PEAK AREA	MAX.ABS. 0.95	BC ON	

STANDARDS

STANDARD 1	5.0
STANDARD 2	10.0
STANDARD 3	20.0
STANDARD 4	
STANDARD 5	

RESLOPE STANDARD NO. 2

PROGRAM 20 Cr

INSTRUMENT MODE	ABSORBANCE
CALIBRATION MODE	CONCENTRATION
MEASUREMENT MODE	PEAK AREA
LAMP POSITION	8
LAMP CURRENT (mA)	7
SLIT WIDTH (nm)	0.2
SLIT HEIGHT	REDUCED
WAVELENGTH (nm)	429.0
SAMPLE INTRODUCTION	SAMPLER AUTOMIXING
TIME CONSTANT	0.05
MEASUREMENT TIME (sec)	1.0
REPLICATES	2
BACKGROUND CORRECTION	ON
MAXIMUM ABSORBANCE	2.00

FURNACE PARAMETERS

STEP NO.	TEMPERATURE (C)	TIME (sec)	GAS FLOW (L/min)	GAS TYPE	READ COMMAND
1	85	40.0	3.0	NORMAL	NO
2	120	10.0	3.0	NORMAL	NO
3	1000	5.0	3.0	NORMAL	NO
4	1000	1.0	3.0	NORMAL	NO
5	1000	2.0	0.0	NORMAL	NO
6	2600	0.8	0.0	NORMAL	YES
7	2600	2.0	0.0	NORMAL	YES
8	2600	2.0	3.0	NORMAL	NO

SAMPLER PARAMETERS
VOLUMES (μL)

	SOLUTION	BLANK	MODIFIER
BLANK	--	10	
STANDARD 1	2	8	
STANDARD 2	5	5	
STANDARD 3	10	0	
SAMPLE	10	0	

RECALIBRATION RATE	0
RESLOPE RATE	0

MULTIPLE INJECT	NO	HOT INJECT	YES	PRE INJECT	NO
		TEMPERATURE	85		
		INJECT RATE	5		

PROGRAM 20 Cr (continued)

QA PROTOCOL PARAMETERS

QC STANDARD RATE	20
QC INITIAL STANDARD POSITION	50
QC INITIAL BLANK POSITION	51
QC CONTINUING STANDARD POSITION	50
QC CONTINUING BLANK POSITION	51
QC STANDARD VOLUME (µL)	10
QC STANDARD CONCENTRATION	50.0 PPB
QC STANDARD LIMITS (%)	90 TO 110
QC SPIKE RATE	0
QC SPIKE VOLUME (µL)	5
QC SPIKE CONCENTRATION	100.0 PPB
MATRIX SPIKE CONCENTRATION	25.0 PPB
INSTRUMENT DETECTION LIMIT	0.1 PPB
REQUIRED DETECTION LIMIT	5.7 PPB

PROGRAM 24 Cr QC ZEEMAN
BLANK REPLICATE 1
ABSORBANCE CONCENTRATION SAMPLER AUTOMIX
PEAK AREA MAX.ABS. 2.00 BC ON

STANDARDS

STANDARD 1 20.0 PPB

STANDARD 2 50.0 PPB

STANDARD 3 100.0 PPB

STANDARD 4

STANDARD 5

RESLOPE STANDARD NO. 2

PROGRAM 25 Cr STDADD

INSTRUMENT MODE	ABSORBANCE
CALIBRATION MODE	STANDARD ADDITIONS
MEASUREMENT MODE	PEAK AREA
LAMP POSITION	8
LAMP CURRENT (mA)	7
SLIT WIDTH (nm)	0.2
SLIT HEIGHT	REDUCED
WAVELENGTH (nm)	429.0
SAMPLE INTRODUCTION	SAMPLER AUTOMIXING
TIME CONSTANT	0.05
MEASUREMENT TIME (sec)	1.0
REPLICATES	2
BACKGROUND CORRECTION	ON
MAXIMUM ABSORBANCE	2.00

FURNACE PARAMETERS

STEP NO.	TEMPERATURE (C)	TIME (sec)	GAS FLOW (L/min)	GAS TYPE	READ COMMAND
1	85	40.0	3.0	NORMAL	NO
2	120	10.0	3.0	NORMAL	NO
3	1100	5.0	3.0	NORMAL	NO
4	1100	1.0	3.0	NORMAL	NO
5	1100	2.0	0.0	NORMAL	NO
6	2700	0.8	0.0	NORMAL	YES
7	2700	2.0	0.0	NORMAL	YES
8	2900	2.0	3.0	NORMAL	NO

SAMPLER PARAMETERS
VOLUMES (μL)

	STANDARD	SAMPLE	BLANK	MODIFIER
BLANK	--	--	20	
ADDITION 1	2	10	8	
ADDITION 2	5	10	5	
ADDITION 3	10	10	0	
SAMPLE	--	10	10	

RECALIBRATION RATE 1

MULTIPLE INJECT	NO	HOT INJECT	YES	PRE INJECT	NO
		TEMPERATURE	85		
		INJECT RATE	5		

QA PROTOCOL PARAMETERS

QC STANDARD RATE	0
QC INITIAL STANDARD POSITION	50
QC INITIAL BLANK POSITION	51
QC CONTINUING STANDARD POSITION	50
QC CONTINUING BLANK POSITION	51
QC STANDARD VOLUME (µL)	5
QC STANDARD CONCENTRATION	1.0 PPB
QC STANDARD LIMITS (%)	90 TO 110
QC SPIKE RATE	0
QC SPIKE VOLUME (µL)	5
QC SPIKE CONCENTRATION	1.0 PPB
MATRIX SPIKE CONCENTRATION	1.0 PPB
INSTRUMENT DETECTION LIMIT	1.0 PPB
REQUIRED DETECTION LIMIT	1.0 PPB

PROGRAM 25	Cr STDADD	QC ZEEMAN
NO.1 BLANK	REPLICATE 1	
ABSORBANCE	STANDARD ADDN'S SAMPLER AUTOMIX	
PEAK AREA	MAX.ABS. 2.00 BC ON	

STANDARDS

ADDITION 1	10.0 PPB
ADDITION 2	25.0 PPB
ADDITION 3	50.0 PPB
ADDITION 4	
ADDITION 5	

PROGRAM 26 T1

INSTRUMENT MODE	ABSORBANCE
CALIBRATION MODE	CONCENTRATION
MEASUREMENT MODE	PEAK AREA
LAMP POSITION	6
LAMP CURRENT (mA)	12
SLIT WIDTH (nm)	0.5
SLIT HEIGHT	NORMAL
WAVELENGTH (nm)	276.8
SAMPLE INTRODUCTION	SAMPLER AUTOMIXING
TIME CONSTANT	0.05
MEASUREMENT TIME (sec)	1.0
REPLICATES	2
BACKGROUND CORRECTION	ON
MAXIMUM ABSORBANCE	0.55

FURNACE PARAMETERS

STEP NO.	TEMPERATURE (C)	TIME (sec)	GAS FLOW (L/min)	GAS TYPE	READ COMMAND
1	250	30.0	3.0	NORMAL	NO
2	1000	20.0	3.0	NORMAL	NO
3	1000	15.0	3.0	NORMAL	NO
4	1000	1.0	0.0	NORMAL	NO
5	2400	0.8	0.0	NORMAL	YES
6	2400	2.0	0.0	NORMAL	YES
7	2400	2.0	3.0	NORMAL	NO
8	40	12.3	3.0	NORMAL	NO

SAMPLER PARAMETERS
VOLUMES (μL)

	SOLUTION	BLANK	MODIFIER
BLANK	--	20	8
STANDARD 1	4	16	8
STANDARD 2	10	10	8
STANDARD 3	20	0	8
SAMPLE	20	0	5

RECALIBRATION RATE	0
RESLOPE RATE	0

MULTIPLE INJECT	NO	HOT INJECT	YES	PRE INJECT	NO
		TEMPERATURE	150		
		INJECT RATE	10		

QA PROTOCOL PARAMETERS

QC STANDARD RATE	20
QC INITIAL STANDARD POSITION	50
QC INITIAL BLANK POSITION	51
QC CONTINUING STANDARD POSITION	50
QC CONTINUING BLANK POSITION	51
QC STANDARD VOLUME (µL)	20
QC STANDARD CONCENTRATION	50.0 PPB
QC STANDARD LIMITS (%)	90 TO 110
QC SPIKE RATE	0
QC SPIKE VOLUME (µL)	5
QC SPIKE CONCENTRATION	100.0 PPB
MATRIX SPIKE CONCENTRATION	25.0 PPB
INSTRUMENT DETECTION LIMIT	0.1 PPB
REQUIRED DETECTION LIMIT	2.8 PPB

PROGRAM 26 Tl QC ZEEMAN
BLANK REPLICATE 1
ABSORBANCE CONCENTRATION SAMPLER AUTOMIX
PEAK AREA MAX.ABS. 0.55 BC ON

STANDARDS

STANDARD 1 20.0 PPB

STANDARD 2 50.0 PPB

STANDARD 3 100.0 PPB

STANDARD 4

STANDARD 5

RESLOPE STANDARD NO. 2

APPENDIX VII-C-3

ORGANIC ANALYSES PROTOCOL
GAS CHROMATOGRAPHY/ MASS SPECTROMETRY (GC/MS)
ANALYSIS OF VOLATILE ORGANIC COMPOUNDS

TITLE: STANDARD OPERATING PROCEDURE FOR THE ANALYSIS OF TCLP VOLATILE ORGANIC COMPOUNDS
(BASED ON: EPA METHOD 8240)
(KEY WORDS: VOLATILE, ORGANICS, GC/MS, TCLP)

SCOPE AND APPLICATION

1.1 This method is used to determine volatile organic compounds in a variety of solid waste matrices. This method is applicable to nearly all types of samples, regardless of water content, including ground water, aqueous sludges, caustic liquors, acid liquors, waste solvents, oily wastes, mousses, tars, fibrous wastes, polymeric emulsions, filter cakes, spent catalysts, soils, and sediments.

1.2 Method 8240 can be used to quantify most volatile organic compounds that have boiling points below 200°C and that are insoluble or slightly soluble in water. Volatile water-soluble compounds can be included in this analytical technique, however, for the more soluble compounds, quantitation limits are approximately ten times higher because of poor purging efficiency. The method is also limited to compounds that elute as sharp peaks from a capillary GC column. Such compounds include low-molecular-weight halogenated hydrocarbons, aromatics, ketones, nitriles, acetates, acrylates, ethers, and sulfides. See Table 1 for a list of compounds, retention times, and their characteristic ions that have been evaluated on a purge-and -trap GC/MS system.

1.3 The Practical Quantitation Limit (PQL) of Method 8240 for an individual compound is approximately 5 µg/kg (ppb) (wet weight) for soil/sediment samples, 0.5 mg/kg (ppm) (wet weight) for wastes, and 5 µg/L (ppb) for ground water. PQLs will be proportionately higher for sample extracts and samples that require dilution or reduced sample size to avoid saturation of detector.

1.4 Method 8240 is based upon a purge-and -trap, gas chormatographic/mass spectrometric (GC/MS) procedure. This method is restricted to use by, or under the supervision of, analysts experienced in the use of purge-and-trap systems and gas chromatograph/mass spectrometers, and skilled in the interpretation of mass spectra and their use as a quantitative tool.

2. SAFETY AND WASTE HANDLING

2.1 **Eye Contact** - Safety glasses with eye shields must be worn when working in the laboratory.

2.2 **Hand Contact** - Use of disposable vinyl or latex gloves provide adequate protection from contact with the samples. All skin contact must be washed off immediately.

2.3 **Respiratory** - Exposure to the vapors from the sample should be kept to a minimum by working in a well-ventilated area.

2.4 Analyst must be aware of MSDS for all chemicals used in the lab.

2.5 **Waste Disposal** - The sample is stored, refrigerated, for six weeks. After six weeks the sample is placed in the waste solvent container for later disposal. Standards are placed in the waste solvent container for disposal.

Contaminated wipes are placed in a metal container that has been lined with a plastic trash bag. A metal top must be kept on the container at all times except to add to or remove the contents.

3. SUMMARY OF METHOD

3.1 The volatile compounds are introduced into the gas chromatograph by the purge-and-trap method or by direct injection. The components are separated via the gas chromatograph and detected using a mass spectrometer, which is used to provide both qualitative and quantitative information. The chromatographic conditions, as well as typical masss spectrometer operation parameters, are given.

TABLE 1. RETENTION TIMES AND CHARACTERISTIC IONS FOR VOLATILE COMPOUNDS

Compound	Retention Time (min)	Primary Ion	Secondary Ion(s)
Acetone	5.3	43	58
Benzene	9.6	78	52, 77
Bromochloromethane (I.S.)	8.6	128	49, 130, 51
Bromodichloromethane	11.4	83	85, 129
4-Bromofluorobenzene (surr)	16.8	95	174, 176
Bromoform	16.3	173	171, 175, 252
Bromomethane	3.7	94	96, 79
2-Butanone	8.3	72	57, 43
Carbon disulfide	11.0	76	78
Carbon tetrachloride	9.3	117	119, 121
Chlorobenzene	14.8	112	114, 77
Chlorobenzene-d_5 (I.S.)	14.8	117	82, 119
Chlorodibromomethane	13.9	129	208, 206
Chlorethane	3.8	64	66, 49
2-Chloroethyl vinyl ether	11.9	63	65, 106
Chloroform	8.8	83	85, 47
Chloromethane	3.0	50	52, 49
Dichlorodifluoromethane**	5.2	85	87, 50, 101
1,1-Dichloroethane	7.3	63	65, 83
1,2-Dichloroethane	9.6	62	64, 98
1,2-Dichloroethane-d_4 (surr.)	9.5	65	102
1,1-Dichloroethene	9.0	96	61, 98
trans-1,2-Dichloroethene	6.6	96	61, 98
1,2-Dichloropropane	11.0	63	62, 41
cis-1,3-Dichloropropene	12.1	75	77, 39
trans-1,3-Dichloropropene	12.9	75	77, 39
1.4-Difluorobenzene (I.S.)	10.2	114	63, 88
Ethylbenzene	15.0	106	91
2-Hexanone	13.6	43	58, 57, 100
Methylene chloride	6.1	84	49, 51, 86
4-Methyl-2-pentanone	12.3	43	58, 100
Styrene	16.0	104	78, 103
1,1,2,2-Tetrachloroethane	17.0	83	85, 131, 133
Tetrachlorethene	13.5	164	129, 131, 166
Toluene	12.6	92	91, 65
Toluene-d_8 (surr.)	12.5	98	70, 100
1,1,1-Trichloroethane	9.1	97	99, 117
1,1,2-Trichloroethane	13.2	97	83, 85, 99
Trichloroethene	10.6	130	95, 97, 132
Trichlorofluoromethane**	4.2	101	103, 66
1,2,3-Trichloropropane	--	75	110, 77, 61
Vinyl acetate	7.4	43	86
Vinyl chloride	3.1	62	64, 61
Xylene	15.3	106	91

** Only if carbon trap used

3.2 If the above sample introduction techniques are not applicable, a portion of the sample is dispersed in methanol to dissolve the volatile organic constituents. A portion of the methanolic solution is combined with water. It is then analyzed by purge-and-trap GC/MS following the normal water method.

3.3 The purge-and-trap process: An inert gas is bubbled through the solution at ambient temperature, and the volatile components are transferred from the aqueous phase to the vapor phase. The vapor is swept through a sorbent column where the volatile components are trapped. After purging is completed, the sorbent column is heated and backflushed with inert gas to desorb the components onto a gas chromatographic column. The gas chromatographic column is heated to elute the components, which are detected with a mass spectrometer.

4. SAMPLE HANDLING AND PRESERVATION

4.1 Samples are prepared by EPA Method 1311. Samples are stored at 4°C until assayed.

5. INTERFERENCES

5.1 Interferences purged or coextracted from the samples will vary considerably from source to source. The analytical system, however, is checked to ensure freedom from interferences, under the analysis conditions, by analyzing method blanks.

5.2 Cross-contamination can occur whenever high-level and low-level samples are analyzed sequentially. Whenever an unusually concentrated sample is analyzed the sample immediately following should be re-analyzed if a positive result for an analyte in the prior sample is obtained. The purge-and-trap system may require extensive bake-out and cleaning after a high-level sample.

5.3 All solvents are to be kept in the hood.

5.4 The analytical system must be demonstrated to be free from contamination under the conditions of the analysis by running laboratory reagent blanks.

6. APPARATUS

6.1 Syringe: 5-ml, gas tight.

6.2 Balance: Analytical, capable of accurately weighing 0.0001 g, and a top-loading balance capable of weighing 0.1 g.

6.3 Glass scintillation vials: 20-mL, with screw caps and Teflon liners or glass culture tubes with a screw cap and Teflon liner.

6.4 Volumetric flasks: 10-mL and 100-mL, class A with ground-glass stoppers.

6.5 Vials: 2-mL, for GC autosampler.

6.6 Spatula: Stainless steel.

6.7 Disposable pipets: Pasteur.

6.8 Purge-and-trap device: Tekmar LSC 2000 or equivalent consisting of three separate pieces of equipment: the sample purger, the trap, and the desorber.

6.8.1 The purging chamber is designed to accept 5-mL samples with a water column at least 3 cm deep. The gaseous headspace between the water column and trap must have a total volume of less than 15 mL. The purge gas must pass through the water column as finely divided bubbles with a diameter of less than 3-mm at the origin.

6.8.2 The trap must be at least 25 cm long and have an inside diameter of at least 0.105 in. Before initial use, the trap should be conditioned overnight at 180°C by backflushing with an inert gas flow of at least 20 mL/min. Tekmar part number 14-0124-003 or equivalent.

6.8.3 The desorber should be capable of rapidly heating the trap to 180°C for desorption. The polymer section of the trap should not be heated higher than 180°C, and the remaining sections should not exceed 220°C during bake-out mode.

6.9 Gas chromatograph/mass spectrometer system:

6.9.1 Gas chromatograph: HP-5980 Series II

6.9.2 Column: DB-624 75m x 0.53mm ID 3μm Film thickness. J & W Cat. Number 125-1334.

6.9.3 Mass spectrometer: HP-MSD 5970 - Capable of producing a mass spectrum that meets all the criteria in Table 2 when 50 ng of 4-bromofluorobenzene (BFB) are injected through the gas chromatograph inlet.

6.9.4 Data system: A UNIX based 9000, series 400 computer operating Target software is interfaced to the mass spectrometers. The most recent version of the EPA/NIH Mass Spectral Library is available.

TABLE 2. BFB KEY ION ABUNDANCE CRITERIA

Mass	Ion Abundance Criteria
50	15 to 40% of mass 95
75	30 to 60% of mass 95
95	base peak, 100% relative abundance
96	5 to 9% of mass 95
173	less than 2% of mass 174
174	greater than 50% of mass 95
175	5 to 9% of mass 174
176	greater than 95% but less than 100% of mass 174
177	5 to 9% of mass 176

7. REAGENTS/STANDARDS

7.1 Stock solutions (TCLP mix) are prepared from pure compounds. The pure compounds are diluted in 10 mL of Methanol to yield a solution containing 10,000 ppm of each compound except Methyl Ethyl Ketone which has a concentration of 20,000 ppm. The amount of each standard to add to 10 mL Methanol is given below.

Compound (CAS number)	Amount to Add	Concentration
Benzene (71-43-2)	114 µL	10,000 ppm
Carbon Tetrachloride (56-23-5)	63 µL	10,000 ppm
Chlorobenzene (108-90-7)	90 µL	10,000 ppm
Chloroform (67-66-3)	67 µL	10,000 ppm
1,4-Dichlorobenzene (95-50-1)	0.0988 g	10,000 ppm
1,2-Dichloroethane (107-06-2)	79.6 µL	10,000 ppm
Methyl Ethyl Ketone (78-93-3)	250 µL	20,000 ppm
Tetrachloroethylene (127-18-4)	62 µL	10,000 ppm
Trichloroethylene (79-01-6)	68.5 µL	10,000 ppm

Mix the stock solution by inverting three times.

7.1.1 Dichloroethylene Vinyl Chloride — 89 µL — 10,000 ppm

7.1.2 Stock standards are stored at -20°C for a maximum of six months.

7.2 Secondary dilution standards: Using stock standard solutions, prepare in methanol secondary dilution standards containing the compounds of interest mixed together. Secondary dilution standards must be stored with minimal headspace and should be checked frequently for signs of degradation or evaporation, especially just prior to preparing calibration standards from them. This standard has a one month expiration date.

7.3 Surrogate standards: The surrogates are toluene-d8, 4-bromfluorobenzene, and 1,2-dichlorethane-d_4. Other compounds may be used as surrogates, depending upon the analysis requirements. Each sample undergoing GC/MS analysis must be spiked with 10 µL of the surrogate spiking solution prior to analysis. The stock surrogates are purchased from Restek part number 30004 or equivalent. These standards have a one month expiration date and have a 25 ppm conc.

7.4 Internal standards: The internal standards are bromochloromethane, 1,4-difluorobenzene, and chlorobenzene-d_5. Other compounds may be used as internal standards as long as they have retention times similar to the compounds being detected by GC/MS. It is recommended that the secondary dilution standard should be prepared at a concentration of 25 µg/mL of each internal standard compound. Stock Internal Standard mixes are purchased from Restek part number 30011 or equivalent.

7.5 4-Bromofluorobenzene (BFB) standard: A standard solution containing 50 ng/μL of BFB in methanol should be prepared.

7.6 Calibration standards: Calibration standards at 20, 50, 100, 150, and 200 ppb concentration levels should be prepared from the secondary dilution of stock standards (see Sections 7.1 and 7.2). Prepare these solutions in reagent water. Each standard should contain each analyte for detection by this method. These standards have a one month expiration date.

7.7 Matrix spiking standards: The standard used for the daily calibration check is used for spiking the sample.

7.8 Reagent water: Reagent water is defined as water in which an interferent is not observed at the method detection limit (MDL) of the parameters of interest. Reagent water is prepared with a Millipore Super-Q system.

7.9 Methanol: Pesticide quality or equivalent. Store apart from other solvents.

7.10 SPCC and CCC - Mid-level calibration standards.

8. PREVENTIVE MAINTENANCE

8.1 All maintenance must be recorded in maintenance logbook.

9. TROUBLESHOOTING/CORRECTIVE ACTION

9.1 When peak tailing occurs the liner should be changed and the first 6 inches of the analytical column removed.

10. QUALITY CONTROL

10.1 Before processing any samples, the analyst must demonstrate, through the analysis of a reagent water blank, that interferences from the analytical system, glassware, and reagents are under control. Each time a set of samples is extracted or there is a change in reagents, a reagent water blank must be processed as a safeguard against chronic laboratory contamination. The blank samples must be carried through all stages of the sample preparation and measurement steps.

10.2 Each day that analysis is performed, the daily calibration standard must be evaluated to determine if the chromatographic system is operating properly. If any changes are made to the system (e.g, column changed), recalibration of the system must take place. Refer to Table 3 for criteria.

10.3 Required instrument QC is found in the following section:

10.3.1 The GC/MS system must be tuned to meet the BFB specifications in Table 2.

10.3.2 There must be an initial calibration of the GC/MS system as specified in 11.1.5. The RSD must be < 25%.

10.3.3 The GC/MS system must meet the SPCC criteria specified in 11.1.8 and the CCC criteria in 11.1.9, each 12 hr.

10.4 When one of the analytes fail any of the acceptance criteria listed in Table 3, the analyst must proceed according to below:

10.4.1 Repeat the test only for those analytes that failed to meet criteria. Repeated failure will confirm a general problem with the measurement system.

10.4.2 Locate and correct the source of the problem and repeat the test for all analytes.

10.4.3 % RSD must be less than 30%.

10.5 The laboratory must analyze a reagent blank, a matrix spike, and a matrix spike duplicate for each analytical batch (up to a maximum of 20 samples/batch) to assess accuracy.

10.5.1 The samples are spiked with 2.5 µL of the 100 ppm TCLP mix, 2.5 µL of the 100 ppm solution of 1,1-Dichloroethane and 1.0 µL of the 200 ppm Vinyl Chloride solution. The TCLP mix is made from a stock solution containing 10,000 ppm of each of the following compounds: Benzene, Carbon Tetrachloride, Chlorobenzene, Chloroform, 1,4-Dichlorobenzene, 1,2-Dichlorobenzene, Tetrachloroethylene and Trichloroethylene. All recoveries must be between 70 - 120%.

TABLE 3. CALIBRATION AND QC ACCEPTANCE CRITERIA[a]

Parameter	Range for Q (µg/L)	Limit for s (µg/L)	Range for x (µg/L)	Range p, p_s (%)
Benzene	12.8-27.2	6.9	15.2-26.0	37-151
Bromodichloromethane	13.1-26.9	6.4	10.1-28.0	35-155
Bromoform	14.2-25.8	5.4	11.4-31.1	45-169
Bromomethane	2.8-37.2	17.9	D-41.2	D-242
Carbon tetrachloride	14.6-25.4	5.2	17.2-23.5	70-140
Chorbenzene	13.2-26.8	6.3	16.4-27.4	37-160
2-Chloroethylvinyl ether	D-44.8	25.9	D-50.4	D-305
Chloroform	13.5-26.5	6.1	13.7-24.2	51-138
Chloromethane	D-40.8	19.8	D-45.9	D-273
Dibromochloromethane	13.5-26.5	6.1	13.8-26.6	53-149
1,2-Dichlorbenzene	12.6-27.4	7.1	11.8-34.7	18-190
1,3-Dichlorobenzene	14.6-25.4	5.5	17.0-28.8	59-156
1,4-Dichlorobenzene	12.6-27.4	7.1	11.8-34.7	18-190
1,1-Dichloroethane	14.5-25.5	5.1	14.2-28.4	59-155
1,2-Dichloroethane	13.6-26.4	6.0	14.3-27.4	49-155
1,1-Dichloroethene	10.1-29.9	9.1	3.7-42.3	D-234
trans-1,2-Dichloroethene	13.9-26.1	5.7	13.6-28.4	54-156
1,2-Dichloropropane	6.8-33.2	13.8	3.8-36.2	D-210
cis-1,3-Dichloropropene	4.8-35.2	15.8	1.0-39.0	D-227
trans-1,3-Dichloropropene	10.0-30.0	10.4	7.6-32.4	17-183
Ethyl benzene	11.8-28.2	7.5	17.4-26.7	37-162
Methylene chloride	12.1-27.9	7.4	D-41.0	D-221
1,1,2,2-Tetrachloroethane	12.1-27.9	7.4	13.5-27.2	46-157
Tetrachloroethene	14.7-25.3	5.0	17.0-26.6	64-148
Toluene	14.9-25.1	4.8	16.6-26.7	47-150
1,1,1-Trichloroethane	15.0-25.0	4.6	13.7-30.1	52-162
1,1,2-Trichloroethane	14.2-25.8	5.5	14.3-27.1	52-150
Trichloroethene	13.3-26.7	6.6	18.5-27.6	71-157
Trichlorofluoromethane	9.6-30.4	10.0	8.9-31.5	17-181
Vinyl chloride	0.8-39.2	20.0	D-43.5	D-251

Q = Concentration measured in QC check sample, in µg/L.
s = Standard deviation of four recovery measurements, in µg/L.
x = Average recovery for four recovery measurements, in µg/L.
p,ps = Percent recovery measured.
D = Detected; result must be greater than zero.

[a] Criteria from 40 CFR Part 136 for Method 624 and were calculated assuming a QC check sample concentration of 20 µg/L. These criteria are based directly upon the method performance data.

10.5.2 Spike one sample per batch or matrix type with as follows:

2.5 µL TCLP mix
2.5 µL 1,1-Dichloroethene
1.0 µL Vinyl Chloride

10.5.3 Compare the percent recovery (p) for each analyte with the corresponding QC acceptance criteria found in Table 3.

10.5.4 If any individual p falls outside the designated range for recovery , that analyte has failed the acceptance criteria. A check standard containing each analyte that failed the criteria must by analyzed.

10.5.5 Compare the percent recovery (p_s) for each analyte with the corresponding QC acceptance criteria found in Table 3. Only analytes that failed the test in Section 10.5 need to be compared with these criteria. If the recovery of any such anlayte falls outside the designated range, the laboratory performance for that analyte is judged to be out of control, and the problem must be immediately identified and corrected. The result for that anlayte in the unspiked sample is suspect and may not be reported for regulatory compliance purposes.

10.6 The surrogates are diluted from 2,500 ppm standard to a final concentration of 25 ppm. Fifty (50) microliters of the concentrated surrogate is diluted to 5 mL in methanol. Surrogate limits are given below:

	Limit (% Recovery)
4-Bromofluorobenzene	86-115
1,2-Dichlorobenzene-d4	76-114
Toluene-d8	88-110

The %RPD for each individual CCC should be less than 30 percent. This criterion must be met in order for the individual calibration to be valid. The CCCs are:

1,1-Dichloroethene
Chloroform,
1,2-Dichloropropane,
Toluene,
Ethylbenzene, and
Vinyl chloride.

10.7 **System Performance Check Compounds (SPCCs):** A system performance check must be made every 12 hrs. of analysis time. If the SPCC criteria are met a comparison of response factors is made for all compounds. This is the same check that is applied during the initial calibration. If the minimum response factors are not met, the system must be evaluated, and corrective action must be taken before sample analysis begins. The minimum response factor for volatile SPCCs is 0.300 (0.250 for Bromoform). Some possible problems are standard mixture degradation, injection port inlet contamination, contamination at the front end of the analytical column, and active sites in the column or chromatographic system. All compounds except Methyl Ethyl Ketone are SPCCs.

10.8 **Calibration Check Compounds (CCCs):** After the system performance check is met, CCCs are used to check the validity of the initial calibration. Calculate the percent difference using:

$$\% \text{ Difference} = (RF(I) - RF(c)) / RF(I) \times 100$$

where:

RFI = average response factor from initial calibration.

RFc = response factor from current verification check standard.

If the percent difference for each CCC is less than 25%, the initial calibration is assumed to be valid. If the criterion is not met (>25% difference), for any one CCC, corrective action MUST be taken. Problems similar to those listed under SPCC's could affect this criterion. If no source of the problem can be determined after corrective action has been taken, a new five-point calibration MUST be generated. This criterion MUST be met before quantitative sample analysis begins.

11. PROCEDURE

11.1 Initial calibration for purge-and-trap procedure:

11.1.1 GD/MS operating conditions:

Electron energy:	70 volts (nominal).
Mass Range	35-260 amu.
Scan time:	To give 5 scans/peak but not to exceed 7 sec/scan.
Initial column temperature:	35°C.
Initial column holding time:	0 min.
Column temperature program:	10°C/min
Final column temperature:	135°C.
Final column holding time:	1 min.
Injector temperature:	200°C.
Source temperature:	According to manufacturer's specifications
Transfer line temperature	250-300°C.
Carrier gas:	Helium at 30 cm/sec.

11.1.2 Each GC/MS system must be hardware-tuned to meet the criteria in Table 2 for a 50-ng injection or purging of 4-bromfluorobenzene (2-μL injection of the BFB standard). Analyses must not begin until these criteria are met.

11.1.3 Assemble a purge-and-trap device that meets the specification in Section 6.11. Condition the trap overnight at 180°C in the purge mode with an inert gas flow of at least 20 mL/min. Prior to use, condition the trap daily for 10 min while backflushing at 180° with the column at 220°C.

11.1.4 Connect the purge-and-trap device to a gas chromatograph.

11.1.5 A five-point calibration curve is developed using appropriate calibration standards. Introduce the sample into the purge and trap device using the 3-way valve.

11.1.5.1 Add 250 μL of Anti-foam to each sample. Raw samples are checked for foaming. If the sample foams add an additional 250 μL of Anti-foam and retest.

11.1.6 Carry out the purge-and-trap analysis procedure as described in Section 11.3.1.

11.1.7 Tabulate the area response of the characteristic ion (see Table 1) against concentration for each compound and each internal standard. Calculate response factor (RF) for each compound relative to one of the internal standards. The internal standard selected for the calculation of the RF for a compound should be the internal standard that has a retention time closest to the compound being measured. The RF is calculated as follows:

$$RF = (A_x C_{is}) / (A_{is} C_x)$$

where:

A_x = Area of the characteristic ion for the compound being measured.

A_{is} = Area of the characteristic ion for the specific internal standard.

C_{is} = Concentration of the specific internal standard.

C_x = Concentration of the compound being measured.

11.1.8 The average RF must be calculated for each compound. A system performance check should be made before this calibration curve is used. Five compounds (the System Performance Check Compounds, or SPCCs) are checked for a minimum average response factor. these compounds are chloromethane, 1,1-dichloroethane, bromoform, 1,1,2,2-tetrachloroethane, and chlorobenzene. The minimum acceptable average RF for these compounds should be 0.300 (0.250 for bromoform). These compounds typically have RFs of 0.4-0.6 and are used to check compound instability and check for degradation caused by contaminated lines or active sites in the system. Examples of these occurrences:

11.1.8.1 Chloromethane: This compound is the most likely compound to be lost if the purge flow is too fast.

11.1.8.2 Bromoform: This compound is one of the compounds most likely to be purged very poorly if the purge flow is too slow. Cold spots and/or active sties in the transfer lines may adversely affect response. Response of the quantitation ion (m/z 173) is directly affected by the tuning of BFB at ion m/z 174/176. Increasing the m/z 174/176 ratio may improve bromoform response.

11.1.8.3 Tetrachloroethane and 1,1-dichlorethane: These compounds are degraded by contaminated transfer lines in purge-and-trap systems and/or active sites in trapping materials.

11.1.9 Using the RFs from the initial calibration, calculate the percent relative standard deviation (%RSD) for Calibration Check Compounds (CCCs).

%RSD = $\frac{SD}{\bar{x}} \times 100$

where:

RSD = relative standard deviation.

$\bar{x}$ = mean of 5 initial RFs for a compound.

SD = standard deviation of average RFs for a compound.

RSD must be less than 30%

$$SD = \sqrt{\sum_{i=1}^{N} \frac{(x_1 - \bar{x})}{N - 1}}$$

11.2 Daily GC/MS calibration:

11.2.1 Prior to the analysis of samples, inject or purge 50-ng of the 4-bromofluorobenzene standard. The resultant mass spectra for the BFB must meet all of the criteria given in Table 2 before sample analysis begins. These criteria must be demonstrated each 12-hr shift.

11.2.2 The initial calibration curve for each compound of interest must be checked and verified once every 12 hrs. of analysis time. This is accomplished by analyzing a calibration standard that is at a concentration near the midpoint concentration for the working range of the GC/MS by checking the SPCC and CCC.

11.2.3 The internal standard responses and retention times in the check calibration standard must be evaluated immediately after or during data acquisition. If the retention time for any internal standard changes by more than 30 sec from the last check calibration (12 hr), the chromatographic system must be inspected for malfunctions and corrections must be made, as required. If the EICP area for any of the internal standards changes by a factor of two (-50% to +100%) for the last daily calibration standard check, the mass spectrometer must be inspected for the malfunctions and corrections must be made, as appropriate. When corrections are made, reanalysis of samples analyzed while the system was malfunctioning are necessary.

11.3 GC/MS analysis:

11.3.1 Water samples:

11.3.1.1 All samples and standard solutions must be allowed to warm to ambient temperature before analysis.

11.3.1.2 Set up the GC/MS system as outlined in Paragraph 11.1.1

11.3.1.3 BFB tuning criteria and daily GC/MS calibration criteria must be met before analyzing samples.

11.3.1.4 Adjust the purge gas (helium) flow rate to 25-40 mL/min on the purge-and-trap device. Optimize the flow rate to provide the best response for chloromethane and bromoform, if these compounds are analytes. Excessive flow rate reduces chloromethane response, whereas insufficient flow reduces bromoform response.

11.3.1.5 To a syringe containing 5 mL of DI water, add 250 μL of the sample and 10 μL of the Internal Standard/Surrogate mixture.

11.3.1.6 The following procedure is appropriate for diluting purgeable samples. All steps must be performed without delays until the diluted sample is in a gas-tight syringe.

11.3.1.6.1 Dilutions may be made in volumetric flasks (10-to 100-mL). Select the volumetric flask that will allow for the necessary dilution. Intermediate dilutions may be necessary for extremely large dilutions.

11.3.1.6.2 Calculate the approximate volume of reagent water to be added to the volumetric flask selected and add slightly less than this quantity of reagent water to the flask.

11.3.1.6.3 Inject the proper aliquot of samples from the syringe into the flask. Aliquots of less than 1-mL are not recommended. Dilute the sample to the mark with reagent water. Cap the flask, invert, and shake three times. Repeat above procedure for additional dilutions.

11.3.1.6.4 Fill a 5-mL syringe with the diluted sample.

11.3.1.7 Add 10.0 µL of surrogate spiking solution and 10 µL of internal standard spiking solution through the valve bore of the syringe; then close the valve. The surrogate and internal standards may be mixed and added as a single spiking solution. The addition of 10 µL of the surrogate spiking solution to 5 mL of sample is equivalent to a concentration of 50 µg/L of each surrogate standard.

11.3.1.8 Attach the syringe-syringe valve assembly to the syringe valve on the purging device. Open the syringe valves and inject the sample into the purging chamber.

11.3.1.9 Close both valves and purge the sample for 11.0 ± 0.1 min at ambient temperature.

11.3.1.10 While the trap is being desorbed into the gas chromatograph, empty the purging chamber. Wash the chamber with a minimum of two 5-mL flushes of reagent water (or methanol followed by reagent water) to avoid carryover of pollutant compounds into subsequent analyses.

11.3.1.11 After desorbing the sample for 4 min, recondition the trap by returning the purge-and-trap device to the purge mode. Wait 15 sec; then close the syringe valve on the purging device to begin gas flow through the trap. The trap temperature should be maintained at 180°C. Trap temperatures up to 220° may be employed; however, the higher temperature will shorten the useful life of the trap. After approximately 7 min, turn off the trap heater and open the syringe valve to stop the gas flow through the trap. When cool, the trap is ready for the next sample.

11.3.1.12 If the initial analysis of a sample or a dilution of the sample has a concentration of analytes that exceeds the initial calibration range, the sample must be reanalyzed at a higher dilution. Secondary ion quantitation is allowed only when there are sample interferences with the primary ion.

11.3.1.13 For matrix spike analysis, add the following matrix spike solutions to the 5 mL of sample purged.

2.5 µL TCLP mix (100 ppm)
2.5 µL 1,1-Dichloroethene (100 ppm)
1.0 µL Vinyl Chloride (200ppm)

Disregarding any dilutions, this is equivalent to a concentration of 50 µg/L of each matrix spike standard.

11.3.1.14 All dilutions should keep the response of the major constituents (previously saturated peaks) in the upper half of the linear range of the curve. Proceed to Sections 11.4.1 and 11.4.2 for qualitative and quantitative analysis.

11.3.2 Water-miscible liquids:

11.3.2.1 Water-miscible liquids are analyzed as water samples after first diluting them at least 20-fold with reagent water.

11.3.2.2 Prepare dilutions directly in a 5-mL syringe filled with reagent water by adding at least 1.0 µL, but not more than 500-µL of liquid sample. The Internal Standard/Surrogate mixed standard is added to 5 mL of reagent water before the sample.

11.3.3 Sediment/soil and waste samples: Samples are extracted with an equal weight of methanol. The methanol extract is then treated as a water sample.

11.4 Data interpretation:

11.4.1 Qualitative analysis:

11.4.1.1 An analyte (e.g., those listed in Table 1) is indentified by comparison of the sample mass spectrum with the masss spectrum of a standard of the suspected compound (standard reference spectrum). Mass spectra for standard reference should be obtained within the same 12 hours as the sample analysis. These standard reference spectra may be obtained through analysis of the calibratio standards. Two criteria must be satisfied verify indentification: (1) elution of sample component at the same GC relative retention time (RRT) as those of the standard component; and (2) correspondence of the sample component and the standard component mass spectrum.

11.4.1.1.1 The sample component RRT must compare within ± 0.06 RRT units of the RRT of the standard component. For reference, the standard must be run within the same 12 hr as the sample. If coelution of interfering components prohibits accurate assignment of the sample component RRT from the total ion chromatogram, the RRT should be assigned by using extracted ion current profiles for ion unique to the component of interest.

11.4.1.1.2 (1) All ions present in the standard mass spectra at a relative intensity greater than 10% (most abundant ion in the spectrum equals 100% must be present in the sample spectrum). (2) The relative intensities of ions specified in (1) must agree within plus or minus 20% between the standard and sample spectra. (Example: For an ion with an abundance of 50% in the standard spectra, the corresponding sample abundance must be between 30 and 70 percent.

11.4.1.2 For samples containing components not associated with the calibration standards, a library search may be made for the purpose of tentative identification. The necessity to perform this type of identification will be determined by the type of analyses being conducted. Guidelines for making tentative identification are:

(1) Relative intensities of major ions in the reference spectrum (ions >10% of the most abundant ion) should be present in the sample spectrum.

(2) The relative intensities of the major ions should agree within ±20% (Example: For an ion with an abundance of 50% in the standard spectrum, the corresponding sample ion abundance must between 30 and 70%).

(3) Molecular ions present in the reference spectrum should be present in the sample spectrum.

(4) Ions present in the sample spectrum but not in the reference spectrum should be reviewed for possible background contamination or presence of coeluting compounds.

(5) Ions present in the reference spectrum but not in the sample spectrum should be reviewed for possible subtraction from the sample spectrum because of background contamination or coeluting peaks. Data system library reduction programs can sometimes create these discrepancies.

Computer generated library search routines should not use normalization routines that would misrepresent the library or unknown spectra when compared to each other. Only after visual comparison of sample with the nearest library searches will the mass spectral interpretation specialist assign a tentative identification.

11.4.2 Quantitative analysis:

11.4.2.1 When a compound has been identified, the quantification of that compound will be based on the integrated abundance from the EICP of the primary characteristic ion. Quantification will take place using the internal standard technique. The internal standard used shall be the one nearest the retention time of that of a given analyte (e.g., see Table 4).

11.4.2.2 Calculate the concentration of each identified analyte in the sample as follows:

$$\text{concentration } (\mu g/L) = \frac{(A_x)(I_s)}{(A_{is})(RF)(V_o)}$$

where:

A_x = Area of characteristic ion for compound being measured.
I_s = Amount of internal standard injected (ng).
A_{is}= Area of characteristic ion for the internal standard.
RF = Response factor for compound being measured (Paragraph 7.2.7).
V_o = Volume of water purged (mL), taking into consideration any dilutions made.

TABLE 4. VOLATILE INTERNAL STANDARDS WITH CORRESPONDING ANALYTES ASSIGNED FOR QUANTITATION

Bromochloromethane

Acetone
Acrolein
Acrylonitrile
Bomomethane
Carbon disulfide
Chloroethane
Chloromethane
Dichlorodifluoromethane
1,1-Dichloroethane
1,2-Dichloroethane
1,2-Dichloroethane (surrogate)
1,1-Dichloroethene
trans-1,2-Dichloroethene
Iodomethane
Methylene chloride
Trichlorofluoromethane
Vinyl chloride

1,4-Difluorobenzene

Benzene
Bromodichloromethane
Bromoform
2-Butanone
Carbon tetrachloride
Chlorodibromomethane
2-Choroethyl vinyl ether
Dibromomethane
1,4-Dichloro-2-butene
1,2-Dichloropropane
cis-1,3-Dichloropropene
trans-1,3-Dichloropropene
1,1,1-Trichlorethane
1,1,2-Trichloroethane
Trichloroethene
Vinyl acetate

Chlorbenzene-d_5

Bromofluorbenzene (surrogate)
Chlorobenzene
Ethylbenzene
Ethyl mehtacrylate
2-Hexanone
4-Methyl-2-pentanone
Styrene
1,1,2,2-Tetrachlorethane
Tetrachloroethene
Toluene
Toluene-d8 (surrogate)
1,2,3-Trichloropropane
Xylene

11.4.2.3 Sediment/soil samples are generally reported on a dry weight basis, while sludges and wastes are reported on a wet weight basis. The % moisture of the sample (as calculated in Paragraph 7.4.1.3.5) should be reported along with the data in either instance.

11.4.2.4 Where applicable, an estimate of concentration for noncalibrated components in the sample should be made. The formulas given above should be used with the following modifications: The areas A_x and A_{is} should be from the total ion chromatograms, and the RF for the compound should be assumed to be 1. The concentration obtained should be reported indication (1) that the value is an estimate and (2) which internal standard was used to determine concentration. Use the nearest internal standard free of interferences.

11.4.2.5 Report results without correction for recovery data. When duplicates and spiked samples are analyzed, report all data obtained with the sample results.

12. CALCULATION

$$\text{Concentration } (\mu g/L) = \frac{(A_x)(I_s)}{(A_{is})(RF)\ V_o}$$

where:

A_x = Area of ion for compound being measured

I_s = Amount of Internal Standard Injected

A_{is} = Area of ion for Internal Standard

RF = Response Factor

V_o = Volume of sample purged

13. REFERENCES

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11. Reference Method 8240.

APPENDIX VII-C-4

ORGANIC ANALYSES PROTOCOL
GAS CHROMATOGRAPHY/ MASS SPECTROMETRY (GC/MS)
ANALYSIS OF SEMI-VOLATILES

TITLE: STANDARD OPERATING PROCEDURE FOR THE ANALYSIS OF TCLP SEMIVOLATILE ORGANIC COMPOUNDS (BASED ON: EPA METHOD 8270) (KEY WORDS: SEMIVOLATILE ORGANICS, GC/MS, TCLP)

1. SCOPE AND APPLICATION

1.1 Method 8270 is used to determine the concentration of semivolatile organic compounds in extracts prepared from all types of solid waste matrices, soils, and ground water. Direct injection of a sample may be used in limited applications.

1.2 Method 8270 can be used to quantify most neutral, acidic, and basic organic compounds that are soluble in methylene chloride and capable of being eluted without derivatization as sharp peaks from a gas chromatographic fused-silica capillary column coated with a slightly polar silicone. Such compounds include polynuclear aromatic hydrocarbons, chlorinated hydrocarbons and pesticides, phthalate esters, organophosphate esters, nitrosamines, haloethers, aldehydes, ethers, ketones, anilines, pyridines, quinolines, aromatic nitro compounds, and phenols, including nitrophenols.

1.3 The following compounds may require special treatment when being determined by this method. Pentachlorophenol, 2,4-dinitrophenol, 4-nitrophenol, 4,6-dinitro-2-methylphenol, 4-chloro-3-methylphenol, benzoic acid, 2-nitroaniline, 3-nitroaniline, 4-chloroaniline, and benzyl alcohol are subject to erratic chromatographic behavior, especially if the GC system is contaminated with high boiling material.

1.4 This method is restricted to use by or under the supervision of analysts experienced in the use of gas chromatograph/mass spectrometers and skilled in the interpretation of mass spectra. Each analyst must demonstrate the ability to generate acceptable results with this method.

2. SAFETY AND WASTE HANDLING

2.1 **Eye Contact** - Safety glasses with eye shields must be worn when working in the laboratory.

2.2 **Hand Contact** - Use of disposable vinyl or latex gloves provide adequate protection from contact with the samples. All skin contact must be washed off immediately.

2.3 **Respiratory** - Exposure to the vapors from the sample should be kept to a minimum by working in a well-ventilated area.

2.4 Analyst must be aware of MSDS for all chemicals used in the lab.

2.5 **Waste Disposal** - The sample is stored, refrigerated, for six weeks. After six weeks the sample is placed in the waste solvent container for later disposal. Standards are placed in the waste solvent container for disposal.

Contaminated wipes are placed in a metal container that has been lined with a plastic trash bag. A metal top must be kept on the container at all times except to add to or remove the contents.

3. SUMMARY OF METHOD

3.1 Prior to using this method, the samples should be prepared for chromatography using the appropriate sample preparation and cleanup methods. This method describes chromatographic conditions that will allow for the separation and quantitation of the compounds in the extract.

4. SAMPLE HANDLING AND PRESERVATION

4.1 Samples are received from the BNA prep lab in autosampler vials. The vials are stored at 0°C until assayed.

5. INTERFERENCES

5.1 Raw GC/MS data from all blanks, samples, and spikes must be evaluated for interferences. Determine if the source of interference is in the preparation and/or cleanup of the samples and take corrective action to eliminate the problem.

5.2 Contamination by carryover can occur whenever high-level and low-level samples are sequentially analyzed. To reduce carryover, the sample syringe must be rinsed out between samples with solvent.

6. APPARATUS

6.1 Gas chromatograph/mass spectometer system:

6.1.1 **Gas chromatograph:** HP-5890 Series II or equivalent

6.1.2 **Column:** 30-m x 0.25-mm I.D. (or 0.32-mm I.D.) 1-um film thickness (J&W Scientific DB-5 or equivalent). J & W catalog number 122-5633.

6.1.3 **Mass spectrometer:** HP-5970 MSD or equivalent. The mass spectrometer must be capable of producing a mass spectrum for decafluorotriphenylphosphine (DFTPP) which meets all of the criteria in Table 1 when 50 ng of DFTPP is injected through the gas chromatograph.

TABLE 1 DFTPP KEY IONS AND ION ABUNDANCE CRITERIA

Mass	Ion Abundance Criteria
51	30-60% of mass 198
68	<2% of mass 69
70	<2% of mass 69
127	40-60% of mass 198
197	<1% of mass 198
198	Base peak, 100% relative abundance
199	5-9% of mass 198
275	10-30% of mass 198
365	>1% of mass 198
441	Present but less than mass 443
442	>40% of mass 198
443	17-23% of mass 442

6.1.4 **GC/MS interface:** A direct interface from the GC to the MS is used.

6.1.5 **Data system:** HP-UX. The system allows the continuous acquisition and storage on machine-readable tape of all mass spectra obtained throughout the duration of the chromatographic program. The computer has software that can search any GC/MS data file for ions of a specific mass and that can plot such ion abundances versus time or scan number. The most recent version of the EPA/NIH Mass Spectral Library is available.

6.2 Syringe: 10-μL.

6.3 Analytical Balance: capable of weighing 0.001 g.

7. REAGENTS/STANDARDS

7.1 Stock Standard Solutions: The following stock standards at the concentration given are purchased from Absolute Standards. Consult the Absolute Standard catalog for specific compounds in each standard.

Cat. No.	Standard	Concentration
10001	Base Neutrals #1	2000 µg/mL
10002	Base Neutrals #2	2000 µg/mL
10004	Toxic Substances #1	2000 µg/mL
10005	Toxic Substances #2	2000 µg/mL
10006	Benzidine & 3,3'-Dichlorobenzidine	2000 µg/mL
10007	Polynuclear Aromatic Hydrocarbons	2000 µg/mL
100018	Phenols	2000 µg/mL
19207	Semi-volatile Spiking Mix	2000 µg/mL

7.2 Internal Standard: The internal standard mix is purchased from Supelco, catalog number 4-8902. This standard contains 2000 µg/mL of Acenapthene-d10, Chrysene-d12, 1,4-Dichlorobenzene-d4, Naphthalene-d8, Perylene-d12, and Phenanthrene-d10. If a SIM analysis, 5 µL of this mixture is added to the sample. If a SCAN analysis, 20 µL of this mixture is added to the sample.

7.3 GC/MS tuning standard: A methylene chloride solution containing 50 ng/µL decafluorotriphenylphosphine (DFTPP) is to be prepared. The standard should also contain 50 ng/µL of pentachlorophenol to verify injection port inertness and GC column performance. Store at 4°C or less when not being used. This standard expires 6 months from date of receipt.

7.4 Calibration Standards: Calibration standards are prepared by diluting the stock standards to final concentrations of 20 µg/mL, 50 µg/mL, 80 µg/mL, 120 µg/mL, and 160 µg/mL. Expiration date for these standards is either date specified by Manufacturer or six months from date of receipt.

7.5 Surrogate Standards: Surrogate standards purchased from Supelco are listed below.

Standard	Catalog Number	Concentration
Acid Surrogate	4-8875	2000 µg/mL
Base-Neutral	4-8925	1000 µg/mL

7.6 Matrix Spike Standards: The matrix spike standard is purchased from Absolute Standard, part number 19207. This standard contains 2000 µg/mL of each compound. For a listing of the compounds consult the Absolute Standard catalog.

7.7 Methylene Chloride, pesticide grade or shown to be free of contaminants by GC.

7.8 Methanol - High Purity from Baxter, Cat. #230-4 or equivalent.

8. PREVENTIVE MAINTENANCE

8.1 Daily remove 3 - 4" from injection side of column, replace septa. If retention gap is used remove 3" - 4" from injection end of retention gap not column.

9. TROUBLESHOOTING/CORRECTIVE ACTION

9.1 If Pentachlorophenol area is not acceptable or pentachlorophenol tails excessively, replace injection port liner and remove an additional 3 - 4 inches from the injector side of the column or retention gap.

10. QUALITY CONTROL

10.1 Before processing any samples, the analyst must demonstrate, through the analysis of a reagent water blank, that interferences from the analytical system, glassware, and reagents are under control. Each time a set of samples is extracted or there is a change in reagents, a reagent water blank must be processed as a safeguard against chronic laboratory contamination. The blank samples must be carried through all stages of the sample preparation and measurement steps.

10.2 The experience of the analyst performing GC/MS analyses is invaluable to the success of the methods. Each day that analysis is performed, the daily calibration standard should be evaluated to determine if the chromatographic system is operating properly.

10.3 Required instrument QC is found in the following sections:

10.3.1 The GC/MS system must be tuned to meet the DFTPP specifications in Table I.

10.3.2 There must be an initial calibration of the GC/MS system as specified in 11.2.2.

10.3.3 The GC/MS system must meet the SPCC criteria specified in 11.3.3 and the CCC criteria in 11.3.4, each 12 hr.

TABLE 2. QC ACCEPTANCE CRITERIA[a]

Parameter	Test conc. (µg/L)	Limit for s (µg/L)	Range for x (µg/L)	Range p, p_s (%)
Acenaphthene	100	27.6	60.1-132.3	47-145
Acenaphthylene	100	40.2	53.5-126.0	33-145
Aldrin	100	39.0	7.2-152.2	D-166
Anthracene	100	32.0	43.4-118.0	27.133
Benzo(a)anthracene	100	27.6	41.8-133.0	33-143
Benzo(b)fluoranthene	100	38.8	42.0-140.4	24-159
Benzo(k)fluoranthene	100	32.3	25.2-145.7	11-162
Benzo(a)pyrene	100	39.0	31.7-148.0	17-163
Benzo(ghi)perylene	100	58.9	D-195.0	D-219
Benzyl butyl phthalate	100	23.4	D-139.9	D-152
ß-BHC	100	31.5	41.5-130.6	24-149
Š-BHC	100	21.6	D-100.0	D-110
Bis(2-chloroethyl)ether	100	55.0	42.9-126.0	12-158
Bis(2-chloroethyl)mehtane	100	34.5	49.2-164.7	33-184
Bis(2-chloroisopropyl)ether	100	46.3	62.8-138.6	36-166
Bis(2-ethylhexyl)phthalate	100	41.1	28.9-136.8	8-158
4-Bromophenyl phenyl ether	100	23.0	64.9-114.4	53-127
2-Chloronaphthalene	100	13.0	64.5-113.5	60-118
4-Chlorophenyl phenyl ether	100	33.4	38.4-144.7	25-158
Chrysene	100	48.3	44.1-139.9	17-168
4,4'-DDD	100	31.0	D-134.5	D-145
4,4'-DDE	100	32.0	19.2-119.7	4-136
4,4"-DDT	100	61.6	D-170.6	D-203
Dibenzo(a,h)anthracene	100	70.0	D-199.7	D-227
Di-n-butyl phthalate	100	16.7	8.4-111.0	1-118
1,2-Dichlorobenzene	100	30.9	48.6-112.0	32-129
1,3-Dichlorobenzene	100	41.7	16.7-153.9	D-172
1,4-Dichlorobenzene	100	32.1	37.3-105.7	20-124
3,3'-Dichlorobenzidine	100	71.4	8.2-212.5	D-262
Dieldrin	100	30.7	44.3-119.3	29-136
Diethyl phthalate	100	26.5	D-100.0	D-114
Dimethyl phthatlate	100	23.2	D-100.0	D-112
2,4-Dinitrotoluene	100	21.8	47.5-126.9	39-139
2,6-Dinitrotoluene	100	29.6	68.1-136.7	50-158
Di-n-octylphthalate	100	31.4	18.6-131.8	4-146
Endosulfan sulfate	100	16.7	D-103.5	D-107
Endrin aldehyde	100	32.5	D-188.8	D-209
Fluoranthene	100	32.8	42.9-121.3	26-137
Fluorene	100	20.7	71.6-108.4	59-121
Heptachlor	100	37.2	D-172.2	D-192
Heptachlor epoxide	100	54.7	70.9-109.4	26.155
Hexachlorobenzene	100	24.9	7.8-141.5	D-152
Hexachlorobutadiene	100	26.3	37.8-102.2	24-116
Hexachloroethane	100	24.5	55.2-100.0	40-113
Indeno(1,2,3-cd)pyrene	100	44.6	D-150.9	D-171
Isophorone	100	63.3	46.6-180.2	21-196
Naphthalene	100	30.1	35.6-119.6	21-133

TABLE 2. QC ACCEPTANCE CRITERIA[a] - Continued

Parameter	Test conc. (µg/L)	Limit for s (µg/L)	Range for x (µg/L)	Range p, p_s (%)
Nitrobenzene	100	39.3	54.3-157.6	35-180
N-Nitrosodi-n-propylamine	100	55.4	13.6-197.9	D-230
PCB-1260	100	54.2	19.3-121.0	D-164
Phenanthrene	100	20.6	65.2-108.7	54-120
Pyrene	100	25.2	69.6-100.0	52-115
1,2,4-Trichlorobenzene	100	28.1	57.3-129.2	44-142
4-Chloro-3-methylphenol	100	37.2	40.8-127.9	22-147
2-Chlorophenol	100	28.7	36.2-120.4	23-134
2,4-Chlorophenol	100	26.4	52.5-121.7	39-135
2,4-Dimethylphenol	100	26.1	41.8-109.0	32-119
2,4-Dinitrophenol	100	49.8	D-172.9	D-191
2-Methyl-4,6-dinitrophenol	100	93.2	53.0-100.0	D-181
2-Nitrophenol	100	35.2	45.0-166.7	29-182
4-Nitrophenol	100	47.2	13.0-106.5	D-132
Pentachlorphenol	100	48.9	38.1-151.8	14-176
Phenol	100	22.6	16.6-100.0	5-112
2,4,6-Trichlorophenol	100	31.7	52.4-129.2	37-144

s = Standard deviation of four recovery measurements, in µg/L.

x = Average recovery for four recovery measurements, in µg/L.

p, p_s = Percent recovery measured.

D = Detected; result must be greater than zero.

[a]Criteria from 40 CFR Part 136 for Method 625. These criteria area based directly on the method performance data in Table 7. Where necessary, the limited for recovery have been broadened to assure applicability of the limits to concentrations below those used to develop Table 7.

10.5 With each batch of samples extracted or diluted analyze a reagent blank, a matrix spike, a matrix spike duplicate/duplicate for each analytical batch (up to a maximum of 20 samples/batch) to assess accuracy.

10.5.1 The concentration of the spike in the sample should be determined as follows:

10.5.1.1 If 250 mL of sample is extracted, add 1 mL of matrix spike.

10.5.1.2 If 20 mL or less of sample is used, add 0.2 mL of matrix spike.

10.5.1.3 % RPD for MSD and MS must be less than 40%.

10.6 If any analyte fails the acceptance criteria for recovery, a QC check standard containing each analyte that failed must be prepared and analyzed.

10.6.1 Prepare the QC check standard by adding 1.0 mL of the QC check sample concentrate to 1 L of reagent water. The QC check standard needs only to contain percent recovery (ps) as 100 (A/T)%, where T is the true value of the standard concentration and A is the value obtained.

10.6.2 Compare the percent recovery (ps) for each analyte with the corresponding QC acceptance criteria found in Table 2. Only analytes that failed the test need to be compared with these criteria. If the recovery of any such analyte falls outside the designated range, the laboratory performance for that analyte is judged to be out of control, and the problem must be immediately identified and corrected. The analytical result for the analyte in the unspiked sample is suspect and may not be reported for regulatory compliance purposes.

10.7 As part of the QC program, method accuracy for each matrix studied has been assessed and records must be maintained.

10.8 To determine acceptable accuracy and precision limits for surrogate standards the following procedure should be performed.

Spike concentration limits are given below:

Compound	Recovery
2-Methylphenol	27 - 120%
4-Methylphenol	27 - 120
2,4-Dinitrotoluene	24 - 96
Hexachlorobenzene	20 - 120
Hexachlorobutadiene	20 - 120
Hexachloroethane	20 - 120
Nitrobenzene	76 - 127
Pentachlorophenol	9 - 103
Pyridine	20 - 120
2,4,5-Trichlorophenol	20 - 120
2,4,6-Trichlorophenol	20 - 120
1,4-Dichlorobenzene	20 - 120

TABLE 3. METHOD ACCURACY AND PRECISION AS FUNCTIONS OF CONCENTRATION[a]

Parameter	Accuracy, as recovery, x1 (µg/L)	Single analyst precision, sr1 (µg/L)	Overall precision, S1 (µg/L)
Acenaphthene	0.96C+0.19	0.15x-0.12	0.21x-0.67
Acenaphthylene	0.89C+0.74	0.24x-1.06	0.26x-0.54.
Aldrin	0.78C+1.66	0.27x-1.28	0.43x+1.13
Anthracene	0.80C+0.68	021.x-0.32	0.27x-0.64
Benzo(a)anthracene	0.88C-0.60	0.15x+0.93	0.26x-0.21
Chloroethane	0.99C-1.53	0.14x-0.13	0.17x-0.28
Benzo(b)fluoranthene	0.93C-1.80	0.22x+0.43	0.29x+0.96
Benzo(k)fluoranthene	0.87C-1.56	0.19x+1.03	0.35x+0.40
Benzo(a)pyrene	0.90C-0.13	0.22x+0.48	0.32x+1.35
Benzo(ghi)perylene	098C-0.86	0.29x+2.40	0.51x-0.44
Benzyl butyl phthalate	0.66C-1.68	0.18x+0.94	0.53x+0.92
ß-BHC	0.87C-0.94	0.20x-0.58	0.30x+1.94
Š-BHC	0.29C-1.09	0.34x+0.86	0.93x-0.17
Bis(2-chloroethyl)ether	0.86C-1.54	0.35x-.099	0.35x+0.10
Bis(2-chloroethoxy)methane	1.12C-5.04	0.16x-1.34	0.26x+2.01
Bis(2-chloroisopropyl)ether	1.03C-2.31	0.24x+0.28	0.25x+1.04
Bis(2-ethylhexyl)phthalate	0.84C-1.18	0.26x+0.73	0.36x+0.67
4-Bromophenyl phenyl ether	0.91C-1.34	0.13x+0.66	0.16x+0.66
2-Chloronaphthalene	0.89C+0.01	0.07x+0.52	0.13x+0.34
4-Chlorophenyl phenyl ether	0.91C+0.53	0.20x-0.94	0.30x-0.46
Chrysene	0.93C-1.00	0.28x+0.13	0.33x-0.09
4,4'-DDD	0.56C-0.40	0.29x-0.32	0.66x-0.96
4,4'-DDE	0.70C-0.54	0.26x-1.17	0.39x-1.04
4,4'-DDT	0.79C-3.28	0.42x+0.19	0.65x-0.58
Dibenzo(a,h)anthracene	0.88C+4.72	0.30x+8.51	0.59x+0.25
Di-n-butyl phthalate	0.59C+0.71	0.13x+1.16	0.39x+0.60
1,2-Dichlorobenzene	0.80C+0.28	0.20x+0.47	0.24x+0.39
1,3-Dichlorobenzene	0.86C-0.70	0.25x+0.68	0.41x+0.11
3,3'-Dichlorbenzidine	1.23C-12.65	0.28x+7.33	0.47+3.45
Dieldrin	0.82C-0.16	0.20x-0.16	0.26x-0.07
Diethyl phthalate	0.43C+1.00	0.28x+1.44	0.52x+0.22
Dimethyl phthalate	0.20C+10.3	0.54x+0.19	1.05x-0.92
2,4-Dinitrotoluene	0.92C-4.81	0.12x+1.06	0.21x+1.50
2,6-Dinitrotoluene	1.06C-3.60	0.14x+1.26	0.19x+0.35
Di-n-octylphthalate	0.76C-0.79	0.21x+1.19	0.37x+1.19
Endosulfan sulfate	0.39C-0.41	0.12x+2.47	0.63x-1.03
Endrin aldehyde	0.76C-3.86	0.18x+3.91	0.73x-0.62
Fluoranthene	0.81C+1.10	0.22x-0.73	0.28x-0.60
Fluorene	0.90C-0.00	0.12x+0.26	0.13x+0.61
Heptachlor	0.87C-2.97	0.24x-0.56	0.50x-0.23
Jeptachlor epoxide	0.92C-1.87	0.33x-0.46	0.28x+0.64
Hexachlorobenzene	0.74C+0.66	0.18x-0.10	0.43x-0.52
Hexachlorobutadiene	0.71C-1.01	0.19x+0.92	0.26x+0.49
Hexachloroethane	0.73C-0.83	0.17x+0.67	0.17x+0.80

TABLE 3. METHOD ACCURACY AND PRECISION AS FUNCTIONS OF CONCENTRATION[a] - Continued

Parameter	Accuracy, as recovery, x1 (µg/L)	Single analyst precision, sr1 (µg/L)	Overall precision, S1 (µg/L)
Indeno(1,2,3-cd)pyrene	0.78C-3.10	0.29x+1.46	0.50x-0.44
Isophorone	1.12C+1.41	0.27x+0.77	0.33x+0.26
Naphthalene	0.76C+1.58	0.21x-0.41	0.30x-0.68
Nitrobenzene	1.09C-3.05	0.19x+0.92	0.27x+0.21
N-Nitrosodi-n-propylamine	1.12C-6.22	0.27x+0.68	0.44x+0.47
PCB-1260	0.81C-10.86	0.35x+3.61	0.43x+1.82
Phenanthrene	0.87C+0.06	0.12x+0.57	0.15x+0.25
Pyrene	0.84C-0.16	0.16x+0.06	0.15x+0.31
1,2,4-Trichlorobenzene	0.94C-0.79	0.15x+0.85	0.21x+0.39
4-Chloro-3-methylphenol	0.840.35	0.23x+0.75	0.29x+1.31
2-Chlorophenol	0.78C+0.29	0.18x+1.46	0.28x+0.97
1,2,4-Trichlorobenzene	0.94C-0.79	0.15x+0.85	0.21x+0.39
4-Chloro-3-methylphenol	0.84C+0.35	0.23x+0.75	0.29x+1.31
2-Chlorophenol	0.78C+0.29	0.18x+1.46	0.28x+0.97
2,4-Dichlorophenol	0.87C-0.13	0.15x+1.25	0.21x+1.28
2,4-Dimethylphenol	0.71C+4.41	0.16x+1.21	0.22x+1.31
2,4-Dinitrophenol	0.81C-18.04	0.38x+2.36	0.42x+26.29
2-Mthyl-4,6-dinitrophenol	1.04C-28.04	0.10x+42.29	0.26x+23.10
2-Nitrophenol	0.07C-1.15	0.16x+1.94	0.27x+2.60
4-Nitrophenol	0.61C-1.22	0.38x+2.57	0.44x+3.24
Pentachlorophenol	0.93C+1.99	0.24x+3.03	0.30x+4.33
Phenol	0.43C+1.26	0.26x+0.73	0.35x+0.58
2,4,6-Trichlorphenol	0.91C-0.18	0.16x+2.22	0.22x+1.81

x1 = Expected recovery for one or more measurements of a sample containing a concentration of C, in µg/L.

sr1 = Expected single analyst standard deviation of measurements at an average concentration of x, in µg/L.

S1 = Expected interlaboratory standard deviation of measurements at an average concentration found of x, in µg/L.

C = True value for the concentration, in µg/L.

x = Average recovery found for measurements of samples containing a concentration of C, in µg/L.

10.8.1 For each sample analyzed, calculate the percent recovery of each surrogate in the sample.

10.8.2 Once a minimum of thirty samples of the same matrix have been analyzed, calculate the average percent recovery (P) and standard deviation of the percent recovery (s) for each of the surrogates.

10.8.3 For a given matrix, calculate the upper and lower control limit for method performance for each surrogate standard. This should be done as follows:

Upper Control Limit (UCL) = p + 2s
Lower Control Limit (LCL) = p - 2s

10.8.4 If recovery is not within limits, the following procedures are required.

Reextract and reanalyze the sample or flag the data as "estimated concentration". If recovery is still a problem label as "matrix effect".

10.8.5 At a minimum, the laboratory should update surrogate recovery limits on a matrix-by-matrix basis, annually.

11. PROCEDURE

11.1 Sample preparation: Samples are prepared by EPA Method 3510 and diluted prior to analysis.

11.2 Initial calibration: The GC/MS operating conditions:

Mass range: 35-500 amu
Scan time: 1 sec/scan
Initial column temperature and hold time: 40°C
Column temperature program: 40-290°C at 8°C/min
Final column temperature hold: 290°C for 4 min.
Injector temperature: 250-300°C
Transfer line temperature: 250-300°C
Source temperature: According to manufacturer's specifications
Injector: splitless
Sample volume: 1 µL
Carrier gas: Helium at 30 cm/sec.

11.2.1 Each GC/MS system must be hardware-tuned to meet the EPA criteria for a 50-ng injection of DFTPP. Pentachlorophenol should be present at its normal response, and no peak tailing should be visible. If degradation is excessive and/or tailing is noted, the injection port may require cleaning.

11.2.2 Analyze 1 µL of each calibration standard (containing internal standards) and tabulate the area of the primary characteristic ion against concentration for each compound (as indicated in Table 1). Figure 1 shows a chromatogram of a calibration standard containing base/neutral and acid analytes. Calculate response factors (RFs) for each compound as follows:

$$RF = (A_x C_{is}) / (A_{is} C_x)$$

where:

A_x = Area of the characteristic ion for the compound being measured.

A_{is} = Area of the characteristic ion for the specific internal standard.

C_x = Concentration of the compound being measured (ng/µL).

C_{is} = Concentration of the specific internal standard (ng/µL).

11.2.3 The average RF should be calculated for each compound. The percent relative standard deviation (%RSD = 100[SD/RF] should also be calculated for each compound. However, the %RSD for each individual Calibration Check Compound (CCC) (see Table 2) must be less than 30%. The relative retention times of each compound in each calibration run should agree within 0.06 relative retention time units.

TABLE 5. CALIBRATION CHECK COMPOUNDS

Base/Neutral Fraction	Acid Fraction
Acenaphthene	4-Chloro-3-methylphenol
1,4-Dichlorobenzene	2,4-Dichlorophenol
Hexachlorobutadiene	2-Nitrophenol
N-Nitroso-di-n-phenylamine	Phenol
Di-n-octylphthalate	Pentachlorphenol
Fluoranthene	2,4,6-Trichlorophenol
Benzo(a)pyrene	

11.3 Daily GC/MS calibration:

11.3.1 Prior to analysis of samples, the GC/MS tuning standard must by analyzed. A 50-ng injection of DFTPP must result in a mass spectrum for DFTPP which meets the criteria given in Table 1. These criteria must be demonstrated during each 12-hr shift.

11.3.2 A calibration standard(s) at mid-level concentration containing all semivolatile analytes, including all required surrogates, must be performed every 12-hr during analysis. Compare the response factor data from the standards every 12-hr with the average response factor from the initial calibration for a specific instrument as per the SPCC and CCC criteria.

11.3.3 **System Performance Check Compounds** (SPCCs): A system performance check must be made during every 12 hr shift.

11.3.3.1 Minimum acceptable average RF is 0.050 for all SPCCs.

11.3.3.2 SPCCs are N-nitroso-di-n-propylamine, hexachlorocyclopentadiene, 2,4-Dinitrophenol, 4-nitrophenol.

11.3.4 **Calibration Check Compounds** (CCCs): After the system performance check is met, all TCLP compounds are used as CCCs to check the validity of the initial calibration. Calculate the percent difference using:

$$\% \text{ Difference} = \frac{\overline{RF}_I - RF_c}{\overline{RF}_I} \times 100$$

where:

$\overline{RF}_I$ = average response factor from initial calibration.

RF_c - response factor from current verification check standard.

If the percent difference for any compound is greater than 20, the laboratory should consider this a warning limit. If the percent difference for each CCC is less than 30%, the initial calibration is assumed to be valid. If the criterion is not met (>30% difference) for any one CCC, corrective action MUST be taken. Problems similar to those listed under SPCCs could affect this criterion. If no source of the problem can be determined after corrective action has been taken, a new five-point calibration MUST be generated. This criterion MUST be met before sample analysis begins.

11.3.5 The internal standard responses and retention times in the calibration check standard must be evaluated immediately after or during data acquisition. If the retention time for any internal standard changes by more than 30 sec from the last check calibration (12 hr), the chromatographic system must be inspected for malfunctions and corrections must be made, as required. If the EICP area for any of the internal standards changes by a factor of two (-50% to +100%) from the last daily calibration standard check, the GC/MS system and standards must be inspected for malfunctions and corrections must be made, as appropriate.

11.4 GC/MS analysis:

11.4.1 Spike the 1-mL extract obtained from sample preparation with 20 µL of the internal standard solution just prior to analysis.

11.4.2 Analyze the 1-mL extract by GC/MS using a 30-m x 0.25-mm (or 0.32-mm) silicone-coated fused-silica capillary column. The mandatory GC/MS operating conditions to be used are specified in Paragraph 7.3.

11.4.3 If the response for any quantitation ion exceeds the initial calibration curve range of the GC/MS system, extract dilution must take place. Additional internal standard must be added to the diluted extract to maintain the required 40 ng/µL of each internal standard in the extracted volume. The diluted extract must be reanalyzed.

11.4.4 Perform all qualitative and quantitative measurements as described in Paragraph 7.6. Store the extracts at 4°C, protected from light in capped vials equipped with unpierced Teflon-lined septa.

11.5 Data interpretation:

11.5.1 Qualitative analysis:

11.5.1.1 An analyte is identified by comparison of the sample mass spectrum with the mass spectrum of a standard of the suspected compound (standard reference spectrum). Mass spectra for standard reference should be obtained on the user's GC/MS within the same 12 hours as the sample analysis. These standard reference spectra may be obtained through analysis of the calibration standards. Two criteria must be satisfied to verify identification: (1) elution of sample component at the same GC relative retention time (RRT) as the standard component; and (2) correspondence of the sample component and the standard component mass spectrum.

11.5.1.1.1 The sample component RRT must compare within ±0.06 RRT units of the RRT of the standard component. For reference, the standard must be run within the same 12 hrs as the sample. If coelution of interfering components prohibits accurate assignment of the sample component RRT from the total ion chromatogram, the RRT should be assigned by using extracted ion current profiles for ions unique to the component of interest.

11.5.1.1.2 The relative intensities of ions must agree within plus or minus 20% between the standard and sample spectra. (Example: For an ion with an abundance of 50% in the standard spectra, the corresponding sample abundance must be between 30 and 70 percent.

11.5.1.2 For samples containing components not associated with the calibration standards, a library search may be made for the purpose of tentative identification. Guidelines for making tentative identification are:

(1) Relative intensities of major ions in the reference spectrum (ions >10% of the most abundant ion) should be present in the sample spectrum.

(2) The relative intensities of the major ions should agree within 0±20%. (Example: For an ion with an abundance of 50% in the standard spectrum, the corresponding sample ion abundance must be between 30 and 70%).

(3) Molecular ions present in the reference spectrum should be present in the sample spectrum.

(4) Ions present in the sample spectrum but not in the reference spectrum should be reviewed for possible background contamination or presence of coeluting compounds.

(5) Ions present in the reference spectrum but not in the sample spectrum should be reviewed for possible subtraction from the sample spectrum because of background contamination or coeluting peaks. Data system library reduction programs can sometimes create these discrepancies.

11.5.2 Quantitative analysis:

11.5.2.1 When a compound has been identified, the quantitation of that compound will be based on the integrated abundance from the EICP of the primary characteristic ion. Quantitation will take place using the internal standard technique. The internal standard used shall be the one nearest the retention time of that of a given analyte.

11.5.2.2 Calculate the concentration of each identified analyte in the sample as follows:

Water:

$$\text{concentration } (\mu g/L) = \frac{(A_x)(I_s)(V_t)}{(A_{is})(RF)(V_o)(V_i)}$$

where:

A_x = Area of characteristic ion for compound being measured.
I_s = Amount of internal standard injected (ng).
V_t = Volume of total extract, taking into account dilutions (i.e., a 1-to-10 dilution of a 1-mL extract will mean V_t = 10,000 µL. If half the base/neutral extract and half the acid extract are combined, Vt = 2,000.
A_{is} = Area of characteristic ion for the internal standard.
RF = Response factor for compound beig measured (Paragraph 7.3.3).
V_o = Volume of water extracted (mL).
V_i = Volume of extract injected (µL).

11.5.2.3 Report results without correction for recovery data.

11.5.2.4 Quantitation of multicomponent compounds (e.g., Aroclors) is beyond the scope of Method 8270.

12. CALCULATION

12.1 See Section 11.5.2.2.

13. REFERENCES

1. U.S. EPA 40 CFR Part 136, "Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the clean Water Act, Method 625," October 26, 1984.

2. U.S. EPA Contract Laboratory Program, Statement of Work for Organic Analysis, July 1985, Revision.

3. Provost, L.P. and R.S. Elder, "Interpretation of Percent Recovery Data," American Laboratory, 15, 58-63, 1983.

4. Eichelberger, J.W., L.E. Harris, and W.L. Budde, "Reference Compound to Calibrate Ion Abundance Measurement in Gas Chromatography-Mass Spectrometry Systems," Analytical Chemistry, 47, 995-1000, 1975.

5. "Method Detection Limit for Methods 624 and 625," Olynyk, P., W.L. Budde, and J.W. Eichelberger, Unpublished report, October 1980.

6. "Interlaboratory Method Study for EPA Method 625-Base/Neutrals, Acids, and Pesticides," Final Report for EPA Contract 68-03-3102 (in preparation).

7. Burke, J.A. "Gas Chromatography for Pesticide Residue Analysis; Some Practical Aspects," Journal of the Association of Official Analytical Chemists, 48, 1037, 1965.

8. Reference EPA Method 8270.

APPENDIX VII-C-5

ANALYST TRAINING PROTOCOL

Method #: 7201
Rev: 2/93
Safety-Kleen Corp. Supersedes: 1/91

ATTACHED IS A DOCUMENT FOR: REVISION DATE: 2/17/93

TITLE: TRAINING PROCEDURE FOR LABORATORY METHODOLOGY AND DOCUMENTATION OF TRAINING

SERIES/SUBJECT

7000 Qualification and Training

7200 Personnel Training

==========

APPROVALS/CONCURRENCES:

DEPARTMENT MANAGER(S) 3/3/93

3/4/93

4/30/93

VICE PRESIDENT, TECHNICAL 5/3/93

==========

TITLE: TRAINING PROCEDURE FOR LABORATORY METHODOLOGY AND DOCUMENTATION OF TRAINING

1. SUBJECT

1.1 This Standard Operating Procedure (SOP) outlines how training of laboratory methodology is performed and how to document this training.

2. PURPOSE

2.1 The purpose of this SOP is to standardize training of laboratory personnel on methodology and provide a means of documenting this training.

2.2 The purpose of documented training is to establish that an analyst is capable of meeting the precision and accuracy acceptance criteria of a given method.

3. SCOPE

3.1 This SOP is applicable to all Safety-Kleen laboratory employees conducting or receiving training on any analytical methodology. It is applicable to both initial training and retraining/recertification situations as well as partial training.

4. RESPONSIBILITIES

4.1 **LAB MANAGER** - Ensure that employees are being trained properly and timely, and that training documentation is complete and correct. Determine whether the employee is sufficiently trained to perform the method correctly and independently. Certify trainees who have successfully completed either initial training or retraining.

4.2 **TRAINER** - Train the trainee on all aspects of the method - theoretical, procedural, mathematical calculations, etc. Demonstrate the method to the trainee. Document training by completing one of the following forms: Analyst Training Form, Analyst Retraining Form, Analyst Partial Training Form, or the Analyst Partial Retraining Form (Attachment 1).

4.3 **TRAINEE** - Ensure that method is understood and that (s)he is able to perform method independently. Ensure that training documentation is complete.

5. DEFINITIONS

5.1 **TRAINER** - Individual experienced in, and currently certified on, the method to be taught, who provides training to trainee. While it is the intent that trainers be experienced with the method, it is also recognized that under certain circumstances, such as when a new method is promulgated, no individual in the laboratory will be experienced or certified on the new method. Under such circumstances, it is permissible for two non-certified analysts to train each other, each fulfilling the role of trainer to the other. Technical assistance is available from the Tech Center to ensure proper implementation and execution of the new SOP.

5.2 **TRAINEE** - Individual who will receive training. The trainee may be inexperienced on a method as in an initial training situation or experienced as in a recertification situation.

5.3 **LABORATORY MANAGER** - Individual in charge of a laboratory or a laboratory section (i.e. a group leader). This person is assumed to be perpetually trained and does not require training documentation unless (s)he is regularly performing sample analyses. "Regularly" performing sample analysis is defined as analyzing more than two samples per period which does not include any samples analyzed while fulfilling the role of trainer during training situations. In the case where the laboratory manager is regularly performing sample analyses, a complete training file must be maintained and his/her training may be:

A) performed simultaneously with another analyst, i.e. the manager trains the analyst and the analyst trains the manager; or,

B) performed by a Quality Assurance specialist, e.g. a QA Coordinator or the Training Chemist.

5.4 **INITIAL TRAINING** - A training event in which the trainee has not been previously trained on the analytical method.

5.5 **ANNUAL RETRAINING (RECERTIFICATION)** - A training event in which the trainee has been previously trained on the method. Recertification of all analysts is required annually on all methods the analyst is required to perform.

5.6 **PARTIAL TRAINING (INITIAL AND RETRAINING)** - A training event in which the trainee is trained on only a specific subset of the sections of an SOP. Certain situations exist where it is desirable to train and certify an analyst on only a portion of an analytical method (e.g. on the preparation portion only of the PCB method, 9202, and not on the analytical sections). In recognition of this need, a provision has been made for partial training of analysts who will be performing only a portion of an SOP. The procedure for partial training is identical to that for an initial or retraining event except that only the appropriate section(s) of a method are taught, learned, performed, and documented on the Analyst Partial (Re)Training Form.

6. PROCEDURE

6.1. INITIAL TRAINING

6.1.1 The lab manager or designee assigns a trainer who is experienced in the method which is going to be taught and who is currently certified in that method, to train the trainee.

6.1.2 Using a written SOP, the trainer explains each section of the method to the trainee such that both are confident that the details of the method are understood by the trainee.

6.1.3 The trainer and the trainee document this understanding in Section 1 of the Analyst Training Form (Attachment 1). Both should initial each section in the spaces provided on the form. If a section does not exist in the method, write "N/A" in the initials space.

6.1.4 The trainer demonstrates the method to the trainee by analyzing appropriate training samples and generating at least three sets of valid non-zero analytical data. Appropriate training samples include initial multipoint calibrations, CCSs, duplicate "non-zero" samples (samples which contain detectable quantities of analyte), matrix

spiked samples, matrix spike duplicates, etc., with the condition that such are specifically called for in the SOP. Special certification samples provided by the Tech Center which contain known quantities of analyte(s) are also acceptable as training samples. All analytical data generated during the demonstration of the method must meet the acceptance criteria as set forth in the QC section of the SOP to be acceptable for training. This demonstration of the method by the trainer to the trainee shall be documented in Section 2 of the Analyst Training Form. The analytical data generated shall be attached to the form and the results recorded in Section 3.

6.1.5 The trainee then performs the method by repeating the same three sets of analyses performed by the trainer and under the observation of the trainer. The results must be within the method control limits as specified in the SOP to be acceptable for analyst certification. The analytical results generated by the trainee shall also be recorded in section 3 and attached to the Analyst Training Form.

6.1.6 The Analysts Training Form is forwarded to the laboratory manager or his/her designee for evaluation. Depending on the results of the evaluation, the laboratory manager or designee either certifies the trainee, establishing that the trainee is capable of performing the method correctly and independently, or schedules additional training to achieve analyst certification.

6.1.7 The results of any additional training shall also be attached to the Analysts Training Form.

6.1.8 Steps 6.1.6 and 6.1.7 are repeated until the trainee achieves certification on the method. This initial training certification is valid for one year unless a new revision of the method is promulgated before the end of that one year period.

6.2 ANNUAL RETRAINING

6.2.1 Annual retraining/recertification is performed in situations where the analyst has previously been trained on the method, i.e. has had an initial training. Recertification of all analysts is required annually on all methods the analyst is required to perform.

6.2.2 The lab manager or designee assigns a trainer who is currently certified to perform the method to train the trainee.

6.2.3 The trainee reviews each section of the method and documents this review in Section 1 of the Analyst Retraining Form (Attachment 1).

6.2.4 For recertification, the QC data which is being generated on a daily basis can be used to document that the analyst can meet the precision and accuracy requirements as set forth in the method. The trainer shall observe the trainee performing one of the required QC analyses and the results shall be documented in Section 2 of the Analyst Retraining Form.

6.2.5 The results generated from the analysis of two other unobserved sets of QC data performed by the trainee shall be recorded in Section 3 of the Analyst Retraining Form.

6.2.6 The Analyst Retraining Form is forwarded to the laboratory manager or his/her designee for evaluation. Depending on the results of the evaluation, the laboratory manager or designee either certifies the trainee, establishing that the trainee is capable of continuing to perform the method independently and correctly, or schedules additional training to achieve analyst recertification.

6.2.7 The results of any additional training shall be attached to the Analyst Retraining Form.

6.2.8 Steps 6.2.6 and 6.2.7 are repeated until the trainee has been recertified on the method. This retraining certification is valid for one year unless a new revision of the method is promulgated before the end of that one year period.

6.3. INITIAL PARTIAL TRAINING

6.3.1 The laboratory manager or designee assigns a trainer who is currently fully certified (as opposed to partially certified) in the method to train the trainee.

6.3.2 Using a written SOP, the trainer explains the appropriate sections of the SOP to the trainee such that both are confident that the trainee understands the details of those portions of the method which (s)he will be required to perform. It is mandatory to cover The Scope & Application and Safety & Waste Handling sections of the SOP as well as any pertinent deviations.

6.3.3 The trainer and trainee document this understanding by completing Section 1 of the Analyst Partial Training Form (Attachment 1) by listing each section of the SOP that was covered. Both trainer and trainee should initial each section covered in the spaces provided on the form.

6.3.4 The trainer demonstrates the method to the trainee by preparing and analyzing three sets of non-zero analytical data and (where applicable) a method blank. To use the previous example, where the analyst is being trained on only the prep portion of SOP 9202, the preparation of a method blank, a positive (non-zero) "production" sample, a matrix spike, and a matrix spike duplicate would be appropriate. All analytical data generated during the demonstration of the method must meet the acceptance criteria as set forth in the QC section of the SOP to be acceptable for training. This demonstration of the method by the trainer to the trainee shall be documented in Section 2 of the Analyst Partial Training Form. The analytical data generated shall be attached to the form and the results recorded in Section 3.

6.3.5 The trainee then performs the method by repeating the same three preparations and/or analyses demonstrated by the trainer and under the observation of the trainer. In the case where the analyst is being trained on preparation procedures only, these samples will be analyzed by the trainer (who, as was noted above, is fully certified in all sections of the method). The analytical results generated by the trainee must be within the method control limits as specified in the QC section of the SOP to be acceptable for analyst partial certification. The results generated by the analysis of the samples prepared by the trainee shall also be recorded in Section 3 and attached to the Analyst Partial Training Form.

6.3.6 The Analyst Training Form is forwarded to the laboratory manager or his/her designee for evaluation. Depending on the results of the evaluation, the laboratory manager or designee either certifies the trainee, establishing that the trainee is capable of performing those sections of the method independently and correctly, or schedules additional training to achieve analyst certification.

6.3.7 The results of any additional training shall also be attached to the Analyst Training Form.

6.3.8 Steps 6.3.6 and 6.3.7 are repeated until analyst partial certification is achieved. This initial partial certification is valid for one year unless a new version of the method is promulgated before the end of that one year period.

6.4 ANNUAL PARTIAL RETRAINING

6.4.1 Annual partial retraining/recertification is performed in situations where the analyst has previously been partially trained on the method, i.e. has had an initial partial training. Partial (or full) recertification of all analysts is required annually on all methods the analyst is required to perform.

6.4.2 The lab manager or designee assigns a trainer who is currently fully certified (as opposed to partially certified) to perform the method to train the trainee.

6.4.3 The trainee reviews each section of the SOP pertinent to his/her partial certification and documents this review in section 1 of the Analyst Partial Retraining Form (attachment 1).

6.4.4 For recertification, the QC data which is being generated (partially) by the analyst on a daily basis can be used to document that the analyst can meet the precision and accuracy requirements as set forth in the method. The trainer shall observe the trainee partially performing one of the required QC analyses and the results shall be documented in section 2 of the Analyst Partial Retraining Form.

6.4.5 The results generated from the analysis of two other unobserved sets of QC data partially performed by the trainee shall be recorded in section 3 of the Analyst Partial Retraining Form.

6.4.6 The Analyst Partial Retraining Form is forwarded to the laboratory manager or designee for evaluation. Depending on the results of the evaluation, the laboratory manager or designee either certifies the trainee establishing that the trainee is capable of continuing to partially perform the method independently and correctly, or schedules additional training to achieve analyst partial recertification.

6.4.7 The results of any additional training shall also be attached to the Analyst Partial Retraining Form.

6.4.8 Steps 6.4.6 and 6.4.7 are repeated until the trainee has been partially recertified on the method. This partial retraining certification is valid for one year unless a new revision of the method is promulgated before the end of that one year period.

ATTACHMENT 1

ANALYST TRAINING FORM

Trainee: _____ Analysis: _____

Method: _____

Trainer: _____ Revision: _____

1. The following sections of the method were explained by the Trainer and understood by the Trainee:

	Trainer	Trainee
Scope & Application	_____	_____
Safety & Waste Handling	_____	_____
Summary of Method	_____	_____
Sample Handling & Pres.	_____	_____
Interferences	_____	_____
Apparatus	_____	_____
Reagents	_____	_____
Preventive Maintenance	_____	_____
Trouble Shooting / Corrective Action	_____	_____
Quality Control	_____	_____
Procedure	_____	_____
Calculations	_____	_____
References	_____	_____
Attachments	_____	_____
Deviations _____	_____	_____

2. Trainee observed analysis performed by Trainer:

_____ _____

3. Trainee repeats analysis. Comparative results:

Sample Type/ID	TRAINER RESULTS	TRAINEE RESULTS
_____	_____	_____
_____	_____	_____
_____	_____	_____

ANALYST CERTIFIED TO PERFORM METHOD ON: _____ **BY:** _____

(Attach all pertinent analytical data)

ANALYST PARTIAL TRAINING FORM

Trainee: _____ Analysis: _____

Method: _____

Trainer: _____ Revision: _____

1. The following sections of the method were explained by the Trainer and understood by the Trainee:

	Trainer	Trainee
Scope & Application	_____	_____
Safety & Waste Handling	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
Deviations _____	_____	_____

2. Trainee observed method performed by Trainer:

_____ _____

3. Trainee repeats analysis. Comparative results:

Sample Type/ID	TRAINER RESULTS	TRAINEE RESULTS
_____	_____	_____
_____	_____	_____
_____	_____	_____

ANALYST CERTIFIED TO PERFORM METHOD ON: _____ **BY:** _____

(on above sections only)

(Attach all pertinent analytical data)

ANALYST PARTIAL RETRAINING FORM

Trainee: _____ Analysis: _____

Method: _____

Trainer: _____ Revision: _____

1. The following sections of the Method were reviewed and understood by the Trainee:

	Trainee
Scope & Application	_____
Safety & Waste Handling	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
Deviations _____	_____

2. Trainer observed Trainee perform a QC procedure:

QC Type/ID	Date	Trainee Result	Trainer Approval
_____	_____	_____	_____

3. Unobserved QC results:

QC Type/ID	Date	Result	Trainee
_____	_____	_____	_____
_____	_____	_____	_____

ANALYST RECERTIFIED ON: _____ **BY:** _____

(on above sections only)

ANALYST PARTIAL RETRAINING FORM

Trainee: _____ Analysis: _____

Method: _____

Trainer: _____ Revision: _____

1. The following sections of the Method were reviewed and understood by the Trainee:

	Trainee
Scope & Application	_____
Safety & Waste Handling	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
Deviations _____	_____

2. Trainer observed Trainee perform a QC procedure:

QC Type/ID	Date	Trainee Result	Trainer Approval
_____	_____	_____	_____

3. Unobserved QC results:

QC Type/ID	Date	Result	Trainee
_____	_____	_____	_____
_____	_____	_____	_____

ANALYST RECERTIFIED ON: _____ **BY:** _____

(on above sections only)

APPENDIX F

PROJECT MANAGEMENT TEAM
PHASE II/III RCRA FACILITY INVESTIGATION
SAFETY-KLEEN CORP. RECYCLE CENTER
DOLTON, ILLINOIS

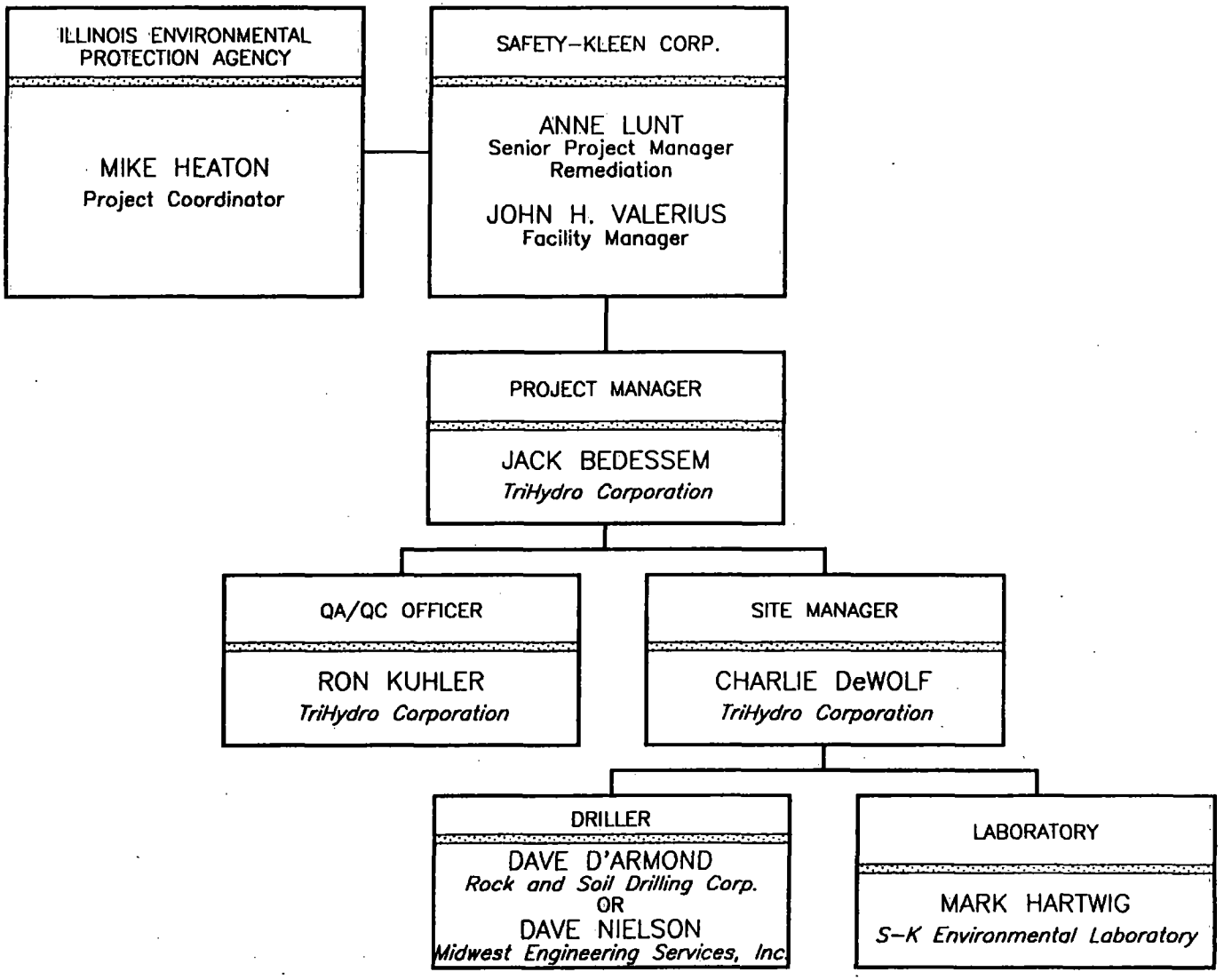

FIGURE F-1 :PROJECT MANAGEMENT TEAM, PHASE II/III RCRA FACILITY INVESTIGATION, SAFETY-KLEEN CORP. RECYCLE CENTER, DOLTON, ILLINOIS

SKDIMGN2

APPENDIX G

TRIHYDRO CORPORATION
GROUND-WATER MONITORING PROCEDURES
PHASE II/III
SAFETY-KLEEN CORP. RECYCLE CENTER
DOLTON, ILLINOIS
RCRA FACILITY INVESTIGATION WORKPLAN

PROJECT: 010

TRIHYDRO CORPORATION

GROUND-WATER MONITORING PROCEDURES MANUAL

October 1993

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Introduction

Success in compliance with the regulatory ground-water monitoring programs will depend in part on the ability to provide reliable water level and water quality data. Many of the routine sampling procedures have been monitored by the EPA and various state environmental regulatory agencies.

All employees involved in ground-water sampling projects are required to review this procedures manual before sampling to ensure the continued generation of reliable data. These procedures are based on experience gained from collecting thousands of ground-water samples and the latest information available in guidance manuals. This manual may be updated as additional experience and information are acquired.

Pre-Field Activities

Several activities are conducted prior to departure for the project site. A project team is assigned and the members begin coordinating the sample collection event with the client(s) and laboratory. Field equipment is checked and organized. Pertinent Health and Safety criteria are reviewed, and a Health and Safety Plan may be developed. Monitoring well access is checked, and provisions are made to pack the necessary equipment and well keys for delivery to the project site.

Project Team

Water quality project teams will consist of the project director, the sampling supervisor, and field team members. The qualifications and responsibilities of individual project team personnel are:

1. Project Director

    a. Schedule sampling events;

    b. Assign qualified personnel to the field team;

    c. Monitor sampling activities (calls from field personnel, etc.); and

    d. Management of report preparation.

2. Sampling Supervisor

a. Qualified chemist;

b. Knowledgeable in sampling techniques;

c. Knowledgeable in operation and maintenance of instruments;

d. Knowledgeable about site safety plan and procedures; and

e. Responsible for:

i. Logging data;

ii. Shipping samples;

iii. Chain-of-custody/sample-analysis-request forms;

iv. Laboratory contact;

v. On-site client contacts;

vi. Assigning field team members' responsibilities and overall supervision;

vii. Preparations for sampling event; and

viii. Ensuring the proper equipment is available and operating.

3. Field team members

a. Knowledgeable in sampling techniques;

b. Able to calibrate and operate instruments properly;

c. Log data acquired during sampling; and

d. Assist the sampling supervisor as necessary.

Preparation

The TriHydro sampling supervisor will review the current sampling and analysis plans and assessment reports to determine if any plans or reports need to be brought to the site during monitoring. The sampling supervisor will also evaluate whether any changes have been made in the sampling and

analytical procedures, and if any groups need to be contacted about split sampling.

The sampling supervisor will review available water quality and water level data before leaving for the sampling site. This preparation ensures that the proper equipment and personnel are available at the site.

All monitoring equipment will be inspected prior to departure, ensuring that it is in proper working order. The specific conductance and pH meters should be operated and standardized before going to the field.

Equipment Inventory

The following equipment and supplies are available for ground-water monitoring:

1. Water Level Measurements

   - Well and gate keys
   - Actat M-scope (if hydrocarbon contamination is not expected)
   - Oil/Water Interface Probe (if hydrocarbon contamination is expected)
   - Steel Tape and Hydrocarbon Paste
   - Gloves

2. Hydrocarbon Thickness Measurements

   - Well and gate keys
   - Oil/Water Interface Probe
   - Steel Tape and Hydrocarbon Paste
   - Gloves

3. Water Quality Monitoring

   - Well and gate keys
   - Bailers - PVC, teflon, and/or stainless steel (select proper type, diameter, and length)

- Bladder pump, logic unit, sample line, airline, regulator, and pressure source (pump or nitrogen tank)
- Rope and cable for sampling devices
- Detergent or solvent for cleaning bailers
- Bailer winch and pipe vice
- Tarps
- Separatory funnel
- Blank PVC casing with bottom cap for discrete fluid sample collection
- Gloves
- Buckets for water disposal
- pH meter, probe, and two buffer solutions
- Conductance meter and probe
- Thermometer or temperature probe
- Glass or plastic beaker for field analyses
- Filtration unit, appropriate filters, regulator, and pressure source (pump or nitrogen tank)
- Sample bottles and preservatives
- Coolers and bagged ice or Blue Ice
- Distilled water and squirt bottles
- Brushes dedicated for decontamination
- Decontamination containers dedicated for wash, rinse 1 and rinse 2
- Bailer storage bags
- Chain-of-custody/sample-analysis-request forms

4. Safety Equipment

- Health and Safety Plan
- Hard hats

- Goggles or safety glasses
- Gloves
- Tyvec suits and booties
- Appropriate shoes or boots
- Respirators with appropriate cartridges
- Explosimeter and/or organic vapor meter
- First-aid kit

Selection of Sampling Equipment

Various sample collection equipment will be used, dependent on the constituents monitored. The following sampling devices are available:

1. Gas-operated teflon bladder pump with adjustable flow
2. Double and single check valve teflon bailers
3. Single check valve stainless steel bailers
4. Submersible pumps with teflon impellers and dedicated discharge tubing

The selection of teflon or stainless steel depends on the constituents of principal interest: teflon is the preferred choice when inorganic constituents (including metals) are of principal interest, and stainless steel is the preferred choice when organic constituents are of principal interest. PVC bailers will be used for evacuating wells prior to sampling, but equipment of PVC construction will not be used for the actual sampling.

Safety Procedures

The sampling supervisor will review all available data and determine the possible health and safety hazards at the site. He or she will prepare a Health and Safety Plan (if determined by the sampling supervisor to be necessary), and make copies of the Plan available to all field team members. He or she will inform all field team members immediately before monitoring of the kinds of contaminants found or expected to be found at the site, and the possible hazards.

The sampling supervisor will be responsible for bringing the appropriate safety equipment to the monitoring site. All field team members will be knowledgeable in the operation of safety equipment he or she will be using. Each field team member is responsible for (1) bringing appropriate safety equipment to each well during monitoring, (2) making it immediately available for use, (3) recognizing safety or health hazards, and (4) undertaking the appropriate safety precautions.

The field team will consist of a minimum of two people at or in the general vicinity of the sampling site. If a field team member will be out of visual contact with the other member(s) of the sampling party, he or she will inform the sampling supervisor of his/her location before heading to the monitoring site.

Access Control

Various protective measures for limiting access to ground-water monitoring wells are employed. Access to individual monitoring wells is controlled by one or more of the following methods:

1. Oversize above-ground protective steel casing with locking lid;

2. Flush mounted well boxes with locking lids and seated box covers; or

3. Wells installed in a controlled access area (i.e., inside the perimeter of a fenced area with locking gates).

The measures listed above ensure only authorized personnel will have access to the monitoring well network. Well keys are retained by the client (e.g., property owner and/or lease holder), project director, and other authorized personnel.

Sample Collection

Activities conducted during a sample collection event include monitoring of fluid levels, well preparation, and sample collection. If immiscible fluids are present and discrete fluid samples are required, the non-aqueous samples are collected prior to well preparation. The procedures for sample collection, listed in order of implementation, are:

1. Fluid level measurements;

2. Collection of immiscible fluids;

3. Well preparation;

4. Sample withdrawal;

5. Field analysis; and

6. Filtration.

Water Level and Hydrocarbon Thickness Measurements

Fluid level data are collected every time that a water quality monitoring event takes place, to determine the horizontal and vertical ground-water flow gradients. Water level and hydrocarbon thickness measurements are collected prior to preparing the well for sample collection. The total depth of the well is periodically measured to determine if the well is silting in and needs to be rehabilitated or replaced. The total depth of the well is needed as well as the water level in order to calculate the volume of standing water in the casing. This ensures that the proper volume of water will be evacuated to provide a sample representative of formation fluids.

In wells with no light immiscible phase (i.e., hydrocarbon floating on the water), an electronic measuring device, such as Actat M-scope, is used to measure the depth to the surface of the ground water. When the signal has tripped, the probe is slowly lowered and raised to accurately identify the water surface. These measurements are recorded to the nearest 0.01 foot. The point of reference is marked on the north side of the well casing, unless otherwise specified.

In wells with light and/or dense phase immiscible layers, an electronic oil/water interface probe is used to determine the interfaces of the immiscible layers (i.e., air to light immiscible, light immiscible to water, and water to heavy immiscible). As the interfaces are detected, the probe is slowly lowered and raised to ensure accurate measurement of the interface. These measurements are recorded to the nearest 0.01 foot. The point of reference is marked on the north side of the casing, unless otherwise specified.

All measurements during a particular monitoring event are made to the designated reference points with the same instrument, to ensure internal consistency. The vertical reference points (i.e. north side top of casing) are established by a licensed surveyor or under supervision of a professional engineer in relation to the nearest permanent benchmark (i.e., USC and GS, USGS, or NGVD). The horizontal well coordinates are established by marking distances in reference to the

project site plan in triangulation or by surveying in reference to the nearest permanent benchmark.

Collection of Immiscible Fluids

If separate phase sampling is required, immiscible fluids (either "floaters or sinkers") are collected prior to well preparation. The presence of an immiscible fluid layer is detected as outlined in the previous section "Water Level and Hydrocarbon Thickness Measurements." The type and measured thickness of an immiscible fluid layer determines which procedures to follow for collection of discrete fluid samples.

The bailer and rope lengths are measured prior to the sample collection. In wells with light phase immiscible fluids, a top-loading or bottom flow control bailer may be used for sample collection. A separatory funnel or control-flow bottom emptying device can be utilized to separate the immiscible fluid from ground water collected when a thin immiscible fluid layer is present.

Dense phase immiscible fluids are collected by lowering a bottom-loading bailer below the depth the dense phase immiscible layer is detected. A separatory funnel or control-flow bottom emptying device can be utilized to separate the immiscible fluid and ground water collected when a thin immiscible fluid layer is present.

Well Preparation

The column of standing fluid, calculated based on the fluid level and total casing depth, is used to determine the volume of water to be removed from the well for development. A minimum of three times the calculated well casing volume is evacuated from a well, except when slow recovery is encountered due to low formation permeability. Contaminated ground water produced during well development should be discharged to the nearest waste disposal, recycling, or treatment facility, or stored in drums until it can be transported to an approved disposal, recycling, or treatment facility.

If the well is incapable of yielding three times the casing volume, it will be evacuated to dryness. When the well recovers sufficiently, a sample is checked for pH, conductivity, and temperature, and the samples are then collected. After sample collection, a final check of pH, conductivity, and temperature is made to verify water quality stability.

All well development data are recorded in the supervising sampler's field log book. In the event more than one sampling

team is onsite, data logged in the technician's log book will be transferred to the supervisor's notebook.

Sample Withdrawal

To ensure the ground-water sample from a well is representative of the formation, physical and chemical alteration must be minimized during sampling. The following measures are taken to accomplish this:

1. Appropriate construction materials for sampling devices (see "Selection of Sampling Equipment"); and

2. Equipment blanks and thorough decontamination of field equipment between wells to ensure no cross contamination occurs (see "Decontamination Procedures Between Wells") if non-dedicated sampling equipment is used.

Ground-water samples are collected in order of decreasing volatility of the constituents being analyzed. A collection order for some common constituents follows:

1. Volatile organics (VOA)
2. Purgeable organic carbon (POC)
3. Purgeable organic halogens (POX)
4. Total organic halogens (TOX)
5. Total organic carbon (TOC)
6. Extractable organics
7. Total metals
8. Dissolved metals
9. Phenols
10. Cyanide
11. Major ions
12. Turbidity
13. Nitrate and ammonia
14. Radionuclides

The exception to this collection order occurs if the well produces lots of sediment. The samples for total and dissolved metals analyses can be moved up in the collection order so that the sediment does not make field filtration impossible or cause false conclusions about metals content in ground water.

Sample agitation is minimized by slowly lowering the sampling device into the well and transferring slowly from the sampling device to the sample container. The sample bottles should be filled to minimize headspace and all air bubbles must be eliminated from the final VOA sample.

With the exception of discrete-phase sampling when multiple phases are present, no intermediate containers will be used to handle ground-water samples, and samples will be transferred directly from the sampling device to sample containers. In the case where discrete sampling is required in a multiple-phase situation, one of the three following mechanisms will be selected to collect the aqueous phase:

1. Bottom-loading bailer equipped with a control-flow device.

2. Secondary sampling casing installed in the well such that light immiscible phases are isolated from the water column.

3. Separatory funnel used to decant the ground-water sample from the immiscible phase.

Selection of one of the above methods depends on field conditions and will be made appropriately such that consistency is maintained.

Samplers will wear clean gloves at each well, in order to prevent contamination of equipment and samples with the hands. Two field personnel are recommended for filling sample containers. One person handles the rope and bailer, and the other person handles the container.

Field Analyses

Specific conductance, pH, and temperature are measured at the time the well is sampled. The measurement procedures are:

1. The pH meter should be calibrated using National Bureau of Standards (NBS) approved buffers. Unless acidic conditions are anticipated, pH 7 and pH 10 buffers are used to calibrate the meter. Check the meter for specific calibration instructions.

2. After well preparation, collect some of the water being sampled in a beaker. Place the clean conductivity and temperature probes (or thermometer if the temperature probe is not available) in the beaker and gently swirl. Select the range on the conductivity meter that is approximately twice your reading (i.e., the reading is 980 μmhos, so the range selected would be 0-2,000 μmhos). Allow 30 seconds for equilibration, swirl the probes, and record the temperature and conductivity in the field log book.

3. Place the clean pH probe in the beaker used for conductivity and temperature, and gently swirl. Allow 30 seconds for equilibration, read the pH, and record in the field log book.

Additional unstable water quality constituents measured in the field at the time of collection may include redox potential, dissolved oxygen, chlorine, and turbidity. If required, these parameters will be measured in the field with appropriate equipment (specific ion electrodes, for example).

Filtration

To minimize chemical changes of ground-water samples, filtration should be done within 10 minutes of sampling. Samples are transferred directly from the sampling device to the filtration device. Filtration will only be performed on samples collected for dissolved constituent analysis.

All ground-water samples are filtered with nitrogen or argon. Pore size of the filters is 0.45 micron. Samples which are filtered must be marked as such on the labels on the sample bottles.

The filter chamber should be thoroughly rinsed out with distilled water and decontaminated according to "Decontamination Procedures Between Wells" of this manual. The chamber needs to be rinsed with a small amount of sample, and approximately 50 ml of sample needs to be pushed through the filter before the filtrate is allowed to run into the sample bottle. The filter should be handled with tweezers to prevent contamination.

Observation should be made during filtration, including rate of filtration, color changes in the sample or filtrate, degassing, etc. Observations should be recorded in the field log book.

Sample Preservation and Handling

Laboratories are required to add the preservative to the sample bottles before they are shipped to the field, because the preservatives are more easily contaminated in the field. All samples are collected and preserved, and holding times followed in accordance with protocol as listed in Table 2-21 of the 3rd Ed. of "Test Methods for Evaluating Solid Waste" EPA SW-846 (SW-846, Revision 1, July 1992). Samples are not transferred from one container to another. The sample container type is noted in reference to the recommendations for sample container type by analysis listed in SW-846.

The sample containers are stored on ice in a cooler for delivery to the laboratory. The organization of sample containers either by sample location or analyses may be appropriate. Glass containers should be protected against breakage during transport to the laboratory. Provisions should also be taken to minimize the possibility of samples freezing during transport.

Chain-of-Custody Control

A record of sample possession from "cradle to grave" is kept in project files. The sample tracking starts with the sample container label. Information provided on the sample label should be complete and accurate. A copy of the chain-of-custody/sample-analysis-request forms should accompany each batch of sample containers from project site to the laboratory.

Sample Label

The information which should appear on the sample container label includes:

1. Sample identification number _____
2. Project number _____
3. Place of collection _____
4. Date and time of collection _____
5. Personnel collecting the sample _____
6. Preservative _____

Chain-of-Custody/Sample Analysis Request Forms

All samples are accompanied by chain-of-custody/sample-analysis-request forms (Figure 1 or equivalent). The sampling supervisor is to keep a copy of this form. Samples are ideally sent to the laboratory on the day of sampling. The laboratory is called at the time of shipment and informed of carrier, arrival time, and location.

Custody Seal

When the samples leave custody, the shipping container is sealed with a custody seal to ensure that the samples have not been disturbed during transportation to the laboratory. The personnel receiving the coolers are to note the condition of the seal and the sample containers within.

If the client prefers, individual sample containers can be provided with custody seals prior to placement in the shipping container for added assurance of sample integrity.

Analytical Methods

The sampling supervisor, in conjunction with the laboratory, will select the appropriate methods based on relevant regulations and guidance, desired detection limits, and laboratory capability. Analytical methods may be selected from "Standard Methods for the Examination of Water and Wastewater," SW-846 (Revision 1, July 1992), "Methods for Chemical Analysis of Water and Wastes" (EPA-60-4-79-020), as well as various American Society of Testing and Measurements (ASTM) procedures. When situations are encountered where the above methodologies are not applicable, methods will be selected which reflect industry standard procedures. In some instances, redundant methodologies (e.g., oil and grease and total petroleum hydrocarbons) may be appropriate. These decisions should be made in consultation with the sampling supervisor, the client, and, if appropriate, governmental agencies.

Of critical importance in selecting an analytical method is the expected detection limit, which must be equal to or lower than the relevant ground-water standard, cleanup level, or other appropriate measure of water quality. Expected detection limits are provided in the references of analytical methodology or at 40 CFR Part 264, Appendix IX.

CHAIN-OF-CUSTODY RECORD

Page _____ of _____

Project No.:	Today's Date:	Date Results Requested:	Analyses Requested
Sampler's Name:	Phone No.: 307-745-7474	Fax No.: 307-745-7729	
Company Name and Address: TriHydro Corporation 920 Sheridan Laramie, WY 82070	Company Contact:		

Collector's Sample No.	Sample Matrix	Date Sampled/ Time Sampled	No. of Containers

Remarks:

Relinquished by:	Affiliation:	Date/Time:	Received by:	Affiliation:	Date/Time:
Relinquished by:	Affiliation:	Date/Time:	Received by:	Affiliation:	Date/Time:
Relinquished by:	Affiliation:	Date/Time:	Received by:	Affiliation:	Date/Time:

Were samples received in good condition?	Remarks:

FIGURE 1 : CHAIN-OF-CUSTODY / SAMPLE ANALYSIS REQUEST FORM

Field QA/QC Procedures

The procedures outlined below are followed by field team members to ensure the collection of reliable data during the ground-water monitoring event. The various samples which can be prepared and submitted for QA/QC analysis in addition to the well samples are also described.

Potential Contamination from Ground Surface Contaminants

During evacuation and sampling of ground-water monitoring wells, certain measures are employed to reduce the potential for ground surface contamination of sampling equipment. A dedicated plastic apron is placed around the casing and the immediate area to reduce the chance of sampling equipment contacting the ground surface. Care is taken to prevent contact of ropes and tubing with the ground. In the event that equipment must be laid down, the apron provides a contaminant-free area.

Field Observations

Field observations are critical in the verification and interpretation of laboratory data. Field observations during well preparation and sampling are recorded in the field log book. The following observations should be noted in field books:

- Color
- Amount and type of sediment
- Degassing
- Hydrocarbon film
- Approximate water level elevations during well preparation and sampling
- Approximate rate of recharge
- Volume of water evacuated
- pH
- Specific conductance
- Temperature

- Miscellaneous conditions which the sampler finds noteworthy

All field monitoring equipment is calibrated daily according to procedures outlined in SW-846. The specific conductance meter is checked with a standardized solution before each sampling trip. The pH meter is calibrated with two buffers at the beginning of each day and checked with two buffers periodically during the day. Additionally, the calibration is checked with a single buffer before each measurement.

Water chemistry field parameters are measured in a dedicated container. For specific conductance measurements, the glass probe must be used when there is organic contamination. The other probes can be used if no organic contamination is present.

Blanks, Spikes, and Duplicate Samples

The integrity of the samples are ensured by preparing one or more of the following quality control samples (if necessary). The QA/QC samples and frequencies described below are consistent with the TEGD and SW-846 (Revision 1, July 1992), which are guidance documents for RCRA projects:

1. Trip Blank - Fill one of each type of sample bottle with an organic or aqueous solution free of any analytes of interest, transport to the site, handle like a sample and return to the laboratory for analysis of volatile organic compounds. This sample set remains sealed until analysis. One trip blank is recommended per sampling day, with a minimum of one per 20 samples.

2. Equipment Rinsate Blank - To ensure decontamination is properly executed, an aqueous or organic solution free of any analytes of interest is poured through the sampling equipment, transferred to sample bottles and sent to the laboratory for the same analyses as the environmental samples. One equipment rinsate blank is recommended for each type of sampling equipment employed at a frequency of one per sampling day, with a minimum of one per 20 samples. An equipment rinsate blank will be prepared with every 10% of daily bailer uses.

3. Blind Duplicate - To ensure contract laboratory accuracy, two separate samples are collected in the field from the same source at the same time. One sample set is labelled with the monitoring well's nomenclature and one set is labelled with alternate

nomenclature. One blind duplicate is recommended every sampling day, with a minimum of one per 20 samples. Blind duplicates are analyzed for the same constituents as the environmental samples. 10% of all ground-water samples collected will be blind duplicates.

4. Field Blank - To ensure laboratory accuracy, one field blank per day will be collected. A field blank is collected by filling a set of sampling containers with an aqueous or organic solution free of the analytes of interest. A field blank is analyzed for the same constituents as the environmental samples.

5. Matrix Spike - For each sampling batch of 20 samples or less, enough volume should be collected for at least one sample so as to allow the laboratory to prepare one matrix spike and either one matrix duplicate or one matrix spike duplicate for each analytical method employed.

Decontamination Procedures Between Wells

Any time monitoring equipment is transferred from one well to another, the following decontamination procedures will be followed:

1. Wash in two separate dedicated containers of an organic detergent/solvent with vigorous brushing inside and out. Remove the check valves on bailers to ensure total decontamination.

2. Wash with a pressurized spray of tap water or rinse in a dedicated container of tap water.

3. Rinse in one dedicated container of distilled water.

4. Repeat the process if the bailer feels greasy, has particulate matter attached to it, or is stained.

Acceptable organic detergents and solvents are Simple Green, hexane, acetone, and methanol. Care must be taken that the cleaning agent does not contain constituents to be monitored in the samples.

Disposable items such as bailer rope and sampler's gloves are never transferred from one well to another. If any of the equipment cannot be decontaminated to the point it does not feel greasy, is stained, or has particulate matter attached, it should be discarded.

Laboratory QA/QC Procedures

The QA/QC program employed by the contract laboratory will be evaluated by the sampling supervisor to ensure the quality of analytical data generated. The guidelines used will depend on project needs and client direction, but will generally follow SW-846 or TEGD protocol if appropriate. The use of sufficient blanks, duplicates, and spike samples to detect erosion in the quality of analytical data will be employed as determined necessary. In all cases, it must be remembered that the analytical data could be involved in litigation. If the quality of the analytical data cannot be defended, the data will most likely be inadmissible as evidence. Specific guidelines which will be followed by the laboratory are:

1. Holding Times - Samples will be analyzed within a time period beginning on the day the sample was collected and specific to the type of analysis performed. Holding times should be consistent with Table 2-21 of the 3rd Edition of SW-846 (Revision 1, July 1992). It is the responsibility of the laboratory to meet these time constraints.

2. Reagent Blanks - Reagent blanks will be run periodically with samples in order to detect contamination within the laboratory. These blanks will be prepared and analyzed in accordance with the laboratory standard operating procedures (SOPs).

3. Surrogate Compounds - To determine whether lab instrumentation is detecting compounds present and accurately determining their concentrations, surrogate compounds are added to the samples in known concentrations. The reported concentrations of the surrogates must be within certain limits set by the EPA. The procedures and control limits will be specified in the laboratory SOPs.

4. Duplicate Samples - If determined necessary, duplicate samples will be collected for 10% of the water samples, and sent to a separate laboratory as a laboratory QA check. Samples to be duplicated will be chosen randomly. The samples and the duplicate sample will be analyzed for the same parameters by the same methods.

Audit Procedures

The sampling supervisor will monitor and audit the performance of the QA procedures outline in this plan. The sampling supervisor will conduct field and office audits which will ensure that the activities are being performed as described in the plan. This ensures that the information being gathered is reliable and of good quality.

Field Audits

The sampling supervisor will schedule audits of field activities at various times to evaluate the execution of sample identification, sample control, chain-of-custody (COC) procedures, field documentation, instrument calibration and field measurement and sampling operations. The evaluation is based on the extent to which the applicable field procedures and QA/QC procedures are being followed.

Field documents pertaining to sample identification and control will be examined for completeness and accuracy. Field notebooks and field data forms will be reviewed to see that all entries are dated and signed and the contents are legible and contain accurate and inclusive documentation of project activities. The field documents shall be written in indelible material or xerox-copied to create a permanent record.

The auditor will also check to see that COC procedures are being followed and that samples are being kept in custody at all time and are in sealed containers or a secure area to prevent tampering.

Sampling operations will be evaluated to determine if they are performed as stated in this plan. The auditor will perform spot checks to determine that the appropriate number of samples are being collected, samples are placed in proper containers, and proper preservations, packaging, and shipment protocols are being followed.

Field measurement activities will be evaluated to determine if they are performed according to QA/QC guidelines. The auditor will spot check documentation for various instruments to ensure that calibration requirements are met. In addition, spot checks of the techniques used by field personnel with these instruments will be performed to ensure that data are being collected adequately.

Office Audits

The project director will review product quality and will see that the project is performed in accordance with approved quality assurance procedures. Prior to the production of the draft document, all work products will undergo review by project staff from the technical disciplines involved in the work. This will include review of calculations, test analyses, field measurements, graphs, tables, computer inputs-outputs, all modeling data and modeling reports and any document which involves generating information from the field data.

Laboratory Audits

Laboratory audits will be performed as necessary.

Post-Field Activities

The sampling supervisor and field team members are responsible for several activities after the samples have been shipped to the laboratory. The post-field responsibilities include laboratory contact, record filing, and equipment checks.

Continued Supervision

The sampling supervisor should call the laboratory on the day the samples are due to arrive at the laboratory to ensure that they have in fact arrived. The sampling supervisor should call the laboratory periodically to make sure that samples are being analyzed within the holding times listed in Table 2-21 of the 3rd Ed. of SW-846 (Revision 1, July 1992).

Records

The sampling supervisor collects all pertinent field data (i.e., well development, chain-of-custody, analytical parameters, copies of field log book, etc.) and files it in the client job file immediately after returning from the field to aid in reviewing analytical laboratory data. The sampling supervisor also makes sure laboratory data are properly filed.

Equipment

Any equipment problems noted during sampling and not corrected in the field should be corrected upon return to the

office. Broken or contaminated equipment cannot be returned to storage.

Deviations from Sample Collection Procedures

The field sampling procedures listed above have been applied during the collection of thousands of ground-water samples and found to provide reliable data. However, the key to successful field work is to expect the unexpected. This manual cannot address every situation that may occur.

Experienced chemists supervise the collection of ground-water samples, and are relied on to identify and interpret critical situations in the field and to modify sampling procedures accordingly. Any deviations from the procedures outlined in this manual must be cleared with the client and noted in writing in the field log book.