RCRA FACILITY INVESTIGATION WORKPLAN
SAFETY-KLEEN SERVICE CENTER
5309 24TH AVENUE SOUTH, TAMPA, FLORIDA
EPA ID NO. FLD 980847271

PREPARED FOR:

SAFETY-KLEEN CORPORATION
1000 North Randall Road
Elgin, Illinois 60123-7857

PREPARED BY:

ECT
Environmental Consulting & Technology, Inc.

5405 Cypress Center Drive
Suite 200
Tampa, Florida 33609
(813) 289-9338

Rick Stebnisky

Richard J. Stebnisky, P.G.
Senior Hydrogeologist

94321-1111

SEPTEMBER 1994

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Department of Environmental Protection
SOUTHWEST DISTRICT
BY ____________

safety-kleen®

August 31, 1994

Mr. G. Alan Farmer, Chief
RCRA Branch
Waste Management Division
U.S. Environmental Protection Agency
345 Courtland Street, NE
Atlanta, Georgia 30365
ATTN: RCRA Permitting Section

RE: Safety-Kleen Corp. Facility, Tampa, Florida; EPA ID No. FLD 980 847 271
RFI Workplan

Dear Mr. Farmer:

Enclosed herewith are two copies of the RFI Workplan (Workplan) for the referenced facility. The Workplan has been prepared pursuant to the EPA letter dated June 6, 1994 and condition II.E.1.b of the facility's HSWA Permit. The workplan has been prepared to satisfy the requirements of condition II.E.1.c of the facility's HSWA permit.

I trust the Workplan, prepared by Environmental Consulting & Technology, Inc., meets your expectations and we look forward to receipt of favorable review comments. Should you or your staff have any questions or comments regarding this submittal, please call me at (813) 621-9200.

Cordially,

John G. Hodges, Jr., CHMM
Senior Project Manager-Remediation
5309 24th Avenue South
Tampa, FL 33619

RECEIVED
SEP 01 1994
Depar[illegible] Environmental Protection
SOUTHWEST DISTRICT
BY ____________

Enclosure(s)

c: FDEP SW Dist. Hazardous Waste Supervisor
Gary Long, S-K Elgin
Della Ridley, S-K Atlanta
Facility 999 File #1780, Tampa
Rick Stebnisky, ECT

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TABLE OF CONTENTS

TABLE OF CONTENTS
(Continued, Page 2 of 3)

TABLE OF CONTENTS
(Continued, Page 3 of 3)

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS

ASTM	American Society for Testing Materials
C	Celsius
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulation
cm	centimeter
ECT	Environmental Consulting & Technology, Inc.
EPA	Environmental Protection Agency
EPC	Environmental Protection Commission of Hillsborough County
ERM	Environmental Resources Management-South, Inc.
FDEP	Florida Department of Environmental Protection
FID	flame ionization detector
FR	Federal Register
ft	feet
ft-msl	feet above mean sea level
ft^2	Square feet
GC	gas chromatograph
HSP	health and safety plan
HSWA	Hazardous and Solid Waste Amendments
mL	milliliter
NIST	National Institute for Standards and Technology
PAH	polynuclear aromatic hydrocarbons
PVC	polyvinyl chloride
QA	quality assurance
QC	quality control

LIST OF ACRONYMS
(Continued, Page 2 of 2)

RCRA	Resource Conservation and Recovery Act
RFI	Resource Conservation and Recovery Act Facility Investigation
S-K	Safety-Kleen Corporation, Inc.
SOP	standard operating procedures
SOPQAM	Standard Operating Procedures and Quality Assurance Manual
SVOC	semivolatile organic compound
SWFWMD	Southwest Florida Water Management District
SWMU	Solid waste management unit
TCLP	toxicity characteristic leaching procedure
TRPH	total recoverable petroleum hydrocarbons
USGS	U.S. Geological Survey
VOC	volatile organic compound
μmhos	micromhos

1.0 INTRODUCTION

Safety-Kleen Corporation (S-K) owns and operates a service center facility located at 5309 24th Avenue South in Tampa, Hillsborough County, Florida. A site location map is provided in Figure 1.

Pursuant to the 1984 Hazardous and Solid Waste Amendments (HSWA) to the Resource Conservation and Recovery Act (RCRA), in December 1989, the U.S. Environmental Protection Agency (EPA) conducted a RCRA facility assessment (RFA) at the S-K Tampa facility (EPA, 1989a). The RFA identified 12 solid waste management units (SWMUs) at the facility as follows:

SWMU No.	Description
1	Service center drum storage area and associated trench
2	Drummed dry cleaning and paint waste unloading dock
3	Solvent return wet dumpsters (3)
4	Spill containment area below the fill shelters
5	Drum rinsing area
6	Waste solvent storage tank
7	Storm water ditch
8	Accumulation center drum storage area and associated trench
9	Drummed waste loading docks (3)
10	Drummed flammable waste storage room
11	Old dumping ground
12	Storm water retention pond

The SWMU location map prepared by EPA is shown in Figure 2. The RFA determined that no further action was required at SWMUs 1 through 10 and 12. In contrast, phase II sampling was recommended for SWMU 11, the "old dumping ground", even though the RFA reported that SWMU 11 is not a RCRA-regulated unit and no evidence of releases were reported for SWMU 11.

As a result of a meeting between EPA and S-K on April 5, 1994, and results of analysis of four soil samples submitted by S-K to EPA on January 28, 1993, the EPA requested by letter dated June 6, 1994 that S-K submit a RCRA Facility Investigation (RFI) Workplan for SWMU 11 pursuant to HSWA permit condition II.E.1.b. Accordingly, S-K submits this RFI Workplan for SWMU 11 pursuant to HSWA permit condition II.E.1.c.

Information regarding the facility's background and operation are provided in the RFA (Appendix A) and the Hazardous Waste Facility Operating Permit Application, revised in February 1993 by Environmental Resources Management-South, Inc. (ERM).

This RFI work plan has been prepared by Environmental Consulting & Technology, Inc. (ECT) in accordance with the HSWA permit, the RFI guidance document (EPA, 1989b), and the EPA Region IV Standard Operating Procedures and Quality Assurance Manual (SOPQAM) (February 1, 1991). Additionally, proposed Subpart S to Title 40 of the Code of Federal Regulation Parts 264, 265, 270, and 271 (40 CFR 264, 265, 270 and 271) (Federal Register [FR], July 27, 1990) was consulted to ensure consistency in the event proposed Subpart S is eventually promulgated.

As suggested by Section 3.1 of the RFI guidance document, the general strategy for this investigation consists of two elements described as follows:

- Section 2.0 of this work plan presents available data and a conceptual model of SWMU 11 that is used to plan the monitoring procedures presented in Section 3.0. This available information includes information on the unit, public record information on the potential for a release, aerial photography, and laboratory analyses for source characterization; and

- Sections 3.0 and 5.0 provide the procedures necessary to undertake sampling and analysis designed to verify whether a release has occurred, and to evaluate the nature, extent, and rate of migration of any verified releases.

Section 4.0 presents the Project Management Plan and Section 6.0 provides the Data Management Plan, both required by the HSWA permit.

All tables, figures, and appendices are included in the tabbed sections at the end of the text.

2.0 CURRENT CONDITIONS

2.1 HYDROGEOLOGIC SETTING

In Hillsborough County, Pliocene to recent-age sands of variable thickness overlie thicker sequences of Tertiary limestones, dolomites, and evaporites that were deposited on an ancient carbonate platform. This sequence of rocks is part of the Florida plateau that thickens and dips to the south and southwest in the Hillsborough County area (Menke *et al.*, 1961). The major hydrogeologic units contained within this sequence of rocks, in descending order, include the surficial aquifer system, the intermediate aquifer system, and the upper Floridan aquifer. These hydrogeologic units are described below and summarized in Figure 3.

2.1.1 SURFICIAL AQUIFER SYSTEM

The Quaternary Age surficial aquifer system consists predominantly of unconsolidated fine sands; interbedded clays, marl, shell, and/or limestone can also be present. This unit typically varies in thickness from approximately 25 to 50 feet (ft) in the county (Southwest Florida Water Management District [SWFWMD], 1988). Beneath the S-K facility, the surficial sediments may be approximately 15 to 30 ft thick, and local lithology tends to consist of fine, slightly silty, quartz sand with a layer of clayey sand to clay on top of a weathered limestone.

The surficial aquifer system is generally unconfined in Hillsborough County. The water table is relatively shallow and generally mimics the topography. Water table fluctuations are normally less than 5 ft during the year (SWFWMD, 1988). Although ground water flow direction in the surficial aquifer is affected by local topography, the general ground water flow direction is to the south and west (SWFWMD, 1988). Transmissivity varies from 200 to greater than 1,600 feet squared per day (ft^2/day) and the storage coefficient varies from 0.05 to 0.2 in Hillsborough County (SWFWMD, 1988). Reported horizontal hydraulic conductivity values for the surficial aquifer in west-central Florida vary from 0.028 ft/day to greater than 1,000 ft/day, whereas reported values for vertical hydraulic conductivity vary from 1.2×10^{-4} ft/day to 13 ft/day (SWFWMD, 1988). Aquifer test results in the Tampa Bay area commonly report hydraulic conductivity values from 1 to 20 ft/day (Vacher *et al.*, 1992).

2.1.2 INTERMEDIATE AQUIFER SYSTEM

The intermediate aquifer system includes all water-bearing units and confining units between the overlying surficial aquifer system and the underlying upper Floridan aquifer. Units comprising the intermediate aquifer system in west-central Florida range in age from Pleistocene to Miocene. Where present in Hillsborough County, the intermediate aquifer system is comprised of sandy clay, clay, and marl with discontinuous interbedded permeable sand, gravel, shell, and limestone (SWFWMD, 1988). The Hawthorn Group (Miocene Age) is the main water-bearing unit of the intermediate aquifer system. Thickness of the intermediate aquifer system in Hillsborough County varies from zero in the north to 300 ft in the southeast. The northeastern boundary of the intermediate aquifer system occurs near the S-K facility; therefore, this system is either thin or absent at the S-K facility.

2.1.3 UPPER FLORIDAN AQUIFER

The upper Floridan aquifer is principally middle Miocene to middle Eocene in age and consists primarily of limestone and dolomite. Stratigraphic units represented within this unit include, in descending order, the Tampa Member of the Hawthorn Group, the Suwannee Limestone, the Ocala Limestone, and the Avon Park Formation. The base of the upper Floridan aquifer is marked by the upper limit of an evaporite unit in the Lake City Formation. The Floridan aquifer varies in thickness in Hillsborough County from less than 1,000 ft in the north to over 1,200 ft in the south; it is approximately 1,100 ft thick beneath the S-K facility (SWFWMD, 1988).

Ground water flow direction within the upper Floridan aquifer in the vicinity of the facility varies seasonally and with pumping conditions, yet the predominant directions appear to be toward the west and south. Reported transmissivity values in the upper Floridan aquifer in Hillsborough County range from approximately 15,000 to 500,000 ft^2/day (SWFWMD, 1988). Reported storage coefficients for the upper Floridan aquifer in Hillsborough County range from 1×10^{-5} to 1×10^{-3} (SWFWMD, 1988). In the vicinity of the S-K facility, a transmissivity value of 160,000 ft^2/day has been reported (SWFWMD, 1988).

2.2 FACILITY TOPOGRAPHY, SURFACE WATER DRAINAGE, AND SOILS

Land surface elevations at the facility generally range between 12 and 14 ft above mean seal level (ft-msl) as shown by the topographic survey and storm water runoff map presented in Figure 4.

The impervious areas of the facility, which include essentially all areas except SWMUs 7, 11 and 12, are sloped such that rainwater runoff is directed southward to the storm water ditch (SWMU 7), which is connected to the storm water retention pond (SWMU 12). Storm water may also flow eastward through the storm water ditch to a roadside drainage ditch (ERM, 1993).

Land surface elevations and visual observations indicate that SWMU 11 is hydrologically isolated from all other areas of the facility; SWMU 11 neither contributes runoff to other areas nor receives it from other areas. Existing as a 1-acre flat grassy field with elevations predominantly between 12.6 and 12.0 ft-msl, SWMU 11 is largely internally drained. Under saturated soil conditions, SWMU 11 can theoretically induce sheet flow toward the northwest corner. In contrast, storm water cannot runoff from SWMU 11 to SWMU 7 or 12, nor can it runoff toward the impervious areas of the facility.

According to the Hillsborough County soil survey, local soil is known as the Myakka-Basinger-Holopaw unit. However, this is not likely relevant because natural soils at and around the facility have been removed and the excavation subsequently backfilled as discussed below.

2.3 LOCAL SOIL EXCAVATION AND BACKFILLING

Research of historical aerial photographs, regulatory files, and onsite soil boring logs indicates that natural soils at and well beyond SWMU 11 have been removed and replaced with various fill materials. This finding is extremely significant in understanding the nature and extent of subsurface materials emplaced in the vicinity of the facility.

Aerial photographs from 1972, 1976, 1985, and 1988 are presented as Figures 5 through 8, respectively. In 1972 (Figure 5), the future S-K facility area appears undeveloped. By 1976 (Figure 6), the 10-acre square that includes the future facility had been entirely excavated and the southeast quadrant was undergoing backfilling. The future boundaries of the S-K facility and SWMU 11 are shown for reference. The excavation appeared as a series of four trenches oriented east-west over the majority of the 10-acre square. The two northernmost trenches pass through the area now occupied by SWMU 11. Physical relations, including a dirt roadway, suggest the excavation and backfilling activities were associated with the industrial complex adjacent and west of the excavation. This industrial complex was constructed between 1972 and 1976; it was apparently owned and operated by Allied Steel Fabricators, Inc. according to files at the Environmental Protection Commission of Hillsborough County (EPC).

By 1985 (Figure 7), the area of the future S-K facility had been completely backfilled and similar excavation activities had commenced at a 20-acre area located directly to the northeast. A dirt roadway continued to connect the industrial complex with the area of the future S-K facility and that road continued through to the northeast toward the 20-acre excavation. In addition, Figure 7 shows elongated objects (approximately 20 ft long by 2 to 3 ft wide) on the ground at both the industrial complex and at the future S-K facility area. It is possible that these objects are steel pipes. These objects document a connection between activities at the industrial complex and the future S-K facility area.

A complaint was filed with EPC on October 24, 1985 that alleged "illegal dumping and burying of solid waste at an excavation site at 24th Avenue and 58th Street." Since the future S-K facility area had been completely filled before February 1985, the complaint must have been directed toward the 20-acre excavation at the northeast corner of 24th Avenue and 58th Street. The complainant, Mr. Robert Smith, indicated that "trash, garbage, etc." were being buried. The landfilling was apparently being conducted under the direction of Mr. Eugene Thompson, who, during a site inspection by EPC, stated that "a small amount of land clearing material and yard trash was utilized in the backfilling of the property", and that "no paint cans or other toxic chemicals were deposited onsite." The EPC closed its investigation on November 13, 1985.

By 1988 (Figure 8), the 20-acre excavation to the northeast had been partially backfilled; it appeared predominantly as a shallow manmade lake. Operations continued at the industrial complex to the west. The S-K facility had been constructed and SWMU 11 appeared as it does today--an open, flat, grassy field in the western portion of the S-K facility.

These aerial photographs indicate that native soils have been disturbed at and beyond the S-K facility and that backfill materials were emplaced throughout the area. Approximately 8 acres have apparently been backfilled to a depth that may average approximately 15 ft bls; as such, the total volume of fill material throughout the area may be on the order of 120 acre-ft. The area of SWMU 11 is 1 acre and the average depth to the water table (temporarily and spatially) may be approximately 2.5 ft. Hence, the vadose zone "soils" (fill materials) at SWMU 11 may comprise a volume of about 2.5 acre-ft, which is only about 2 percent of the total fill volume throughout the area. The total volume of fill materials in SWMU 11 may be approximately 15 acre-ft, or about 12 percent of the areawide fill volume. Approximately 80 to 85 percent of the fill volume occurs below the water table in the phreatic zone.

The filling activities occurred unknown to S-K and prior to purchase of the property by S-K. Subsurface boring logs from locations within and east of SWMU 11 provide insight to the nature of materials used to backfill the property.

2.4 NATURE OF CONSTITUENTS DETECTED IN FILL MATERIALS

S-K submitted results of four "soil" sample analyses to EPA by letter dated January 28, 1993, along with a map showing sampling locations. These samples were collected to characterize soil (for disposal) that was later excavated to create trenches for installation of a fire suppression system. The January 28 letter is attached as Appendix B, which includes field notes from the sampling event that describe subsurface materials encountered by hand auguring. The field notes, by ERM, indicate that eight hand auger borings were completed typically to a depth of 5 ft bls, except where subsurface obstructions precluded penetration to that depth. Fill material was encountered at each boring and most boreholes had to be relocated several times before the hand auger could penetrate to the desired depth. In addition to sand, the fill materials noted include: asphalt, wood, shell fragments, concrete, carpet, rock, clothing, coil spring, electrical tape, and a hair comb. No environmentally egregious fill materials were noted. At this facility, all "soil" is actually fill material.

The four composite samples of fill materials (Comp-1 through Comp-4) were analyzed for volatile organics by EPA Method 8240, base/neutral and acid extractable organics by EPA Method 8270, and the eight RCRA metals. Table 1 provides a summary of all constituents detected in the four samples. No volatile organics were detected; in contrast, several metals and various polynuclear aromatic hydrocarbons were detected.

Subsequently, one composite sample was collected from the excavated fill materials by ECT and analyzed for the eight RCRA metals by the toxicity characteristic leaching procedure (TCLP) method; results showed that no metals were detected in the TCLP extract, except barium at a low concentration. The TCLP results suggest that metals in the fill material are not likely to be soluble or mobile at the facility. These results are also included in Appendix B.

Considerable evidence strongly suggests that the constituents detected by EPA Method 8270 are the result of the asphalt in the fill materials; that evidence is summarized below.

1. Asphalt was observed to be ubiquitous in the fill materials observed by both the ERM and the ECT sampling teams; in contrast, no visual or olfactory evidence of chemical contamination or egregious matter was observed by either sampling team.
2. The constituents detected are representative of those expected in asphalt.
3. The constituents detected are not representative of S-K's products or waste stream. Media impacted by mineral spirits typically shows naphthalene as the dominant EPA Method 8270 constituent, whereas no naphthalene was detected in any of the four samples. Similarly, volatile organics such as ethylbenzene and xylene are essentially

always found in media impacted by mineral spirits, whereas no volatile organics were detected in any of the four fill samples.

4. On February 5, 1993, four additional grab samples of the fill material were collected by split spoon sampling from SWMU 11 in the same area as two of the previous samples (Comp-1 and Comp-2). The purpose of this additional sampling was to estimate the depth of fill material and to conduct an experiment to test the thesis that detections of EPA Method 8270 constituents are due to the occurrence of asphalt. The experiment was conducted by ERM and proceeded as follows:
    a. A subsurface boring (SB-100) was dug by post hole to 5 ft bls and followed by split spoon grab sampling of fill materials from depth intervals of 5 to 7, 7 to 9, 9 to 11, and 11 to 13 ft bls.
    b. Subsurface materials encountered were documented in a lithologic log.
    c. Visible asphalt pebbles were selectively removed from each of the four samples.
    d. The four samples were then laboratory analyzed by EPA Method 8270.

The lithologic log, field notes, and analytical laboratory report for this February 5, 1993 experiment are provided in Appendix C. The fill materials encountered through the entire depth of investigation were consistent with those previously reported; the various fill materials extend beyond a depth of 13 ft bls at this location.

Significantly, no EPA Method 8270 constituents were detected in any of the four samples. Therefore, this experiment documented that when visible asphalt pebbles were removed from the samples, no

> constituents were detected. These results were reproducible in all four samples. In extreme contrast, EPA Method 8270 constituents were detected in all four previous samples when asphalt pebbles were not removed. This experiment demonstrates significant correlation between the occurrence of asphalt and the detection of EPA Method 8270 constituents.

Available data demonstrate with reasonable assurance that asphalt is the source of constituents detected by EPA Method 8270 in fill materials at the S-K facility. Asphalt at or near the surface is clearly not considered a threat to human health or the environment; it is used routinely as surface pavement. Therefore, existing data are not indicative of a release of hazardous constituents from SWMU 11; the data simply indicate that asphalt is ubiquitous in the fill materials that comprise both SWMU 11 and the area around the facility.

In contrast, no data are currently available to determine whether the SWMU 11 fill materials have released hazardous constituents to ground water within or beyond SWMU 11.

3.0 PROPOSED RCRA FACILITY INVESTIGATION ACTIVITIES

This section describes the rationale and locations for the collection of samples necessary for source characterization and release investigation. All proposed investigations will be undertaken in accordance with the health and safety provisions of 29 CFR 1910.120. The investigative approaches specified below are consistent with Appendix B of the HSWA permit, proposed Subpart S of 40 CFR 264, 265, 270, and 271, the RCRA Facility Investigation Guidance (May 1989b), and the EPA Region IV Standard Operating Procedures and Quality Assurance Manual (February 1, 1991).

In accordance with the preamble to proposed Subpart S (55 FR 30802), the investigation will be focused on specific concerns identified in the RFA and will be staged to avoid unnecessary analysis. While the work plan provides for complete characterization of the release and plausible contaminant migration pathways, it is recognized that the results of initial activities may preclude the need for implementation of proposed subsequent activities. This approach will serve to minimize unnecessary and unproductive investigations, and to focus resources on characterizing actual environmental problems at SWMU 11 (55 FR 30810).[1]

3.1 PHASE I--RELEASE VERIFICATION/SOURCE CHARACTERIZATION

As discussed more thoroughly in Sections 2.3 and 2.4, SWMU 11 comprises 1 acre situated within a 10-acre square of which approximately 8 acres have been excavated and backfilled from land surface to a depth that may average some 15 ft bls. Approximately 15 to 20 percent of the fill material occurs above the water table in the vadose zone, whereas some 80 to 85 percent occurs below the water table in the phreatic zone. Asphalt is ubiquitous in the fill and results in sample analyses that

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[1] As provided at 55 FR 30812, this RFI work plan calls for a focus staged investigation, the scope and emphasis of which will be refined as releases are verified and/or found not to have occurred.

consistently show the presence of EPA Method 8270 constituents; in contrast, when the asphalt is removed from the samples analytical results consistently show no detections. As such, the existing data do not indicate a release of hazardous constituents from SWMU 11, but rather the omnipresent occurrence of asphalt in the fill that comprises SWMU 11. No data are available to determine whether hazardous constituents have been released to ground water within or beyond SWMU 11.

In light of current conditions at the S-K facility, the primary objective of this RFI's phase I is to ascertain whether hazardous constituents have been released to ground water within SWMU 11 in such a way that poses a threat to human health or the environment. Another objective is to supplement the existing data regarding the fill materials to more fully characterize the suspected source.

Phase I of this RFI will include the following activities:

1. Drill four boreholes to approximately 12 ft bls and install four shallow ground water monitor wells at locations strategically selected to maximize the potential to detect a release (Figure 9);
2. Collect duplicate grab samples of fill material at middepth within the vadose zone (approximately 1 to 2 ft bls) at three of the four borehole locations--M2, M3, and M4 (Figure 9). Extensive data are currently available for the M1 location;
3. Physically remove visible asphalt particles from one of the duplicates from each borehole, and analyze all six samples by EPA Methods 8240 and 8270, and for various metals. The three samples from which asphalt will be removed will be analyzed to retest the hypothesis that asphalt is the sole source of EPA Method 8270 constituents in the fill material. This activity is similar to the previous experiment (at the

M1 location) described in Section 2.4. The asphalt removed will be saved for potential future analysis;

4. Document in detail and photograph materials encountered in each boring to characterize the physical nature of the fill materials; and
5. Sample ground water from each well for analysis by EPA Methods 8240 and 8270, and for various metals.

The RFA indicated that, while no evidence of a release was found for SWMU 11, there was high a potential for a release only to the soil and ground water pathways. This RFI focuses primarily on the ground water release pathway; it includes vadose zone fill ("soil") sampling only to help characterize the suspected source material. That is, detection of constituents in vadose material would not be indicative of a release from SWMU 11 to soils; rather, it would provide insight to the nature of the source materials that constitute SWMU 11. Detecting a release and characterizing the source by ground water monitoring would be far more efficacious than conducting a more rigorous vadose zone investigation. This approach is consistent with applicable regulatory intent, and logical considering existing conditions at the facility. Rationale for this approach are summarized below.

First, some 80 to 85 percent of the fill materials occur below the water table, and those materials have had up to 18 years to dissolve and mobilize in ground water. Second, SWMU 11 is essentially internally drained (see Section 2.2); as such, hazardous constituents in the remaining 15 to 20 percent of vadose materials would tend to migrate vertically downward with infiltrating water, through the permeable fill materials, and to the shallow water table. This process has also been ongoing for up to 18 years. Third, the vadose zone of SWMU 11 only constitutes approximately 2 percent of the areawide total volume of fill, whereas the phreatic zone of SWMU 11 may constitute 10 percent of the areawide fill volume. Fourth, ground water appears to be the only viable release migration pathway at SWMU 11. Based on analyses of nine fill material samples to date, the only hazardous constituents detected are related to asphalt in the fill material. Considering that SWMU 11 is essentially internally drained and that asphalt is used ubiquitously as surface pavement, there is no viable likelihood of a release of concern along a surface migration pathway. Fifth, with the sampling and analysis proposed in items 2 and 3 (above), a total of 15 samples of fill material will have been analyzed for source characterization. Sixth, if ground water tests clean, then the vadose zone materials are not acting as a contaminant source and there would be no point in conducting a more extensive vadose zone investigation.

In summary, for this facility, ground water analytical data will provide necessary and productive information regarding release and source characterization, whereas extensive vadose material analyses would be of limited value at this point in the RFI.

Proposed locations of the four monitor wells are shown in Figure 9. Rationale for the strategic selection of monitor well locations is provided below. Refer also to Figures 5 and 6 for the subsurface locations of the two east-west oriented trenches within SWMU 11, and to Section 2.1 for information regarding the expected south and west directions of ground water flow at SWMU 11.

Monitor Well Designation	Location Rationale
M1	Located in the same area that showed positive detections of EPA Method 8270 constituents in two of two samples (Comp-1 and Comp-2) when asphalt was left in the samples (Appendix B), and the same area that showed no detections in four of four samples when visible asphalt was removed (Appendix C). Located in an area known to contain asphalt and other fill materials to a depth of at least 13 ft bls (see Appendix C). This extremely important well will document whether the source materials of previous detections are prone to release hazardous constituents to ground water.

Monitor Well Designation	Location Rationale
M2	Located adjacent to and hydraulically downgradient of the septic tank drain field, which receives all wastewater discharged from the facility. Also located in the center of the southern trench that underlies SWMU 11 to detect any constituents that may be migrating westward, preferentially through the permeable fill materials.
M3	Located near the storm water retention pond, in the western section of the southern trench, and along the western (hydraulically downgradient) boundary of SWMU 11. This well can detect constituents infiltrating to ground water from the pond, and those migrating preferentially westward through the southern trench.
M4	Located within the west-central portion of the northern trench at the western (hydraulically downgradient) boundary of SWMU 11 to detect any constituents migrating preferentially westward through the permeable fill materials of the northern trench.
M1 to M4	The four monitor wells will also enable phase II evaluation of hydrogeologic conditions at SWMU 11, including the hydraulic conductivities of the fill materials, and the direction and rate of ground water flow.

Specific details regarding methods of monitor well installation, sampling, and analysis are provided in Section 5.0.

If analytical results of ground water samples show the presence of hazardous constituents at concentrations that would pose a threat to human health or the environment, then S-K will implement the phase II investigation (Section 3.2). If such constituent concentrations are not present, then S-K will document all phase I activities in the Draft RFI report with a recommendation for no further action, if appropriate.

3.2 PHASE II--RELEASE CHARACTERIZATION

If warranted by the phase I results, the phase II investigation will focus on characterizing the release, including evaluation of hydrogeologic conditions affecting release migration and potential receptors of the release. The specific objectives of the phase II investigation are to:

1. Evaluate pertinent hydrogeologic conditions at the facility;
2. Locate, identify, and characterize specific source materials or "hot spots";
3. Delineate the extent of any ground water plume of hazardous constituents that originate from SWMU 11; and
4. Evaluate plausible release migration pathways and potential receptors.

Activities described in this Section 3.2 will be executed to achieve the stated objectives. If, after evaluation of data obtained through these activities, S-K determines that the objectives are not satisfied, then additional iterations of appropriate activities will be executed.

The RFI activities will include characterization of releases originating from SWMU 11 that extend beyond that unit, and those that extend beyond the facility boundary where necessary to protect human health and the environment (if offsite access is granted by adjacent property owners). However, this investigation will not include complete characterization of any release from either offsite sources or from beyond the S-K SWMUs (RCRA Section 4004[u]).

Further, if a release is verified to be originating from the 1-acre SWMU 11 fill, then it is likely that the release would also be originating beyond SWMU 11 from the remaining approximate 7 acres that have been filled (see Section 2.3). If it becomes evident during this RFI that SWMU 11 is only a minor contributor to an areawide problem, then S-K would discontinue offsite characterization of the areawide release.

If necessary to protect human health or the environment, this situation would more appropriately be addressed under either: the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA); RCRA Section 3013 or 7003; the EPC; or the Florida Department of Environmental Protection (FDEP) (55 FR 30829).

3.2.1 SURVEYING AND WATER TABLE ELEVATION MAPPING

All monitor wells will be surveyed for vertical control by a surveyor, licensed and registered in the State of Florida. The top of casing elevation at each monitor well will be surveyed to an accuracy of 0.01 ft. The top of the riser casing will be notched where well elevations are established. Bench marks previously established and traceable to a U.S. Geological Survey survey marker will be used, if available. Water table elevations will be measured at each well using an electronic measuring tape.

This elevation data, along with at least three sets of water level measurements in the wells, will enable evaluation of the ground water flow direction and associated migration of contaminants.

3.2.2 AQUIFER TESTING AND ANALYSIS

Single-well aquifer tests (slug tests) will be conducted at the four shallow monitor wells to estimate the hydraulic conductivity of the fill materials within SWMU 11. During the slug test, a volume of water is instantaneously displaced and the change in water level is monitored and recorded over a period of time as the well water returns to static equilibrium. ECT will utilize an Envirolab data logger and pressure sensitive transducer to monitor and record water level changes during slug testing.

The aquifer response data collected during the slug test are analyzed by computer using applicable equations of ground water flow to calculate the hydraulic conductivity at the specific well location. Analytical methods developed by Hvorslev

(1951) and/or Bouwer and Rice (1976) will be applied to estimate the hydraulic conductivity.

The site-specific hydraulic conductivity will be used in conjunction with the measured hydraulic gradient to estimate the average linear ground water flow velocity and direction through SWMU 11.

3.2.3 GROUND WATER IMPACTS SCREENING PROGRAM

To evaluate potential source(s) and the extent of ground water impacts at the facility, and to minimize the number of monitor wells required to characterize the horizontal and vertical extent of these impacts, a preliminary ground water screening program will utilize "direct push" (wellpoint) sampling technology and field-lab analyses using a portable gas chromatograph (GC), or other appropriate instrumentation.

Selection of ground water screening locations will be guided by the ground water analytical data obtained during the phase I investigation and the hydrogeologic analysis (Sections 3.2.1 and 3.2.2). The phase I results will also dictate the indicator constituents for the field GC screening analysis. However, if the phase I results suggest some inorganic indicator parameter would be more useful, then an appropriate field analysis would be substituted for the GC (e.g., conductivity, pH, etc.).

Stainless steel well points will be pushed through the vadose zone at 15 or more locations and ground water samples will be collected for GC analysis. Samples will be collected in presumed and suspect source areas from depths near or at the water table. The results of the GC field screening will provide a reasonable estimate of the areal extent of ground water impacts at the site, and a preliminary assessment of the ground water "hot spots" based upon the levels and distribution of impacts in samples collected. This screening methodology will provide the information required to strategically site shallow monitor wells in a cost-effective manner. It may also indicate the need to assess possible offsite impacts.

Upon evaluation of the field analyses of the shallow ground water samples, two appropriate locations will be selected to assess the vertical extent of ground water impacts. Well points will be pushed (or drilled if obstructions preclude penetration) to discrete sampling depths at an appropriate depth intervals (perhaps 5- to 10-ft intervals) until the vertical extent of ground water impacts is approximated by field GC analyses in the area of identified ground water impacts. The information gained will be used to select the appropriate location and screen interval for a least one deep monitor well.

3.2.4 MONITOR WELL INSTALLATION

Based upon the results of the ground water screenings and the phase I results, additional monitor wells may be installed to supplement the other four wells at the facility. The new wells may include shallow wells to a depth of approximately 12 ft bls, and a deeper well(s) to a depth to be determined by the ground water screening program.

Unless previously installed wells serve these purposes, one monitor well will be installed in a location to serve as a background monitoring well; one well will be installed in a downgradient location to define the horizontal, downgradient extent of impacts at the facility; and two shallow wells will be located to document the lateral boundaries of impacts. Additional shallow monitor wells may be installed, as necessary. The deep monitor well will be installed to document the base of the plume in an area showing high concentrations. The actual locations of monitor wells will be based upon results of the field screening program and the phase I monitoring results.

Section 5.2 provides a detailed description of methods to be used for borehole drilling, well installation and development, equipment decontamination, soil vapor screening, and hazardous materials handling.

3.2.5 GROUND WATER SAMPLING AND ANALYSIS

Ground water samples will be collected from the monitor wells in accordance with procedures detailed in Section 5.3. Each ground water sample may be analyzed for volatile organic compounds (VOCs) by EPA Method 8240, semivolatile organic compounds (SVOCs) by EPA Method 8270, and various metals, as outlined in Section 5.5.4. However, the constituents to be analyzed during phase II may be reduced to reflect indicator parameters or only those constituents of concern based on phase I results.

3.2.6 SOURCE CHARACTERIZATION

Additional physical and chemical characterization of source materials may be conducted (beyond that done in phase I), as necessary to more fully understand the nature of the source.

Background locations may be identified for soil or ground water sampling and analysis.

Containerized fill materials from boreholes (see Section 5.2) may be analyzed for select TCLP analyses, if analyses of total constituent concentrations indicate the possibility of the materials being hazardous by the toxicity characteristic. This testing would indicate the propensity for pertinent constituents to leach from the fill, and whether the fill would be regulated by RCRA Subtitle C due to a hazardous characteristic.

In addition, asphalt materials in the fill may be subjected to both GC and infrared analyses to confirm the origin of the material, and to provide a chemical signature or "finger print" for comparison with other analyses conducted during the RFI.

Specific procedures for additional characterization may be dependent upon information obtained and cannot be reasonably detailed at this time.

3.2.7 POTENTIAL RECEPTORS STUDY

This RFI will include data collection regarding the human populations and environmental systems that are susceptible to contaminant exposure from SWMU 11. Existing data strongly suggest that ground water is the only plausible exposure pathway from SWMU 11 (see RFA [Appendix A] and Section 3.1). The study will include a drive by survey and visual reconnaissance to locate local public and private water wells, and surface waters, as appropriate. Readily available records will also be obtained from the Southwest Florida Water Management District (SWFWMD) to help locate water wells. The S-K facility's water well is located in the extreme northeast corner of the facility (Figure 9). It is the sole source of water at the facility other than bottled water, which is purchased for drinking. All wastewater discharge goes to the onsite septic tank. Literature will be researched to obtain information regarding this well's construction and any available water quality analyses.

Local land use will be compared to information in the facility permits to verify accuracy. Information gained can also facilitate evaluation of remedial methods and facility cleanup levels, if necessary.

3.3 RCRA FACILITY INVESTIGATION SCHEDULES AND REPORTS

A Draft RFI report will be prepared upon completion of investigative activities and submitted to EPA pursuant to HSWA permit condition II.E.3. A copy of the report will also be forwarded to the FDEP Southwest District office. The report will include an analysis and summary of investigations conducted, and results and conclusions of those investigations.

Table 2 presents RFI schedules A and B. Schedule A will apply if only the phase I investigation is warranted, and the Draft RFI report would be submitted to EPA within 119 days of RFI Workplan approval. Schedule B will apply if both phase I and II investigations are warranted; it assumes that two iterations of phase II field activities will be required to achieve the RFI objectives. Schedule B provides that the Draft RFI report would be submitted to EPA within 308 days of RFI Workplan approval.

4.0 PROJECT MANAGEMENT PLAN

This Project Management Plan emphasizes the necessary expertise, responsiveness, accountability, and flexibility to ensure the most efficacious implementation of the RFI project. Continuing data evaluation and communication between EPA and S-K will be necessary so that timely decisions may be made as to any necessary further assessment in accordance with Section 3.7 of the RFI guidance. The overall project objective is to develop sufficient data as is reasonably necessary to confirm whether SWMU 11 constitutes a risk to public health and/or the environment. The activities proposed to satisfy this objective are detailed in Section 3.0, along with the schedules for implementation of the RFI. Section 4.1 presents the project organization and personnel tailored to the required investigations. Project accounting management methods are discussed in Section 4.2.

4.1 PROJECT ORGANIZATION

The project organization is illustrated on Figure 10. The responsibilities of key project personnel are described below.

4.1.1 PROJECT MANAGER

The project manager will be responsible for effective day-to-day management of all operations of this project. The project manager, Richard J. Stebnisky, P.G., has project management experience with numerous former and ongoing site investigations, and has specific expertise in the following areas, all of which will be required in the subject RFI:

- Topographic surveys;
- Lithologic descriptions;
- Sampling and analysis of ground water and waste;
- Hydrogeologic investigations;
- Contamination assessments;

- Contamination migration;
- Exposure assessment; and
- RCRA compliance and corrective actions.

As project manager, Mr. Stebnisky's responsibilities will specifically include:

- Determination of sampling procedures and approval of sampling plans, including monitoring site locations, chemical parameters, schedules, and manpower allocations;
- Preparation of progress reports with the assistance of key support personnel;
- Management of all funds for labor and materials procurement;
- Management of the team toward unified, productive project accomplishment;
- Direct communication and liaison with the client;
- Preparation and technical review of all task deliverables; and
- Technical leadership.

To supervise the day-to-day operations of the project, including the preparation and technical review of all project deliverables, management of funds, and management of daily field activities, the project manager has the authority to:

- Allocate budgets among the work elements required for the project;
- Approve or disapprove of any labor, material, or subcontractor charges to the project;
- Establish and enforce work element milestones to ensure timely completion of site investigations;
- Authorize support personnel to participate in the project as required; and
- Approve or disapprove contributions to any technical deliverable for each work element.

4.1.2 FIELD GEOLOGIST

The proposed field geologist, Mr. John Harper, has specific ground water and waste sampling experience with numerous contaminated sites, including the following related disciplines:

- Field sampling techniques and documentation;
- Monitor well installation, development, and testing;
- Hydrogeologic evaluations and lithologic descriptions; and
- Report preparation.

Mr. Harper's responsibilities include planning and coordinating all phases of hydrogeologic investigations, well siting, well installation, and soil and ground water sampling. He is also responsible for hydrogeologic data evaluation and the preparation of draft reports. Specific duties include: supervising personnel during drilling operations to ensure that all monitor well installation, and logging requirements are met; collecting, preserving, and shipping samples in accordance with project requirements; ensuring onsite compliance with safety and quality assurance (QA) procedures; and evaluating hydrogeologic data such as ground water flow direction.

4.1.3 HEALTH AND SAFETY MANAGER

Mr. Michael Luster, CIH, is the designated health and safety manager responsible for personal safety of all ECT personnel. Specifically, Mr. Luster's responsibilities include the preparation of a project health and safety plan (HSP) detailing required safety standard operating procedures (SOPs); monitoring of the labeling, shipping, and control of potentially hazardous samples; and briefing of all field and laboratory personnel regarding the special hazards that may be associated with accomplishment of the project.

4.1.4 QUALITY ASSURANCE MANAGER

The project QA manager, Ms. Lori K. Jennis is responsible for providing unbiased monitoring and periodic auditing of the quality control (QC) procedures of the project team; ensuring that established laboratory and field QC procedures are being followed; ensuring adequate QA documentation is provided; and ensuring that all QA/QC problems are handled expeditiously.

4.2 PROJECT ACCOUNTING MANAGEMENT METHODS

ECT uses the BST Management Information System (MIS) for project cost control. The system involves a computerized accounting package designed to interact and utilize all information provided by the accounting system such as timesheet entry (labor effort), accounts payable, operating supplies, and subcontractor costs.

All labor and other direct cost charges for each task are collected and maintained by the MIS. The project manager receives project cost information reports that detail work performed. These reports show labor charges (hours and dollars) by individual and other direct costs (accounts payable by vendor, laboratory costs, subcontractor costs, operating supply costs, etc.). Because this system is continually updated, the project manager is able to review project status at any time by viewing the information on a computer terminal or by printed reports. With the detailed project cost and budget information shown on these reports, the project manager can continually compare actual costs versus budgeted costs. Consequently, budget problems can be identified and corrected early. The cost information can also be readily formatted as supporting information to accompany invoices. The BST system is one of the most modern, flexible accounting packages that can provide specialty reports for budget comparisons, scheduling information, and graphics output, and can readily accommodate task and budget changes.

5.0 SAMPLING AND ANALYSIS PLAN

This section describes the methods to be used for collecting samples of fill materials and ground water. Details of the sampling rationale and sample locations are discussed in Section 3.0. The sampling methods described below are in accordance with the EPA Region IV SOPQAM, February 1, 1991. Moreover, the sample collection methods are consistent with FDEP SOPs for Laboratory Operations and Sample Collection Activities, September 30, 1992. The EPA will be notified within 20 days of any RFI sampling activity in accordance with HSWA permit condition II.E.2.

5.1 SAMPLING OF FILL MATERIALS

Sample locations and rationale for fill materials are discussed in Sections 3.1 and 3.2. Samples will be collected from the vadose zone using a stainless steel bucket auger or spoon, decontaminated using the procedure specified in Section 5.4.

Phase I grab samples will be collected in duplicate from three locations using a decontaminated stainless steel hand auger and stainless steel spoon. Apparent asphaltic materials will be manually removed from one of the duplicates at each location using a decontaminated steel spoon or tweezers, as appropriate. Both samples will be placed into appropriate containers for analysis of VOCs, SVOCs, and various metals. The asphalt will also be saved for possible analysis.

Precleaned, prelabeled sample containers for all of the above samples will be provided by Progress Environmental Laboratories (Progress) under strict chain of custody. Fill samples to be analyzed for VOC concentrations will be placed directly into 40-milliliter (mL) glass vials or 4-ounce glass widemouth jars with a Teflon® septum cap using a stainless steel spoon. The sample container will be completely filled, leaving a minimum of headspace, then tightly capped. Fill samples collected for analysis of semivolatile organics will be placed into 8-ounce glass widemouth jars with Teflon® lined caps. Samples to be analyzed for metals will be placed into 8-ounce plastic or glass widemouth jars with plastic caps.

During the fill sampling effort, sizeable chunks of apparent asphaltic materials may also be collected as they are encountered using a decontaminated stainless steel spoon and placed into a decontaminated glass or stainless steel baking dish. Once approximately 200 grams of this material have been accumulated, a grab or composite sample would be placed into 16-ounce glass widemouth jars with Teflon® lined caps provided under chain of custody by META Environmental, Inc. (META). This sample may be analyzed by META using GC/flame ionization detector (FID) and infrared as detailed in Section 5.5.4.

New latex gloves will be worn when sample containers and decontaminated sampling equipment are being handled. Each sample container will be carefully labeled immediately upon collection so that it can be readily identified by laboratory personnel. Details of sample preservation, chain of custody, and analyses are included in Section 5.5.

Phase II sampling would proceed similarly.

5.2 MONITOR WELL INSTALLATION

Monitor well locations and rationale are discussed in Sections 3.1 and 3.2. The monitor wells will be installed to approximately 12 ft bls using hollow stem augers in accordance with American Society for Testing and Materials (ASTM) D-1452 procedures. Continuous split spoon sampling will be conducted within hollow stem augers for purposes of lithologic description. Monitor wells will be installed through the center of the hollow drill stem and positioned at the appropriate depths.

Each monitor well will have a 10-ft length of number 10 slot screen constructed of 2-inch diameter, schedule 40 polyvinyl chloride (PVC) casing attached to a 2-inch diameter schedule 40 PVC riser casing. Threaded joints will be used for coupling the sections of casing and screen. Glued or heat-welded joints will not be used. The annular space outside the well screen will be filled with a 20 to 30 mesh clean quartz filter pack to approximately 1 ft above the well screen. A 0.5-ft thick fine sand seal will be placed in the annulus above the clean sand filter pack. The remaining annular space will be grouted with a cement slurry (Portland, Type I). The well will be completed with an above ground riser pipe with a protective casing. Alternatively, the surface completion may include a protective steel valve box and manhole assembly set into a concrete pad, particularly in trafficked areas. Figure 11 illustrates a typical shallow monitor well design. Any deep well would be constructed similarly, except that the screen interval would be 5 ft.

During all borehole drilling, ambient air will be monitored with an OVA to identify generation of potentially hazardous and/or toxic vapors or gases. Air monitor results will be included in the boring logs. Material encountered during borehole drilling will be containerized in new, unused drums. The boring logs will indicate the depth(s) from which suspect materials were collected for containerization.

Portable tanks will be used to transport and hold drilling water. To eliminate the potential for cross contamination, all drilling equipment and well construction materials will be steam cleaned using water from the drilling water source prior to drilling at each location. Drilling will proceed from the potential "least" to the "most" impacted areas.

Development of wells will be accomplished as soon as practical after well installation. Well development will be performed with a centrifugal pump, submersible pump, and/or bailer until the water is clear and the well sediment free to the fullest extent practical. If well yields cannot sustain the flow rate of the pump, a bottom discharge bailer will be used. Water will not be added to the well to aid in development. Well development water will be discharged in the vicinity of the monitor well in accordance with the EPA Region IV SOPQAM. Well development data recorded in the field will be tabulated in the field notebook.

The water level indicator probe and pump or bailer will be washed with tap water and Liquinox® solution, followed by a tap water and distilled water rinse, and allowed to air dry prior to use in the next well.

5.3 GROUND WATER SAMPLING

Ground water sampling will begin after the monitor wells have been allowed to reach equilibrium for a minimum of 24 hours. The following procedures will be followed on the day of sampling:

1. The surface of the water table will be examined for the presence of free floating hydrocarbons.
2. If applicable, the thickness of the hydrocarbon layer will be measured (to ±0.01 ft) using a clear, acrylic bailer.
3. The depth to water will be measured (to ±0.01 ft) from the top of casing.
4. The well depth will be sounded and recorded and the volume of the water in the well calculated.
5. The volume of fluid in the screen and well casing will be purged a minimum of three times. Wells will be purged until conductivity, pH, and temperature have stabilized using the following criteria: pH ± 0.1 unit; temperature ±0.5 degrees Celsius (° C); conductivity ±10 micromhos (μmhos) per centimeter (cm). These data will become part of the project record. The amount of fluid purged will be measured and recorded. Well purge water will be handled according

to the previously described procedures for well development water. Ground water sampling will then be accomplished by using a peristaltic pump and tygon tubing to collect filtered and unfiltered samples for metals analysis, and a laboratory decontaminated dedicated bailer for samples to be analyzed for organics.

6. To protect the wells from contamination during sampling, the following guidelines will be followed:
    a. A dedicated bailer will be used for sampling the monitor wells for organics. The bailer will be decontaminated and supplied by the analytical laboratory. Monofilament line or braided nylon line will be dedicated for each well for lowering sampling equipment into the well; the line will not be reused. Separate disposable latex gloves will be used each time a well is either purged or sampled.
    b. If a pump is used to purge water from the well, the pump and the hoses, as well as elevation tapes or calibrated water level probes, if used, will be thoroughly decontaminated between samples.
    c. All sampling and well purging equipment will be protected from ground contact by placing the equipment on disposable aluminum or polyethylene sheeting to prevent soil contamination from tainting the ground water samples.
    d. Samples will be collected from any background wells and wells suspected of being free from contamination before sampling wells that are suspected or known to contain contaminants.
7. Onsite measurements of water quality obtained during the ground water sampling episodes will consist of conductivity, temperature, and pH. These data will be presented in the final report. Measurements will be made using either a Hydrolab or a Corning Checkmate pH,

temperature, and conductivity meter. Calibration standards will be run and recorded prior to, during, and after each sampling day as described in Section 5.5.5.

8. Inert threaded PVC well casings will be used in this program. Adsorption of certain compounds on the PVC surface may affect the apparent ground water concentrations. To minimize adsorption of analytes by PVC, each well will be purged and then sampled as soon as sufficient water recharge into the well occurs. In this manner, the contact time between the water sample and the PVC will be kept to the shortest possible period.

9. All samples will be collected in a manner that will minimize aeration and prevent oxidation of compounds in the sample. The 40-mL glass vial for ground water samples to be analyzed for volatile organics will be filled until it overflows, then tightly capped with a Teflon® septum cap, and inverted to check for the presence of air bubbles. The samples for semivolatile organics will be discharged into amber glass 8-ounce widemouth bottles with Teflon® lined caps. Samples to be analyzed for metals will be placed into 1-liter plastic bottles with plastic caps. Details of sample preservation, chain of custody, and analyses are included in Section 5.5.

10. During the sampling of each monitor well, the following information will be recorded in a notebook:
    a. Well number;
    b. Date;
    c. Time;
    d. Static water level (to ±0.01 ft);
    e. Depth of well;
    f. Number of bailer volumes removed or pumping rate, if applicable;

g. Time of pumping, if applicable;
h. Total volume of water purged from well;
i. Water quality measurements of pH, conductivity, and temperature;
j. Other pertinent observations of water samples (color, turbidity, odor, etc.);
k. Fractions sampled and preservation method;
l. Weather conditions and/or miscellaneous observations; and
m. Signature of sampler.

5.4 FIELD DECONTAMINATION

All sampling equipment will be decontaminated by the following procedure prior to use and between samples to avoid cross contamination:

- Wash with Liquinox® and tap water (drinking quality), using a brush if necessary to remove particulate matter and surface films;
- Rinse thoroughly with tap water (drinking quality);
- Rinse with 10 to 15 percent reagent grade nitric acid (glassware only);
- Rinse thoroughly with analyte-free water;
- Rinse with pesticide grade isopropanol;
- Rinse with analyte-free water; and
- Allow to air-dry.

All drilling equipment and well construction materials will be steam cleaned prior to use or reuse.

5.5 SAMPLE QUALITY ASSURANCE/QUALITY CONTROL

The sample QA procedures described among the following subsections are in accordance with the EPA Region IV SOPQAM and FDEP SOPs. Laboratory QA procedures and qualifications are included in Appendix D.

5.5.1 SAMPLE PRESERVATION AND HOLDING TIMES

All ground water and fill samples will be placed on ice immediately upon labeling of the sample containers, and maintained at or below 4° C until analyzed. Any ground water samples to be analyzed for cyanide concentrations will be preserved with sodium hydroxide to a pH greater than 12 and analyzed within 24 hours of sample collection. Ground water samples to be analyzed for metals concentrations will be preserved with nitric acid to a pH less than 2; mercury will be analyzed within 28 days, and all other metals will be analyzed within 6 months of sample collection. Ground water samples to be analyzed for VOCs will be preserved with hydrochloric acid and analyzed within 14 days of sample collection. Ground water samples to be analyzed for SVOCs will be preserved only by chilling, and will be extracted within 7 days of sample collection and analyzed within 40 days thereafter. Laboratory analyses for fill materials and ground water are specified in Section 5.5.4.

5.5.2 SAMPLE CUSTODY

The objective of sample custody is to ensure an accurate record of the possession and handling of the sample containers from the moment they leave the laboratory until they are returned to the same laboratory. A sample container (whether empty or full) is defined as being in someone's custody if it is:

- In the sampler's or transferee's actual physical possession;
- In the sampler's or transferee's view, after being in their physical possession;
- In the sampler's or transferee's physical possession and then locked or otherwise sealed so that tampering will be evident; or
- Placed in a designated secure area, restricted to authorized personnel only.

The sample chain-of-custody begins when precleaned sample bottles are obtained from the laboratory. Sample chain-of-custody forms are supplied by the laboratory and each sample container is prelabeled. These labels include the following:

- Name of the contracted laboratory,
- A unique identification number generated by the contracted laboratory,
- Space for sampler to write sample location or station identification number,
- Space for sampler to write date and time, and
- Space for the sampler to print and sign their names (initials are acceptable on labels).

Field chain-of-custody procedures are as follows:

- Designated laboratory contact signs as *Relinquished by* prior to relinquishing the sample containers to ECT personnel or a common carrier;
- ECT personnel sign as *Recipient* if they picked up the sample containers from the laboratory; or
- If a common carrier is used, ECT personnel sign as *recipient* after confirming that sample containers have arrived and are intact;
- ECT personnel would sign the chain-of-custody form as *Relinquished by* upon delivering the sample containers (in a sealed cooler or other suitable shipping container) to the laboratory or a common carrier (if a common carrier is used, the carrier would be identified on the chain-of-custody form and a copy of the shipping receipt would be included in the field logbook); and
- Designated laboratory contact would sign as *Recipient* upon receiving sample containers either from ECT personnel or common carrier.

Chain-of-custody within the contracted laboratory is described within Appendix D.

A copy of the chain-of-custody form along with all other field documentation (discussed below) will remain on file under each project number in the custody of the ECT project or task manager.

5.5.3 FIELD DOCUMENTATION

The following information will be included on the chain-of-custody form:

- The samplers' names printed on the form;
- Each unique sample number (obtained from the sample container label) entered on the form;
- Each sample matrix identified;
- The sample description (e.g., station designation or location) included;
- The number of containers noted;
- The preservatives used and any deviations from standard preservation procedures noted and recorded; and
- The requested analyses indicated on the chain-of-custody form and conform to the requirements of the specific project.

Other field documentation, in addition to chain-of-custody forms and sample labels, include field data sheets such as equipment use reports, soil boring logs, sampling logs, and field calibration log sheets, as provided in Appendix E. These and any ancillary field documents can be traced to specific sampling events through ECT's use of project and task numbers and sampling dates and times.

For all field measurements and field sampling efforts, the field team will record in indelible ink the following information on chain-of-custody forms and/or field forms:

- Unique ECT project and task number;
- Date and time of sample collection or field measurement;

- Names of all ECT personnel and visitors present in the field;
- If a sample is collected, the information required on the chain-of-custody form (as described above);
- Source of sample including designation, location, and matrix type;
- Description of sample point (e.g., monitor well, number, boring, key landmarks, etc.);
- Order of sample collection;
- Preservatives used and any deviations from standard preservation procedures;
- Field measurements such as pH, temperature, and conductivity;
- Relevant site conditions (e.g., weather, unusual conditions, etc.);
- Sampling and purging (if applicable) equipment (e.g., pumps, bailers, etc.);
- If applicable, field decontamination procedures used;
- Types of QC samples collected (e.g., field blanks, equipment blanks, split, etc.) and when and where these samples were collected; and
- Signatures of sampler(s).

5.5.4 ANALYTICAL PROCEDURES

5.5.4.1 Field Procedures

During monitor well purging prior to ground water sample collection, ground water quality measurements will be made in the field as follows:

- Specific conductance by EPA Method 120.1;
- pH by EPA Method 150.1; and
- Temperature by EPA Method 170.1.

Field equipment calibration procedures are detailed in Section 5.5.5.

5.5.4.2 Laboratory Procedures

Samples of fill materials to be collected for source characterization include:

- Grab samples for analysis by EPA Methods 8240 and 8270 and for cyanide (EPA Method 9010), mercury (EPA Method 7471) and, antimony, arsenic, barium, beryllium, cadmium, chromium, lead, nickel, selenium, sodium, and thallium (EPA Method 6010). EPA Methods 8240 and 8270 are GC/mass spectrometry methods applicable to VOCs and SVOCs, respectively. EPA Method 9010 is a colorimetric method for analysis of cyanide concentrations. EPA Method 7471 is a manual cold vapor technique for analysis of mercury, and 6010 is an inductively coupled plasma method.
- Grab samples of containerized drill cuttings may be analyzed for VOCs in TCLP extract (EPA Method 1311), and for pertinent metals by TCLP (40 CFR 261, Appendix II).
- Composite or grab samples of apparent asphalt particles included in the fill may be submitted as separate samples for analysis by EPA Method 8310, which is a high performance liquid chromatography method to determine PAH concentrations.
- Chunks/pieces of apparent asphalt pavement may be extracted with methylene chloride by overnight rotator shake and analyzed by GC/FID to generate chromatograms for comparison with other sample signatures or "finger prints". Split samples will be extracted with freon, polar material will be removed with silica gel, then the samples will be analyzed for total recoverable petroleum hydrocarbon (TRPH) concentrations by EPA Method 418.1.

Fill samples for analysis by EPA Methods 8240, 8270, 8310, 9010, 7471, 6010, and TCLP will be analyzed by Progress. Analysis of apparent asphalt pavement by GC/FID and EPA Method 418.1 (modified for soils) will be conducted by META.

Laboratory QA procedures for Progress are detailed in Appendix D, and a statement of qualifications for META is provided as Appendix F.

Ground water samples will be analyzed by EPA Methods 8240 (VOCs), 8270 (semivolatile organics), 9010 (cyanide), 7471 (mercury), and 6010 (antimony, arsenic, barium, beryllium, cadmium, chromium, lead, nickel, selenium, sodium, and thallium) by Progress.

The selected EPA methods for laboratory analysis of fill material and ground water are detailed in EPA SW-846, Test Methods for Evaluating Solid Waste Physical/ Chemical Methods, 3rd Edition, Final Update, 1992.

Field equipment blanks, trip blanks, and duplicate samples will also be prepared and analyzed, as described in Section 5.5.7.

5.5.5 CALIBRATION PROCEDURES AND FREQUENCY

5.5.5.1 Field Measurements

Field instruments will be calibrated prior to initial sampling, every 4 hours thereafter, and at the end of the sampling day. Instrument calibration will be documented on the ECT Field Equipment Calibration Form included in Appendix E. The calibration, operation, and maintenance procedures for field instrumentation routinely used by ECT personnel are specific to manufacturer's instructions. The following paragraphs briefly summarize these procedures.

Calibration Standard Receipt and Traceability

Calibration standards and pH buffer solutions used for field instrument calibration and QC checks are obtained from companies that supply scientific products (e.g., Fisher Scientific, American Scientific Products, etc.). All buffer and calibration standards are certified and standardized against or traceable to National Institute for

Standards and Technology (NIST) reference materials through the specific supply company. When standards or buffers are received at ECT, they are logged in on a Standards Receipt and Traceability Form by the field services manager. The information recorded includes: (1) product, (2) supplier, (3) date received, (4) expiration date, (5) lot number, and (6) any relevant comments. All solutions are stored according to manufacturer's suggestion for optimal shelf life. Stock solutions are marked with expiration date and replaced with new solutions when the recommended shelf life is exceeded.

pH Probes

Calibration is performed using an NIST traceable standard solution (buffer) of pH 7 and a second buffer that brackets the pH range expected in the samples. The procedures for calibrating the pH probe are as follows:

- Function switch is set to "pH" to allow the probe to equilibrate;
- Select the appropriate pH buffers to bracket the expected pH (always pH 7 buffer and then either pH 4 or 10 buffer, depending on expected pH);
- Remove the protective cap, clean the probe with deionized water, then blot (do not wipe) with a soft paper tissue;
- Place the probe in the pH 7 buffer and gently swirl the probe;
- Follow the manufacturer's instructions for adjusting the pH reading to match the buffer;
- Remove the probe from the buffer, rinse with deionized water, blot the probe dry, and insert the probe in the second pH buffer and gently swirl the probe;
- Follow the manufacturer's instructions for adjusting the second pH reading to match the buffer; and
- Provided that the instrument is calibrated correctly, it is ready for use.

Temperature Probes

Temperature measurements are made with a thermistor. These thermistors are checked against a field-grade thermometer prior to the each daily use. Moreover, the thermistors are checked in the office at least annually against an NIST precision thermometer. The thermistor is checked at two or more temperatures against this NIST precision thermometer. These readings should agree within ±0.1° C.

Conductivity Probes

Conductivity is reported as conductivity at 25° C. Calibration is performed using potassium chloride standard solutions. A general description of the calibration procedure follows:

- Set function switch to "conductivity" to allow the probe to equilibrate;
- Select the appropriate conductivity standards (100 and 1,000 μmhos/cm will usually *bracket* fresh water);
- Remove the protective cap, clean the probe with deionized water, then blot (do not wipe) with a soft paper tissue;
- Place the probe in the first standard and gently swirl the probe (make sure that there are no air bubbles trapped in or on the probe);
- Follow the manufacturer's instructions for adjusting the conductivity reading to match the standard;
- Remove the probe from the standard, rinse with deionized water, blot the probe dry, and insert the probe in the second conductivity standard and gently swirl the probe;
- Follow the manufacturer's instructions for adjusting the second conductivity reading to match the standard (if possible); and
- Provided that the instrument is calibrated correctly, it is ready for use.

The probe must measure within 10 percent of the standard to be considered in control, and should read within 5 percent (7 percent considered a warning level) to be optimum.

5.5.5.2 Laboratory Analyses

Calibration procedures and frequency for laboratory operations are included in Appendix D.

5.5.6 PREVENTIVE MAINTENANCE

ECT personnel routinely maintain field equipment for optimal results. All maintenance procedures are documented in control logbooks designated for each piece of equipment. Any field activities involving routine maintenance will be recorded in field logbooks by the individual performing the adjustment of the equipment. Maintenance performed at an authorized repair service will be documented in the maintenance log, including service location, specific repair, and method of transport. The field services manager maintains all documentation concerning routine maintenance and nonroutine repairs. In the event that the primary ECT field equipment is inoperable as determined by calibration difficulties, backup field instruments will be obtained from other sources. These instruments will be calibrated prior to recording data. In no event shall instruments be used to record data unless the performance of the equipment has been documented.

5.5.7 INTERNAL QUALITY CONTROL CHECKS

This section describes the internal QC check procedures for field sampling. Laboratory QC checks are described in Appendix D. The various types of field QC samples (equipment, field, and travel blanks and duplicates) are designed to measure:

- The integrity of sample container and sample equipment cleaning;
- The actual sample collection process;
- Purity of sample preservative or additive reagents;

- The influence of site environmental conditions (e.g., excess contamination);
- Cross contamination of samples; and
- Indeterminate artifacts introduced during the transport of samples, sample and shipping containers, cleaning agents, and sampling equipment.

All field QC blanks will be preserved, documented, and transported in the same manner as the collected samples. The information obtained from the laboratory analyses will serve to expose a potential source of impurity. The following paragraphs describe equipment, field, and travel blank and duplicate sample collection frequency.

5.5.7.1 Duplicate Samples

Sampling events involving five or more samples will include the collection of at least one duplicate sample or 10 percent of the samples, whichever is greater. A duplicate sample will include all parameter groups and matrices to be analyzed.

5.5.7.2 Equipment Blanks

Equipment blanks are prepared according to the following procedure:

- Document equipment, date, time, and sample location on field forms and chain-of-custody. Designated as field decontamination equipment blank or dedicated (precleaned) equipment blank.
- Fill or rinse equipment with analyte-free water.
- Pour rinsate directly into sample containers as provided for each parameter group of interest. Repeat as necessary.
  - Sampling Events Involving Ten or More Samples of Similar Matrix--The equipment blank is designed to address cross contamination in the field between sample sources due to

deficient field cleaning procedures. This blank also addresses lab preservation procedures, environmental site interference, integrity of the source blank water for field cleaning, and those concerns singularly addressed by the travel blank.

There is at least one equipment blank submitted and analyzed on precleaned sampling equipment for every 20 samples in each parameter group (which includes all matrices). This equipment blank will be composed in the field before sampling begins by filling or rinsing the precleaned equipment (i.e., bailer, pump tubing, spoon, etc.) with analyte-free water, filling the designated blank containers, preserving, and documenting in the exact manner as the collected samples.

An equipment blank will be prepared for each parameter group sampled where a particular piece of sampling equipment was employed for sample collection. Equipment that is cleaned onsite requires additional equipment blanks to be collected and analyzed for each parameter group at a rate of one blank or 5 percent of the equipment sets that are cleaned, whichever is greater. These blanks shall be collected and analyzed for all types of matrices.

- Sampling Events Involving Less Than 10 Samples of Similar Matrix--One equipment blank will be collected and analyzed for each parameter group of either field decontaminated or precleaned equipment.

5.5.7.3 Travel (Trip) Blanks

The travel blank is designed to address interferences derived from improper sample container cleaning preparation, contaminated source blank water, sample cross contamination during storage/transport, and extraneous environmental conditions affecting the sampling event to and from the site, including delivery to the analytical laboratory. Travel blanks are required for volatile organic method analyses at a rate of one per transport cooler per day when 10 or more samples are submitted.

Travel blanks are composed by the laboratory in the appropriate sample container using source blank water and hydrochloric acid preservative. Travel blanks are then sealed and stored in the ice chest where real samples will be stored and transported. Travel blanks are to originate at the laboratory providing the sample containers and blank water for the equipment and field blanks.

5.5.7.4 Blanks for Nonaqueous Samples

Field collected blanks for soil samples will be collected as follows:

- Trip blanks (aqueous) in the same frequency as for water samples (for volatile organic method groups only);
- Equipment blanks using the same criteria and frequency as those for water samples. The collected blanks will be analyzed using appropriate water analysis methods; and
- Duplicates using same criteria and frequency as those for water samples of one or 10 percent, whichever is greater.

5.5.8 DATA REDUCTION, VALIDATION, AND REPORTING

For all field sampling parameters, the data acquired are those that are directly read from the instrument. The following reporting units will be used during all phases of the project:

- pH will be reported to 0.1 standard units;

- Specific conductance will be reported to two significant figures below 100 μmhos/cm and three significant figures above 100 μmhos/cm;
- Temperature will be reported to the nearest 0.5° C;
- Water levels measured in wells will be reported to the nearest 0.01 ft; and
- Soil sampling depths will be reported to the nearest 0.5 ft.

Field measurements will be made by competent field geologists and technicians. Field data collected during project tasks will be identified and reported to the project manager for validation. Pertinent field measurement data (i.e., field parameters, well boring logs) will be included in appropriate appendices within the RFI report.

5.5.8.1 Quality Control Validation and Data Integrity

When data are transferred to a computer file (spreadsheet, graphic program, word processing program, etc.), the data are checked by the person entering the data and the project manager. Supporting documentation (e.g., field observations, ancillary measurements, etc.) are also checked by the project manager, as well as all field forms. These procedures are further detailed in Section 6.0. The project or task manager is responsible for checking to ensure that custody integrity is maintained. This means that the chain-of-custody forms have been accurately completed, and that possession of the sample containers and samples has been controlled and documented.

Four different procedures will be used by the project manager to validate data:

- Routine checks will be made during the processing of data, for example, looking for errors in identifying codes (e.g., time of sampling, location of sample, method of sampling, etc.).
- Internal consistency of a data set will be evaluated that may involve plotting the data into control charts and evaluating trends.

- Checks for consistency of the data set over time will be performed. This can be accomplished by visually comparing data sets against gross upper limits obtained from historical data sets. Anomalous data will be identified.
- Checks may be made for consistency with parallel data sets, i.e., data sets obtained presumably from the same population (e.g., from the same region of the aquifer or volume of soil).

The purpose of these validation checks and tests is to identify outliers; that is, an observation that does not conform to the pattern established by other observations. Outliers may be the result of transcription errors or instrument breakdowns. Outliers may also be manifestations of a greater degree of spatial or temporal variability for the environmental samples than expected.

After an outlier has been identified, a decision concerning its fate must be rendered. Obvious mistakes in data will be corrected when possible, and the correct value will be inserted. If the correct value cannot be obtained, the data may be included but discounted. An attempt will be made to explain the existence of the outlier. If no plausible explanation can be found for the outlier, a note to that effect will be included in the report. Also, if deemed necessary, the effect of the outlier when included in and excluded from the data set, will be evaluated.

5.5.8.2 Reporting

The following format may be used for the RFI report:

- Introduction--background, objective, applicable regulations;
- Methods--description of field and laboratory methods;
- Results--presentation of laboratory and field data and QC results in both tabular and graphical form (the format of tables and graphics is designed to complement the text);

- Discussion and Conclusions--interpretation of the field and laboratory data and identification of potential receptors;
- References; and
- Appendices--soil boring logs, monitor well construction diagrams, laboratory analyses, etc.

Document control procedures and report distribution are discussed in Section 6.3.

ECT will retain a hard copy of the final report in the project file maintained by the project manager. The file will contain all original and official field documents pertinent to the project and the data processing department will retain computer disks of all archived documents indexed by disk number, document, date, and client. All data are at a minimum stored under office security measures and held for a period no less than 3 years. Details of data management are included in Sections 6.1 and 6.2.

6.0 DATA MANAGEMENT PLAN

This section discusses ECT's data and report processing procedures, project file requirements, and all project-related reports.

6.1 FIELD DATA MANAGEMENT

With the exception of photographic records, data resulting from field assessment activities are entered directly onto field forms (Appendix E) contained in the project-specific bound notebook. Each page of the field notebook will be numbered and accounted for. At the end of each task, photocopies of completed field forms are provided to the project manager for identification of any omissions, errors, or other difficulties. If corrections are necessary, a single line will be drawn through the incorrect data, and the correction will be initialled and dated. Original field forms within the bound notebook are signed and dated by the project manager at intervals throughout the assessment and/or at the completion of the assessment.

As field data become available, they are processed to the extent necessary to evaluate the adequacy of the data and/or to enable interpretations to be made. This initial processing could involve simply confirming adequate equipment calibration and decontamination, or may require tabulation and plotting of field parameters, water levels, or elevation surveys. This procedure allows for early identification of the need for any further data collection. If the available field data is confirmed to be adequate and complete, further processing may be undertaken as necessary to allow for inclusion of the data within the project report (charts, graphs, figures, etc.).

The transfer of data from field forms to reportable charts, graphs, etc., will be conducted by computer entry personnel or qualified members of the field team. The product of this effort will be checked for accuracy and presentation by the project manager or a designee, whereupon the original bound field forms will be incorporated into the project file. If further field assessment efforts are necessary, new bound field notebooks will be prepared specific to the data collection requirements of the new field task.

For field data, surveyed land surface elevations will be reported to an accuracy of 0.1 ft, monitor well elevations and depth to water measurements will be reported to 0.01 ft, fill material sampling depths will be reported to 0.5 ft, temperature will be reported to 0.5° C, pH will be reported to 0.1 standard units, and specific conductance will be reported to two significant figures below 100 μmhos/cm and three significant figures at or above 100 μmhos/cm. Visual observations will be noted in whatever detail is warranted by the circumstances. Original photographic prints will be dated by the project manager and maintained in the custody of the project manager. All records of field activities will be retained in the project file for a period no less than 3 years.

6.2 LABORATORY DATA MANAGEMENT

Photocopies of all laboratory reports will be appended to the RFI report. Summary tables will be included in the RFI report and will be checked prior to furnishing to the project manager for final review. Original laboratory reports will be maintained in the project file for a period no less than 3 years. Refer also to Appendix D for data management at the laboratory.

6.3 REPORTING

Deliverables are reviewed by the project manager, the document coordinator and at least one other qualified individual prior to submission. The author and all reviewers sign and date the Document Review Form that accompanies the draft following each review; multiple drafts are sometimes necessary dependent upon the complexity of the project and the number of reviewers.

Figures, tables, charts, graphs, and photographs are included whenever they may enhance the clarity and/or completeness of data presentation. Appropriate interpretations will be made as to the consequences of detected parameters with respect to complete exposure pathways and potential receptors. If applicable, conclusions will be made as to the need for further assessment or corrective measures.

Two copies of the Draft RFI report will be submitted to EPA's Region IV Waste Management Division, and one copy will be submitted to the FDEP southwest district. At least one copy of the report will be retained in the project file, and one copy will be stored among all other deliverables filed sequentially by project number.

7.0 REFERENCES CITED

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Southwest Florida Water Management District. 1988. Ground-Water Resource Availability Inventory: Hillsborough County, Florida.

Vacher, H.L., G.W. Jones, and R.J. Stebnisky. 1992. Heterogeneity of the Surficial Aquifer System in West Central Florida. In the Plio-Pleistocene Stratigraphy and Paleontology of Southern Florida (Ed. T.M. Scott). Florida Geological Survey, Special Publication No. 36. pp. 93-100.

TABLES

Table 1. Summary of Detected Constituents in "Soil" (Fill Materials) †
Safety-Kleen, 24th Avenue, Tampa Facility

Constituent	Units	COMP-1* 12/14/92	COMP-2* 12/15/92	COMP-3* 12/15/92	COMP-4* 12/15/92
Fluorene	µg/kg	400	<330	3400	<330
Phenanthrene	µg/kg	2300	700	21000	2000
Anthracene	µg/kg	550	<330	5800	520
Fluoranthene	µg/kg	2000	990	25000	2800
Pyrene	µg/kg	2300	1000	16000	3000
Benzo(a)anthracene	µg/kg	1100	440	9300	1700
Chrysene	µg/kg	840	350	6800	1500
Benzo(b)fluoranthene	µg/kg	1000	390	6200	1700
Benzo(k)fluoranthene	µg/kg	640	<330	3800	930
Benzo(a)pyrene	µg/kg	880	350	5600	1500
Indeno(1,2,3-c,d)pyrene	µg/kg	480	<330	2000	830
Dibenzo(a,h)anthracene	µg/kg	<330	<330	1100	440
Benzo(g,h,i)perylene	µg/kg	510	<330	2000	840
Arsenic	mg/kg	<0.5	0.8	<0.5	0.5
Barium	mg/kg	<25	27	27	36
Chromium	mg/kg	12	5.6	3.5	8.8
Lead	mg/kg	43	34	10	65

Notes:
µg/kg = Micrograms per kilogram.
mg/kg = Milligrams per kilogram.
COMP = Composite

† All samples were analyzed for EPA Methods 8240 and 8270 and RCRA metals.
*Composite-1 = SB-1A, SB-1B, SB-2A, SB-2B
Composite-2 = SB-3A, SB-3B, SB-4A, SB-4B
Composite-3 = SB-5A, SB-5B, SB-6A, SB-6B
Composite-4 = SB-7A, SB-8A

Sources: ERM, 1992; ECT, 1994.

Table 2. RCRA Facility Investigation Schedules A and B
Safety-Kleen Corporation, 24th Avenue Facility
Tampa, Florida

RFI Activity	Activity Duration (Weeks)	Cumulative Schedule (Days)
SCHEDULE A--PHASE I ONLY		
EPA approval of RFI Workplan	0	0
Phase I planning/contracting	7	49
Phase I field activities	1	56
Laboratory analyses	3	77
Data evaluation--phase II not warranted	1	84
Prepare Draft RFI report	5	119
Submit Draft RFI to EPA	--	**119**
SCHEDULE B--PHASES I AND II		
EPA approval of RFI Workplan	0	0
Phase I planning/contracting	7	49
Phase I field activities	1	56
Laboratory analyses	3	77
Data evaluation/phase II warranted	1	84
Submit Progress Report I to EPA	--	90
Phase II planning/contracting	8	146
Submit Progress Report II to EPA	--	180
Phase II field activities--first iteration	6	188
Laboratory analyses	3	209
Data evaluation	1	216
Phase II field activities--second iteration	4	244
Laboratory analyses	3	265
Submit Progress Report III to EPA	--	270
Prepare Draft RFI report	7	308
Submit Draft RFI report to EPA	--	**308**

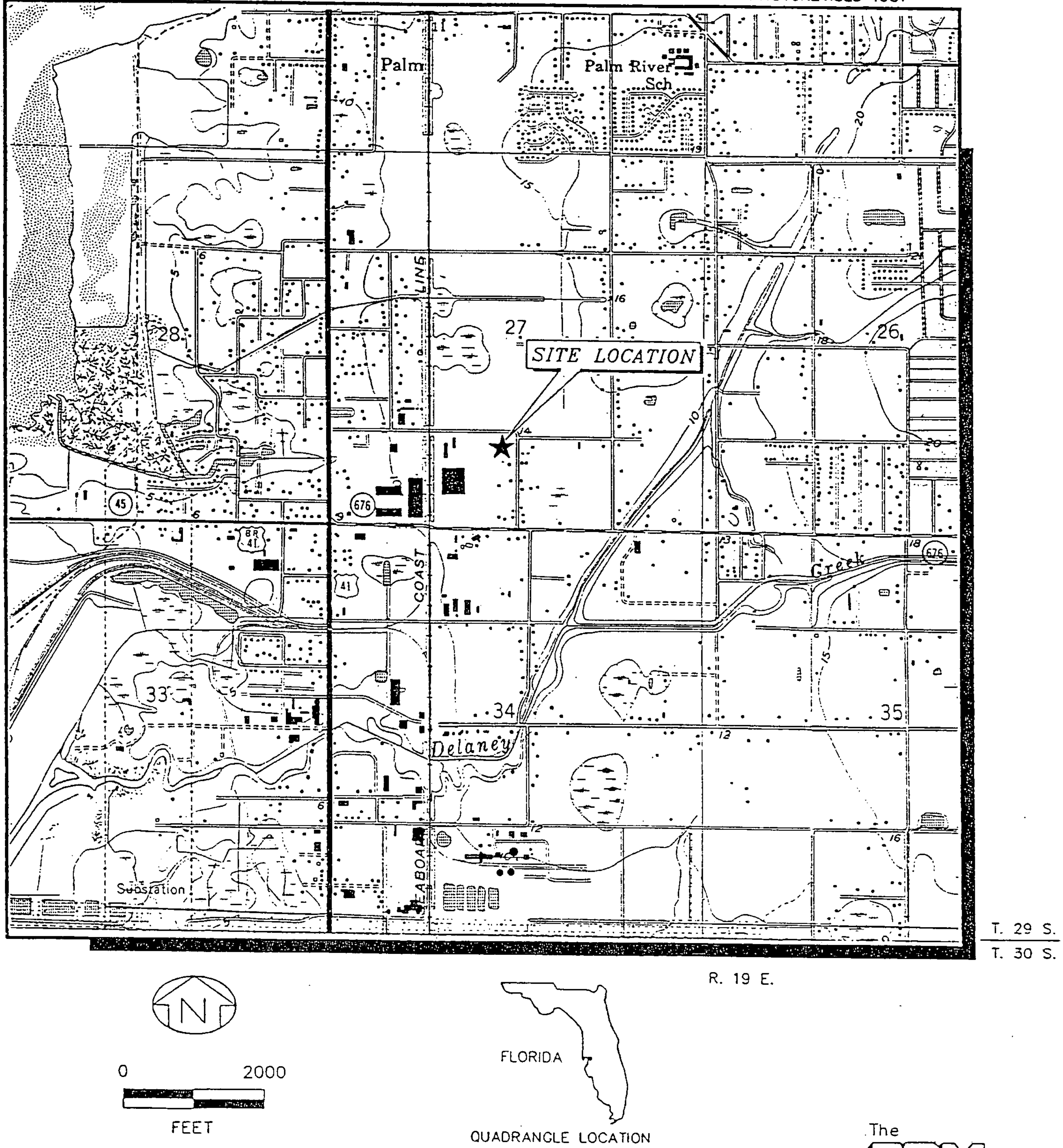
Source: ECT, 1994.

FIGURES

Figure 1.
Site Location Map
Safety-Kleen Corporation
24th Avenue Facility
Tampa, Florida

TAMPA QUADRANGLE
FLORIDA–HILLSBOROUGH CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
1956
PHOTOREVISED 1981

Source: ERM, 1992.



The ERM

SWMU Location Map For Safety-Kleen

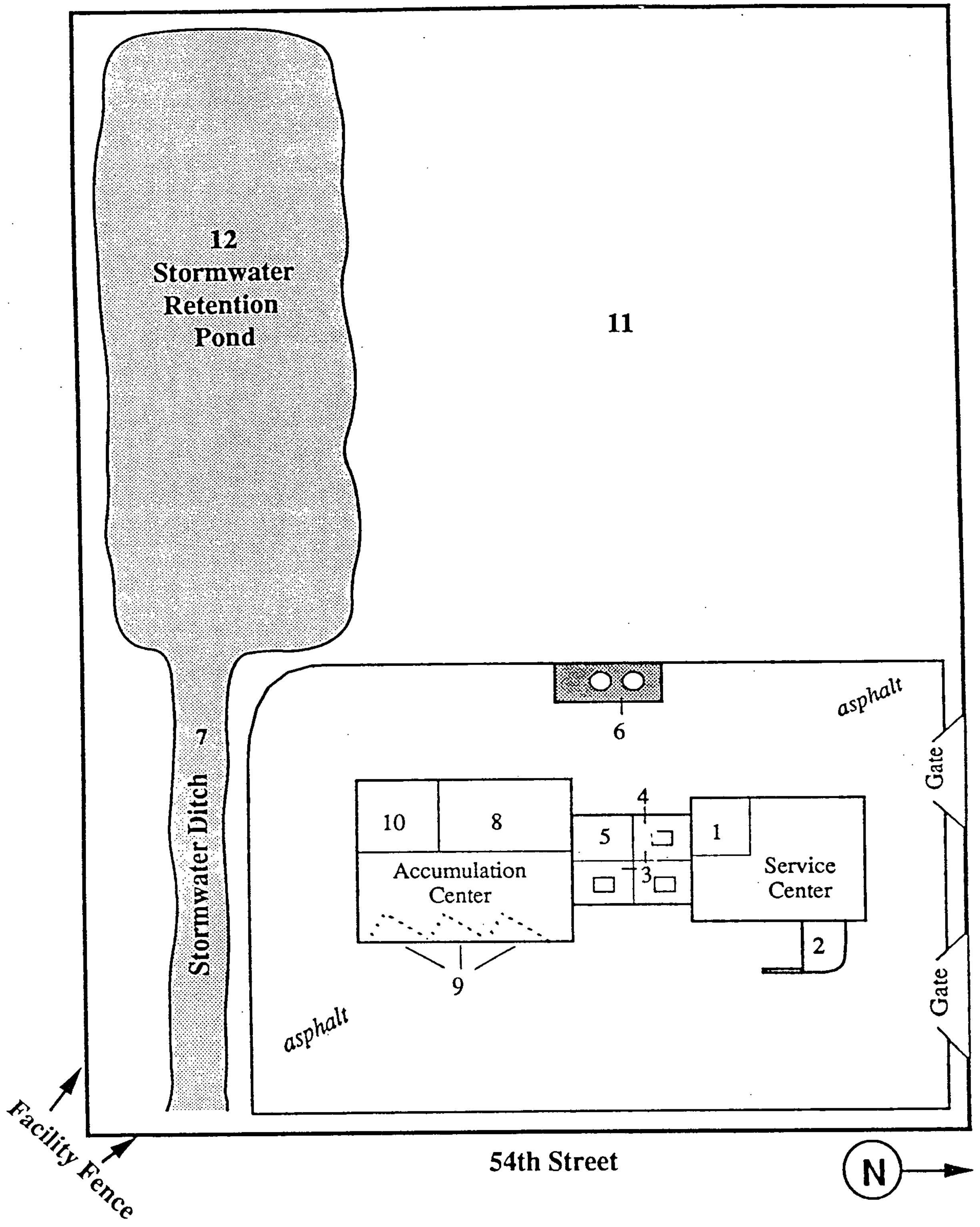


FIGURE 2.
SOLID WASTE MANAGEMENT UNIT LOCATION MAP
SAFETY-KLEEN CORPORATION
24TH AVENUE FACILITY
TAMPA, FLORIDA
Source: EPA, 1989a.

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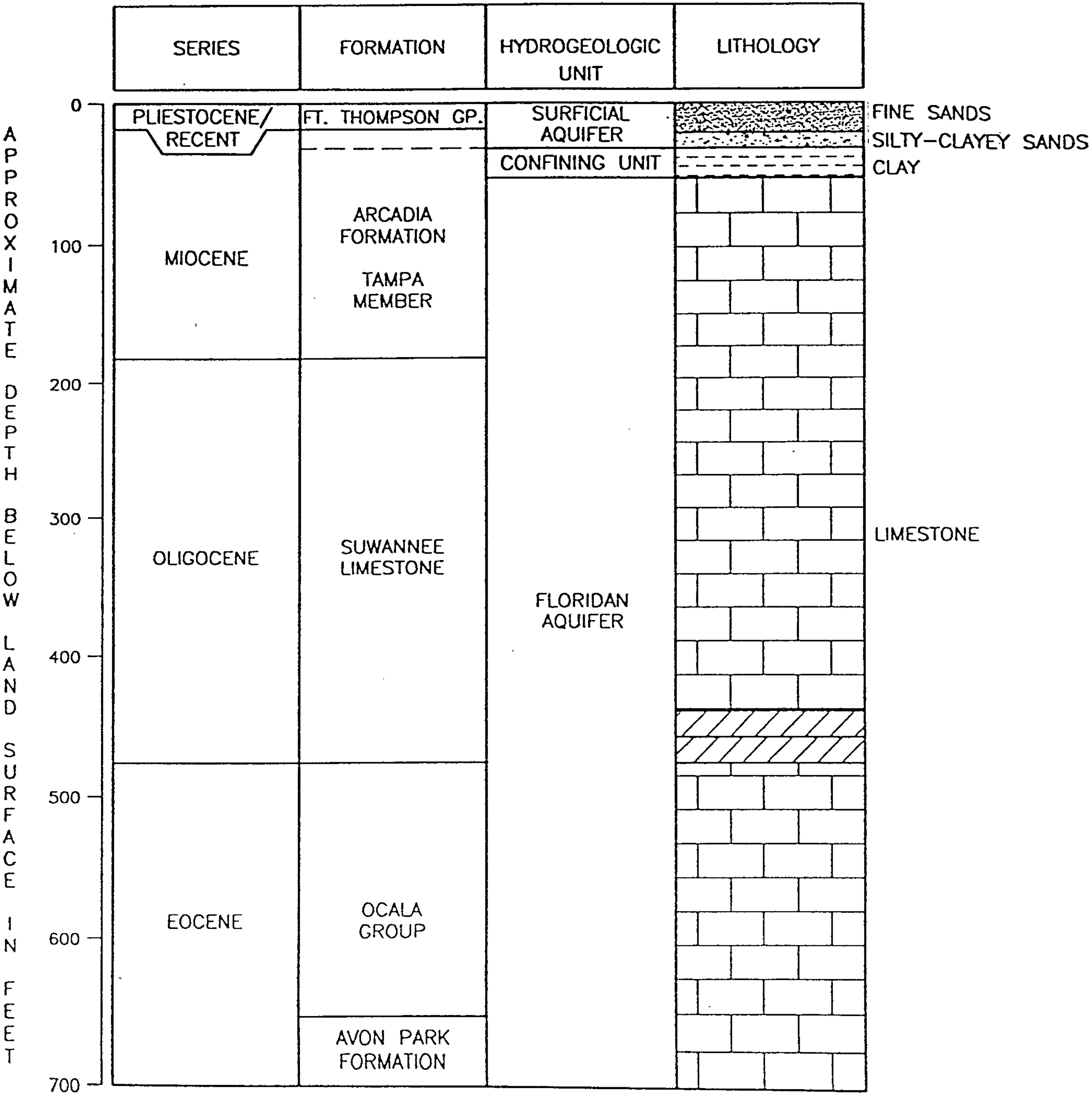
Environmental Consulting & Technology, Inc.



GENERAL HYDROGEOLOGY OF THE TAMPA BAY AREA (MODIFIED FROM LEWIS AND ESTAVEZ, 1988; AFTER WEHLE, 1978.)

FIGURE 3.
GENERAL HYDROGEOLOGY OF THE TAMPA BAY AREA
SAFETY-KLEEN CORPORATION
24TH AVENUE FACILITY
TAMPA, FLORIDA
Source: ECT, 1994.

ECT
Environmental Consulting & Technology, Inc.

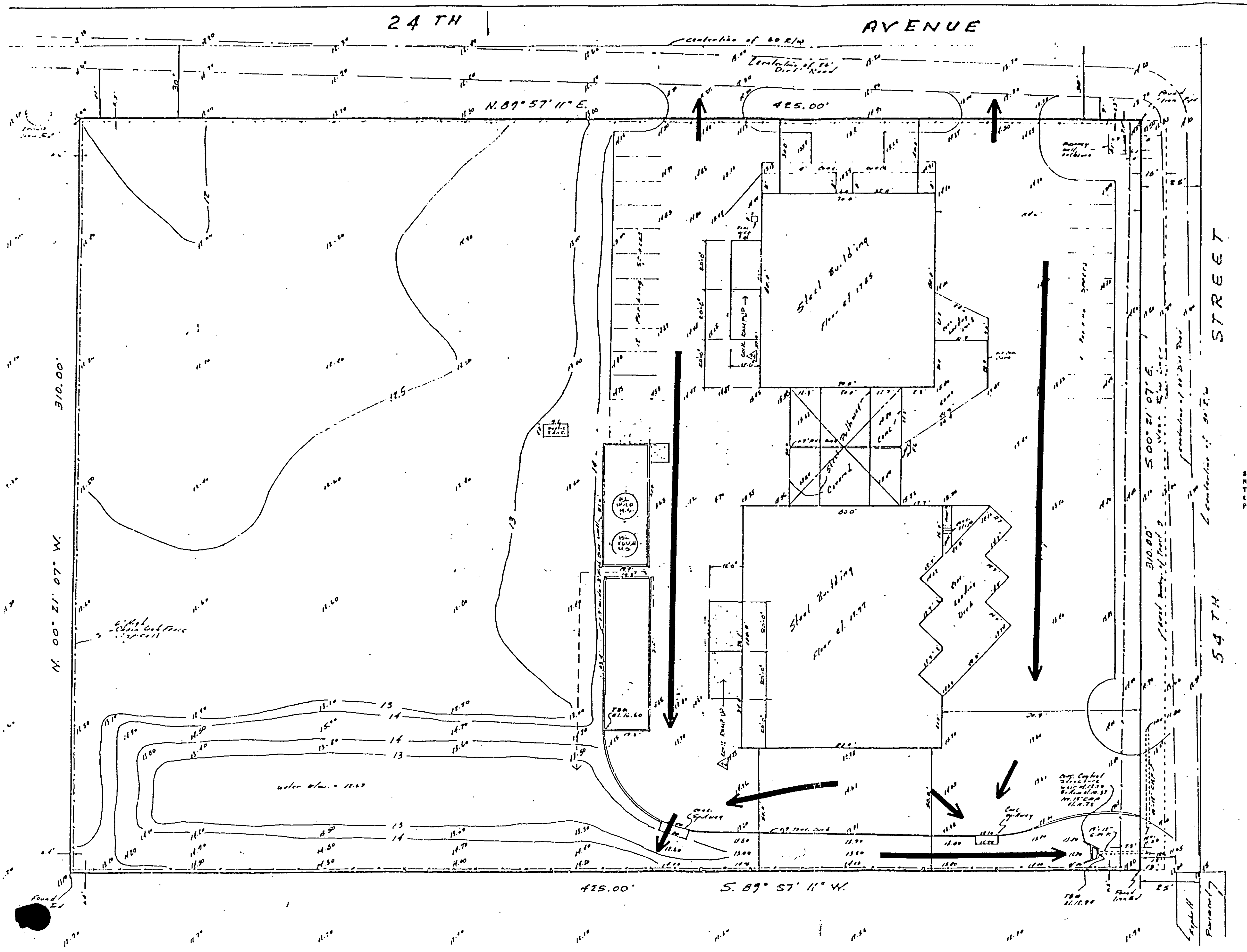


Figure 4.
Facility Topographic and
Stormwater Runoff Map
Safety-Kleen Corporation
24th Avenue Facility
Tampa, Florida

Source: ERM, 1993.

Notes: This Parcel as described is in zone "B" as defined by the National Flood Insurance Program.
(Community Panel No. 120112 0367 C)

Bearings as indicated refer to an assumed meridian.

safety-kleen corp.

EXIST. SITE PLAN

SCALE 1"=40'-0"
DATE 3/13/87
1 ADDED RAMPS

FOR SERVICE CENTER BRANCH:
TAMPA, FL.

D12801

Survey of: The West 425.00 feet of the East 435.00 feet of the North 310.00 feet of TRACT 9, in the Southwest 1/4 of Section 27, Township 29 South, Range 19 East, SOUTH TAMPA SUBDIVISION, according to map or plat thereof as recorded in Plat Book 6, Page 3 of the Public Records of Hillsborough County, Florida.

This certifies that we have made a survey of the above described property and that the survey and this plat conforms to the minimum technical standards set forth by the Florida Board of Land Surveyors, pursuant to Section 472.027, Florida Statutes.

August 28, 1987

JOHN MELL[illegible], INC.

For: Safety Kleen

JM Job No. M873581

STORMWATER RUNOFF

N

0 40
SCALE
(FEET)

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FIGURE 5.
AERIAL PHOTOGRAPH -- 1972
SAFETY-KLEEN CORPORATION
24TH AVENUE FACILITY
TAMPA, FLORIDA
Source: Hillsborough County Engineering Department, 1972.

94321 1111 083094

FIGURE 6.
AERIAL PHOTOGRAPH -- 1976
SAFETY-KLEEN CORPORATION
24TH AVENUE FACILITY
TAMPA, FLORIDA
Source: Hillsborough County Engineering Department, 1976.

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94321 1111 083094

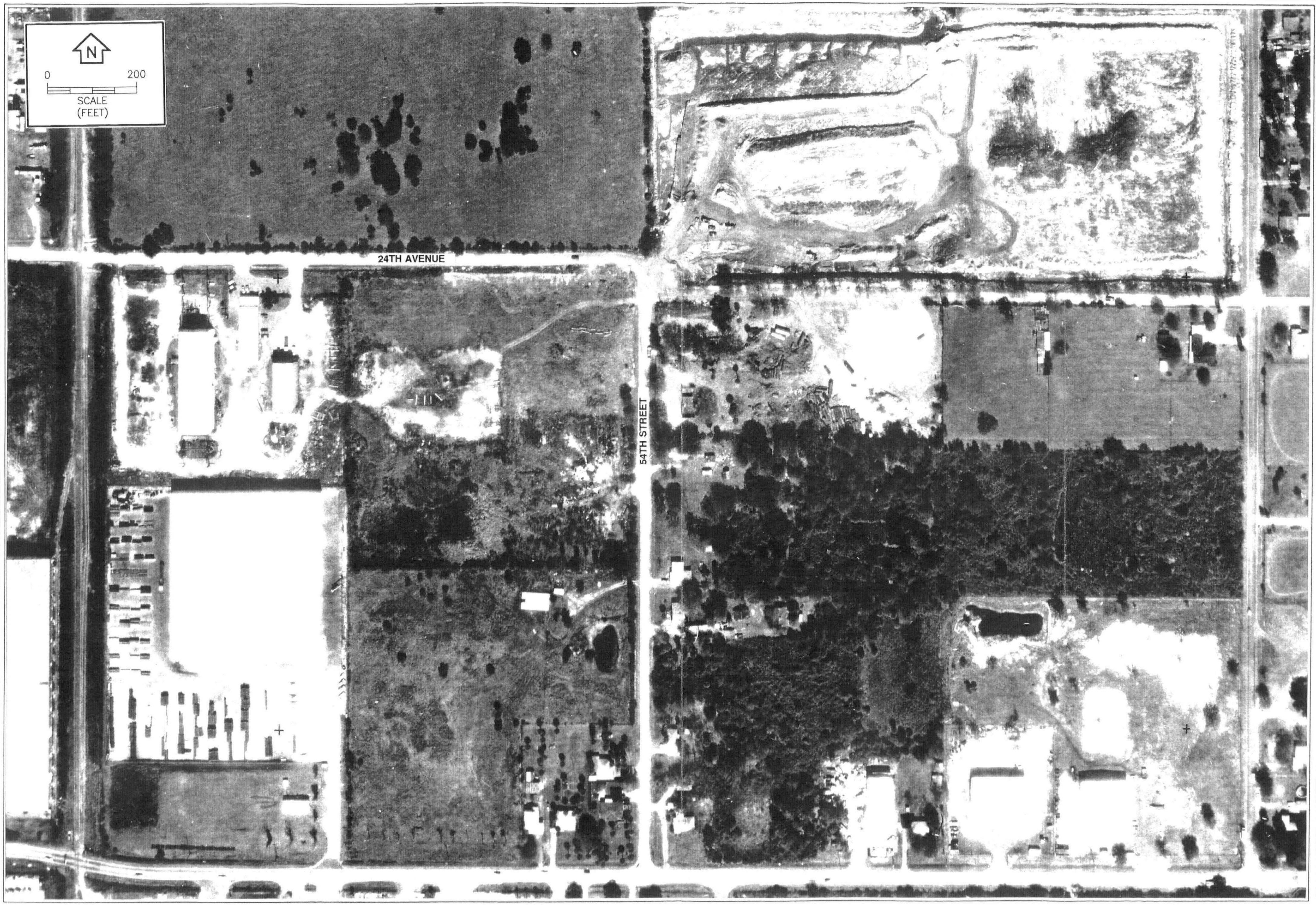

FIGURE 7.
AERIAL PHOTOGRAPH -- 1985
SAFETY-KLEEN CORPORATION
24TH AVENUE FACILITY
TAMPA, FLORIDA
Source: Hillsborough County Engineering Department, 1985.

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FIGURE 8.
AERIAL PHOTOGRAPH -- 1988
SAFETY-KLEEN CORPORATION
24TH AVENUE FACILITY
TAMPA, FLORIDA
Source: Hillsborough County Engineering Department, 1988.

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PH1MWLOC-94P

94321 1111 083094

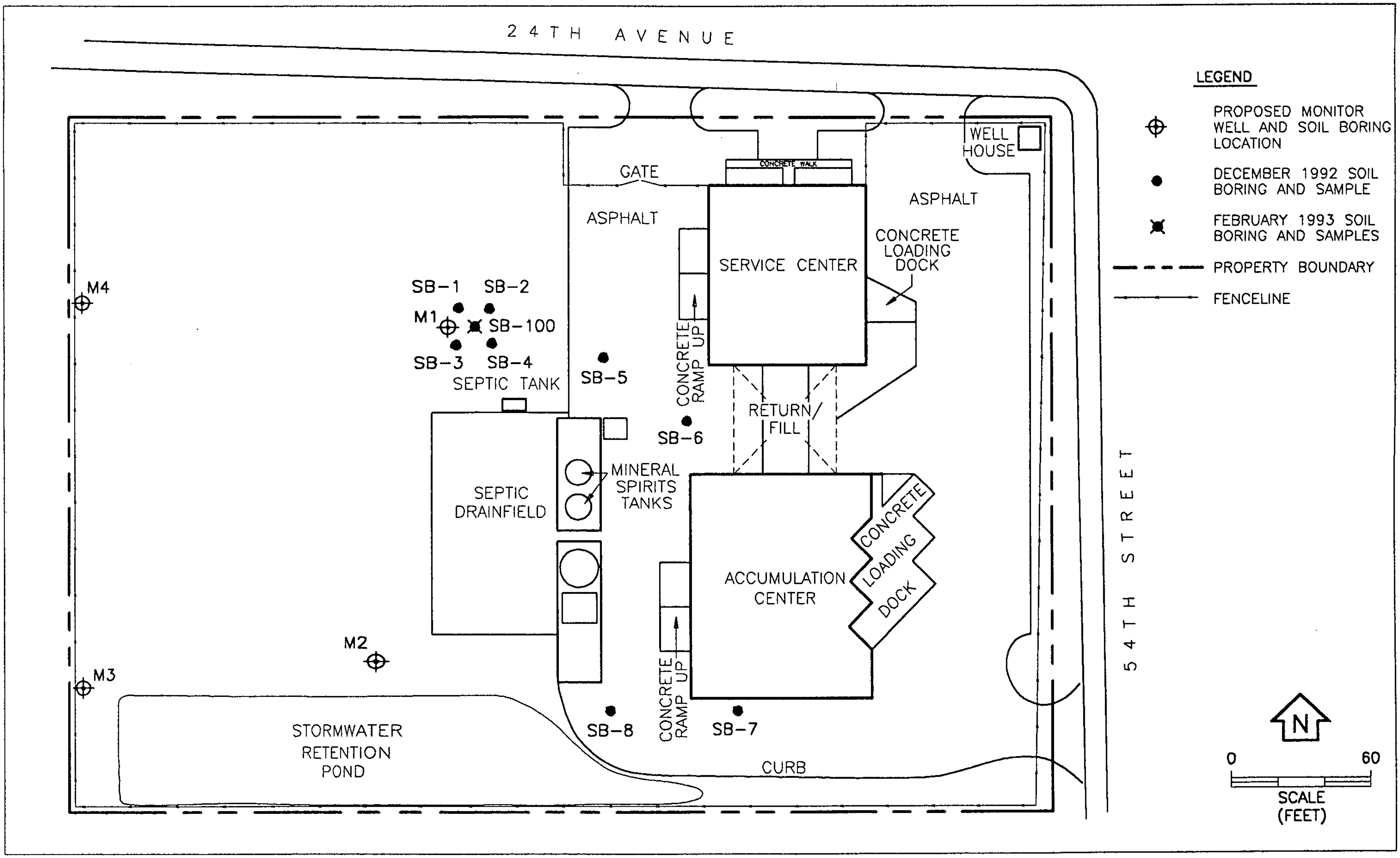

FIGURE 9.
PROPOSED PHASE I MONITOR WELL LOCATIONS
SAFETY-KLEEN CORPORATION
24TH AVENUE FACILITY
TAMPA, FLORIDA
Source: ERM, 1993; ECT, 1994.

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ORGCHART-94P

94321 1111 083094

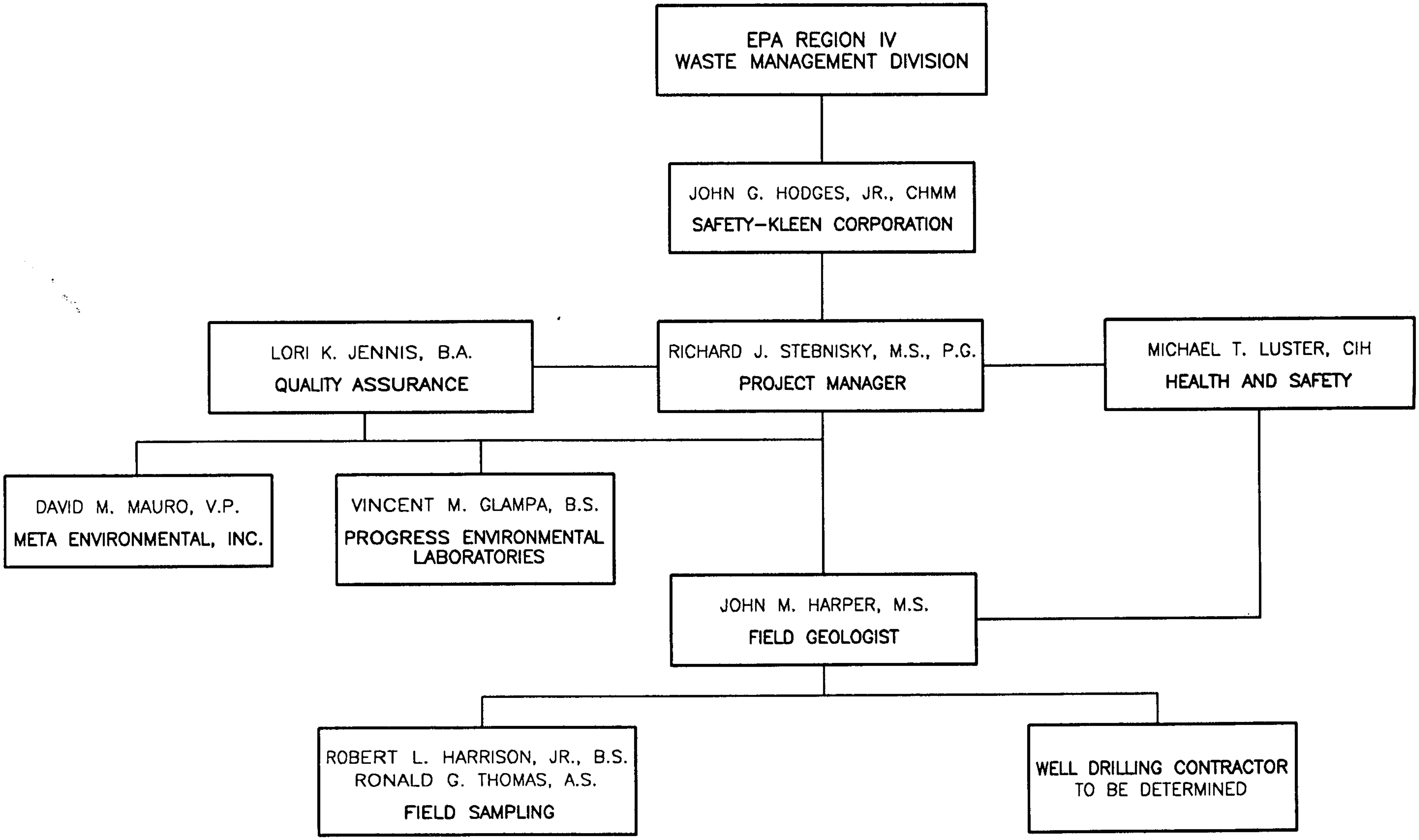

FIGURE 10.
PROJECT ORGANIZATIONAL CHART
SAFETY-KLEEN CORPORATION
24TH AVENUE FACILITY
TAMPA, FLORIDA
Source: ECT, 1994.

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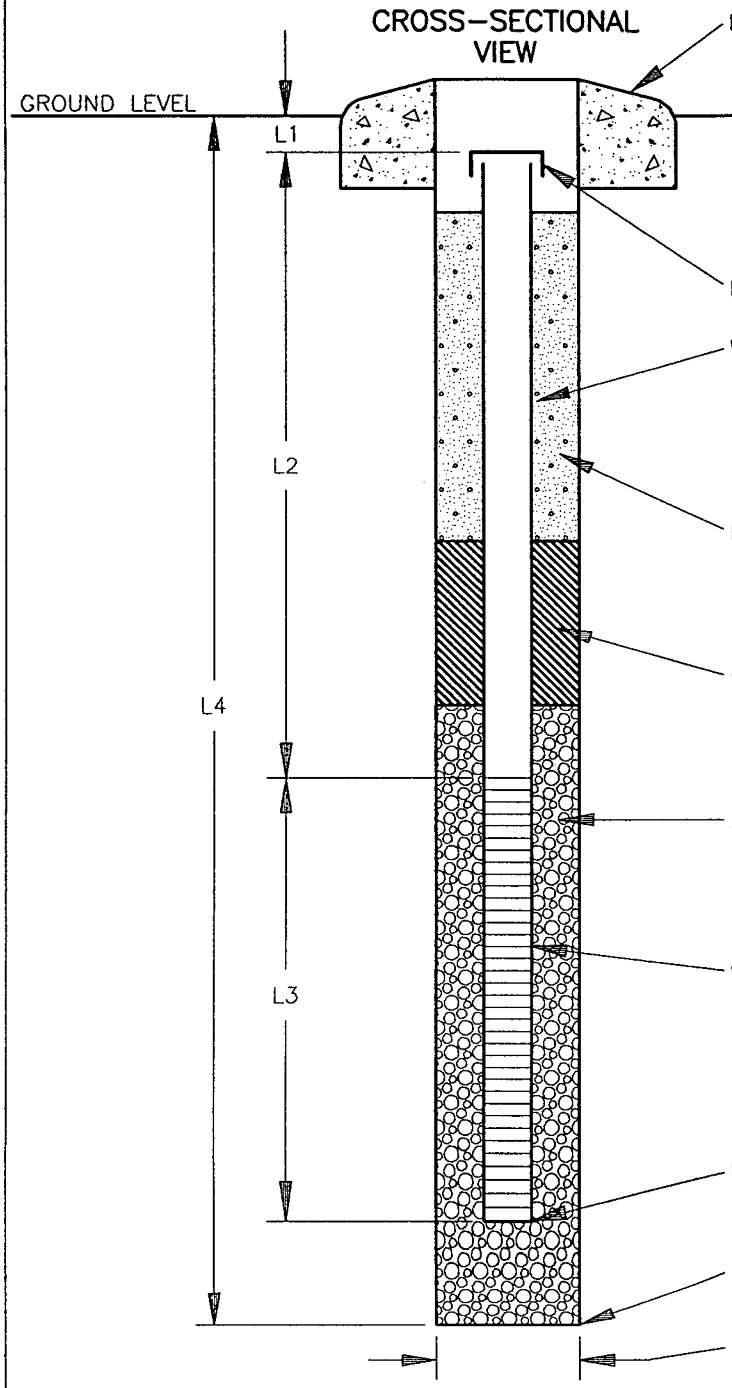
Environmental Consulting & Technology, Inc.

MONITOR WELL CONSTRUCTION DETAILS FLUSH GRADE MANHOLE



PROTECTIVE CASING AND CONCRETE PAD	
CASING MATERIAL	STEEL
CASING DIAMETER	8 INCHES
CASING LENGTH	8 INCHES
PAD DIMENSIONS	2 FT x 2 FT
HEIGHT ABOVE GROUND	0.2 FT
LOCKABLE CAP	
WELL CASING	
MATERIAL	PVC
DIAMETER	2 INCHES
JOINT TYPE	FLUSH
LENGTH	2 FEET
BACKFILL AROUND CASING	
MATERIAL	GROUT
THICKNESS	0.5 FOOT
SEAL	
TYPE OF SEAL	FINE SAND
THICKNESS	0.5 FOOT
FILTER PACK	
TYPE OF FILTER	SILICA SAND
DISTANCE ABOVE SCREEN	1 FOOT
WELL SCREEN	
SCREEN MATERIAL	PVC
DIAMETER	2 INCHES
LENGTH	10 FEET
SLOT SIZE	0.010 INCHES
DEPTH TO BOTTOM OF MONITORING WELL	12.2 FEET
DEPTH TO BOTTOM OF FILTER SAND	12.5 FEET
DIAMETER OF BOREHOLE	8 INCHES

PROJECT SAFETY-KLEEN 24TH AVE.
PROJECT NO. 94321-1111
MONITOR WELL TYPICAL

L1 = 0.2 FT.
L2 = 2 FT.
L3 = 10 FT.
L4 = 12.5 FT.

NOT TO SCALE

FIGURE 11.
PROPOSED MONITOR WELL DESIGN
SAFETY-KLEEN CORPORATION
24TH AVENUE FACILITY
TAMPA, FLORIDA
Source: ECT, 1994.

ECT
Environmental Consulting & Technology, Inc.

APPENDIX A

FINAL RCRA FACILITY ASSESSMENT
SAFETY-KLEEN CORPORATION, TAMPA, FLORIDA

FINAL RCRA FACILITY ASSESSMENT

SAFETY-KLEEN CORPORATION
Tampa, Florida

EPA I.D. No. FLD980847271

Prepared for:

Ms. Rowena Sheffield
U.S. Environmental Protection Agency
Region IV
345 Courtland Street, N.E.
Atlanta, GA 30365

Prepared by:

A.T. Kearney, Inc.
225 S. Riverside Plaza
Chicago, IL 60606

EPA Contract No. 68-W9-0040
Work Assignment No. R04-01-20

December 1989

INTERIM RCRA FACILITY ASSESSM

Safety-Kleen Corporation
Tampa, Florida
EPA I.D. No. FLD980847271

TABLE OF CONTENTS

INTERIM RCRA FACILITY ASSESSM

Safety-Kleen Corporation
Tampa, Florida
EPA I.D. No. FLD 980 847 271

LIST OF FIGURES

LIST OF TABLES

I. EXECUTIVE SUMMARY

The Safety-Kleen Corporation (Safety-Kleen) facility is located in Tampa, Florida, and occupies approximately three acres within a light industrial area, with open fields and residential housing nearby. Safety-Kleen acts as a service, storage and transfer facility. The company, which began operating at this site in 1986, leases small-parts washers and solvents to customers, collects spent solvents from customer sites and stores the waste solvents at the Tampa facility until they are shipped to one of Safety-Kleen's recycling centers in Lexington, South Carolina. The Tampa site also acts as a transfer facility for wastes from other Safety-Kleen facilities in South Florida.

Hazardous waste managed by this facility is classified as D001, D006, D007, D008, F001, F002, F004, F003 and F005. This hazardous waste includes: waste solvents; mineral spirits, 1,1,1-trichloroethylene, methylene chloride, 1,1,2-trichloro-1,2,2-trifluoroethane, and lacquer thinners; dry-cleaning wastes; paint wastes; wet dumpster and tank bottom sludge; and immersion cleaner (which contains chlorinated solvents and cresylic acid). Approximately 874,000 gallons of hazardous waste is stored and shipped annually from this facility.

The facility has experienced several small spills or releases in the four years it has been in operation. According to the available information, these spills have been confined to concrete/paved areas and did not reach surrounding soils. In each case, the spilled material was cleaned from the contained areas using an absorbent. The resultant waste from cleanup activities was sent off-site for disposal.

A total of twelve SWMUs were identified through the file review and VSI of the facility. Based on the review of the facility's files, and on observations during the VSI, the greatest potential for release of hazardous constituents is from the Old Dumping Ground, (SWMU 11). The suggested further action is to sample the soil in this area.

II. INTRODUCTION

The 1984 Hazardous and Solid Waste Amendments (HSWA) to the Resource Conservation and Recovery Act (RCRA) provide new authority to the Environmental Protection Agency (EPA) to require comprehensive corrective action for releases of hazardous waste and hazardous constituents from solid waste management units (SWMUs) and areas of concern (AOCs) at all operating, closed or closing RCRA-regulated facilities. The intent of this authority is to address previously unregulated releases to air, surface water, soil and groundwater, and the generation of subsurface gas. In order to accomplish this objective, a RCRA Facility Assessment (RFA) is undertaken, consisting of a Preliminary Review (PR) of available and relevant documents, a Visual Site Inspection (VSI) and, if warranted, a Sampling Visit (SV).

This report summarizes the results of the RFA of the Safety-Kleen Corporation, Tampa, Florida, facility. The report is based on a review of the file materials maintained at EPA Region IV and the Florida Department of Environmental Resources (FDER) including RCRA, CERCLA, Air, Water and Groundwater files. A Visual Site Inspection (VSI) was performed October 2, 1989.

Section II discusses the facility's ownership and regulatory history, process description, waste management practices, and history of releases. The facility's environmental setting, such as location and surrounding land use and geology and soils, is also presented in this section. A description of the SWMUs is presented in Section III in the form of a checklist. Section IV contains a summary of the findings from the PR and VSI. A suggested sampling strategy is discussed in Section V. References used to prepare this report are listed in Section VI. A map of the facility identifying the locations of the SWMUs is presented in Appendix A. Appendix B contains a copy of the VSI field notes, and Appendix C consists of the VSI photographic log.

A total of twelve SWMUs were identified as a result of the assessment. Table IV-1 in Section IV lists the SWMUs identified during the PR and VSI. Figure A-1 in Appendix A shows the approximate location of each SWMU identified at the facility.

A. FILE SEARCH AND VSI

The file search of the regional files for the facility was conducted by Pat Martz of A.T. Kearney, Inc. The file search at the state office was conducted on August 14, 1989, by Deirdre McNulty of A.T. Kearney, Inc. The Visual Site Inspection (VSI) of the Safety-Kleen facility in Tampa, Florida, was conducted on October 2, 1989. The following individuals participated in the VSI:

Rajesh Aji	A.T. Kearney, Inc.
Gail Carter	Kearney/Centaur
Paul Pederson	Safety-Kleen

Frank Taylor	Safety-Kleen
James Davis	Safety-Kleen
David Galloway	Safety-Kleen
Hugh Hazen	US EPA Region IV
William Neimes	FDER-Tallahassee
Debra Kolme	FDER-Tampa

The inspection team arrived at the Safety-Kleen facility at 9:00 a.m., Eastern Daylight Time (EDT), on October 2, 1989. An introductory meeting was held in the Service Center Sales Office. The facility representatives were briefed by EPA on the purpose and scope of the VSI. At this time the potential solid waste management units were discussed, and the available information for each unit was reviewed.

The introductory meeting ended at 10:00 a.m., EDT, and the team proceeded to the facility buildings and grounds for the VSI. The weather was clear, sunny and humid. The temperature was approximately 85°F and the winds were southwesterly.

Photographs were taken by Rajesh Aji, of A.T. Kearney, Inc., using a Canon Automatic camera and Kodak 200 ASA color print film. The VSI was completed by 11:15 a.m., EDT, and the team remained at the facility while the facility representatives collected and copied additional information not obtained during the original file searches. The VSI Team left the facility at 12:00 p.m., EDT.

B. FACILITY DESCRIPTION

Ownership and Regulatory History

The Safety-Kleen facility in Tampa, Florida, was built and began operating in 1985 under the ownership of the Safety-Kleen Corporation. The Safety-Kleen Corporation continues to operate the facility. According to the facility representatives, prior to 1985 the site consisted of a vacant lot. The eastern portion of the property - Old Dumping Ground (SWMU 11) - was used as a dumping ground for assorted rubbish. No information was available regarding the source of this rubbish or past ownership of the property.

In July 1985, Safety-Kleen submitted their initial RCRA Part A permit application to the FDER (Reference 4). The facility also notified EPA of its hazardous waste generator and transportation activities. In June 1986, Safety-Kleen submitted its RCRA Part B permit application to FDER for the storage of waste mineral spirits (D001, D006, D008) in a 15,000-gallon, above-ground tank and for two container storage areas for hazardous waste (D001, D006, D007, D008, F001-F005). The total capacity for the two container storage areas is 75,000 gallons. A revised Part B permit application was submitted in August 1988, and is currently under review by FDER. At this writing, Safety-Kleen has not been issued a RCRA Part B permit.

In June 1985, Safety-Kleen submitted a Construction Permit Application Number HC 29-118986 for the construction of a hazardous waste tank and container storage area. The FDER responded to the construction permit application over the following four months with four Notices of Deficiencies (NODs). Some of the deficiencies noted were as follows: submission of a scale map locating drinking water wells within one-quarter mile from the facility; correction of EPA I.D. numbers; submission of a drawing showing the wet dumpsters' locations; and drawings which were not certified by a registered engineer (References 11, 12, 13, 14 and 15). In September 1988, FDER issued Safety-Kleen a permit to construct the hazardous waste tank and container storage area (Reference 22). At this time, the facility has no other federal or state environmental permits.

Process Description

The Tampa Safety-Kleen facility is a service-oriented operation that leases small-parts washing equipment which use hydrocarbon and halogenated solvents from automotive repair and industrial maintenance shops. The parts washers are leased to customers under a contractual agreement that provides regularly-scheduled solvent changes and machine maintenance. Under the agreements between Safety-Kleen and its customers, the "ownership" of the solvents remains with Safety-Kleen; the customers "lease" the solvents. The solvents remain the property of Safety-Kleen and approximately two-thirds of the clean solvent leased to customers is the product of the recycling process, which the Safety-Kleen Corporation operates in their Lexington, South Carolina, facility.

In addition to operating as a service center for customers within the Tampa Bay area, this Safety-Kleen facility operates as a transfer station for other Safety-Kleen service centers and waste solvents transfer stations in southern Florida (Reference 27). As a transfer station, waste solvents are shipped to this facility for consolidation before being shipped to Safety-Kleen's recycling facility in Lexington, South Carolina. The service center and transfer station operations are run independently of one another at the Tampa facility (References 27, 29).

The Tampa Safety-Kleen facility is only involved in hazardous waste generation, transportation, and storage. No treatment or reclamation activities are conducted at this facility.

Transfer Facility Process

As a transfer facility, this Safety-Kleen location handles dumpster sediment, dry-cleaning wastes, paint waste, industrial solvents, and spent immersion cleaner. The immersion cleaner is collected at other transfer stations located in South Florida, and is then shipped to the Tampa transfer station for consolidation. The spent immersion cleaners (D001, F002 and F004) and perchloroethylene (PCE) solvent still bottoms and filter cartridges, from the dry cleaning industry arrive at the Service Center in 16- or 30-gallon drums. These wastes remain in their original containers, and are stored in the Service Center Drum Storage

Area (SWMU 1) and the Accumulation Center Drum Storage Area (SWMU 8), until enough containers have accumulated for a full shipment. Wastes are consolidated into a full truckload and shipped on a weekly basis to the Lexington recycling facility.

All wastes shipped to the Tampa facility are sent with a hazardous waste manifest listing the Tampa Safety-Kleen as the designated facility (References 27 and 39). Prior to shipment to the recycling facility, the hazardous waste labels are removed from the drummed waste and are replaced with new labels that denote the Tampa facility as the generator. When the wastes are shipped to South Carolina, a manifest is readied showing the Tampa facility as the generator of this waste and the South Carolina Safety-Kleen facility as the transporter and designated facility. The above arrangement was initiated and agreed upon by Safety-Kleen and FDER provided the waste is not stored at the Tampa facility for more than 10 days (Reference 27). This arrangement facilitates compliance with regulations during the permitting process for all seven Safety-Kleen facilities in Florida.

Additionally, the Tampa facility acts as a transfer station for paint waste, which is sent to another Safety-Kleen facility for reclamation. These wastes, which contain various thinners and paints, are collected in five-gallon pails and sixteen-gallon drums, and are stored in the Drummed Flammable Waste Storage Room (SWMU 10) until a truckload of waste has accumulated and is then sent to an independent reclaimer. The recovered solvent is then returned to Safety-Kleen and is redistributed to facility customers for use as product.

Service Center Process

Upon arrival at the Service Center, the drummed spent mineral spirits are emptied into one of three Solvent Return Wet Dumpsters (SWMU 3), which are located in the Drummed Waste Loading Dock Area (SWMU 9). Metal grating within these wet dumpsters filters out extraneous material that may be present in the spent solvent, such as metal parts, rags and paper. The solvent is allowed to settle, and the liquid portion is pumped to a 15,000-gallon Waste Solvent Storage Tank (SWMU 6). This waste solvent is shipped off-site approximately once every seven days by tanker truck to the recycling facility in Lexington, South Carolina. The solvent sludge that accumulates at the bottom of the wet dumpsters along with the plastic drum liners are put in 16- or 30-gallon drums, and are also shipped to the recycling center where the sludge is blended for use as an alternate fuel in cement kilns. The fuel is then shipped off-site to Safety-Kleen cement kilns.

The empty waste solvent drums are rinsed with clean recycled solvent in the Drum Rinsing Area (SWMU 5), and are filled with clean solvent supplied by the Lexington recycling facility. This clean solvent is stored in a 15,000-gallon tank located adjacent to the Waste Solvent Storage Tank (SWMU 6). The clean solvent is then returned to customers throughout the area which the Tampa Safety-Kleen facility serves.

No analytical testing is performed on the waste solvents at the Tampa facility. Before accepting an industrial client's/customer's waste for recycling, a sample is taken and analyzed at Safety-Kleen's corporate laboratory in Elgin, Illinois. Specific criteria is used to determine whether the waste stream contains contaminants such as pesticides, herbicides, pharmaceuticals, printing or inking operation waste, etc. Sales representatives who service the parts washing machines, visually examine the spent product for consistency and volume of material recovered during their routine stops. The odor is also noted to test for the presence of volatile materials such as gasoline.

Wastes Managed

Several types of hazardous wastes are managed by the Safety-Kleen facility. Some of these wastes result from the servicing of Safety-Kleen customers, while others result from the maintenance of the service and accumulation centers.

Spent mineral spirits solvent is classified by Safety-Kleen as an ignitable and an EP Toxic Waste (D001, D006, D008) because the solvent may contain lead and/or cadmium. This waste solvent arrives at the Safety-Kleen facility in 30- and 16-gallon drums. The drummed solvent is transferred to Solvent Return Wet Dumpsters (SWMU 3), where the suspended solids are allowed to settle out.

Dumpster sediment that accumulates at the bottom of the Solvent Return Wet Dumpsters (SWMU 3) is classified as an ignitable waste (D001) and possibly an EP Toxic Waste (D006 and/or D008). This dumpster sediment is removed manually with a shovel on an as-needed basis and is transferred to 16-gallon drums. These drums are stored in the Drummed Flammable Waste Storage Room (SWMU 10) until they are transferred to the Safety-Kleen recycling facility in Lexington, South Carolina. (At the recycling facility, the dumpster sediment is blended into an alternate fuel to be used in cement kilns.) The facility representatives estimate that approximately 12,000 gallons of dumpster sediment are shipped annually from the Safety-Kleen, Tampa, facility.

Bottom sediment in the Waste Solvent Storage Tank (SWMU 6) is removed approximately every two years. The composition and classification of this bottom sediment are similar to the Solvent Return Wet Dumpsters' (SWMU 3) bottom sediment. A Safety-Kleen vacuum truck is used to remove this sediment, which is then shipped to the recycling facility in South Carolina for blending into alternate fuels.

Immersion cleaner from the small parts washers contains chlorinated solvents (F002) and cresylic acid (F004). The wastes remain in their original drums. Approximately every seven to ten days, enough drummed immersion cleaner is accumulated at the Tampa facility for a full shipment to the recycling facility in South Carolina. It is estimated that 20,000 gallons are shipped from the Tampa facility to the recycling facility on an annual basis (References 35 and 39).

Dry-cleaning wastes are containerized while on the customer's premises. These wastes, which consist of still bottoms, powder residue from filter systems and spent filter cartridges, are transferred to 30- and 16-gallon drums and polyethylene filter tubes, and are placed in lined boxes. The containerized dry-cleaning wastes are then shipped by Safety-Kleen directly to the Service Center Drum Storage Area (SWMU 1) at the Tampa facility. The wastes are stored here until they can be shipped to the recycling center in Lexington. Approximately eighty percent of the dry-cleaning solvent managed by this facility is perchloroethylene (F002); seventeen percent is mineral spirits (D001, D006 and D008); and the remaining three percent is trichloro-trifluoroethane (F002) (Reference 35). It is estimated that 150,000 gallons of dry-cleaning waste are shipped annually from the accumulation center to the recycling facility.

Paint and paint equipment cleaning wastes consist of various lacquer thinners (D001, F003 and F005) and paints (D006, D007 and D008). These wastes are collected in 5- or 16-gallon drums at the customer's place of business, and are stored in the Drummed Flammable Waste Storage Room (SWMU 10) for approximately seven to ten days. They are then shipped to the Lexington facility for recycling.

Seven different types of industrial solvents are collected from customers. These solvents and the estimated annual amounts are collected annually are: mineral spirits (D001, D006 and D008), 38,600 gallons; 1,1,1-trichloroethylene (F001 and F002), methylene chloride (F001 and F002) and 1,1,2-trichloro-1,2,2-trifluoroethane (F001 and F002), 157,600 gallons (combined total for all halogenated solvents); and lacquer thinners (D001, F003 and F005), 60,400 gallons.

History of Releases

The review of available file material and discussions with facility representatives during the VSI identified a one-time release of 50 gallons of petroleum naphtha from the product storage tank adjacent to the Waste Solvent Storage Tank (SWMU 6) and ten smaller releases of various hazardous wastes ranging in quantity from 1 to 20 gallons.

The 50-gallon release of petroleum naphtha occurred on June 16, 1986. Both the Waste Solvent Storage Tank (SWMU 6) and the adjacent product storage tank were tested according to manufacturer specifications and were being filled to begin routine operation at the facility (Reference 16). The product tank's manway was removed to facilitate the installation of the tank gauges, and upon filling the tank, the manway gasket was found to be leaking. The release was contained in the diked area that surrounds the tank, and the spill was cleaned up with absorbent towels which were then drummed and sent to the Safety-Kleen Recycling Center in Lexington, South Carolina.

Pinholes present in two drums resulted in two of the ten "smaller" releases (one and two gallons of F002 were released) (Reference 38). Four releases were the result of "mismanagement" of the drums, such as a drum being punctured with a handcart or tipped over while being transported with a handcart. These releases of hazardous waste ranged from 1.5 gallons to 10 gallons (References 34 and 38). The four remaining releases resulted from: an overfill of a drum in the solvent return fill shelter (10 gallons released); a strap, which was used to stabilize a drum, breaking (13.5 gallons of perchloroethylene were released); and a pump in the solvent return fill shelter would not shut off (20 gallons of D001 were released) (References 23, 24 and 38). In all of the above releases, the waste solvent was confined to concrete or pavement and was contained with either absorbent towels or oil dry. The releases did not reach soil or surface water, and the absorbent material was drummed and shipped to the Safety-Kleen Recycling Center in Lexington, South Carolina (References 23, 34 and 38).

C. ENVIRONMENTAL SETTING

Location and Surrounding Land Use

The Tampa Safety-Kleen facility is located in Hillsborough County, approximately two miles east of the northern portion of Tampa Bay, in an area known as East Tampa (see Fig. II-1 for facility location map). The facility is approximately three acres in size and is located at a latitude and longitude of 27°55'21"N and 82°23'40"W. The facility is bounded on the west by a Seaboard Railway System right of way and some light industry, and on the north, south, and east by fields and woodland (Reference 37).

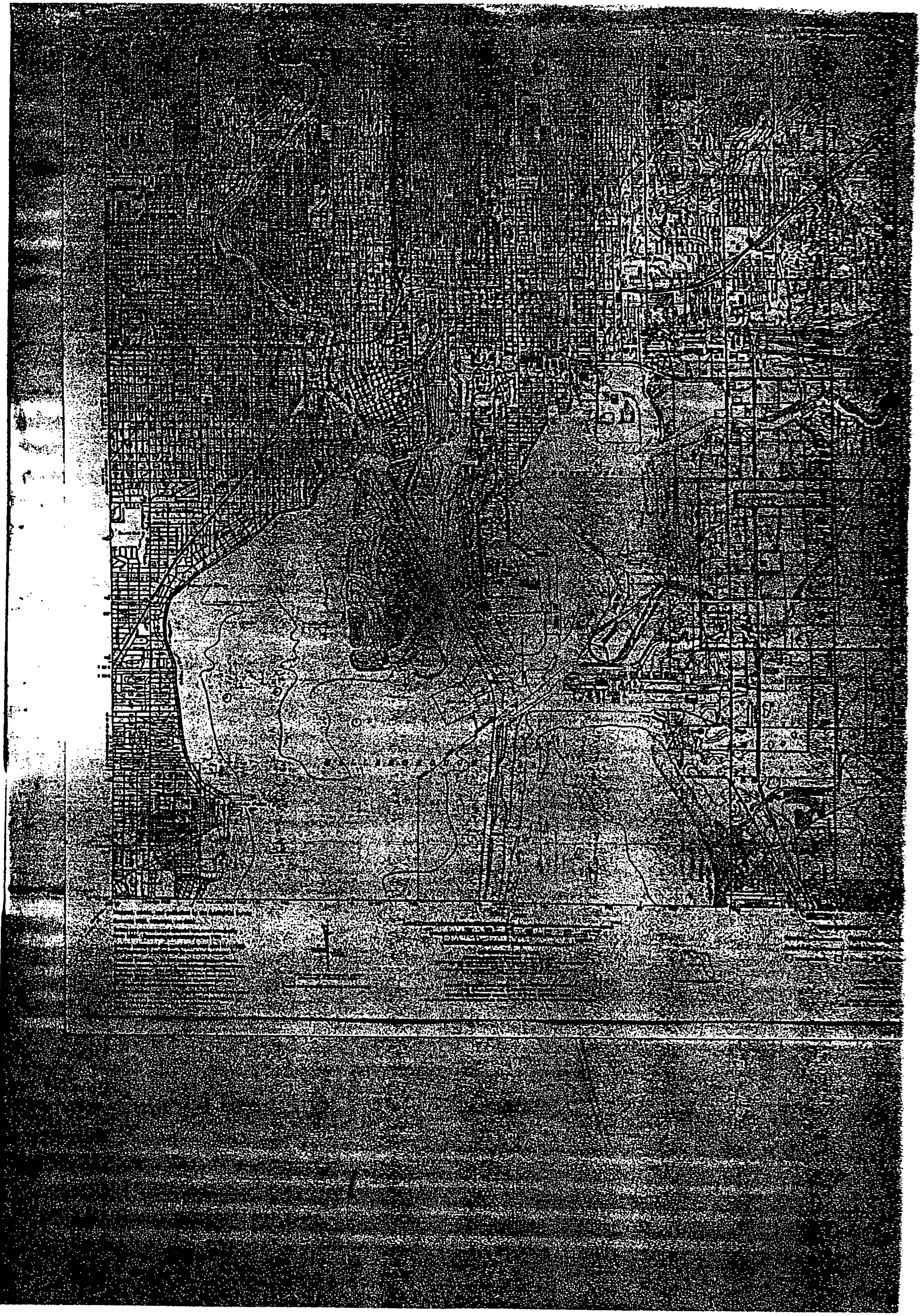
Climate and Meteorology

The facility's address is listed as Tampa; however the climate and weather conditions for the city of St. Petersburg, Florida, were used as reference because of the facility's proximity to St. Petersburg, which is located approximately 20 miles northeast of Tampa.

St. Petersburg has a mean annual temperature of 73.60°F. The mean winter and summer temperatures are 62.73°F and 82.66°F, respectively. Mean annual precipitation is 53.10 inches, with June through September having twice as much rainfall as the remaining months. There is no recordable amount of annual snowfall. Prevailing winds in the Tampa/St. Petersburg area are southeast and east. Wind directions are influenced locally by conventional forces inland and by the land-and-sea-breeze-effects near the coast (Reference 37). Prevailing wind directions are somewhat erratic, but generally follow a pattern of north in winter and south in summer, with the windiest months being March and April.

Topography, Surface Drainage and Flood Plain

The Safety-Kleen facility is located at an average elevation of ten feet above sea level (Reference 41). There are no streams on site, and the distance to the nearest major body of surface water, which is the East Bay, is approximately a mile from the facility. Surface and stormwater



runoff from the facility's parking lot and service areas drain to the south via a long depression in the asphalt of the service areas. This runoff enters the Stormwater Ditch, (SWMU 7) south of the facility, then flows west to the facility's Stormwater Retention Pond (SWMU 12). The stormwater runoff evaporates and/or percolates into the soil and groundwater below the Stormwater Retention Pond (SWMU 12).

The Safety-Kleen facility lies outside the areas where previous studies of the 100-year flood plain have been conducted by the Federal Emergency Management Agency (FEMA), preparers of the National Flood Insurance Rate maps. Available FEMA flood plain maps for the land that lies directly north, northwest and west, show that these areas do not lie in the 100-year flood plain. The facility's Part B permit application stated that the facility was not inside the 100-year flood plain (Reference 40).

Geology and Soils

Hillsborough County is located in the west-central part of Florida. It is bounded on the south by Manatee County, on the east by Polk County, on the north by Pasco County and on the west by Pinellas County and Tampa Bay. Hillsborough County, is in the Floridan section of the Atlantic Coastal Plain, in an area known as the Coastal Lowlands (Reference 36).

The surface drainage in Hillsborough County is toward Old Tampa Bay, Hillsborough Bay, and Tampa Bay. Drainage is slow in the Coastal Lowlands, and is maintained by swampy areas and a few small streams which drain to the west toward the coast.

The soil unit that exists at the facility location is known as the Myakka-Basinger-Holopaw unit. This soil unit exists in areas that are nearly level. The soils are poorly-drained, and have a sandy or loamy subsoil or are sandy throughout. This soil unit typically has a surface layer of black or gray fine sand approximately five to seven inches thick. The subsurface layer is gray fine sand to a depth of approximately 20 to 28 inches. The upper part of the subsoil is black fine sand; the middle part is reddish-brown fine sand; and the lower part is brownish-yellow fine sand (Reference 36).

Groundwater

No site-specific studies of groundwater beneath the facility or in surrounding areas have been conducted; therefore, the information presented here is on a regional level. The west-central section of Florida is underlain by an aquifer system known as the Floridan Aquifer System. This system is composed of three hydrologically-connected units. The surficial aquifer is predominantly fine sand, interbedded with clay, marl, shell, limestone and phosphorite. Below this lies the intermediate aquifer and confining beds. The upper confining bed of this unit is made up of undifferentiated deposits, with the major component being clastic. The intermediate aquifer and lower confining bed is contained within the Hawthorn Formation and is mostly composed of dolomite, sand, clay and limestone. The general lithology of the

Floridan Aquifer, located below this Hawthorn Formation is limestone interspursed with sand chalk, fossiliferous sand, and dolomitic (near the lower unit). The lower confining unit for this aquifer system is composed of two stratigraphic units known as Lake City limestone and Oldsmar limestone, and below is the Cedar Keys limestone (Reference 43).

The base of the Upper Floridan Aquifer in west-central Florida is generally at the first occurrence of vertically-persistent, intergranular evaporites. Hydraulic tests of rocks with intergranular evaporites indicate that they have extremely low permeabilities. The rocks below the "middle confining unit" of the Floridan Aquifer System have an estimated low transmissivity so that freshwater flow is limited to rocks above the section, with intergranular evaporites, in west-central Florida (Reference 43).

The water levels and the quantities and patterns of flow in the Upper Floridan Aquifer and the overlying aquifers change in response to deviations from normal rainfall levels, natural recharge, and human activities including construction of withdrawal and recharge wells, impoundments and dredging. (Reference 43). The Tampa Bay area has the largest concentration of population in west-central Florida. A major portion of the area is underlain by a highly-permeable dolomite zone, which contains saline water and is not usable for municipal supplies. Large, inland municipal well fields are used to supply potable water.

These large well fields of the Tampa Bay area are characterized by relatively thin, confining beds with high-leakage valves, so the capacity for inducing additional large amounts of groundwater recharge, when the head difference between the Upper Floridan Aquifer and the surficial aquifer is increased, is great. Because of this head difference, moderate water-level declines occur in the Upper Floridan Aquifer well fields. These water-table head differences usually recover during the rainy season (Reference 43). Groundwater pumpage of the aquifer system in the Tampa Bay area is only one of the activities related to urban development that impact the flow of this aquifer. The construction of dams and levees, and impoundment of surface water in this low-lying area, as well as the construction of drain fields, canals and ditches, has also had an impact on the aquifer. General urban construction, which includes roads, borrow pits, parking areas and buildings, has played a large role, as well as the dredging in Tampa Bay to provide ship channels to access the bay and Gulf. The combination of the thick confining beds, urban development, and the large withdrawals of water from the Upper Floridan Aquifer in the area of Hillsborough County, has resulted in large declines in the potentiametric surface of the Upper Floridan Aquifer over a large area (Reference 43).

III. SWMU DESCRIPTIONS

SWMU DATA SHEET

Page 1 of 1

SWMU NUMBER: 1 PHOTO NUMBER: 1a, 1b and 1c

NAME: Service Center Drum Storage Area and Associated Trench

TYPE OF UNIT: Drum Storage

PERIOD OF OPERATION: 1986 to present

PHYSICAL DESCRIPTION AND CONDITION:

The Service Center Storage Area is a RCRA-regulated unit located inside a building. The unit is approximately 40 feet long by 30 feet wide, and is surrounded by a 4-inch-high concrete curb 6 inches wide. An 8-foot-high chain-link fence with 3 rows of barbed wire at the top surrounds the unit. The fence has a locking gate, and a containment trench, which is part of the unit's design, is located within the unit in front of the gate. The trench measures 12 feet long by 2 feet wide by 1 foot, 8 inches deep. The total capacity of this containment system equals one-tenth of the total capacity of 6,283 gallons that will be stored in this area. The concrete pad and curb are sealed with an epoxy coating. Drummed waste is stored in this unit between seven and a maximum of ten days. During the VSI, the epoxy-coated concrete floor and containment trench were in good condition. The drums of waste were positioned on wooden pallets in this unit.

WASTES AND/OR HAZARDOUS CONSTITUENTS MANAGED:

Waste immersion cleaner, (F001/F005) (halogenated/non-halogenated solvents), Mineral Spirit Dumpster Mud (D001, D006, D008).

RELEASE PATHWAYS: Air (L) Surface Water (L) Soil (L)
Groundwater (L) Subsurface Gas (L)

HISTORY AND/OR EVIDENCE OF RELEASE(s):

Over the four-year operating period, two drums of waste solvent were found to have pinhole leaks. The amount of released solvent from both leaks equaled approximately three gallons. The releases were confined to the building, completely cleaned up, and no evidence of these releases are present.

RECOMMENDATION:
No Further Action (X)
RFA Phase II Sampling ( )
RFI Necessary ( )

REFERENCES: 22, 29 and 42

COMMENTS: The unit was observed to be in good condition during the VSI. It is located indoors and has secondary containment. Hence, the potential to all media was assessed as low.

Project Name: Safety-Kleen
Tampa Facility

Date: December 1, 1989

SWMU DATA SHEET

Page 1 of 1

SWMU NUMBER: 2 PHOTO NUMBER: 2a

NAME: Drummed Dry-Cleaning and Paint Waste Unloading Dock

TYPE OF UNIT: Loading Dock

PERIOD OF OPERATION: 1986 to present

PHYSICAL DESCRIPTION AND CONDITION:

This unit is located along the eastern side of the Service Center Building. The unit is constructed of cinder blocks that have been covered with concrete, and is approximately 18 feet long by 15 feet wide, narrowing to approximately five feet wide at its easternmost edge. The unit rises approximately two-and-one-half feet from the concrete pad on which the arriving trucks park while unloading drummed waste. Drummed dry-cleaning and paint wastes are unloaded from trucks with hand carts, and are stored in the nearby Service Center Drum Storage Area (SWMU 1) until being shipped to the Safety-Kleen Recycling Center.

WASTES AND/OR HAZARDOUS CONSTITUENTS MANAGED:

Drummed dry-cleaning waste, F002 and D001 and paint wastes.

RELEASE PATHWAYS: Air (L) Surface Water (L) Soil (L)
Groundwater (L) Subsurface Gas (L)

HISTORY AND/OR EVIDENCE OF RELEASE(s):

According to the available file material, only a single release of five gallons of mineral spirits sludge occurred on this loading dock. The release was contained and cleaned up with absorbent towels. Stains and small cracks in the concrete were observed during the VSI.

RECOMMENDATION: No Further Action (X)
RFA Phase II Sampling (   )
RFI Necessary (   )

REFERENCES: 22

COMMENTS: Although the unit was observed during the VSI to have minor staining and small cracks, the potential for release from this unit was assessed to be low. It is concrete and has secondary containment structures. The potential for release to all media is low.

Project Name: Safety-Kleen
Tampa Facility

Date: December 1, 1989

SWMU DATA SHEET

Page 1 of 1

SWMU NUMBER: 3 PHOTO NUMBER: 3a

NAME: Solvent Return Wet Dumpsters (3)

TYPE OF UNIT: Temporary Liquid Waste Storage

PERIOD OF OPERATION: 1986 - present

PHYSICAL DESCRIPTION AND CONDITION:

These three wet dumpsters are positioned under a covered area, approximately fifty feet square, located between the facility~~'s~~ Service Center and Accumulation Center. The wet dumpsters are constructed of steel and are approximately four feet long by three feet wide by four feet deep. A metal grating is positioned across the opening of the dumpster. The grating is set approximately one foot from the dumpsters' open end. The dumpsters are covered with a hinged top. These wet dumpsters are positioned within a Spill Containment Area below the Fill Shelters (SWMU 4), and spills resulting from the transfer operation would be collected in that unit. The liquid wastes deposited in these dumpsters are pumped, via above-ground pipes, to the Waste Solvent Storage Tank (SWMU 6). Any sludge or mud which collects in the dumpster is drained, stored in the Service Center Drum Storage Area (SWMU 1) and shipped off-site for disposal.

WASTES AND/OR HAZARDOUS CONSTITUENTS MANAGED:

This unit manages waste mineral spirits, D001, D006, D008 that are shipped to the facility from customers in bulk form (tanker truck).

RELEASE PATHWAYS: Air (L) Surface Water (L) Soil (L)
Groundwater (L) Subsurface Gas (L)

HISTORY AND/OR EVIDENCE OF RELEASE(s):

No evidence of release was noted in the file material and none was observed during the VSI.

RECOMMENDATION: No Further Action (X)
RFA Phase II Sampling ( )
RFI Necessary ( )

REFERENCES: 15, 17, 19 39, and 42

COMMENTS: The unit was observed to be in good condition during the VSI. The transfer operations at this unit appeared to be well managed and wastes are not allowed to collect in the dumpsters. It is above-ground, located in a covered area, and has secondary containment. Hence, the potential for release to all media is low.

Project Name: Safety-Kleen
Tampa Facility

Date: December 1, 1989

SWMU DATA SHEET

Page 1 of 1

SWMU NUMBER: 4 PHOTO NUMBER: 4a and 4b

NAME: Spill Containment Area Below the Fill Shelters

TYPE OF UNIT: Concrete Containment Area

PERIOD OF OPERATION: 1986 - present

PHYSICAL DESCRIPTION AND CONDITION:

This unit is located below the fill shelters, which are located between the Service Center and the Accumulation Center. The unit is composed of two concrete pads with four-inch curbs. The pads are separated by a small cinder-block and cement walkway. The two curbed pads are approximately 25 feet square. Each pad has two sumps, placed approximately one-and-one-half feet from the wet dumpsters. (There are three wet dumpsters and four sumps.) These sumps are eighteen inches in diameter and two feet in depth. Should a release from the dumpster occur, the sumps would be manually pumped with the waste solvent being routed to the Waste Solvent Storage Tank (SWMU 6). The pad portion of the unit appeared to be in good condition. The condition of the sumps could not be assessed during the VSI, because they were filled with water. A heavy metal grating is located approximately two feet above the unit, which is used by facility personnel for greater access to the dumpsters.

WASTES AND/OR HAZARDOUS CONSTITUENTS MANAGED:

Waste mineral spirit, D001, and mineral spirit sludge.

RELEASE PATHWAYS: Air (L) Surface Water (L) Soil (L)
Groundwater (L) Subsurface Gas (L)

HISTORY AND/OR EVIDENCE OF RELEASE(s):

No evidence of release was noted in the file material and none was observed during the VSI.

RECOMMENDATION:
No Further Action (X)
RFA Phase II Sampling ( )
RFI Necessary ( )

REFERENCES: 39 and 42

COMMENTS: The wastes managed in this unit are not corrosive/destructive to concrete. The total volume of wastes managed in the sumps is small and the containment area is designed to handle 110% of the total volume of waste managed in this area. Also, the sumps are relatively new units (less than five years old) and therefore do not require integrity testing. Hence, the potential for release to all media is low.

Project Name: Safety-Kleen
Tampa Facility

Date: December 1, 1989

SWMU DATA SHEET

Page 1 of 1

SWMU NUMBER: 5 PHOTO NUMBER: 5a and 5b

NAME: Drum Rinsing Area

TYPE OF UNIT: Washing or Rinsing Area

PERIOD OF OPERATION: 1986 - Present

PHYSICAL DESCRIPTION AND CONDITION:

This unit is located in the fill shelter area between the Service Center and the Accumulation Center. The unit is positioned on heavy metal grating above the Spill Containment Area below the Fill Shelters (SWMU 4). The unit consists of a whole, vertically-placed 55-gallon collection drum that holds mineral spirits, and a vertically-halved 55-gallon drum positioned horizontally on top of the whole 55-gallon drum. The halved drum serves as a washing container. 16-gallon and 30-gallon drums that contained waste mineral spirits are placed on their sides in the washing container. A spray/nozzle apparatus, attached to a small pump, brings the mineral spirits from the 55-gallon collection drum to the washing container, and the interior of the smaller waste drum is rinsed. The mineral spirit rinse, and any waste residue removed from the waste drum, are allowed to drain back to the collection drum. After several rinses, the spent mineral spirits from the collection drum are shipped off-site for recycling.

WASTES AND/OR HAZARDOUS CONSTITUENTS MANAGED:

Waste Mineral Spirits, D001.

RELEASE PATHWAYS: Air (L) Surface Water (L) Soil (L)
Groundwater (L) Subsurface Gas (L)

HISTORY AND/OR EVIDENCE OF RELEASE(s):

No evidence of release was noted in the file material and none was observed during the VSI.

RECOMMENDATION:
No Further Action (X)
RFA Phase II Sampling ( )
RFI Necessary ( )

REFERENCES: 27, 39, and 42

COMMENTS: The potential for release to all environmental media is low because the unit has secondary containment and is not in continuous use.

Project Name: Safety-Kleen
Tampa Facility

Date: December 1, 1989

SWMU DATA SHEET

Page 1 of 1

SWMU NUMBER: 6 PHOTO NUMBER: 6a, 6b, 6c and 6d

NAME: Waste Solvent Storage Tank

TYPE OF UNIT: Tank

PERIOD OF OPERATION: 1986 - Present

PHYSICAL DESCRIPTION AND CONDITION:

This unit consists of one above-ground tank positioned on a metal frame. The unit is located west of the facility's fill shelters and two buildings. The diked area surrounding the tank is approximately 20 feet wide by 40 feet long by four feet high. The concrete pad and concrete-coated cinder-blocks that make-up the dike walls have an epoxy coating on them. The tank manages waste mineral spirit routed to the tank via three-inch overhead carbon steel pipes. The waste mineral spirit is from the facility's three Solvent Return Wet Dumpsters (SWMU 3). This tank has a 15,000-gallon capacity and the shell and thickness are specified as 1/4-inch hot-rolled carbon steel (H.R.C.S.) and the tank ends are 5/16-inch H.R.C.S. The tank's operating pressure is atmospheric and the operating temperature is ambient. The maximum height of waste solvent in the tank is 95 percent capacity and is monitored by a high-level alarm. No cracks or stains were observed in the diked area surrounding these tanks during the VSI. This is a RCRA-regulated unit.

WASTES AND/OR HAZARDOUS CONSTITUENTS MANAGED:

Waste Mineral Spirits, D001, D006, D008.

RELEASE PATHWAYS: Air (L) Surface Water (L) Soil (L)
Groundwater (L) Subsurface Gas (L)

HISTORY AND/OR EVIDENCE OF RELEASE(s):

No evidence of release was noted in the file material and none was observed during the VSI.

RECOMMENDATION:
No Further Action (X)
RFA Phase II Sampling ( )
RFI Necessary ( )

REFERENCES: 22, 31, 39, and 42

COMMENTS: The tank was observed to be in good condition during the VSI. It is RCRA-regulated and has secondary containment and a high level alarm. The potential for release to all environmental media is low.

Project Name: Safety-Kleen
Tampa Facility

Date: December 1, 1989

SWMU DATA SHEET

Page 1 of 1

SWMU NUMBER: 7 PHOTO NUMBER: 7a and 7b

NAME: Stormwater Ditch

TYPE OF UNIT: Earthen drainage ditch

PERIOD OF OPERATION: 1986 - Present

PHYSICAL DESCRIPTION AND CONDITION:

The Stormwater Ditch is located between the facility's south service or delivery area and the facility's south fence. This ditch is a shallow unlined depression in the native soil and grass. Stormwater entering the ditch flows west to a Stormwater Retention Pond (SWMU 12).

WASTES AND/OR HAZARDOUS CONSTITUENTS MANAGED:

This unit receives stormwater runoff from all areas of the facility which do not have secondary containment. These areas include the Drummed Dry-Cleaning and Paint Waste Unloading Dock (SWMU 2) and the parking lot.

RELEASE PATHWAYS: Air (L) Surface Water (L) Soil (L)
Groundwater (L) Subsurface Gas (L)

HISTORY AND/OR EVIDENCE OF RELEASE(s):

There were no documented releases from this unit in the available file material. During the VSI, a large stain was observed in the east parking lot. This stain extends from the Dry-Cleaning and Paint Waste Unloading Dock (SWMU 2) to the Stormwater Ditch. According to the facility representatives, the stain was caused by a concrete cleaner, which contains no hazardous constituents according to the MSDS sheets provided by the facility.

RECOMMENDATION:
No Further Action (X)
RFA Phase II Sampling ( )
RFI Necessary ( )

REFERENCES: 39, 42, and 23

COMMENTS: The potential for release to all environmental media is low because the facility practices good housekeeping. Spillage has been minimal, but when it occurred, it has been contained and cleaned up.

Project Name: Safety-Kleen
Tampa Facility

Date: December 1, 1989

SWMU DATA SHEET

Page 1 of 1

SWMU NUMBER: 8 PHOTO NUMBER: 8a and 8b

NAME: Accumulation Center Drum Storage Area and Associated Trench

TYPE OF UNIT: Drum Storage Area

PERIOD OF OPERATION: 1986 - Present

PHYSICAL DESCRIPTION AND CONDITION:

This container storage area is located indoors in the facility's Accumulation Center (the southernmost of the two buildings present on the site), adjacent to the buildings' north and west walls. The unit is approximately 60 feet long by 40 feet wide. The concrete floor has an epoxy coating, as does the four-inch concrete curb located along the three edges of the unit that border the buildings' walls. A concrete containment trench, which is part of the unit's design, is located along the unit's fourth edge. The trench is approximately 60 feet long by two feet wide by 18 inches deep. Another containment trench, approximately 20 feet long, is located in front of the sliding doors that access this storage area to the outdoors. No cracks or stains were observed on this unit. This is a RCRA-regulated unit.

WASTES AND/OR HAZARDOUS CONSTITUENTS MANAGED:

Waste mineral spirits, D001, D006, D008; waste chlorinated solvent, F002 and F004; mineral spirit dumpster mud, D001, D006 and D008; waste halogenated solvents, F001 and F002; and paint wastes and non-halogenated wastes, F003 and F005.

RELEASE PATHWAYS: Air (L) Surface Water (L) Soil (L)
Groundwater (L) Subsurface Gas (L)

HISTORY AND/OR EVIDENCE OF RELEASE(s):

No evidence of release was noted in the file material and none was observed during the VSI.

RECOMMENDATION:
No Further Action (X)
RFA Phase II Sampling ( )
RFI Necessary ( )

REFERENCES: 19, 39, and 42

COMMENTS: This unit is located indoors and has secondary containment. It was observed to be in good condition during the VSI and the potential for release to all media is low.

Project Name: Safety-Kleen
Tampa Facility

Date: December 1, 1989

SWMU DATA SHEET

Page 1 of 1

SWMU NUMBER: 9 PHOTO NUMBER: 9a and 9b

NAME: Drummed Waste Loading Docks (3)

TYPE OF UNIT: Loading Dock

PERIOD OF OPERATION: 1986 - Present

PHYSICAL DESCRIPTION AND CONDITION:

These three loading docks are located along the eastern wall of the Accumulation Center. The base of the units are composed of heavy steel plate that is placed in the concrete floor. The concrete floor that surrounds these metal plates has an epoxy coating. The fourth edge of the steel plate is welded to a smaller steel plate positioned vertically on the outside entrance to the loading docks. A secondary containment sump is located below each loading dock. The sumps are constructed of concrete and are approximately eight feet long by one foot wide by 18 inches deep. The sumps are bordered by the Accumulation Center's outside wall on two sides, and a three-inch concrete curb on the other two sides. The sumps are blind, and rainwater that collects in them is pumped out manually and collected in drums which are shipped to South Carolina for disposal.

WASTES AND/OR HAZARDOUS CONSTITUENTS MANAGED:

Waste mineral spirits, D001 and D008; waste chlorinated solvent, F002 and F004; mineral spirit dumpster mud, D001 and possibly D006 and/or D008; waste halogenated solvents, F001 and F002; and paint waste and non-halogenated wastes, F003 and F005.

RELEASE PATHWAYS: Air (L) Surface Water (L) Soil (L)
Groundwater (L) Subsurface Gas (L)

HISTORY AND/OR EVIDENCE OF RELEASE(s):

No evidence of release was noted in the file material and none was observed during the VSI.

RECOMMENDATION:
No Further Action (X)
RFA Phase II Sampling (   )
RFI Necessary (   )

REFERENCES: 39 and 42

COMMENTS: The sumps were observed to be in good condition during the VSI, and the potential for release to all media is low.

Project Name: Safety-Kleen
Tampa Facility

Date: December 1, 1989

SWMU DATA SHEET

Page 1 of 1

SWMU NUMBER: 10 PHOTO NUMBER: 10a and 10b

NAME: Drummed Flammable Waste Storage Room

TYPE OF UNIT: Drum Storage Area

PERIOD OF OPERATION: 1986 - Present

PHYSICAL DESCRIPTION AND CONDITION:

The unit is located indoors in the southwest corner of the facility's Accumulation Center. The unit is approximately 40 feet long by 30 feet wide. The two inner walls of this unit are constructed of cinder-blocks, and the two outer walls are composed of metal panels that would collapse "out" should an explosion occur. The floor and four-inch curbs along the two outer walls are constructed of concrete and have an epoxy coating. A trench, approximately 30 feet long by two feet wide by two feet deep, is located inside this unit in front of the unit's fusable-link door. The unit's door is weighted in such a way that, should an explosion or fire occur in the unit, the fuse would melt and the door would shut automatically. No cracks or stains were observed in the floor of this unit during the VSI.

WASTES AND/OR HAZARDOUS CONSTITUENTS MANAGED:

Paint wastes and paint-related waste products.

RELEASE PATHWAYS: Air (L) Surface Water (L) Soil (L)
Groundwater (L) Subsurface Gas (L)

HISTORY AND/OR EVIDENCE OF RELEASE(s):

No evidence of release was noted in the file material and none was observed during the VSI.

RECOMMENDATION:
No Further Action (X)
RFA Phase II Sampling (   )
RFI Necessary (   )

REFERENCES: 39 and 42

COMMENTS: The drums are stored indoors and the area has secondary containment. The potential for release to all media is low.

SWMU DATA SHEET

Page 1 of 1

SWMU NUMBER: 11 PHOTO NUMBER: 11

NAME: Old Dumping Ground

TYPE OF UNIT: Land disposal

PERIOD OF OPERATION: This area was used as a dumping ground prior to 1986.

PHYSICAL DESCRIPTION AND CONDITION:

The unit consists of an area of approximately one acre near the western boundary of the property. At present the area is unused and was observed to be covered with vegetation. According to facility representatives, prior to 1986, this area was used for dumping household and office trash. Facility representatives also indicated that no hazardous wastes or chemicals were disposed of in this area although there was no documentation available to substantiate this. No additional information was available regarding the source of this waste or past ownership of the property.

WASTES AND/OR HAZARDOUS CONSTITUENTS MANAGED:

Household and office trash including used furniture, washing machines, tires and other appliances were disposed of in this area.

RELEASE PATHWAYS: Air (L) Surface Water (L) Soil (H)
Groundwater (H) Subsurface Gas (L)

HISTORY AND/OR EVIDENCE OF RELEASE(s):

No evidence of release was noted in the file material and none was observed during the VSI.

RECOMMENDATION:

	No Further Action	( )
	RFA Phase II Sampling	(X)
	RFI Necessary	( )

REFERENCES: 42

COMMENTS: No documentation regarding the actual use of this area prior to 1986 was available. The potential for release to soil and groundwater is high due to the unlined nature of the unit if hazardous constituents are present. The potential to release to all other environmental media is low.

Project Name: Safety-Kleen
Tampa Facility

Date: December 1, 1989

SWMU DATA SHEET

Page 1 of 1

SWMU NUMBER: 12 PHOTO NUMBER: 12

NAME: Stormwater Retention Pond

TYPE OF UNIT: Surface Impoundment

PERIOD OF OPERATION: 1986 - present

PHYSICAL DESCRIPTION AND CONDITION:

This pond is an unlined earthen pit approximately 100 feet long by 25 feet wide by six inches to one foot in depth. Run off from the Stormwater Ditch (SWMU 7) collects in this unit. Vegetation such as cattails and native reed grasses is prevalent in the pond.

WASTES AND/OR HAZARDOUS CONSTITUENTS MANAGED:

This unit manages stormwater runoff which collects in the Stormwater Ditch (SWMU 7) and flows into the Stormwater Retention Pond. The runoff originates from areas at the facility that have no secondary containment.

RELEASE PATHWAYS: Air (L) Surface Water (L) Soil (L)
Groundwater (L) Subsurface Gas (L)

HISTORY AND/OR EVIDENCE OF RELEASE(s):

RECOMMENDATION:
No Further Action (X)
RFA Phase II Sampling ( )
RFI Necessary ( )

REFERENCES: 23, 39, and 42

COMMENTS: The facility appears to practice good housekeeping. Spillage has been minimal and when they have occurred, spills have been contained and cleaned up. Therefore the presence of hazardous wastes or hazardous constituents is unlikely and the potential for release to all environmental media is low.

Project Name: Safety-Kleen
Tampa Facility

Date: December 1, 1989

IV. SUMMARY

TABLE IV-1

SOLID WASTE MANAGEMENTS UNITS

SWMUs

1. Service Center Drum Storage Area and Associated Trench
2. Drummed Dry-Cleaning and Paint Waste Unloading Dock
3. Solvent Return Wet Dumpsters (3)
4. Spill Containment Area Below the Fill Shelters
5. Drum Rinsing Area
6. Waste Solvent Storage Tank
7. Stormwater Ditch
8. Accumulation Center Drum Storage Area and Associated Trench
9. Drummed Waste Loading Docks (3)
10. Drummed Flammable Waste Storage Room
11. Old Dumping Ground
12. Stormwater Retention Pond

Table IV-2

SOLID WASTE MANAGEMENT UNITS REQUIRING NO FURTHER ACTION

SWMU No.	SWMU Description
1	Service Center Drum Storage Area and Associated Trench
2	Drummed Dry-cleaning and Paint Waste Unloading Dock
3	Solvent Return Wet Dumpsters (3)
4	Spill Containment Area Below the Fill Shelters
5	Drum Rinsing Area
6	Waste Solvent Storage Tank
7	Stormwater Ditch
8	Accumulation Center Drum Storage Area and Associated Trench
9	Drummed Waste Loading Docks (3)
10	Drummed Flammable Waste Storage Room
12	Stormwater Retention Pond

Table IV-3

SOLID WASTE MANAGEMENT UNITS THAT ARE RCRA-REGULATED UNITS

SWMU No.	SWMU Description
1	Service Center Drum Storage Area and Associated Trench
6	Waste Solvent Storage Tank
8	Accumulation Center Drum Storage Area and Associated Trench

Table IV-4

SOLID WASTE MANAGEMENT UNITS REQUIRING PHASE II SAMPLING

SWMU No.	SWMU Description
11	Old Dumping Ground

V. SUGGESTED SAMPLING STRATEGY

No.	Unit Name	Dates	Suggested Sampling	Evidence of Releases (Yes/No)
11	Old Dumping Ground	Prior to 1986	Soil sampling is suggested to determine the presence of hazardous waste or hazardous constituents. Surface and sub-surface soil samples should be collected from areas where dumping has been suspected or where wastes may have been stored. Samples should be analyzed for Appendix IX constituents.	No

VI. REFERENCES

1. Letter from John P. Labman, U.S. EPA, to Theodore H. Mueller, Safety-Kleen Corporation, regarding concerns of clarifications or modifications of regulations. Date Received: July 21, 1981.

2. Solvent Sample Analysis - Summary Report. Dated: October 24, 1984.

3. Application For a Hazardous Waste Facility Permit. Dated: June 28, 1985.

4. RCRA Part A Application. Dated: July 3, 1985.

5. Conversation Record. Dated: November 1, 1985.

6. Material Safety Data Sheets and Attachments. Dated: November 5, 1985.

7. Letter from Stanley A. Walczynski, P.E., (Regional Environmental Engineer) to Satish Kastury, FDER, regarding facility operations. Dated: February 11, 1986.

8. Letter from Raoul Clarke, FDER, to Stanley A. Walczynski, P.E., regarding schedule of Safety-Kleen permit applications. Dated: May 1, 1986.

9. Laboratory Analysis Sheet of Safety-Kleen waste by KDM Company. Dated: May 21, 1986.

10. Letter from Robert W. McVety, FDER, to James H. Scarbrough, U.S. EPA, regarding Safety-Kleen's problems with waste storage prior to recycling permit requirements. Dated: June 10, 1986.

11. Letter from Armando Gonzalez, FDER, to Ellen J. Jurczak, Safety-Kleen, regarding a construction permit and an extension to respond to first N.O.D.s. Dated: July 18, 1986.

12. Letter from Armando Gonzalez, FDER, to Ellen J. Jurczak, Safety-Kleen, regarding a construction permit application and a second N.O.D. Dated: August 25, 1986.

13. Letter from Armando Gonzalez, FDER, to Ellen J. Jurczak, Safety-Kleen, regarding a construction permit application and additional information about the N.O.D.s. Dated: September 23, 1986.

14. Letter from Armando Gonzalez, FDER, to Ellen J. Jurczak, Safety-Kleen, regarding a construction permit application and a third N.O.D. Dated: October 2, 1986.

15. Letter from Armando Gonzalez, FDER, to Ellen J. Jurczak, Safety-Kleen, regarding a construction permit application and responses to a fourth NOD. Dated: November 7, 1986.

16. Waiver of 90-Day Time Limit. Dated: September 29, 1986.

17. Letter from Safety-Kleen to FDER regarding spill at the facility. Dated: November 18, 1986.

18. Letter from Ellen J. Jurczak, Safety-Kleen, to Armando Gonzalez, FDER, regarding construction permit application. Dated: December 11, 1986.

19. Letter from Safety-Kleen to FDER regarding disposal of dry-cleaning filters. Dated: February 19, 1988.

20. This reference was deleted because it related to the Safety-Kleen facility located at Manhattan Avenue.

21. Letter from Armando Gonzalez, FDER, to Gordon and Bonnie Burman, Safety-Kleen, regarding construction of a Hazardous Waste Tank and Container Storage Facility. Dated: June 30, 1988.

22. Draft permit from FDER to Safety-Kleen, pertaining to the construction of a hazardous waste tank and container storage area. Not Dated.

23. Letter from Paul Pederson, Safety-Kleen, to James H. Scarbrough, U.S. EPA, regarding additional SWMUs and releases. Dated: July 25, 1988.

24. Application for a Hazardous Waste Facility Permit. Dated: August 25, 1988.

25. Part A Application. Dated: September 1, 1988.

26. Notice of Permit from Armando Gonzalez, FDER, to Gordon and Bonnie Burman, Safety-Kleen. Permit for construction of a Hazardous Waste Tank and Container Storage Facility. Dated: September 28, 1988.

27. Hazardous Waste Inspection Report. Dated: October 18, 1988.

28. RCRA Inspection Report - Land Ban Checklist for Generators. Dated: October 18, 1988.

29. Information Regarding Potential Releases from Solid Waste Management Units. Dated: November 7, 1988.

30. FDER Interoffice Memorandum regarding RCRA Closure Permit Application and Supporting Documents for Safety-Kleen. Dated: January 12, 1989.

31. Letter from Rob Omiecinski, Safety-Kleen, to Armando Gonzalez, FDER, regarding the design installation plan for Safety-Kleen's above-ground hazardous waste storage tank system.

32. Safety-Kleen Field Spill Report Form. Dated: July 12, 1989.

33. Safety-Kleen Description of Business Activity. Undated.

34. Information Regarding Potential Releases from Solid Waste Management Units. Undated.

35. Exhibits from unknown document. Undated.

36. Soil Survey of Hillsborough County, Florida; United States Department of Agriculture, Soil Conservation Service.

37. *Climates of the States*, Third Edition Volume 1, Gate Research Company, Detroit, Michigan.

38. Safety-Kleen Corp. Spill Report Forms, obtained during VSI.

39. VSI Field Log. Dated: October 2, 1989.

40. Part B Application. June 1986.

41. United States Department of the Interior Geological Survey 7.5-Minute Series Topographic map; Tampa Quadrangle.

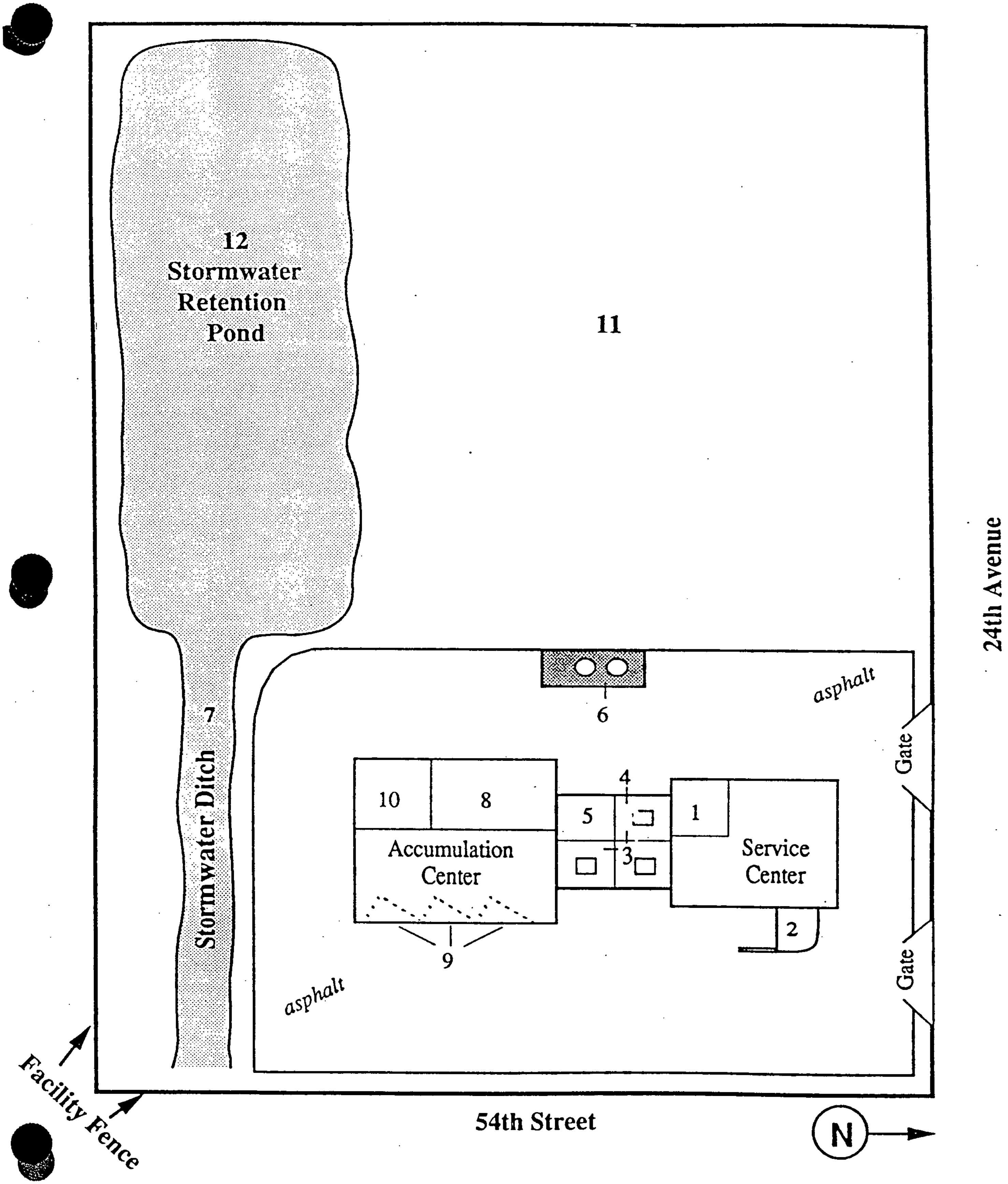
42. Visual Site Inspection conducted by Rajesh Aji - A.T. Kearney and Gail Carter - Kearney/Centaur. Date: October 2, 1989

43. Hydrology of the Floridan Aquifer System in West-Central Florida by Paul Ryder; U.S. Geological Survey Professional Paper 1403 F; 1985..

APPENDIX A

SWMU Location Map

SWMU Location Map For Safety-Kleen



References 40 and 39

Not to scale

1.813-ik

APPENDIX B

VSI Log Book

BEST AVAILABLE COPY

Property of A.T. Kearney, Inc.
Kearney / Centaur
Address 225 Reinekers Ln
Alexandria, VA 22314
Telephone 703 / 548-4700

This Book is manufactured of a High Grade 50% Rag Paper having a Water Resisting Surface, and is sewed with Nylon Waterproof Thread.

INDEX (3)

Safety-Kleen Corporation
Tampa, Florida

EPA ID No. FLD 980 847 271

Unit Name
Dimensions / Capacity
Material of Construction
Year Operational
Wastes managed - type
-where from (wastes)
-where to
Release controls
Release History
when
How
How much waste released
Clean-up of waste.

Date: October 2, 1989

Entered the Facility at 9:00 AM

Weather Conditions:
Sunny
warm 80-85
Clear
wind 5-7 knots.

Entered at Building
for opening meeting.

Facility Representatives:

GC

Participates at the opening meeting:

Gall Carter	Kearney/Cantaur
Rajesh Aji	A.T. Kearney
Hugh Hazen	USEPA
William C. Heinges	State of Florida (FLDER) Talla.
Paul ~~Patterson~~ Pederson	Elgin, IL Safety Kleen
Frank ~~Peter~~ Taylor	Safety-Kleen Accumulation Center
Jim Davis	
Dave Galaway (Frank's Assistant)	

Arrived later ←
Debra Rohne - Tampa Rep. State.

Photos:

9:08 Rajesh Intro meeting

RFA Process
40 CFR.
Appendix 9
Releases from all SWMU's.
RFA Process = Part B Process.
HWSA Permit

1. Preliminary Review
2. VSI - units.
3. RFA —

SWMU's at Facility

Letter Agenda

JC.

<u>Operations</u>

Safe-Service L
Paint Thinner
Solvents
Closed-loop system
Solvents leased to customers
Picked up
Sent to Recycling unit
in Lexington, S.C

Paint Thinners & Refinishers. ?
Dry Cleaning
Parts Washer. or Cleaner Dist.

Waste Solvents 70% solvent recovered.

Sludge - distilled
Safety-Therm
Burns off useable sol.
Oils - Kiln
Dry Sludge - Tested.
Solids - Landfilled or
Blended as solid fuel
GSX - Pinewood S.C

GC

Southwest Florida
Water Management.

John Huhurt.

Recycled Solvent will be
added to waste solvent
so the facility has a
full Truck-load of solvent
to go to the Recycling
Fac at: Lexington S.C.

~~Storager~~
Transporter
Generator

Facility opened 1986. June 30
Previous land use -
Some dumping of tires & trash
basically an open field.

- Facility lies outside of any
previous studies conducted
by Fed Eme. Mana. Agency.
NFIR

GC

2 Tanks -
North Tank Farm - 2 Tanks
South Tank Farm - never been used.

South Building - Accumulation Center.
North Building - Service Center.

~~Enviropays~~

Enviropact - tests stormwater from diked area for contamination

Part B - submitted 785

No operating permit at this time.

No other permits.

JC

Stormwater pond drains to the road drains - no concrete pipes - soil trenches or drains

A visual qualitative test is done on the waste

SC

Photo: 1: 10 am
Service Center
Drum Storage Area in the
Service Center Area.

Photo 2: Trench in Drum
Storage Area -
Trench located in front
of gate.

Photo 3: Drums in Storage Area

10:00 am Tour of facility –

Service Center – A on Map.
Drum Storage Area
Used Immersion Center. –
Sludge from wet dumpster
also staged here.
waste from Dry Cleaner

D001 ~~D00~~ mineral spirits.
F002 Cor.
~~F004~~ ~~paint~~ gr.

Storage less than 10 days.

Blind Sump – manually pumped.

obs –
Drums on metal & wooden
pallet.
Epoxy lined floor. in good
condition
Drums stacked 1, 2, & 3 high
with no pallets in between.

Drums in good condition
No visual evidence of
releases.

Of
GC

10:10.
Photo: 4 Well -
Facing NE.

Releases - 2 releases of approximately 5 gallons - Releases contained w/absorbent towels - drummed and sent to the Recycling Center in Lexington

~~Rex~~ Eight foot locking chain-link fence with 3 rows of barbed wire surrounds this unit - within the Building or Service Center.

Photo 5: North 10:10
Drum unloading area
Dry Cleaning &
Paint Related waste.

Photo 6: Southeast
Stains on asphalt
leading from unloading dock
to driveway area

Low lying area in
Parking lot of facility
Driveway leads to a
~~con~~ stormwater collection
pond.

Unloading Dock B

Dry Cleaning waste drums
& Paint Related waste drums.

Drums on pallets —
Pallet hand cart or small
hand cart used.

Dimensions of Loading dock
18 x 15 sloping to 6 at
eastern edge

OBS —
Some rust stains
& a few small cracks.
no diking along edge.
Surrounded by facility
parking lot or driveway.

GC

Photo 7: 10:13 Wet Dumpster

Photo 8: Overview of Area.

Photo 9: Sump below Fill Shelter / Wet Dumpsters.

* Fill Shelter - Wet dumpsters -

Wet Dumpster
3 x 4 x 14 feet deep.

Steel -
1986 begin operation

Parts washing solvent.
Drums from customers are dumped there.

* Metal Grated Area
50 x 25 feet -
Diked concrete area below this 3-4 inch curb.
Sump - Blind - 2 feet.
If a spill should occur it would be ~~manually~~ piped to the waste solvent storage tank.

→

GC

Waste Solvent is pumped
to the Waste Solvent
Storage Tank -
via carbon steel pipes
2" fitting back welded.
overhead for waste solvent.

Strainer cleaned daily -

Sludge cleaned out as
necessary.

Divisions within wet dumpsters
so sludge does not get
pumped out with the waste
solvent.

Orange line - clean solvent
Brown line - waste solvent.

GC

Photo 10: 10:30
Facing South –

North Tank Farm.

Photo 11: Southwest
Overview of Tanks

Photo 12: West –
Tanks and assoc.
piping.

Tanks have ←
high level alarms –
level gauge.

Tanker loading/unloading area.

* Southern Tank – Clean Solvent.
North Tank – Waste Solvent.

Surrounded by a 4 foot
concrete dike.

2 – 15,000 gallon tanks.
positioned on a metal frame.

dike has epoxy coating –

Release – June 1986 –
tank was being filled with
clean solvent.
Gasket not fitted correctly.

3" carbon steel lines feed the
tanks.

Obs – dike inside & out in
good condition.
no rust or cracks.

GC

10:35

Photo 13: Hook-up lines within diked area.

Photo 14: facing Northwest
Old Tanks from other facilities within Florida
Tanks have been cleaned out.
7 tanks
3 old wet dumpsters.

Photo 15: drainage ditch looking east from Containment Pond.

Photo 16: Stormwater Detention Pond.

Hookup piping for the Tanker trucks #15 positioned within the diked area.

Stormwater Detention Pond around with cattails. Some fish within pond - very shallow.

100 X 25 feet -
6 inches to 1 foot deep.

YC

Photo 17: Septic Field

Photo 18: Pumping Station/ Lift Station – flows by gravity to this area then gets pumped to the field.

* Septic Field west from the North Tank Farm. —

approx. 25 X 50 feet.

Build-up drain field because water table is so low.

Facility 3½ acres - surrounded by a 8 foot high fence w/ 3 rows of barbed wire.

GC

Roll 2

Photo 19: Drums in Acc. Area
NW — 10:50

Photo 20: Sump with Acc. Area in front of Door.

Photo 21: Tanker (Drums) near Loading Area

* — Accumulation Service Center — epoxy floor.

Storage of Haz Waste.
Freeon
mineral spirits

Unload trucks —
Relabel —

Wastes from other Safety Kleen Service Centers throughout Florida Collected Here — Relabeled and sent to the Lexington S.C. Recycling Center.

Blind Sumps — in front of Building Loading /unloading area. 2 feet wide
2 1/2 deep.
15 feet

One long trench separates the drum storage area from the loading area.

GC

Photo 22: Sumps outside of Waste Drum loading area

Floor - in good condition - no cracks or stains.

Sumps ~~[illegible]~~ outside of Drum unto or. loading

Sumps approx. 8 feet long 1½ feet by 2 feet deep

Sump - blind surrounded by 2½ inch curb

Rainwater drummed & sent to Lexington. SC.

Sumps are pumped or drained as necessary.

Good condition.

MC

Photo: 23: Drums within Flammable waste Storage Area.

Photo: 24: Sump along wall of Flammable waste Storage Area.

Waste Flammables-

Room approx. 40 X 30
epoxy-lined floor-

with sump in-floor along

Paint Thinner - F004
& Clean Product - Carburetor Cleaner
(Creosol)
Drums on wooden pallets.
Stacked 1 to 4 high.

also stored here,

OBS - Floor in good condition - no cracks or stains.

GC

Photo 25: Containment pond overfill area.

Releases - 1 to 2 gallons
clean product release -

If a spill should occur it is
cleand within absorbate towels
drummed & sent to Lexington,
- Salvage drums are located
within area -

Two walls concrete
cinder-block

Two walls are panels
that would colapse "out"
should an explosion occur

Door on this unit is
fusable link
Door weight - fuse
melts - door would shut.
equipment,
~~experiment~~ all explosion
AC. proof

AC

Potable water

Environmental Engineering

Health Dept.
272-6320
Ken- Rech

Photo: 26 & 27 Drum washing unit.
11:35 —

Facility Tour ended 11:15

Back to Service Center Office -
going over blue prints &
& part B -

Release Reports -
Received during VSI
Service Center &
Accumulation center -

Facility Phone #
(813) 826-1203 -

Left facility grounds at 12:00
noon

Gail
Carter

APPENDIX C

Photograph Log

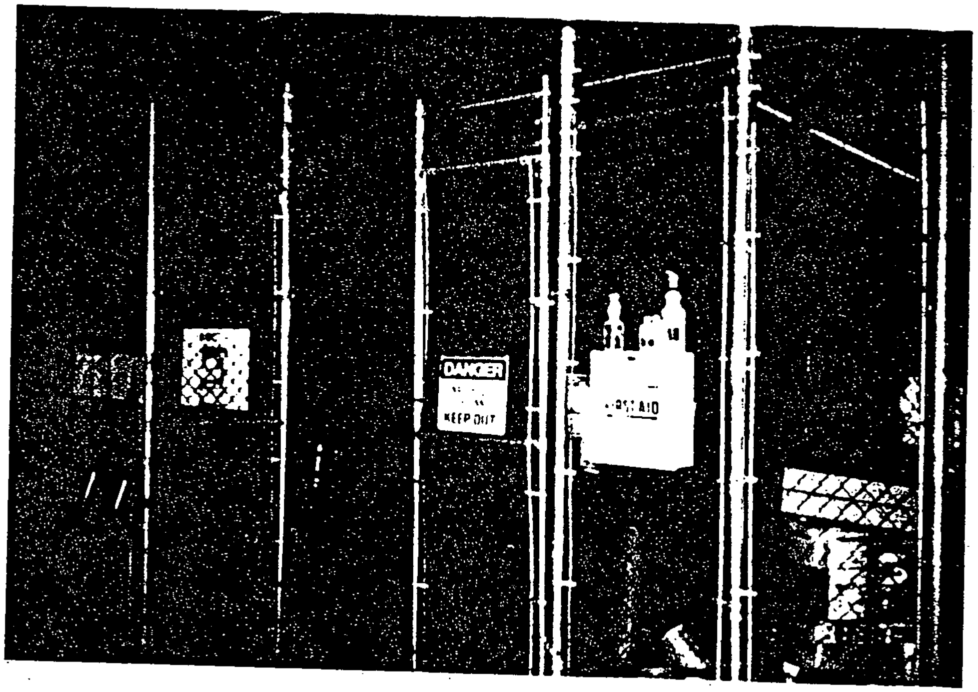


Photo 1a. Service Center Drum Storage Area (SWMU 1)

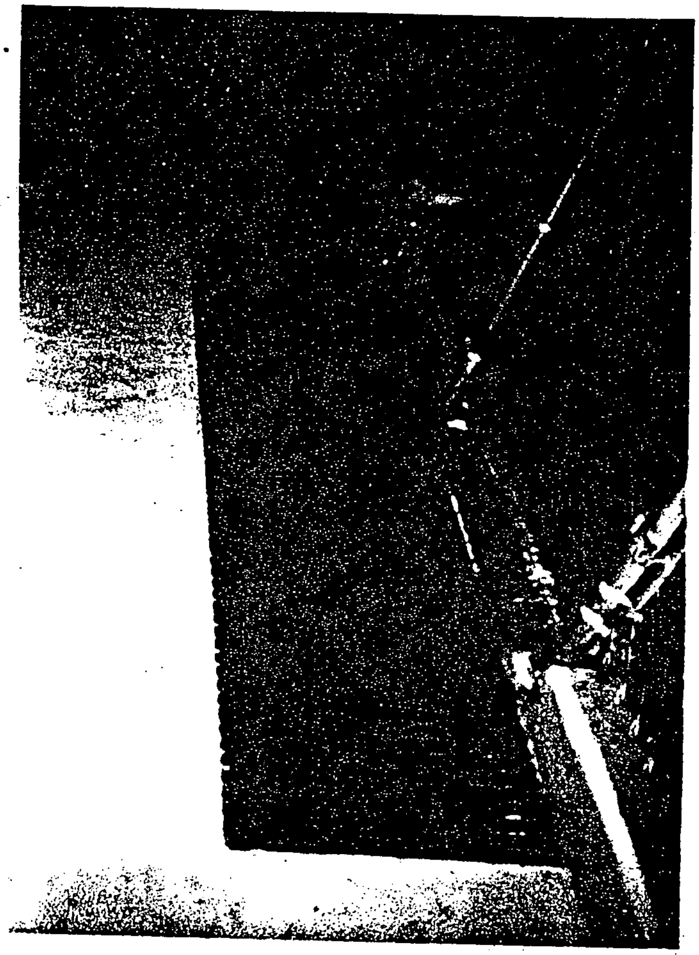


Photo 1b. Containment trench located in front of the Service Center Drum Storage Area (SWMU 1) gate.

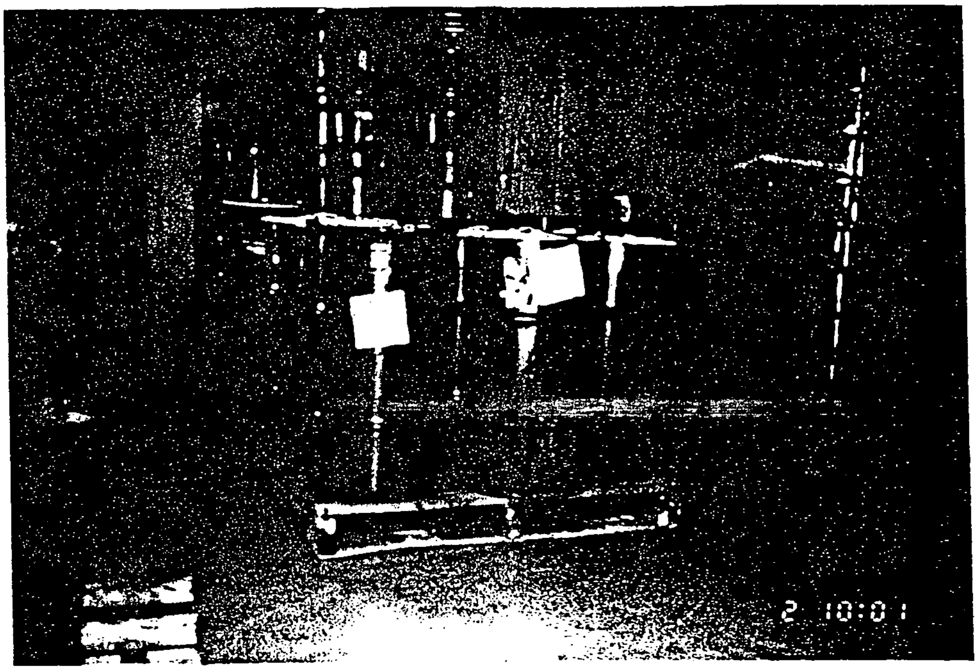


Photo 1c. Drums of waste within the Service Center Drum Storage Area (SWMU 1). The drums were positioned on wooden pallets and the epoxy-coated floor was in good condition. Note height of stacked waste drums.

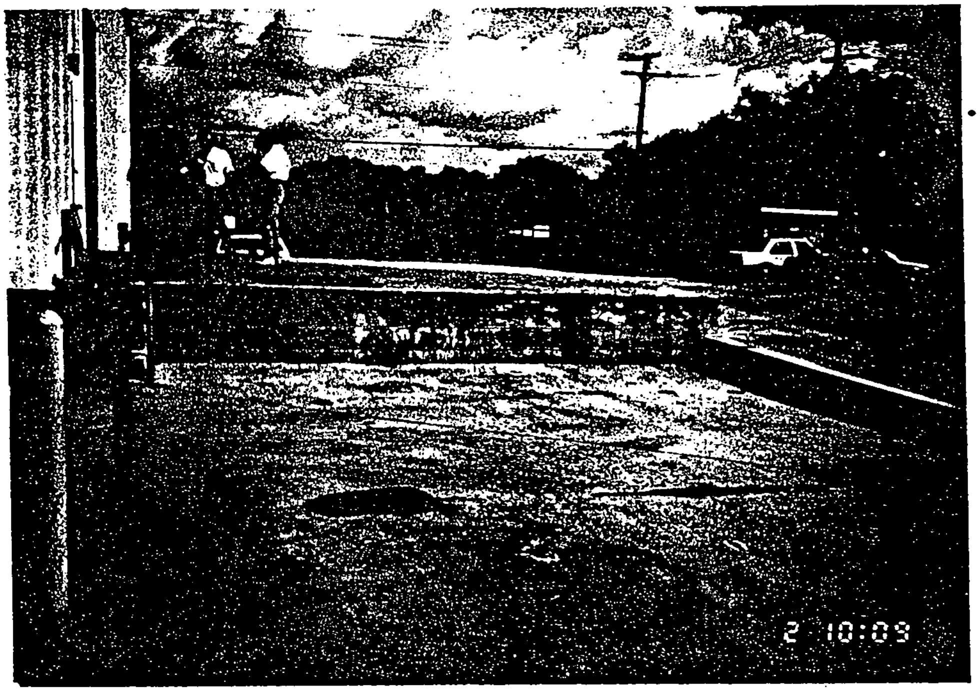


Photo 2. A view of the Drummed Dry Cleaning and Paint Waste Unloading Dock (SWMU 2), facing north. Note stains on the concrete pad below the loading dock.

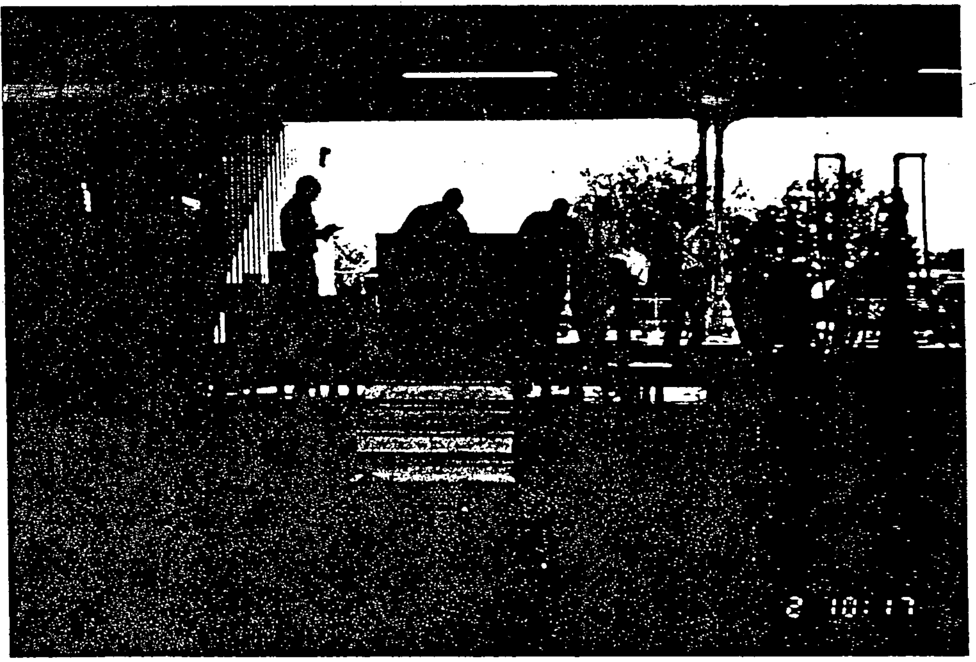


Photo 3. View of an open Solvent Return Wet Dumpster (SWMU 3).

Part of RFA
Report - from
A.T. Kearney -
Report dated 12/1/89.

Photo 4a. Overview of the facility's solvent return fill shelters. The Solvent Return Wet Dumpsters (SWMU 3) are located here, and the Spill Containment Area Below the Fill Shelters (SWMU 4) can be seen beneath the metal grate platform.

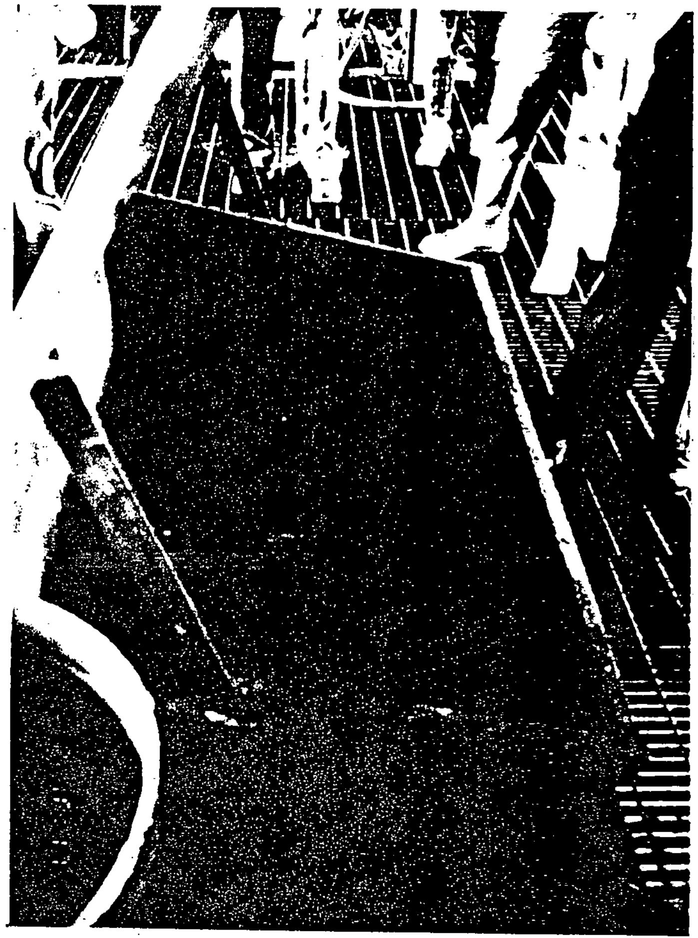


Photo 4b. This sump is located in the Spill Containment Area below the Fill Shelters (SWMU 4).

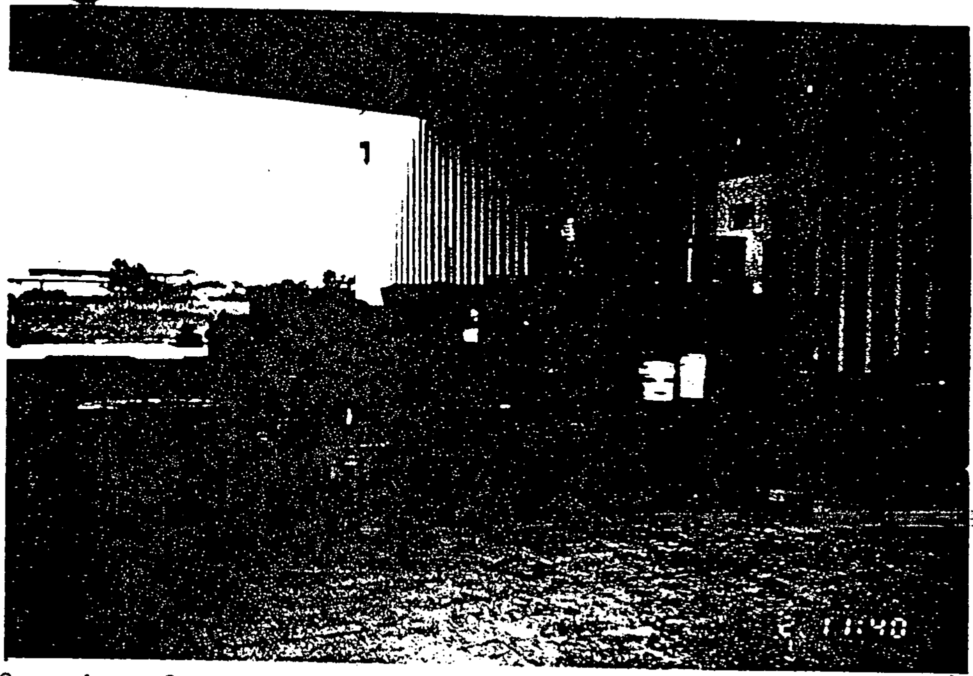


Photo 5a. Overview of the Drum Rinsing Area (SWMU 5). The drum-washing apparatus is the 55-gallon drum that has a halved 55-gallon drum positioned lengthwise over it. This area is located above the Spill Containment Area Below the Fill Shelters (SWMU 4).

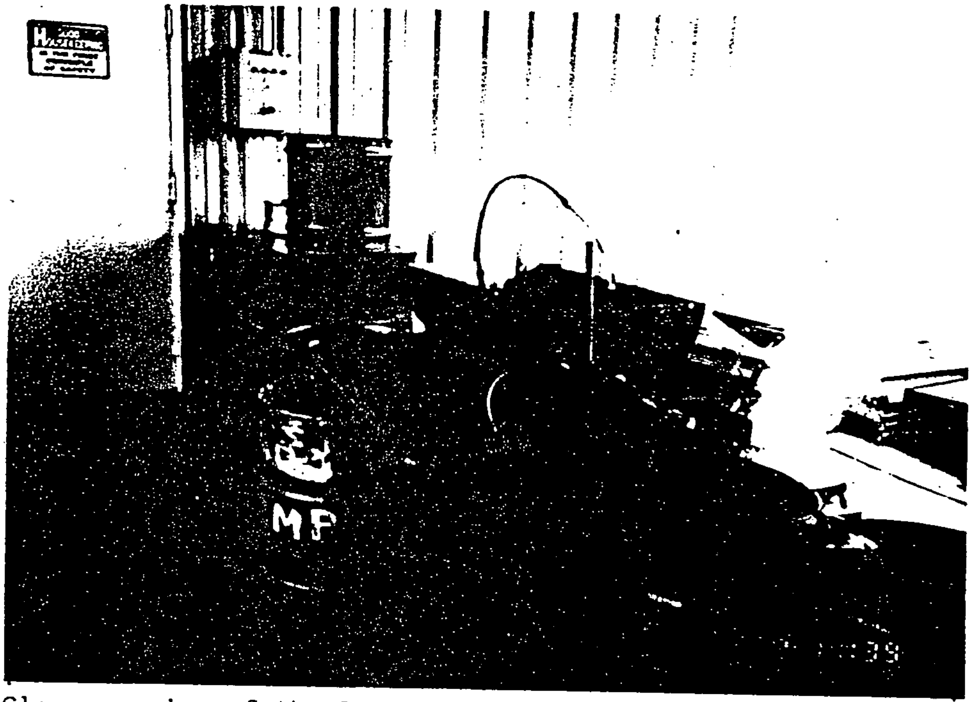


Photo 5b. Close-up view of the Drum Rinsing Area (SWMU 5).

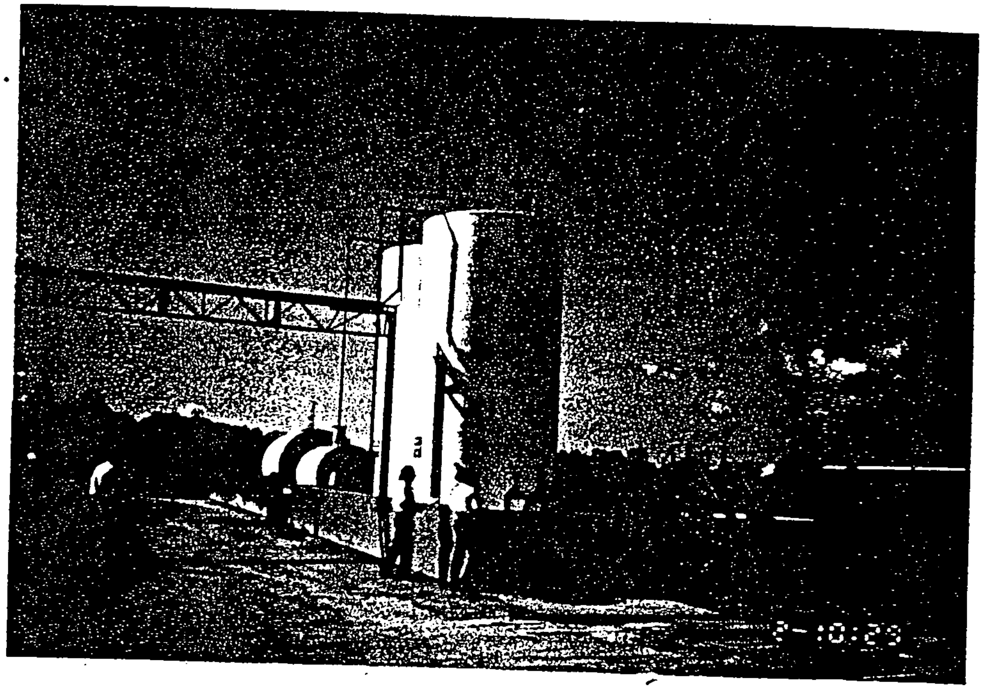


Photo 6a. Overview of the Waste Solvent Storage Tank area (SWMU 6), facing south. Note overhead piping to the tanks from the fill shelters.

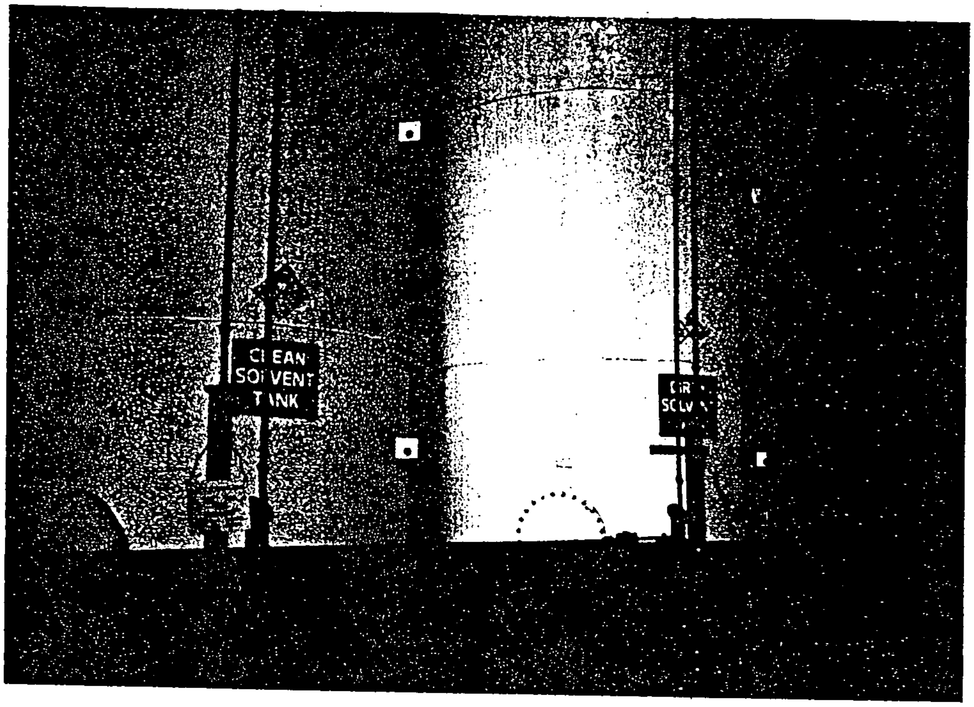


Photo 6b. Close-up of the product tank and the Waste Solvent Storage Tank (SWMU 6).

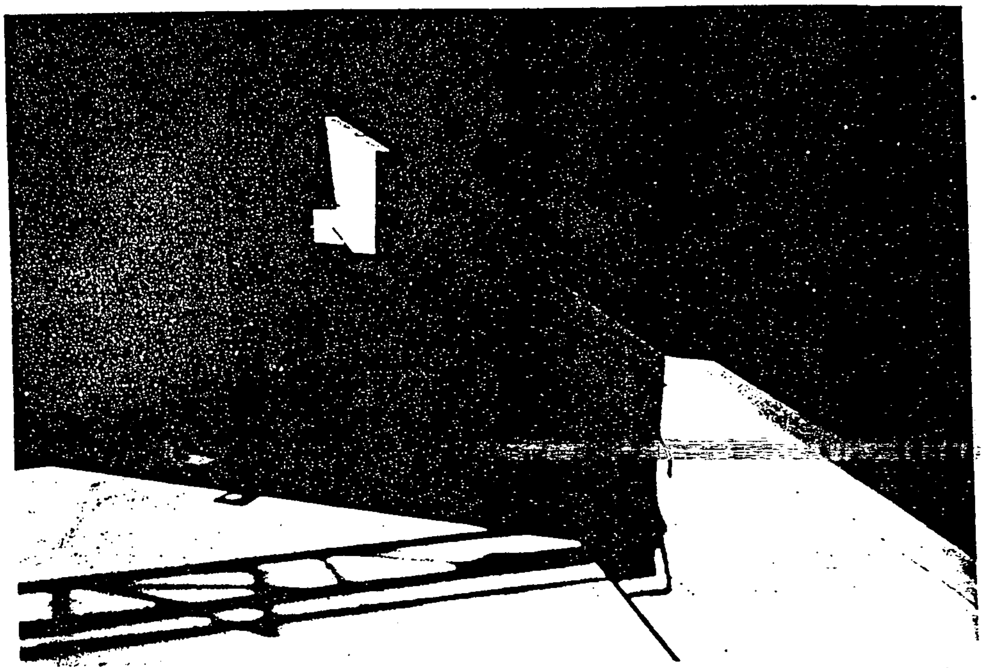


Photo 6c. Epoxy-coated concrete pad and cinder-block dike that surround the Waste Solvent Storage Tank area (SWMU 6). This view is facing south.

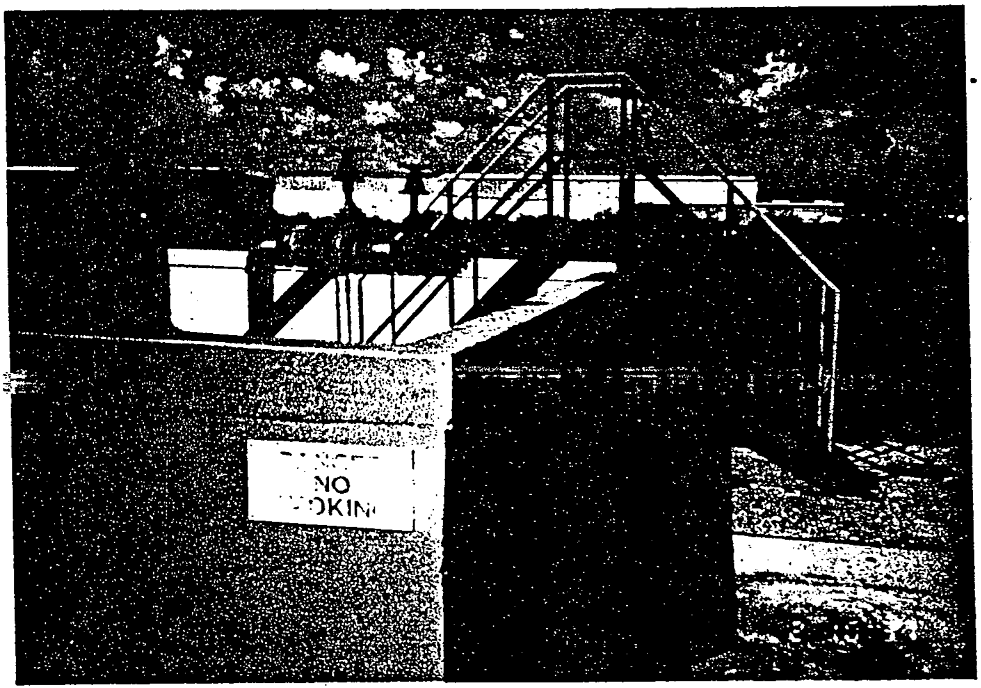


Photo 6d. The tanker truck hookup pipes and valves for waste solvents (brown pipe, to the right) and clean solvents (orange pipe, to the left). These pipes are used for transferring solvents to and from a tanker truck.

Photo 7. View of the Stormwater Ditch (SWMU 7), facing east. The chain-link fence to the right is the facility's southern border.

Photo 8a. The Accumulation Center Drum Storage Area (SWMU 8).

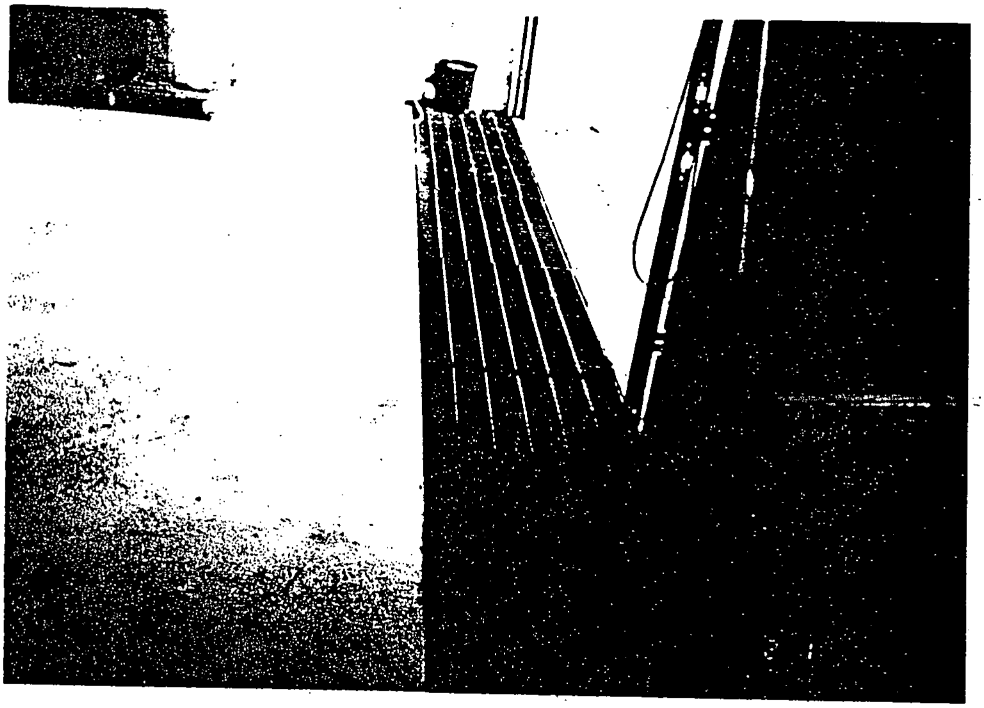


Photo 8b. Trench located in front of the Western doors within the Accumulation Center Drum Storage Area (SWMU 8).

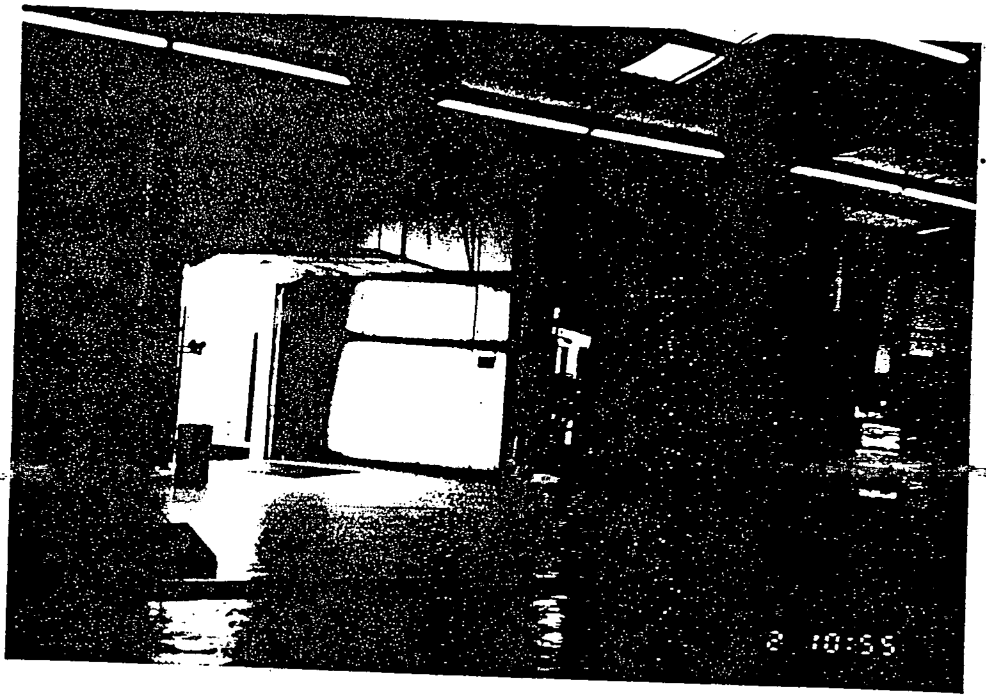


Photo 9a. Two of the three Drummed Waste Loading Docks (SWMU 9). The third loading dock is to the right, just outside this photo. The floor is epoxy-coated in this area.

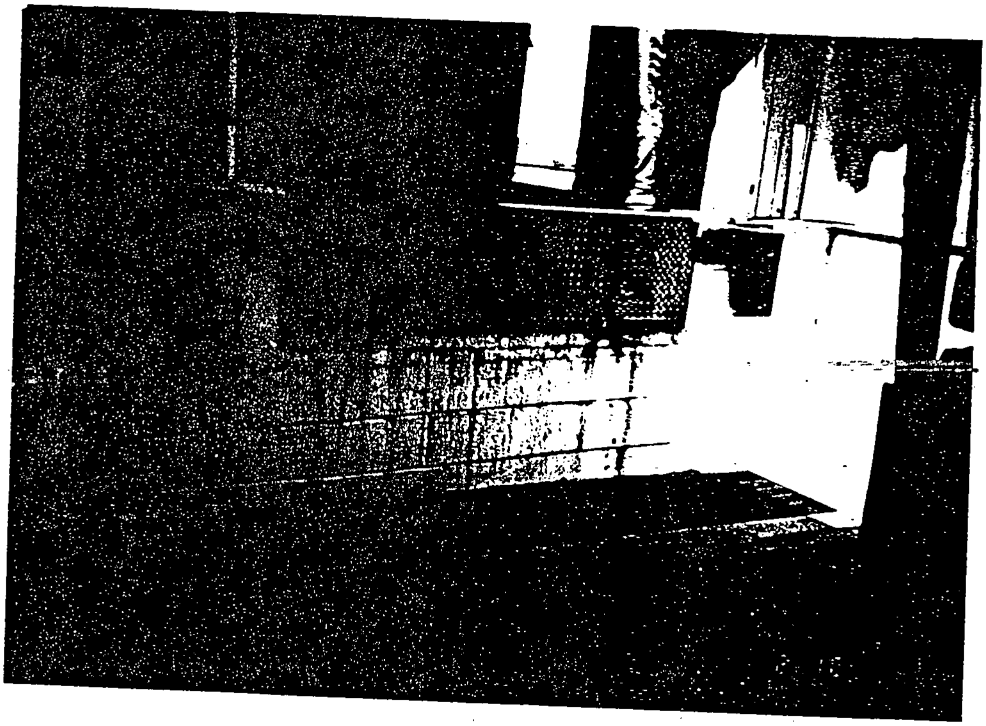


Photo 9b. This sump is located outdoors within one of the Drummed Waste Loading Docks (SWMU 9). The other two loading docks also have sumps positioned in similar layouts.

Photo 10a. The Drummed Flammable Waste Storage Room (SWMU 10). All drums were positioned on wooden pallets. Note that drummed waste to the left is stacked four drums high.

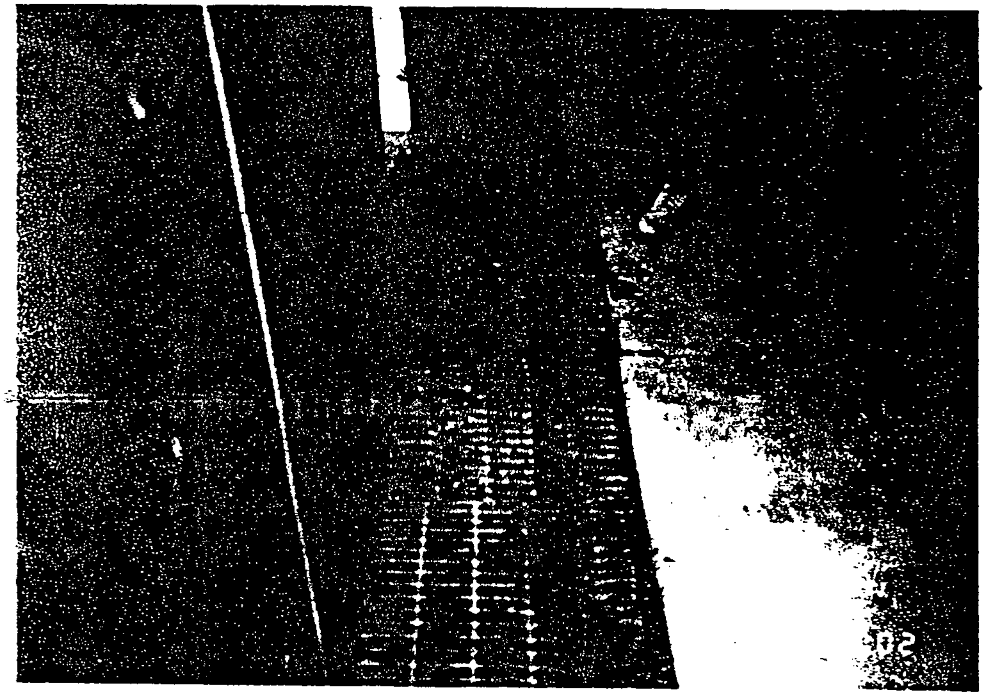


Photo 10b. Trench within the Drummed Flammable Waste Storage Room (SWMU 10). This trench is positioned in front of the sliding door to the Drummed Flammable Waste Storage Room (SWMU 10).

Photo 11. View of the Old Dumping Ground (SWMU 11), facing north.

Photo 12. View of the Stormwater Retention Pond (SWMU 12), facing west. Tall grass and cattails are growing in this pond.

APPENDIX B

JANUARY 28, 1993 LETTER FROM SAFETY-KLEEN: FILL SAMPLING, ANALYSIS, AND OTHER RELATED INFORMATION

safety-kleen®

VIA FEDERAL EXPRESS AIRBILL #6097235222

January 28, 1993

Mr. James H. Scarbrough, P.E.
Chief, RCRA and Federal Facilities Branch
Waste Management Division
Environmental Protection Agency, Region IV
345 Courtland Street
Atlanta, Georgia 30365

RE: Safety-Kleen Corp. Facility, Tampa, Florida; EPA I.D. No. FLD 980 847 271
Notification Pursuant to Condition II.C.1 of HSWA Permit

Dear Mr. Scarbrough:

Enclosed herewith are analytical results of soil samples collected at the above-referenced facility, which are being submitted to satisfy condition II.C.1 of the HSWA permit for this facility. A map, showing the sample locations, is also enclosed.

These samples were collected by our consultant, ERM-South, Inc., to characterize soil planned to be excavated for installation of a fire-suppression system. Note that asphalt-related constituents were detected, which is a manifestation of profuse amounts of ground-up asphalt in the samples reported by the sampling team.

I trust the information provided herein may facilitate your review of the Revised Confirmatory Sampling Plan that was submitted in February, 1992. Should you or your staff have any questions, comments, or require any additional information, please contact me at 813/682-8094.

Cordially,

John G. Hodges, Jr.
Senior Project Manager-Remediation

Enclosure(s)

c: Satish Kastury, FDER-BS&HW, Tallahassee
Gary Santii, FDER-Southwest District

C:\STATES\FL\JS012893.LET

129 S. KENTUCKY AVE, SUITE 701 LAKELAND, FL 33801 PHONE 813/682-8094 FAX 813/688-3683

25x 40 x 4

SB-1 + SB-2 = Comp 1

SB-3 + SB-4 = Comp 2

SB-5 + SB-6 = Comp 3

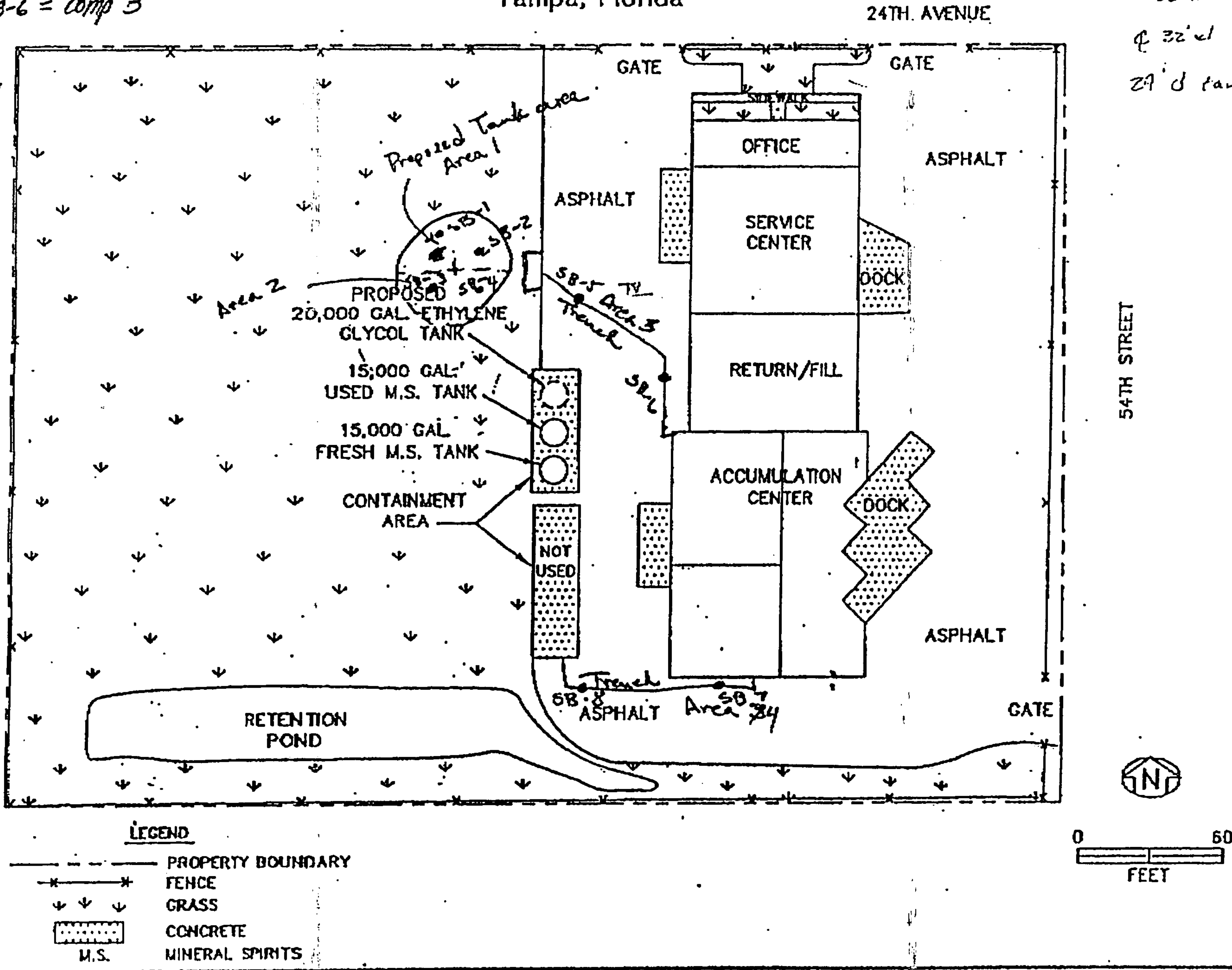
SB-7 + SB-8 = Comp 4

Figure I.B.3-1
Site Layout Map
Safety-Kleen Corp. Facility
Tampa, Florida

52' d

& 32' d

29' d tank



Project Number: ERM07SFK18
13311220-19
Project ID: TAMPA
Work Order Number: F212210

ANALYTICAL RESULTS

Volatile Organics in Soil
EPA Method 8240

	GTEL Sample Number	1221001- 1221004	1221005- 1221008	1221009- 1221012	1221013- 1221014
	Client Identification	COMP-1*	COMP-2*	COMP-3*	COMP-4*
	Date Sampled	12-14-92	12-15-92	12-15-92	12-15-92
	Date Extracted	12-21-92	12-21-92	12-21-92	12-21-92
	Date Analyzed	12-21-92	12-21-92	12-21-92	12-21-92
Analyte	QL,ug/kg[a]	Concentration, ug/kg[c]			
Chloromethane	1000	<QL	<QL	<QL	<QL
Bromomethane	1000	<QL	<QL	<QL	<QL
Vinyl Chloride	1000	<QL	<QL	<QL	<QL
Chloroethane	1000	<QL	<QL	<QL	<QL
Methylene Chloride	500	<QL	<QL	<QL	<QL
Acetone	10000	<QL	<QL	<QL	<QL
Carbon Disulfide	500	<QL	<QL	<QL	<QL
1,1-Dichloroethene	500	<QL	<QL	<QL	<QL
1,1-Dichloroethane	500	<QL	<QL	<QL	<QL
1,2-Dichloroethene (total)[b]	500	<QL	<QL	<QL	<QL
Chloroform	500	<QL	<QL	<QL	<QL
1,2-Dichloroethane	500	<QL	<QL	<QL	<QL
2-Butanone	10000	<QL	<QL	<QL	<QL
1,1,1-Trichloroethane	500	<QL	<QL	<QL	<QL
Carbon Tetrachloride	500	<QL	<QL	<QL	<QL
Vinyl Acetate	5000	<QL	<QL	<QL	<QL
Bromodichloromethane	500	<QL	<QL	<QL	<QL
1,2-Dichloropropane	500	<QL	<QL	<QL	<QL
cis-1,3-Dichloropropene	500	<QL	<QL	<QL	<QL
Trichloroethene	500	<QL	<QL	<QL	<QL
Dibromochloromethane	500	<QL	<QL	<QL	<QL
1,1,2-Trichloroethane	500	<QL	<QL	<QL	<QL
Benzene	500	<QL	<QL	<QL	<QL

(continued)
ANALYTICAL RESULTS

Volatile Organics in Soil
EPA Method 8240

GTEL Sample Number		1221001- 1221004	1221005- 1221008	1221009- 1221012	1221013- 1221014
Client Identification		COMP-1*	COMP-2*	COMP-3*	COMP-4*
Date Sampled		12-14-92	12-15-92	12-15-92	12-15-92
Date Extracted		12-21-92	12-21-92	12-21-92	12-21-92
Date Analyzed		12-21-92	12-21-92	12-21-92	12-21-92
Analyte	QL,ug/kg[a]	Concentration, ug/kg[c]			
2-Chloroethyl Vinyl Ether	1000	<QL	<QL	<QL	<QL
trans-1,3-Dichloropropene	500	<QL	<QL	<QL	<QL
Bromoform	500	<QL	<QL	<QL	<QL
4-Methyl-2-Pentanone	5000	<QL	<QL	<QL	<QL
2-Hexanone	5000	<QL	<QL	<QL	<QL
Tetrachloroethene	500	<QL	<QL	<QL	<QL
1,1,2,2-Tetrachloroethane	500	<QL	<QL	<QL	<QL
Toluene	500	<QL	<QL	<QL	<QL
Chlorobenzene	500	<QL	<QL	<QL	<QL
Ethylbenzene	500	<QL	<QL	<QL	<QL
Styrene	500	<QL	<QL	<QL	<QL
Xylenes (total)	500	<QL	<QL	<QL	<QL
1,2-Dichlorobenzene	500	<QL	<QL	<QL	<QL
1,3-Dichlorobenzene	500	<QL	<QL	<QL	<QL
1,4-Dichlorobenzene	500	<QL	<QL	<QL	<QL
Quantitation Limit Multiplier[c]		1	1	1	1
Percent Solids, %		777	79	88	88

a Quantitation limit.
b Total 1,2-dichloroethene is the sum of the cis- and trans- isomers.
c The quantitation limit multiplier indicates the adjustments made to the data and QLs for sample dilutions and percent solids.
* Composite-1 SB-1A, SB-1B, SB-2A, SB-2B
Composite-2 SB-3A, SB-3B, SB-4A, SB-4B
Composite-3 SB-5A, SB-5B, SB-6A, SB-6B
Composite-4 SB-7A, SB-8A

ANALYTICAL RESULTS

Base/Neutrals and Acids in Soil
EPA Method 8270^a

GTEL Sample Number		1221001-1221004	1221005-1221008	1221009-1221012	1221013-1221014
Client identification		COMP-1*	COMP-2*	COMP-3*	COMP-4*
Date Sampled		12-14-92	12-15-92	12-15-92	12-15-92
Date Extracted		12-18-92	12-18-92	12-18-92	12-18-92
Date Analyzed		12-23-92	12-23-92	01-02-93	12-23-92
Analyte	QL, ug/Kg^b	Concentration, ug/kg^c			
Phenol	330	<QL	<QL	<QL	<QL
bis(2-Chloroethyl) ether	330	<QL	<QL	<QL	<QL
2-Chlorophenol	330	<QL	<QL	<QL	<QL
1,3-Dichlorobenzene	330	<QL	<QL	<QL	<QL
1,4-Dichlorobenzene	330	<QL	<QL	<QL	<QL
Benzyl Alcohol	660	<QL	<QL	<QL	<QL
1,2-Dichlorobenzene	330	<QL	<QL	<QL	<QL
2-Methylphenol	330	<QL	<QL	<QL	<QL
bis(2-Chloroisopropyl) ether	330	<QL	<QL	<QL	<QL
4-Methylphenol	330	<QL	<QL	<QL	<QL
N-Nitroso-di-n-propylamine	330	<QL	<QL	<QL	<QL
Hexachloroethane	330	<QL	<QL	<QL	<QL
Nitrobenzene	330	<QL	<QL	<QL	<QL
Isophorone	330	<QL	<QL	<QL	<QL
2-Nitrophenol	330	<QL	<QL	<QL	<QL
2,4-Dimethylphenol	330	<QL	<QL	<QL	<QL
Benzoic Acid	1700	<QL	<QL	<QL	<QL
bis(2-Chlorethoxy)methane	330	<QL	<QL	<QL	<QL
2,4-Dichlorophenol	330	<QL	<QL	<QL	<QL
1,2,4-Trichlorobenzene	330	<QL	<QL	<QL	<QL
Naphthalene	330	<QL	<QL	<QL	<QL
4-Chloroaniline	660	<QL	<QL	<QL	<QL
Hexachlorobutadiene	330	<QL	<QL	<QL	<QL

(continued)

ANALYTICAL RESULTS

Base/Neutrals and Acids in Soil
EPA Method 8270[a]

GTEL Sample Number		1221001- 1221004	1221005- 1221008	1221009- 1221012	1221013- 1221014
Client Identification		COMP-1*	COMP-2*	COMP-3*	COMP-4*
Date Sampled		12-14-92	12-15-92	12-15-92	12-15-92
Date Extracted		12-18-92	12-18-92	12-18-92	12-18-92
Date Analyzed		12-23-92	12-23-92	01-02-93	12-23-92
Analyte	QL, ug/Kg[b]	Concentration, ug/kg[c]			
4-Chloro-3-methylphenol	660	<QL	<QL	<QL	<QL
2-Methylnaphthalene	330	<QL	<QL	<QL	<QL
Hexachlorocyclopentadiene	330	<QL	<QL	<QL	<QL
2,4,6-Trichlorophenol	330	<QL	<QL	<QL	<QL
2,4,5-Trichlorophenol	330	<QL	<QL	<QL	<QL
2-Chloronaphthalene	330	<QL	<QL	<QL	<QL
2-Nitroaniline	1700	<QL	<QL	<QL	<QL
Dimethyl phthalate	330	<QL	<QL	<QL	<QL
Acenaphthylene	330	<QL	<QL	<QL	<QL
2,6-Dinitrotoluene	330	<QL	<QL	<QL	<QL
3-Nitroaniline	1700	<QL	<QL	<QL	<QL
Acenaphthene	330	<QL	<QL	<QL	<QL
2,4-Dinitrophenol	1700	<QL	<QL	<QL	<QL
4-Nitrophenol	1700	<QL	<QL	<QL	<QL
Dibenzofuran	330	<QL	<QL	<QL	<QL
2,4-Dinitrotoluene	330	<QL	<QL	<QL	<QL
Diethylphthalate	330	<QL	<QL	<QL	<QL
4-Chlorophenyl phenyl ether	330	<QL	<QL	<QL	<QL
Fluorene	330	400	<QL	3400	<QL
4-Nitroaniline	1700	<QL	<QL	<QL	<QL
4,6-Dinitro-2-methylphenol	1700	<QL	<QL	<QL	<QL
N-Nitrosodiphenylamine	330	<QL	<QL	<QL	<QL
4-Bromophenyl phenyl ether	330	<QL	<QL	<QL	<QL

(continued)

ANALYTICAL RESULTS

Base/Neutrals and Acids in Soil
EPA Method 8270[a]

GTEL Sample Number		1221001- 1221004	1221005- 1221008	1221009- 1221012	1221013- 1221014
Client Identification		COMP-1*	COMP-2*	COMP-3*	COMP-4*
Date Sampled		12-14-92	12-15-92	12-15-92	12-15-92
Date Extracted		12-18-92	12-18-92	12-18-92	12-18-92
Date Analyzed		12-23-92	12-23-92	01-02-93	12-23-92
Analyte	QL, ug/Kg[b]	Concentration, ug/kg[c]			
Hexachlorobenzene	330	<QL	<QL	<QL	<QL
Pentachlorophenol	1700	<QL	<QL	<QL	<QL
Phenanthrene	330	2300	700	21000	2000
Anthracene	330	550	<QL	5800	520
Di-n-butylphthalate	330	<QL	<QL	<QL	<QL
Fluoranthene	330	2000	990	25000	2800
Pyrene	330	2300	1000	16000	3000
Butyl benzyl phthalate	330	<QL	<QL	<QL	<QL
3,3'-Dichlorobenzidine	660	<QL	<QL	<QL	<QL
Benzo[*a*]anthracene	330	1100	440	9300	1700
Chrysene	330	840	350	6800	1500
bis(2-Ethylhexyl)phthalate	330	<QL	<QL	<QL	<QL
Di-n-octyl phthalate	330	<QL	<QL	<QL	<QL
Benzo[*b*]fluoranthene	330	1000	390	6200	1700
Benzo[*k*]fluoranthene	330	640	<QL	3800	930
Benzo[*a*]pyrene	330	880	350	5600	1500
Indeno[1,2,3-*c,d*]pyrene	330	480	<QL	2000	830
Dibenzo[*a,h*]anthracene	330	<QL	<QL	1100	440
Benzo[*g,h,i*]perylene	330	510	<QL	2000	840
Quantitation Limit Multiplier[e]		1	1	1	1
Percent Solids		77	79	88	88

Footnotes

ANALYTICAL RESULTS

Base/Neutrals and Acids in Soil
EPA Method 8270[a]

a Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, Table 2, US EPA November 1986; extraction by EPA Method 3550.

b Quantitation limit. All results are reported on a wet weight basis.

c Data Flag Definitions

J Indicates an estimated value. This flag is used when the mass spectral data indicates the presence of a compound that meets the identification criteria but the result is less than the quantitation limit, but greater than zero, or when reporting an estimated concentration for a tentatively identified compound.

B Indicates that the analyte was found in the blank as well as a sample. It indicates possible/probable blank contamination and warns the data user to take appropriate action.

e The quantitation limit multiplier indicates the adjustments made for sample dilutions.

NOTE: Sample temperature when received at the laboratory was °C.

	Composite-1	SB-1A, SB-1B, SB-2A, SB-2B
*	Composite-2	SB-3A, SB-3B, SB-4A, SB-4B
	Composite-3	SB-5A, SB-5B, SB-6A, SB-6B
	Composite-4	SB-7A, SB-8A

Project Number: ERM07SFK18
13311220-19
Project ID: TAMPA
Work Order Number: F212210

ANALYTICAL RESULTS

Total Metals in Soil
EPA Method 7000 - Atomic Absorption Methods[a]

		GTEL Sample Number	1221001-1221004	1221005-1221008	1221009-1221012	1221013-1221014
		Client Identification	COMP-1*	COMP-2*	COMP-3*	COMP-4*
		Date Sampled	12-14-92	12-15-92	12-15-92	12-15-92
		Date Digested	12-17-92	12-17-92	12-17-92	12-17-92
		Date Analyzed	12-22-92	12-22-92	12-22-92	12-22-92
Analyte	Method #	QL, mg/kg[b]	Concentration, mg/kg			
Arsenic	7060	0.5	<QL	0.8	<QL	0.5
Barium	7080	25	<QL	27	27	36
Cadmium	7131	0.5	<QL	<QL	<QL	<QL
Chromium	7191	1.0	12	5.6	3.5	8.8
Lead	7421	0.5	43	34	10	65
Mercury	7471	0.1	<QL	<QL	<QL	<QL
Selenium	7740	0.5	<QL	<QL	<QL	<QL
Silver	7761	0.5	<QL	<QL	<QL	<QL
Quantitation Limit Multiplier[c]			1	1	1	1
Percent Solids %			77	79	88	88

a Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, US EPA November 1986.

b QL = Quantitation Limit.

c The Quantitation Limit Multiplier indicates the factor necessary for the adjustment of the quantitation limits due to sample dilutions.

* Composite-1 SB-1A, SB-1B, SB-2A, SB-2B
Composite-2 SB-3A, SB-3B, SB-4A, SB-4B
Composite-3 SB-5A, SB-5B, SB-6A, SB-6B
Composite-4 SB-7A, SB-8A

QA NONCONFORMANCE SUMMARY

1.0 Sample Handling

1.1 Sample handling and holding time criteria were not met for zero samples.

2.0 QC Check Sample

2.1 The control limits were met for 8 out of 8 elements.

3.0 Method Blanks

3.1 Zero target elements were found in the method blank.

4.0 Matrix Spike (MS) Accuracy

4.1 The recovery limits were exceeded in the matrix spike for zero elements.

5.0 Sample Duplicate Precision

5.1 The maximum percent difference (RPD) was exceeded for zero elements in the duplicate samples.

6.0 Laboratory Control Sample

6.1 The recovery limits were not met for zero elements for the laboratory control samples.

ERM-South, Inc.
Environmental Resources Management

CHAIN OF CUSTODY RECORD

Princess Palm Avenue, Suite 100 • Tampa, Florida 33619 • (813) 622-8727
2 N.W. 79th Avenue • Miami, Florida 33122 • (305) 591-3076

Project No./I.D. 1311220.19 / SK-Tampa Sheet 1 of 2
Sampled By DS Bottles Supplied By GTEL
NOTE: When analyses are complete return this form to:
Name: Dan Shubelcken @ ERM-South, Inc., Tampa, Florida

Sample I.D.	Sample Description	Collection Date/Time	No. of bottles	Analysis Requested	Remarks
SB-1 A	Soil 01	12/14/92 1300	3	8240/8270 (2) & 8 RCRA Metals (1)	See Comments
SB-1 B	Soil AREA 1 02	12/14/92 1309	3	" " "	"
SB-2 A	Soil 03	12/14/92 1419	3	" " "	"
SB-2 B	Soil 04	12/14/92 1442	3	" " "	"
SB-3 A	Soil 05	12/14/92 1514	3	" " "	"
SB-3 B	Soil AREA 2 06	12/15/92 1100	3	" " "	"
SB-4 A	Soil 07	12/15/92 1126	3	" " "	"
B-4 B	Soil 08	12/15/92 1146	3	" " "	"

Shipping package opened by: DS Date: 12/14/92 Time: 900
Employer: ERM-South Containers intact (Y/N) Y

Samples packaged & sealed by: DS Date: 12/15/92 Time: 1750
Employer: ERM-South Method of Shipment: Hold for Pick-up

Received in laboratory by: Date: Time:
Employer: Seals intact (Y/N)
Containers intact (Y/N) If not, describe in Comments section

NOTE: Laboratory's Chain of Custody shall be in effect from receipt through analysis.

Relinquished By		Received By		Samples Intact	Date	Time	Initials	
Name	Employer	Name	Employer				Sender	Rec'r
		Kellee Voight						KV
								F212210 21

COMMENTS:

Analyze for 8240/8270 & 8 RCRA metals; report only ~~[illegible]~~ items on TCLP list
Composite samples from each area into one sample per area (will end up w/ 4 samples [Area 1, 2, 3, & 4] to analyze).

White - Project file Yellow - Quality

ERM ERM-South, Inc.
Environmental Resources Management

CHAIN OF CUSTODY RECORD

9 Princess Palm Avenue, Suite 100 • Tampa, Florida 33619 • (813) 622-8727
2b N.W. 79th Avenue • Miami, Florida 33122 • (305) 591-3076

Project No./I.D. 1311220.19 / SK-Tampa Sheet 2 of 2
Sampled By DS Bottles Supplied By GTEL
NOTE: When analyses are complete return this form to:
Name: Dan Shebolkeen @ ERM-South, Inc., Tampa, Florida

Sample I.D.	Sample Description	Collection Date/Time	No. of bottles	Analysis Requested	Remarks
SB-5A	Soil AREA 3 09	12/15/92 1254	3	8240/8270 & 8 RCRA Metals	See Comments
SB-5B	Soil AREA 3 10 DS	~~12/15~~ 12/15 1315	3	" " "	"
SB-6A	Soil AREA 3 11	12/15/92 1351	3	" " "	"
SB-6B	Soil AREA 3 12	12/15/92 1402	3	" " "	"
SB-7A	Soil Area 4 13	12/15/92 1509	3	" " "	"
SB-7B	Not Collected	—	—	—	—
SB-8A	Soil 14 15	12/15/92 1543	3	8240/8270 & 8 RCRA metals	See Comments
B-8B	Not Collected 16	—	—	—	—

Shipping package opened by: D.S Date: 12/14/92 Time: 900
Employer: ERM-South Containers intact (Y/N) Y

Samples packaged & sealed by: DS Date: 12/15/92 Time: 1750
Employer: ERM-South Method of Shipment: Hold for Pick-up

Received in laboratory by: Date: Time:
Employer: Seals intact (Y/N)
Containers intact (Y/N) If not, describe in Comments section

NOTE: Laboratory's Chain of Custody shall be in effect from receipt through analysis.

Relinquished By		Received By		Samples Intact	Date	Time	Initials	
Name	Employer	Name	Employer				Sender	Rec'r
		Kellie Voight						KV

COMMENTS: Composite samples from each area into one sample per area.
Analyze for 8240/8270 & 8 RCRA Metals;
Report ~~all~~ items on TCLP list, only.

pies: White – Project file; Yellow – Quality Control Officer; Pink – Sampler; gold Laborator

File

December 16, 1992

Project No. 1311220.19

MEMORANDUM

TO: Mike Starks

FROM: Dan Shabeldeen DS

COPY: Files

RE: Soil sampling in excavation areas for tank construction at the SK - 24th Ave. Facility.

In preparation of sampling, time was spent on coordination which should be mentioned. On December 10 & 11, 1992 (Thursday and Friday) I spent several hours trying to coordinate between Jim Davis facility manager for Safety-Kleen and Chris Smith of Wiginton Sprinkler, Inc. (the prime consultant). As it evolved, Jim said that any samples taken from the site were to be split with SK requiring the reordering of more sample kits. Jim later found out that splits would not be required.

Originally the area to be sampled was described as an area 40x25 feet and 4 feet deep in the open field where the tank would be located west of the parking lot. Upon further discussions, we found out that the areas to be sampled included a pipe trench from the proposed pump house across the asphalt parking lot to the existing accumulation building. To do so would require busting through asphalt, backfilling the hole and patching the hole upon completion.

Before I could begin sampling, I had to request of Chris Smith to send someone out to the site to layout the proposed pipe runs. On Friday he said someone would be there Monday at 8:00 AM. On Monday at 9:00 AM , I called Jim who said no one from Wiginton had been out.

At that time I called Chris to inquire as to the status of the layout, he assured me that if it had not been done, it would be shortly.

I arrived at the site at 10:35 AM and looked over the proposed excavation areas. There was no sign that Wiginton had been out. I met with Jim, who had been on a conference call, at 10:55; we walked over the site and confirmed that no one from Wiginton had been out yet. At 11:05 AM Chris Smith and Neal Smith of Wiginton arrived at the site. I discussed dimensions of the excavation areas including the trench. As it turned out, two pipe trenches have been designed and the tank area is actually 47 feet in diameter and 10 feet deep and the trenches would be 2 feet wide and aproximately 5-6 feet deep. This new information required that we again modify our sampling plan and include two additional borings through asphalt. Wiginton completed the system layout at 12:00, during which time I modified the sampling plan and prepared equipment.

I began sampling in the field where I discovered numerous impediments to auguring which included: limerock, asphalt and large shell fragments, a coil spring, electrical tape, strips of clothing, a broken comb, and carpet fabric. Later Jim informed me that the site was a SWMU. As noted in the attached field notes, up to ten borings were attempted in one area in trying to reach 8 feet, BLS. Many of the holes had to be shallower than planned due to obstructions.

To accomplish the sampling task, I had to return to the site on Tuesday, December 15, 1992. That day was spent finishing the tank area and sampling the trench runs. Please see attached field notes for further details.

9.00 Began mobilizing
10.00 left office for the site
1015 Stopped @ store to purchase water & paper towels

1035 Arrived @ site & signed in @ office
Jim Davis was on a conference call
so I went out to scope proposed tank
location.

1046 No sign that Wiggington Sprinkler was out. they
were supposed to layout the location of the
lines from the proposed tank across
the asphalt drive.

10.48 Went inside; Jim was still on conference call.
Since no lines were laid out or tank located, I
called Wiggington for second time this
morning (once prior to leaving office). Spoke w/
secretary who said Chris Smith & superintendent
were out of the office together. I left message
for him to call me.

1055 Met Jim Davis he confirmed that no one from
Wiggington has been out. He said they previously
set small stones to mark tank location. The
stones have since been removed perhaps due to
mowing. He showed me the general location
of the tank. I requested drums for excess
soil. He walked off to get same.

1105 Chris Smith & Neal Smith arrived from Wiginton
They are here to layout pipe & tank location & provide
info on extent of excavation.

1115 Deconed equip. preparing jars while Wiginton
lays out line. Writing out labels.

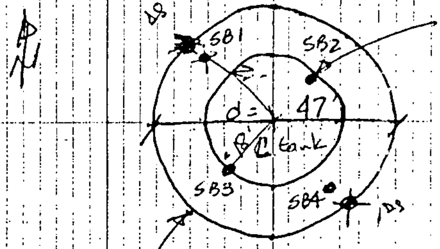
Noon
1200 Wiginton finished layout of trenches &
layout of tank. Said that tank area
is circular 47' diameter will taper
to 10' depth @ 35' diameter & hold @
10' for inner area under tank. Trenches
will be ~2' x 5' deep. Two segment of
trenches exist one along west side of building
& one along south side of building.

Approximated area to be excavated: ~500 yd^3
FDER: 500-1000 yd^3 = 5 composite samples
Will only take 4 composite samples as
previously determined. (as per conversation
w/ Mike Starks, to confirm configuration).

12.10 Spoke w/ M. Starks over the phone described
the situation w/ set-up of excavation areas.
He agreed to stay w/ 4 composites 2 @
tank & 1 each at the trenches.

1213 Will set-up @ tank area & begin
sampling.

1224 Layout of Tank area (Areas 1 & 2)



35' excavation within which depth = 10'

97' diameter total excavation limit
transition to 10' depth @ d = 35'

SB-1 } will be to 6' depth (Collect samples @ 5 & 6')*
SB-4 }

SB-2 } will be to 10' depth (Collect samples @ 5 & 10')*
SB-3 }

*depending on depth to water.

1236 Begin sampling @ SB-1

1250 Pulled out of 1st hole hit rock @ ~ 2 ft. Start another next to 1st.

1300 Collected Sample SB-1 A (@ 3')

1309 Collected Sample SB-1 B (@ 5'), hit rock or wood & couldn't continue. Encountered water @ ~ 4½ ft. Fill material contains considerable rock & wood debris making augering difficult.

1315 Set-up on SB-2 (Sample @ 4 & 8 due to high watertable, don't expect to be able to auger much more than 2-3' below water)

1328 Moved equip. & decon'ed. Went inside to ask Jim for three more drums. Only one had been provided. Begin SB-2

1340 Four attempts @ hand-augering @ this location unsuccessful so far hole varied from 6" to 3 feet. Encountered lime rock fragment and wood debris.

1348 Fifth & sixth attempts also unsuccessful. Stopped @ ~1' depth after encountering lime rock fragments, shell, coil spring, electrical tape & asphalt pavement chunks.

1408 Attempts 7-9 aborted due to above mentioned reasons. Attempt 10 aborted @ 3 foot depth: hit rock or wood. Water table appears to be 3½ - 4 feet BLS.

1410 SB-2 is @ base of slope from parking lot. Will move to SB-3 which is southwest away from parking lot perhaps I will be able to collect a deep sample there.

1415 With staunch determination, I went back into SB-2 to try to break through obstruction, which proved to be wood (roots etc.) & was able to auger down to 4 feet & collect my sample.

1419 Collected sample SB-2A. Will continue in same hole.

1442 Collected & labelled sample SB-2B. taken @ 7' due to hole continually ~~#~~ DS collapsing. Will decon & move to SB-3

1504 Augered down to 4' to collect sample SB-3A Encountered limerock, asphalt (cobble size) and remenants of carpet (the shag variety) or something similar @ 3' BLS.

1514 Completed sample SB3-A

1522 Had to pull out of 1st hole, encountered wood & debris which I couldn't penetrate. pulled out @ 5' BLS

1525 Pulled out of 2nd; encountered limerock @ 1.0'

1532 Pulled of of 3rd hole; same as above. Depth = 2'

1542 Augered down to 4' in hole 4; encountered rock or shell, had to pull out. Going to call office.

1553 Met w/ Jim Davis before he left for the day. He said that the tank area is a solid waste/hazardous area which was used as a dump prior to SK occupation. I told him what I have been encountering & he understood & added that they have pulled 3' hoses from that area. Jim told Steve to have someone bring used drums into explosion room when done

1557 Called M. Starkes @ the office to let him know the situation. He was on the phone so I left a message for him to call me when he's off

1615 Sealed Drum #1 containing soil from SB-1 & SB-2. Using labels from J. Davis of SK & SK convention labeled as follows

Drum #1
RQ Petroleum Naptha Combustable Liquid
UN 1255 (~~Dooo~~ DS D001)
SK DOT # 528

Soil from SB-1 & SB-2
Note: Drum ~~#~~ DS 7/8 full

1625 Start 5th attempt @ SB-3B

1632 Aborted 5th attempt @ SB-3B; depth = 3.' Due to the lack of success, I am packing up & heading to the office to discuss strategy w/ M. Starkes.

1640 Sealed drum #2 & marked as described for Drum #1. Note drum #2 is ~ ½ full.

1650 Informed Steve that I was done for the day & requested that he retrieve the 2 drums. He did.

1657 Left site for the office Call Starkes on the way in.

1715 Arrived @ office. Done for the day

DS
12/14/92

---

830 Met w/ M. Starkes in office informed him of conditions @ site including difficulty in augering, backfilling holes in pavement, & patching.

930 Left office, Have to stop @ Home Depot to purchase asphalt patch & backfill material. I decided to use sand instead of grout. Sand will be poured directly in the boring w/no mixing required, a water tight seal will not be required.

10:00 Left Home Depot for site, stopped for DI water.

10:20 Arrived @ site & signed in @ office, Looked for Jim Davis; he was running around at the grounds. Spoke w/ Steve & told him that I would need another drum later.

1030 Preparing to attempt SB-3B & SB-4, Mike Starkes previously suggested that if I can't get to 8 feet BLS, I could sample shallower.

1047 Deconed equip. starting SB-3B

1100 Collected sample SB-3B @ 5' BLS after encountering wood debris & asphalt which slowed augering. Terminated boring @ impenetrable substance. WT ~4' Placing soil excess in Drum #3.

1110 Deconed equipment.

1116 Begin SB-4A

1126 Completed collection of SB-4A. Only minor impedements, was able to penetrated. Collected @ 3' BLS. Will continue in ~~samp~~ a same hole.

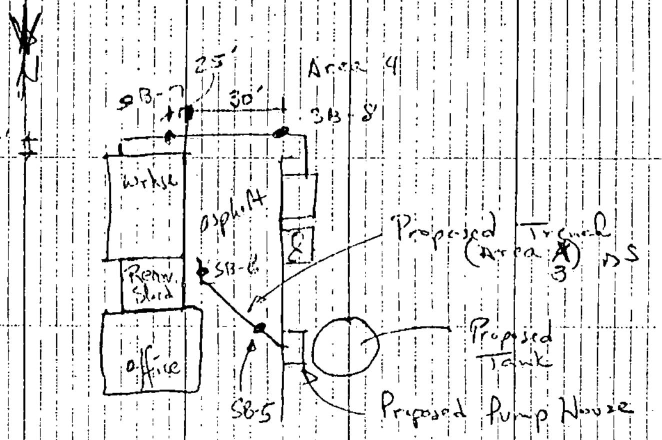
1146 Collected Sample SB-4B @ 6' BLS. Encountered wood debris and broken comb which slowed process. Sealed Drum #3 & labeled as follows

RQ Petroleum Naptha Combustable Liquid
UN 1255 (D001)
SK DOT# 528
Soil from Soil Boring SB-3 & SB-4
Drum #3

Using a SK Haz waste Drum label.

1150 Collect equipment & move to Area ~~#~~ 3 DS which will be pipe run from proposed pump house to main building. Will take four samples from 2 borings. Sample @ 2½' & 5'. According to Chris Smith of Wiginton Sprinkler trench will be 5-6' deep.

1208 Relocated to Area ~~#~~ 3 DS (SB-5 & 6)



1210 Jack Krivack - Proj. Mgr of SK stopped by to discuss sampling procedure.

1220 Called M. Harkins @ office to inquire about backfilling holes in field. He said yep so I'll need to purchase more sand.

1225 Begin breaking through asphalt @ SB-~~4~~ 5 DS

1242 Broke thru asphalt will begin to auger

1254 Completed sampling SB-5A @ 2½'

1315 Completed sample SB-5B @ 4' BLS. Terminated boring due to ~~a~~ DS impenetrable resistance. Fought w/ wood obstruction just to get to 4'. Only collected SB-5B (8240/8270-A), no soil was collected for 8240/8270-B or metals - unable to do so. Did not hit water table.

1316 Will backfill hole w/sand now & patch asphalt @ end of day.

1323 Relocated @ SB-6; will begin busting asphalt using a pick & a lot of brawn. Note used 3/4 Bag of Quickrete All purpose Sand (70# Bag) to backfill SB-5.

1351 Completed collected sample SB-~~#~~DS 6A @ 2½'. Will continue in same hole.

1402 Completed SB-6B @ 5' BLS. No obstructions encountered (yeah) Will backfill hole w/above brand sand. Will patch asphalt @ EOD. WT not encountered

1408 Borrowed push broom from staff to sweep up @ SB-5 & SB-6.

1421 Finished sweeping up around SB-5 & SB-6.

1425 Scaled and labeled Drum #4. Since no water table was encountered, the label reads as follows:

Drum #4
RQ Hazardous Waste, Solid, NOS
ORM-E NA9189 (D018)
SK DOT # 1331
Soil from SB-5 & SB-6 Area #3 DS

1428 Relocating to Area 4 (i.e. pipe run along south side of building; from building to outside containment area west of warehouse.

1440 Went inside & requested another drum. Set-up on SB-7 behind accumulation Bldg. Will
1444 begin to break through asphalt.

1449 Broke through asphalt. SB-7 located 25' east of southwest corner of Accumulation building on line laid out by Wigington.

1450 Will start boring.

1509 Completed collecting sample SB-7A @ 2½' BLS. Will continue in same hole.

1511 Unable to continue past 2½' due to obstruction. Will have to abort. Can not collect sample SB-7B which was to be @ 5' BLS.

1517 DS Completed sweeping up around boring & backfilled w/sand. Will patch asphalt later.

1520 Set-up on SB-8 located

Will begin asphalt penetration.

1538 Penetrated asphalt, will start augering

1543 Completed collecting sample SB-8A @ 2' depth BLS; couldn't get to 2½ due to impenetrable rock in bottom of hole.

1547 Unable to continue in this hole and to collect Sample SB-8B @ 5' BLS.

1610 Applied asphalt patch & swept up around boring. Sealed Drum #5 will mark same as Drum #4.

1624 Patched & cleaned up around SB-7

1635 Completed patching & cleaning up around SB-5 & SB-6. Need to get more info off of Drum #4 such as facility address to complete label on Drum #5 (other labels were pre-stamped).

0-007-~~8~~50 DD
SK Corp
5309 24th ~~St.~~ Av. South
Tampa FL 33619
FLD

0-007-50
SAFETY-KLEEN CORP
5309 24TH AVE S
TAMPA FL 33619
FLD 980847271

James Murphy (staff) said he would try to find stamp el stamp label on Drum 5-

1654 Backfilled all the holes (& attempted holes) for SB-1 through SB-4 in Areas 1 & 2. Used 3½ bags of sand

1700 Discarded trash & signed out @ office. Heading home to office. Need to pick up a bag of ice for samples. Will call GTEL on the way in & arrange for pickup.

1725 Arrived back @ office. Will unload

1758 Completed COC form & package samples. Called for pick-up but Todd Beasley (GTEL) was out till tomarrow afternoon. I left message for someone to call re: pick-up. No one has called yet. Will finish cleaning out truck.

1815 Completed paper work, parked van & locked up finished for the day

DS 12-15-92

Safety-Kleen®

Safety-Kleen Corporation
TCLP Analysis

Rolloffs from Fire System Trenches

Generator

Safety Kleen Corporation
5309 24th Avenue South
Tampa, FL 33619

Report Date: 06/25/93

Work Order #: 93-06-077
Survey #: 304743

Attention:
Jim Davis

Customer Representative:
316301, Adam Spivey

Dear Client:

The enclosed Safety-Kleen TCLP Metals analysis of Dirt, Asphalt, and Debris for Safety Kleen Corporation DOES NOT show TCLP characteristic waste codes.

For a material to be classified as non-hazardous, the generator must determine that the waste is not defined as a "listed" hazardous waste, not mixed with a "listed" hazardous waste, not derived from a "listed" hazardous waste, and obtain adequate information pertaining to the hazardous characteristics of ignitability (waste code D001), corrosivity (waste code D002), reactivity (waste code D003), and toxicity ("TCLP" waste des D004-D043).

If a corresponding preship analysis number was provided with this TCLP sample, that prequalification report will be revised to reflect the results shown in this report.

Please do not hesitate to call Henry Herzog (x7324) if there are any questions.

Sincerely,

Mark Hartwig
TCLP Laboratory Manager

RECEIVED
JUL 02 1993
SAFETY-KLEEN CORP.
ENVIRONMENTAL ENGINEER
TAMPA REGION

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: 312/694-2733

Safety-Kleen TCLP Analysis
Safety Kleen Corporation
Page 2 of 3 **Layer:** TOTAL

Work Order #: 93-06-077
Survey #: 304743

TCLP Metals

EPA WASTE #	**ANALYTE**	DATE ANALYZED	**REG LIMIT** (mg/L)	PQL (mg/L)	**RESULT** (mg/L)
D004	Arsenic	06/21/93	5.00	0.450	< 0.450
D005	Barium	06/21/93	100	0.0500	0.216
D006	Cadmium	06/21/93	1.00	0.0500	< 0.0500
D007	Chromium	06/21/93	5.00	0.0500	< 0.0500
D008	Lead	06/21/93	5.00	0.350	< 0.350
D009	Mercury	06/21/93	0.200	0.000800	< 0.00080
D010	Selenium	06/21/93	1.00	0.550	< 0.550
D011	Silver	06/21/93	5.00	0.100	< 0.100

Sample Description: Dirt, Asphalt, and Debris

Sample Handling Dates/Times:

Date Sampled: 06/04/93 11:15:00
Date Received: 06/08/93
Date Report Printed: 06/25/93

Extraction/Leaching Dates for Layer: TOTAL

Bottle Leach: 06/15/93

Sample Composition:

Number of Phases: 1
Percent Solids: 100%
Percent Dry Solids: NA

Report Comments

Requested TCLP Metals analysis does not show characteristic waste codes. No corresponding prequalification analysis was submitted with this sample. Refer to the data summary on page 2 for details of analytical results.

Every effort is made, including extensive pretreatment of the sample, to obtain PQLs below the regulatory limit for all substances. However, when the PQL exceeds the regulatory limit, this is due to the intrinsic nature of the material tested and the inherent limitations of the official methods in dealing with certain waste types.

Every effort is also made to analyze a representative composite portion of the sample submitted. These results, however, apply only to the portion of the sample actually analyzed.

This report may not be reproduced except in its entirety.

Analytical Review By / Date: Rita Shaw 6/28/93

Corporate Review By / Date: Annabelle A. Dellinger 6/28/93

MEMORANDUM

SUBJECT: TCLP DATA ANALYSIS
INTERPRETING FINAL REPORT

DATE: MARCH 18, 1992

TO: REGIONAL AND BRANCH MANAGERS

FROM: MARK HARTWIG
(MH92013)

PRACTICAL QUANTITATION LIMIT (PQL)

The PQL takes into account any "real world" or "practical" limitations resulting from interferences. If an analyte is not detected, the instrument result will read "<PQL". (Refer to A and B in the example below.) The PQL, therefore, is the minimum value that can be reported with confidence when the analyte's presence cannot be confirmed due to method limitations and/or interferences. Each sample will have a unique PQL due to the need to dilute the sample or due to various sample preparation methods.

MATRIX SPIKE RECOVERY %

The "% Rec" is the percent of analyte retrieved from a sample when it was added deliberately or "spiked" to the sample. This procedure is a check to ensure that the analyte, if present, will be detected in this particular sample type. If the % recovery is <80%, the Final Result must be adjusted or bias corrected to take into account that all of the analyte may not have been detected.

* (<0.400/0.67 = <0.597)

FINAL RESULT

At times, the PQL will be greater than the Reg. Limit due to sample dilution. Additionally, bias correcting (correcting for low recovery) may generate a Final Result which **APPEARS** greater than the Reg. Limit (refer to A). As long as the Final Result is reported as with a "less than sign" preceding the numerical value, the sample **DOES NOT** fail on that analyte. The result reported is the lowest value detectable for that particular sample. This is an acceptable EPA reporting method. If a sample exceeds the regulatory limit for any particular analyte, the EPA waste code will be stated in the first paragraph of the cover letter and in the last paragraph of the report.

EXAMPLE:

	Reg. Limit (mg/L)	Prac. Quan. Limit (mg/L)	Instrument Result (mg/L)	Mtrx Spike Rec %	Final Result (mg/L)
*A.	0.500	0.400	<0.400	67	<0.597
B.	0.13	0.900	<0.900	85	<0.900

"less than 0.597"

Questions or Comments Call X7355

TCLP GLOSSARY OF TERMS

PQL:	The Practical Quantitation Limit is the smallest amount of a pollutant that the test can measure for that particular sample. Some samples respond to the test better than others so each sample may have a different PQL.
MATRIX SPIKE:	Deliberately adding TCLP pollutants to a separate portion of the sample prior to analysis. If the analysis detects less of the pollutants than was actually added, this is considered a low recovery and the test result for the sample is increased accordingly. This adjustment or increase in the test result is referred to as Bias Correction.
INSTRUMENT RESULT:	The pollutant concentration prior to bias correction for Matrix Spike Recovery.
FINAL RESULT:	The pollutant's concentration after bias correction for Matrix Spike Recovery. (Remember, Bias Correction is only applied in the case of low retrieval of pollutants deliberately added.)
MATRIX INTERFERENCE:	Any non-pollutant material present in the sample which either suppresses or exaggerates the test result.
ANTI-FOAMING AGENT:	A chemical added to the sample to inhibit foaming during the analysis. The analysis cannot be accomplished if foaming is present.
NON-AQUEOUS SAMPLES:	Typically organic liquids either oils or solvents.
COMBINED RESULTS:	The mathematically combined or weighted average of separate test results obtained on multiphase samples, i.e.) soil and water mixture.
SINGLE-PHASE:	100% solid material (soil, etc.) or 100% liquid (less than 0.5% solids).
MULTI-PHASES:	Two or more physically distinct portions of a sample, i.e.) soil & water, water & oil, a liquid containing greater than 0.5% solids.
SULFATE PRESENCE:	Sulfates in a sample will lead to low pollutant recovery (retrieval) due to formation of a sediment.

TCLP GLOSSARY OF TERMS
(continued)

ETHOD OF STANDARD ADDITION:	A required method of testing if a pollutants recovery is low due to sample interference.
NO LEACHING REQUIRED:	Single phase sample containing less than 0.5% solids or solid sample containing less than 0.5% liquid.
VERDILUTED OR MATRIX SPIKES [illegible] DILUTED OUT:	This occurs in samples exhibiting either severe [illegible] interferences or have pollutants whose concentrations are so high that the test reading is off-scale. By diluting the sample the reading can be brought back on scale.
SPECIAL NOTE:	Particularly severe matrix interferences can result in a Final Result reported as "less than" a level which may be greater than the Regulatory Limit. This is not uncommon for many industrial waste streams. When this occurs due to limitations in the required EPA test methods the EPA prescribed reporting format is "<PQL".

APPENDIX C

FEBRUARY 5, 1993 EXPERIMENT: FILL SAMPLING AND ANALYSIS INFORMATION

RECD FEB 19 1993

cc: MJS
311-19

GTEL
ENVIRONMENTAL
LABORATORIES, INC.

Southeast Region
10500 University Center Drive, Suite 160
Tampa, FL 33612
(813) 979-9092 800-933-GTEL (4835)
FAX: 813-979-6914

Todd Beasly

Project Number: ERM07SFK18
1311220.19
Project ID: 24TH AVE., TAMPA
Work Order Number: F302074

February 18, 1993

Mr. Jeff Lorrain
ERM-South, Inc.
9501 Princess Palm Ave., Suite 100
Tampa, FL 33619

Dear Mr. Lorrain,

Enclosed please find the analytical results for the samples received by GTEL Environmental Laboratories, Inc. on February 5, 1993 under chain of custody record (not available).

A formal Quality Assurance/Quality Control (QA/QC) program is maintained by GTEL, which is designed to meet or exceed the EPA requirements. Analytical work for this project met QA/QC criteria unless otherwise stated in the footnotes.

GTEL is certified (approved) by the State of Florida under Certificate Number HRS#E84196 and by the State of South Carolina under Certificate Number #96025.

If you have any questions concerning this analysis or if we can be of further assistance, please call our Customer Service Representative.

Sincerely,
GTEL Environmental Laboratories, Inc.

Harold Vernon
Laboratory Director

Project Number: ERM07SFK18
1311220.19
Project ID: 24TH AVE., TAMPA
Work Order Number: F302074

ANALYTICAL RESULTS

Base/Neutrals and Acids in Soil
EPA Method 8270[a]

GTEL Sample Number		0207401	0207402	0207403	0207404
Client Identification		SB-100 11-13'	SB-100 9-11'	SB-100; 7-9'	SB-100 5-7'
Date Sampled		02-05-93	02-05-93	02-05-93	02-05-93
Date Extracted		02-09-93	02-09-93	02-09-93	02-09-93
Date Analyzed		02-16-93	02-16-93	02-17-93	02-17-93
Analyte	QL, ug/kg[b]	Concentration, ug/kg			
Phenol	330	<QL	<QL	<QL	<QL
bis(2-Chloroethyl) Ether	330	<QL	<QL	<QL	<QL
2-Chlorophenol	330	<QL	<QL	<QL	<QL
1,3-Dichlorobenzene	330	<QL	<QL	<QL	<QL
1,4-Dichlorobenzene	330	<QL	<QL	<QL	<QL
Benzyl Alcohol	660	<QL	<QL	<QL	<QL
1,2-Dichlorobenzene	330	<QL	<QL	<QL	<QL
2-Methylphenol	330	<QL	<QL	<QL	<QL
bis(2-Chloroisopropyl) Ether	330	<QL	<QL	<QL	<QL
4-Methylphenol	330	<QL	<QL	<QL	<QL
N-Nitroso-di-n-propylamine	330	<QL	<QL	<QL	<QL
Hexachloroethane	330	<QL	<QL	<QL	<QL
Nitrobenzene	330	<QL	<QL	<QL	<QL
Isophorone	330	<QL	<QL	<QL	<QL
2-Nitrophenol	330	<QL	<QL	<QL	<QL
2,4-Dimethylphenol	330	<QL	<QL	<QL	<QL
Benzoic Acid	1700	<QL	<QL	<QL	<QL
bis(2-Chlorethoxy)methane	330	<QL	<QL	<QL	<QL
2,4-Dichlorophenol	330	<QL	<QL	<QL	<QL
1,2,4-Trichlorobenzene	330	<QL	<QL	<QL	<QL
Naphthalene	330	<QL	<QL	<QL	<QL
4-Chloroaniline	660	<QL	<QL	<QL	<QL
Hexachlorobutadiene	330	<QL	<QL	<QL	<QL

Project Number: ERM07SFK18
1311220.19
Project ID: 24TH AVE., TAMPA
Work Order Number: F302074

(continued)

ANALYTICAL RESULTS

Base/Neutrals and Acids in Soil
EPA Method 8270^{a}

GTEL Sample Number		0207401	0207402	0207403	0207404
Client Identification		SB-100 11-13'	SB-100 9-11'	SB-100 7-9'	SB-100 5-7'
Date Sampled		02-05-93	02-05-93	02-05-93	02-05-93
Date Extracted		02-09-93	02-09-93	02-09-93	02-09-93
Date Analyzed		02-16-93	02-16-93	02-17-93	02-17-93
Analyte	QL, ug/kg^{b}	Concentration, ug/kg			
4-Chloro-3-methylphenol	660	<QL	<QL	<QL	<QL
2-Methylnaphthalene	330	<QL	<QL	<QL	<QL
Hexachlorocyclopentadiene	330	<QL	<QL	<QL	<QL
2,4,6-Trichlorophenol	330	<QL	<QL	<QL	<QL
2,4,5-Trichlorophenol	330	<QL	<QL	<QL	<QL
2-Chloronaphthalene	330	<QL	<QL	<QL	<QL
2-Nitroaniline	1700	<QL	<QL	<QL	<QL
Dimethylphthalate	330	<QL	<QL	<QL	<QL
Acenaphthylene	330	<QL	<QL	<QL	<QL
2,6-Dinitrotoluene	330	<QL	<QL	<QL	<QL
3-Nitroaniline	1700	<QL	<QL	<QL	<QL
Acenaphthene	330	<QL	<QL	<QL	<QL
2,4-Dinitrophenol	1700	<QL	<QL	<QL	<QL
4-Nitrophenol	1700	<QL	<QL	<QL	<QL
Dibenzofuran	330	<QL	<QL	<QL	<QL
2,4-Dinitrotoluene	330	<QL	<QL	<QL	<QL
Diethylphthalate	330	<QL	<QL	<QL	<QL
4-Chlorophenyl Phenyl Ether	330	<QL	<QL	<QL	<QL
Fluorene	330	<QL	<QL	<QL	<QL
4-Nitroaniline	1700	<QL	<QL	<QL	<QL
4,6-Dinitro-2-methylphenol	1700	<QL	<QL	<QL	<QL
N-Nitrosodiphenylamine^{d}	330	<QL	<QL	<QL	<QL

Project Number: ERM07SFK18
1311220.19
Project ID: 24TH AVE., TAMPA
Work Order Number: F302074

(continued)

ANALYTICAL RESULTS

Base/Neutrals and Acids in Soil
EPA Method 8270[a]

GTEL Sample Number		0207401	0207402	0207403	0207404
Client Identification		SB-100 11-13'	SB-100 9-11'	SB-100 7-9'	SB-100 5-7'
Date Sampled		02-05-93	02-05-93	02-05-93	02-05-93
Date Extracted		02-09-93	02-09-93	02-09-93	02-09-93
Date Analyzed		02-16-93	02-16-93	02-17-93	02-17-93
Analyte	QL, ug/kg[b]	Concentration, ug/kg[c]			
4-Bromophenyl Phenyl Ether	330	<QL	<QL	<QL	<QL
Hexachlorobenzene	330	<QL	<QL	<QL	<QL
Pentachlorophenol	1700	<QL	<QL	<QL	<QL
Phenanthrene	330	<QL	<QL	<QL	<QL
Anthracene	330	<QL	<QL	<QL	<QL
Di-n-butylphthalate	330	<QL	<QL	<QL	<QL
Fluoranthene	330	<QL	<QL	<QL	<QL
Pyrene	330	<QL	<QL	<QL	<QL
Butylbenzylphthalate	330	<QL	<QL	<QL	<QL
3,3'-Dichlorobenzidine	660	<QL	<QL	<QL	<QL
Benz[a]anthracene	330	<QL	<QL	<QL	<QL
Chrysene	330	<QL	<QL	<QL	<QL
bis(2-Ethylhexyl)phthalate	330	<QL	<QL	<QL	<QL
Di-n-octylphthalate	330	<QL	<QL	<QL	<QL
Benzo[*b*]fluoranthene	330	<QL	<QL	<QL	<QL
Benzo[*k*]fluoranthene	330	<QL	<QL	<QL	<QL
Benzo[*a*]pyrene	330	<QL	<QL	<QL	<QL
Indeno[1,2,3-*c,d*]pyrene	330	<QL	<QL	<QL	<QL
Dibenz[*a,h*]anthracene	330	<QL	<QL	<QL	<QL
Benzo[*g,h,i*]perylene	330	<QL	<QL	<QL	<QL
Quantitation Limit Multiplier[c]		10	10	10	10
Percent Solids, %		75.8	76.7	67.9	82.9

ERM-South, Inc.
Environmental Resources Management

Princess Palm Avenue, Suite 100 • Tampa, Florida 33619 • (813) 622-8727
2858 N.W. 79th Avenue • Miami, Florida 33122 • (305) 591-3076

CHAIN OF CUSTODY RECORD

FAX
621-8504

Project No./I.D. 131220.19 Sheet 1 of 1
Sampled By JML Bottles Supplied By
NOTE: When analyses are complete return this form to:
Name: @ ERM-South, Inc., Tampa, Florida

Sample I.D.	Sample Description	Collection Date/Time	No. of bottles	Analysis Requested R.A.	Remarks 2-5-93
SB-100, 11-13'	soil	2/5/93	1	B/N 8270 01	
SB-100, 9-11'	soil	2/5/93	1	B/N 8270 02	extract and Hold only
SB-100, 7-9'	soil	2/5/93	2	B/N 8270 03	extract and Hold only
SB-100, 5-7'	soil	2/5/93	2	B/N 8270 04	extract and hold only

Shipping package opened by: JML Date: 2/4/93 Time: 1700
Employer: ERM Containers intact ([✓ Y]/N)

Samples packaged & sealed by: JML Date: 2/5/93 Time: 1200
Employer: ERM Method of Shipment: Courier

Received in laboratory by: Date: 2-5-93 Time: 5:23
Employer: GTEL Seals intact (Y/[✓ N])
Containers intact ([✓ Y]/N) If not, describe in Comments section

NOTE: Laboratory's Chain of Custody shall be in effect from receipt through analysis.

Relinquished By		Received By		Samples Intact	Date	Time	Initials	
Name	Employer	Name	Employer				Sender	Rec'r

COMMENTS: For samples so marked, extract only. Hold extracts for authorization to proceed.

51-4A

F302074 R.A.

1311220.19 SK 24th Ave Tampa 2/5/93

0945 Arrive on site, Drillers Arrive on site
James Olden } J.M. Hensley Drilling
Earl Williams }
met Jim Davis of SK. Located boring site, signed in and received safety briefing.

0915 Drillers begin to decon.

0935 Drillers finished Decon
Post hole to 5'
first split spoon hit refusal, recovered spoon and found ~2" of wood. Decided to proceed in same hole will try to drive through wood

1020 second attempt 3/15/65/70 (5-7')
collected 7-9' spoon, 9-11' spoon, 11-13' spoon

1040 Drillers decon, containerize ~~to~~ cuttings decon water, grout boring to surface. Waste drums labeled to SK's satisfaction

1140 left site.

JM 2/5/93

559.01

0800

1100

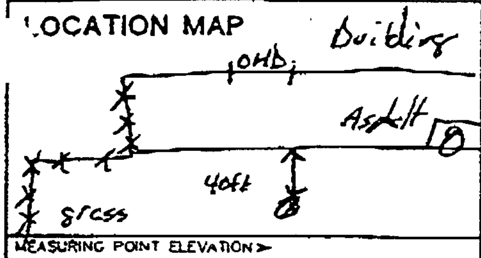
1145

1240

1545

1700

LOCATION MAP



ERM-SOUTH WELL LOG

PROJECT ➤ 1311220.19
WELL NO.
DATE ➤ 2/5/93
LOCATION ➤ 24th Ave SK, Tampa
LOGGED BY ➤ JML
WEATHER ➤ Cloudy mild
DRILLING METHOD ➤ N/A
DRILLED BY ➤ Jim. Heasley
SAMPLING METHOD ➤ SPT
OVA ➤ N/A
MEASURING POINT ELEVATION ➤
LAND SURFACE ELEVATION ➤
FILTER PACK ➤ NA TOP DEPTH BOTTOM DEPTH
SEAL ➤ N/A TOP DEPTH BOTTOM DEPTH
CASING ➤ TYPE N/A DIAMETER LENGTH
WATER LEVEL INITIAL 5' ☐ B.G.S. ☐ B.M.P.
BOREHOLE DIAMETER
SCREEN ➤ TYPE N/A SLOT DIAMETER LENGTH
WATER LEVEL AT COMPLETION N/A ☐ B.G.S. ☐ B.M.P.
BOREHOLE DEPTH
DEVELOPMENT ➤ METHOD N/A
GALLONS PUMPED
PUMPING RATE
COMMENTS ➤

MOISTURE CONTENT	SORTING	DENSITY	PLASTICITY	SAMPLE NO.	OVA (PPM)	DEPTH	SAMPLE RECOVERY	PENETRATION RESISTANCE	LITHOLOGY/REMARKS	GRAPHIC LOG	WELL COMPLETION
Dry									0-5' Sand, Qtz, browish grey, 5YR med-fn, trace silt, trace clay, Tar & Asphalt cobbles, shell Frag Textile shreds		
sat	Poor (Fill)	Herogenous						3 19 65 20	5-7' Sand, Qtz, browish grey 5YR med-fn, trace clay, shell Frag. 2" wood layer (ock)		
Sat								7 3 2 2	7-9' Sand, Qtz, browish grey 5YR, traces clay, silt, wood, shell fragment. Fiberglass, Asphalt		
Sat								1 5 4 2	9-11' sand, Qtz browish grey 5YR ~~trace~~ Med-Fn, traces clay, silt, wood, Fiberglass shell fragment Limerock		
Sat								1 2 1 7	11-13' Sand, browish grey med Fn, clay, Tar, Very thin bed, ~~and~~ Limerock, shell layer at 13'		

APPENDIX D

QUALITY ASSURANCE PLAN
PROGRESS ENVIRONMENTAL LABORATORIES
4420 PENDOLA POINT ROAD
TAMPA, FLORIDA 33619

900306G
Rev 4
6392/6792
TLH/ART/GIAMPA

COMPREHENSIVE QUALITY ASSURANCE PLAN

For

PROGRESS ENVIRONMENTAL LABORATORIES
4420 Pendola Point Road
Tampa, Florida 33619
(813) 247-2805

Prepared By

Progress Environmental Laboratories
4420 Pendola Point Road
Tampa, Florida 33619
(813) 247-2805

RECEIVED
FEB 26 1992
Dept. of Environmental Regulation
Quality Assurance Section

Peter D. Hay
Peter D. Hay, Consultant Manager — 21 Feb 92
Date

Vincent M Giampa
Vincent M. Giampa, Consultant QA Officer — 2-24-92
Date

for Sylvia S. Labie, DER QA Officer — 5/25/93
Date

TABLE OF CONTENTS

QA Plan Elements

3.0 STATEMENT OF POLICY

This is a generic quality assurance plan which is intended for use in ongoing operations at the Progress Environmental Laboratories for inter-company and outside clients. As a Florida certified laboratory, Progress Environmental Laboratories (PEL) will follow prescribed FDER, USEPA, or other applicable approved standard methods and will maintain QA Documentation as outlined in this plan or its subsequent revisions. This section is included as a statement of policy for the comprehensive quality assurance plan.

PEL's environmental capabilities include sampling, preparation and analyses for physical, inorganic, volatile organic, and extractable organic parameters. Field measurements are taken during sampling operations.

PEL shall follow good QA/QC management practices and is committed to generating data of verifiable quality.

4.0 ORGANIZATION And RESPONSIBILITIES

4.1 Capabilities

Progress Environmental Laboratories (PEL) has capabilities for performing field and laboratory sampling and measurement. Field services, as detailed in Section 6 of this document, include collections of soil and water samples as well as performance of field tests. Our laboratory is capable of preparing and analyzing soil and water samples for various physical, inorganic and organic parameters.

4.2 Key Personnel

4.2.1 President/Manager

The PEL President ensures that the necessary equipment, material, and personnel are available to accomplish scheduled projects. The president also assures that corrective actions are being conducted assuring QA goals.

4.2.2 Laboratory Supervisor

The laboratory supervisor is responsible for the daily supervision of operations of the environmental laboratory and field services. The laboratory supervisor, at present, also serves as our QA officer both in the field and in the laboratory. In addition, the laboratory supervisor performs field sampling and laboratory analyses as required.

4.2.3 Quality Assurance Officer (QAO)

At PEL, our laboratory supervisor also serves as QAO. These are separate and distinct responsibilities. The QAO is responsible for final data validation, initiation of audits, assisting in compiling QAPS and training of laboratory personnel. The QAO is also responsible for updating MDL's and reviewing all warning and control criteria used in the laboratory.

4.2.4 Supervising Chemist

At PEL, our supervising chemist serves as both a supervisor in the field and in the laboratory, as well as performing all phases of organic analyses and field measurements. In addition, our supervising chemist performs final data validation as required and assists in the training of laboratory personnel.

4.2.5 Chemist

Our laboratory chemist performs all phases of organic sample preparations and analysis. Organic analysis includes EPA Methods 608/8080, 610/8100, and 625/8270. Additional analysis includes oil and grease and TRPH. Our chemist is trained to perform the organic analysis on PEL's Gas Chromatograph and Mass Spectrometer.

4.2.6 Laboratory Technician

The major responsibilities of PEL's laboratory technician include field assignments and inorganic sample preparations and analysis. Our laboratory technician is trained on the CVAA, Furnace (GFAA), and the ICP instrument analysis. Additional analysis performed by our laboratory technician include Total Dissolved Solids, Total Suspended Solids, Ph, Turbidity, Flouride, Ammonia as Nitrogen, and Phosphates.

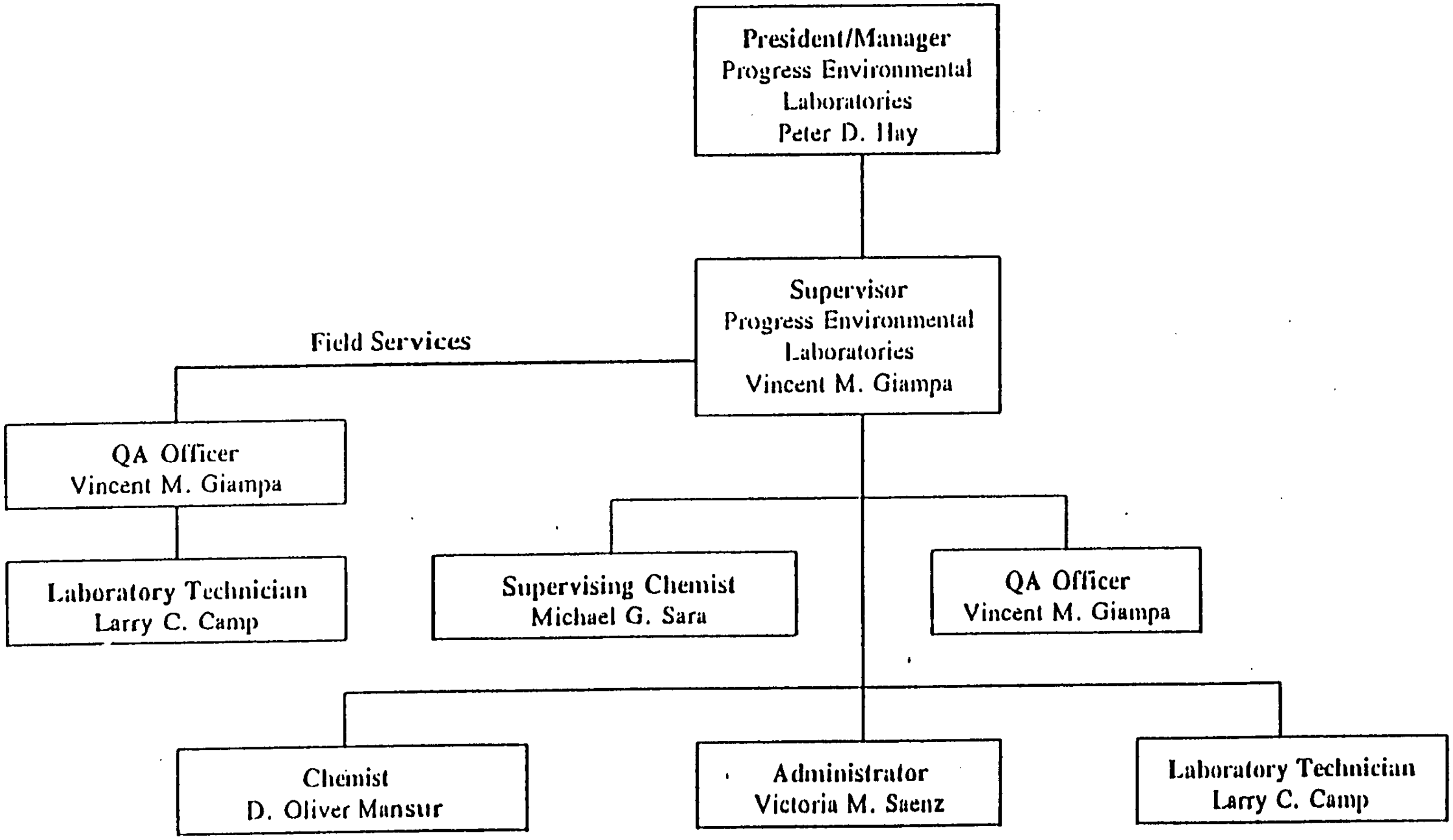
4.2.7 Laboratory Support Specialist

At PEL, the major responsibilities of our laboratory support specialist include all LIMS operations including chain of custody, sample login, data entry, and report generation. Our laboratory administrator is also trained on the GFAA Furnace instrument analysis.

4.3 Organization Chart

PROGRESS ENVIRONMENTAL LABORATORIES

Main Telephone No. 813/247-2805



5.0 QA TARGETS FOR PRECISION, ACCURACY, AND METHOD DETECTION LIMITS

The following tables enumerate the preparation methods, analysis methods and QA objectives currently used at PEL. Precision, accuracy and method detection limits were generated using in-house data unless specifically noted as EPA published data.

TABLE 5-1

SAMPLE PREPARATION METHODS

Sample Prep Method Number	Description	Matrix	Sample Prep for These Methods
CLP SOW 7/88	Acid Digestion	Water	6010, 7041
CLP SOW 7/88	Acid Digestion	Water	7060, 7131, 7191, 7421, 7520, 7740, 7761, 7841, 7911
245.1	Mercury Digestion	Water	245.1
245.5	Mercury Digestion	Soil	245.5
CLP SOW 7/88	Acid Digestion	Soil	6010, 7060, 7131, 7191, 7421, 7520, 7940, 7761, 7841, 7911
3510	Aqueous Extraction	Water	8080, 8100, 8270, 8310
3550	Soil Extraction	Soil	8080, 8100, 8270, 8310
3620	Florisil Clean-up	Soil, Water	8080
3660	Sulfur Clean-up	Soil, Water	8080
3630	Silica Gel Clean-up	Soil, Water	8100
3580	Solvent Dilution	non-aqueous	8080, 8270, 8100
EPA 1311	TCLP	Waste	6010, 245.1, 8010, 8020, 8080, 8270
9071	Soxhlet	Solid	9073
EPA 504, 8011	Micro Extraction	Water	504, 8011
EPA 5030	Purge and Trap	Soil, Water	8010, 8020, 8240
EPA 8315	Aqueous Extraction	Water	8315

TABLE 5-2A

QUALITY ASSURANCE OBJECTIVES

FOR THE ANALYSIS OF WATER, GROUNDWATER, AND OTHER AQUEOUS SAMPLES				
Component	Analytical Method #	Precision % RPD	Accuracy % Recvy	MDL ug/L
Conductivity	#EPA 120.1	0-24	90-102	1 umho/ cm
Hardness	#SM 314 A	0-14	66-129	60
pH	#EPA 150.1	0-6*	99.5-100.5*	0.1 pH
Dissolved Oxygen	EPA 360.1	0-5**	95-105**	0.001
TDS (Filterable Residue)	#EPA 160.1	0-7	86-117	10000
TSS (Non-filterable Residue)	#EPA 160.2	0-71	87-104	4000
Temperature	#EPA 170.1	±0.1°C	±0.2°C	0.1°C
Turbidity	#EPA 180.1	0-7*	N/A*	0.1 NTU*
Aluminum	#EPA 200.7/6010	0-17	79-128	50
Arsenic	"	0-25	70-126	100
Barium	"	0-13	85-116	11
Beryllium	"	0-8	80-110	1
Cadmium	"	0-14	83-110	4
Calcium	"	0-14	66-129	22
Chromium	"	0-11	80-114	9
Copper	"	0-6	77-120	17
Iron	"	0-16	90-109	10
Lead	"	0-16	83-119	57
Magnesium	"	0-14	79-119	2

Note: Water includes surface waters and wastewaters. Also included are wastes in both solid, semisolid, or sludge.

#NOTE: 100, 200, 300, 600, and SM 407A Series Methods used for aqueous samples.
6000, 7000, and 8000 Series Methods used for both soil and aqueous.
245.5 used for solids and sediment.
* Value based on EPA published data.
**PEL QC Goal.
D = Detected.
^Estimated precision, accuracy, and detection limits for HPLC Method until sufficient QC data generated. QC goals until sufficient data generated.

FOR THE ANALYSIS OF WATER, GROUNDWATER, AND OTHER AQUEOUS SAMPLES

Component	Analytical Method #	Precision % RPD	Accuracy % Recvy	MDL ug/L
Manganese	"	0-14	88-115	3
Nickel	"	0-6	82-116	30
Potassium	"	0-20	70-114	283
Selenium	"	0-25	75-133	100
Silver	"	0-15	75-110	14
Sodium	"	0-17	49-142	91
Vanadium	"	0-20	86-113	19
Zinc	"	0-3	87-109	6
Antimony	#EPA 204.2/7041	0-20	80-119	1.6
Arsenic	#EPA 206.2/7060	0-14	65-133	3.2
Cadmium	#EPA 213.2/7131	0-63	75-121	0.2
Chromium	#EPA 218.2/7191	0-38	72-140	0.3
Lead	#EPA 239.2/7421	0-67	78-125	1.0
Mercury	#EPA 245.1/245.5	0-24	75-129	0.2
Nickel	#EPA 249.2	0-24	71-119	1.8
Selenium	#EPA 270.2/7740	0-40	88-116	1.1
Silver	#EPA 272.2/7761	0-23	48-137	0.2
Thallium	#EPA 279.2/7841	0-30	70-131	1.2
Vanadium	#EPA 286.2/7911	0-19	85-108	1.4
Alkalinity	#EPA 310.1	0-35	87-114	1000*
Fluoride	#EPA 340.2	0-25	75-129	100*
Ammonia	#EPA 350.3	0-16	74-109	30*
Phosphorus (Total)	#EPA 365.2	0-17	82-115	10

Note: Water includes surface waters and wastewaters. Also included are wastes in both solid, semisolid, or sludge.

#NOTE: 100, 200, 300, 600, and SM 407A Series Methods used for aqueous samples.
6000, 7000, and 8000 Series Methods used for both soil and aqueous.
245.5 used for solids and sediment.
* Value based on EPA published data.
**PEL QC Goal.
D = Detected.
^Estimated precision, accuracy, and detection limits for HPLC Method until sufficient QC data generated. QC goals until sufficient data generated.

FOR THE ANALYSIS OF WATER, GROUNDWATER, AND OTHER AQUEOUS SAMPLES				
Component	Analytical Method #	Precision % RPD	Accuracy % Recvy	MDL ug/L
Ortho-Phosphorus	#EPA 365.2	0-11	82-115	10
Sulfate	#EPA 375.4	0-26*	90-108*	1000*
Chloride	#SM^2 407A	0-20	78-120	1500*
Oil and Grease	EPA 413.1/503A	0-30**	59-145	5
Petroleum Hydrocarbons	EPA 418.1	0-30**	59-145	.5
1,2-Dibromoethane	EPA 504, 8011	0-20**	80-120**	.02
Bromodichloromethane	#EPA 601/8010	0-16	87-118	.13
Bromoform	"	0-19	82-124	.19
Bromomethane	"	0-14	60-126	.38
Carbontetrachloride	"	0-69	20-153	.19
Chloroethane	"	0-28	46-145	.53
2-Chloroethylvinylether	"	0-20	70-135	.25
Chloroform	"	0-13	82-120	.19
Chloromethane	"	0-28	12-171	.57
Cis-1,3-Dichloropropene	"	0-39	84-117	.12
Dibromochloromethane	"	0-16	79-120	.14
Dichlordifluoromethane	"	0-81	D-156	.45
1,1-Dichloroethane	"	0-20	69-128	.55
1,2-Dichloroethane	"	0-10	78-125	.24
1,1 Dichloroethene	"	0-56	20-150	.34
1,2-Dichloropropane	"	0-14	82-120	.10
Methylene Chloride	"	0-14	89-120	.48
Tetrachloroethene	"	0-53	40-139	.22

Note: Water includes surface waters and wastewaters. Also included are wastes in both solid, semisolid, or sludge.
#NOTE: 100, 200, 300, 600, and SM 407A Series Methods used for aqueous samples.
6000, 7000, and 8000 Series Methods used for both soil and aqueous.
245.5 used for solids and sediment.
* Value based on EPA published data.
**PEL QC Goal.
D = Detected.
^Estimated precision, accuracy, and detection limits for HPLC Method until sufficient QC data generated. QC goals until sufficient data generated.

FOR THE ANALYSIS OF WATER, GROUNDWATER, ^AND OTHER AQUEOUS SAMPLES

Component	Analytical Method #	Precision % RPD	Accuracy % Recvy	MDL ug/L
1,1,2,2-Tetrachloroethane	"	0-9	77-127	.16
Trans-1,2-Dichloroethene	"	0-47	53-132	.15
Trans-1,3-Dichloropropene	"	0-18	83-120	.20
Trichloroethene	"	0-29	47-141	.19
1,1,1-Trichloroethane	"	0-43	33-143	.12
1,1,2-Trichloroethane	"	0-15	86-121	09
Trichlorofluoromethane	"	0-70	D-195	.49
Vinyl Chloride	"	0-55	14-159	.70
Benzene	#EPA 602/8020	0-26	53-146	.13
Chlorobenzene	"	0-13	83-121	.42
1,2-Dichlorobenzene	"	0-22	82-124	.06
1,3-Dichlorobenzene	"	0-15	85-117	.46
1,4-Dichlorobenzene	"	0-15	66-141	.03
Ethylbenene	"	0-18	51-139	.08
Toluene .	"	0-22	45-143	.27
Acetone	#EPA 8240	0-20**	80-120**	100**
Acrolein	"	"	"	10**
Acrylonitrile	"	"	"	10**
Benzene	"	"	"	5**
Bromodichloromethane	"	"	"	5**
Bromoform	"	"	"	5**
Bromomethane	"	"	"	10**
2-Butanone (MEK)	"	"	"	100**

Note: Water includes surface waters and wastewaters. Also included are wastes in both solid, semisolid, or sludge.
#NOTE: 100, 200, 300, 600, and SM 407A Series Methods used for aqueous samples.
6000, 7000, and 8000 Series Methods used for both soil and aqueous.
245.5 used for solids and sediment.
* Value based on EPA published data.
**PEL QC Goal.
D = Detected.
^Estimated precision, accuracy, and detection limits for HPLC Method until sufficient QC data generated. QC goals until sufficient data generated.

FOR THE ANALYSIS OF WATER, GROUNDWATER, AND OTHER AQUEOUS SAMPLES

Component	Analytical Method #	Precision % RPD	Accuracy % Recvy	MDL ug/L
Carbon Disulfide	#EPA 8240	0-20**	80-120**	5**
Carbon Tetrachloride	"	"	"	5**
Chlorobenzene	"	"	"	5**
Chloroethane	"	"	"	10**
2-Chloroethylvinylether	"	"	"	10**
Chloroform	"	"	"	5**
Chloromethane	"	"	"	10**
Dibromochloromethane	"	"	"	5**
1,2-Dichlorobenzene	"	"	"	5**
1,3-Dichlorobenzene	"	"	"	5**
1,4-Dichlorobenzene	"	"	"	5**
Dichlorodifluoromethane	"	"	"	5**
1,1-Dichloroethane	"	"	"	5**
1,2-Dichloroethane	"	"	"	5**
1,1-Dichloroethene	"	"	"	5**
Trans-1,2-Dichloroethene	"	"	"	5**
1,2-Dichloropropane	"	"	"	5**
Cis-1,3-Dichloropropene	"	"	"	5**
Trans-1,3-Dichloropropene	"	"	"	5**
Ethylbenzene	"	"	"	5**
2-Hexanone	"	"	"	50**
4-Methyl-2-Pentanone	"	"	"	50**
Methylene Chloride	"	"	"	5**

Note: Water includes surface waters and wastewaters. Also included are wastes in both solid, semisolid, or sludge.

#NOTE: 100, 200, 300, 600, and SM 407A Series Methods used for aqueous samples.
6000, 7000, and 8000 Series Methods used for both soil and aqueous.
245.5 used for solids and sediment.
* Value based on EPA published data.
**PEL QC Goal.
D = Detected.
^Estimated precision, accuracy, and detection limits for HPLC Method until sufficient QC data generated. QC goals until sufficient data generated.

FOR THE ANALYSIS OF WATER, GROUNDWATER, AND OTHER AQUEOUS SAMPLES

Component	Analytical Method #	Precision % RPD	Accuracy % Recvy	MDL ug/L
Styrene	#EPA 8240	0-20**	80-120**	5**
Tetrachloroethene	"	"	"	5**
1,1,2,2-Tetrachloroethane	"	"	"	5**
Toluene	"	"	"	5**
1,1,1-Trichloroethane	"	"	"	5**
1,1,2-Trichloroethane	"	"	"	5**
Trichloroethene	"	"	"	5**
Trichlorofluoromethane	"	"	"	5**
Vinyl Acetate	"	"	"	50**
Vinyl Chloride	"	"	"	10**
Total Xylenes	"	"	"	5**
Aldrin	#EPA 608/8080	0-20	99-133	.18
alpha-BHC	"	0-21	72-98	.14
Aroclor-1016	"	0-30**	55-111**	1.00**
Aroclor-1221	"	0-72**	44-150**	1.00**
Aroclor-1232	"	0-54**	28-196**	1.00**
Aroclor-1242	"	0-36**	50-140**	1.00**
Aroclor-1248	"	0-48**	60-140**	1.00**
Aroclor-1254	"	0-42**	44-115**	1.00**
Aroclor-1260	"	0-30**	37-109**	1.00**
beta-BHC	"	0-13	80-98	.09
Chlordane	"	0-38	54-110	.014
DBC (Surrogate)	"	0-32	60-103	.23

Note: Water includes surface waters and wastewaters. Also included are wastes in both solid, semisolid, or sludge.
#NOTE: 100, 200, 300, 600, and SM 407A Series Methods used for aqueous samples.
6000, 7000, and 8000 Series Methods used for both soil and aqueous.
245.5 used for solids and sediment.
* Value based on EPA published data.
**PEL QC Goal.
D = Detected.
^Estimated precision, accuracy, and detection limits for HPLC Method until sufficient QC data generated. QC goals until sufficient data generated.

FOR THE ANALYSIS OF WATER, GROUNDWATER,^ AND OTHER AQUEOUS SAMPLES

Component	Analytical Method #	Precision % RPD	Accuracy % Recvy	MDL ug/L
4-4'-DDD	"	0-14	50-66	.09
4-4'-DDE	"	0-16	92-129	.19
4-4'-DDT	"	0-28	68-112	.23
delta-BHC	"	0-41	59-140	.42
Dieldrin	"	0-40	73-143	.37
Endosulfan I	"	0-10	79-94	.08
Endosulfan II	"	0-72	75-182	.56
Endosulfan Sulfate	"	0-62	36-154	.61
Endrin	"	0-8	95-107	.06
Endrin Aldehyde	"	0-54	45-131	.45
gamma-BHC	"	0-21	76-109	.17
Heptachlor epoxide	"	0-10	95-117	.18
Heptachlor	"	0-6	65-71	.03
Methoxychlor	"	0-25	83-139	.29
Toxaphene	"	0-38**	54-110**	.24
Acenaphthene	#EPA 610/8100	0-82	38-105	.52
Acenaphthylene	"	0-84	30-89	.46
Anthracene	"	0-74	47-103	.44
Benzo(a)anthracene	"	0-80	43-108	.51
Benzo(a)pyrene	"	0-81	42-106	.50
Benzo(b)fluoranthene	"	0-82	42-114	.55
Benzo(ghi)perylene	"	0-85	41-110	.53
Benzo(k)fluoranthene	"	0-85	41-104	.49

Note: Water includes surface waters and wastewaters. Also included are wastes in both solid, semisolid, or sludge.

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6000, 7000, and 8000 Series Methods used for both soil and aqueous.
245.5 used for solids and sediment.
* Value based on EPA published data.
**PEL QC Goal.
D = Detected.
^Estimated precision, accuracy, and detection limits for HPLC Method until sufficient QC data generated. QC goals until sufficient data generated.

FOR THE ANALYSIS OF WATER, GROUNDWATER, AND OTHER AQUEOUS SAMPLES				
Component	Analytical Method #	Precision % RPD	Accuracy % Recvy	MDL ug/L
Chrysene	"	0-81	42-106	.51
Dibenzo(ah)anthracene	"	0-80	41-109	.53
Fluoranthene	"	0-80	40-107	.53
Fluorene	"	0-81	40-102	.48
2-Fluorobiphenyl (Surrogate)	"	0-89	31-92	.48
Ideno(123-cd)pyrene	"	0-82	42-111	.54
Naphthalene	"	0-80	32-88	.45
Nitrobenzene d5 (Surrogate)	"	0-82	34-92	.46
Phenanthrene	"	0-75	42-106	.51
Pyrene	"	0-78	42-109	.53
Terphenyl d14 (Surrogate)	"	0-92	37-112	.59
Acenaphthene	#EPA 625/8270	0-13	77-89	9
Acenaphthylene	#EPA 625/8270	0-15	76-89	10
Aniline	#EPA 8270	0-11	58-65	6
Anthracene	#EPA 625/8270	0-24	78-100	16
Benzidine	#EPA 625/8270	0-161	5-67	46
Benzo(a)anthracene	#EPA 625/8270	0-25	81-105	18
Benzo(a)pyrene	#EPA 625/8270	0-29	80-107	21
Benzo(b)fluoranthene	#EPA 625/8270	0-33	79-112	25
Benzo(ghi)perylene	#EPA 625/8270	0-38	64-96	24
Benzo(k)fluoranthene	#EPA 625/8270	0-33	99-138	30
Benzoic Acid	#EPA 8270	0-35	D-71	51
Benzyl Alcohol	#EPA 8270	0-18	65-78	10

Note: Water includes surface waters and wastewaters. Also included are wastes in both solid, semisolid, or sludge.
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6000, 7000, and 8000 Series Methods used for both soil and aqueous.
245.5 used for solids and sediment.
* Value based on EPA published data.
**PEL QC Goal.
D = Detected.
^Estimated precision, accuracy, and detection limits for HPLC Method until sufficient QC data generated. QC goals until sufficient data generated.

FOR THE ANALYSIS OF WATER, GROUNDWATER, AND OTHER AQUEOUS SAMPLES				
Component	Analytical Method #	Precision % RPD	Accuracy % Recvy	MDL ug/L
Bis(2-chloroethoxy)methane	#EPA 625/8270	0-13	75-86	8
Bis(2-Chloroethyl)ether	#EPA 625/8270	0-11	74-83	7
Bis(2-ethylhexyl)phthalate	#EPA 625/8270	0-25	80-103	18
Bis(2-Chloroisopropyl)ether	#EPA 8270	0-68	58-118	45
4-Bromophenyl Phenyl Ether	#EPA 625/8270	0-19	86-105	14
Butyl Benzyl Phthalate	#EPA 625/8270	0-28	77-101	18
4-Chloro-3-Methylphenol	#EPA 625/8270	0-18	81-97	12
4-Chloroaniline	#EPA 8270	0-5	70-74	3
2-Chloronapthalene	#EPA 625/8270	0-14	76-88	9
2-Chlorophenol	#EPA 625/8270	0-11	69-77	6
4-Chlorophenyl Phenyl Ether	#EPA 625/8270	0-5	92-97	3
Chrysene	#EPA 625/8270	0-24	81-104	18
Di-n-Butylphthalate	#EPA 625/8270	0-46	85-134	37
Di-n-octylphthalate	#EPA 625/8270	0-33	78-108	23
Dibenzo(a,h)anthracene	#EPA 625/8270	0-32	72-98	19
Dibenzofuran	#EPA 8270	0-9	83-92	6
1,3-Dichlorobenzene	#EPA 8270	0-31	57-78	16
1,2-Dichlorobenzene	#EPA 8270	0-25	65-84	14
1,4-Dichlorobenzene	#EPA 8270	0-30	59-80	15
3,3'-Dichlorobenzidine	#EPA 625/8270	0-19	82-100	13
2,4-Dichlorophenol	#EPA 625/8270	0-12	79-91	9
Diethylphthalate	#EPA 625/8270	0-8	88-96	6
2,4-Dimethylphenol	#EPA 625/8270	0-11	72-82	7

Note: Water includes surface waters and wastewaters. Also included are wastes in both solid, semisolid, or sludge.
#NOTE: 100, 200, 300, 600, and SM 407A Series Methods used for aqueous samples.
6000, 7000, and 8000 Series Methods used for both soil and aqueous.
245.5 used for solids and sediment.
* Value based on EPA published data.
**PEL QC Goal.
D = Detected.
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FOR THE ANALYSIS OF WATER, GROUNDWATER, AND OTHER AQUEOUS SAMPLES				
Component	Analytical Method #	Precision % RPD	Accuracy % Recvy	MDL ug/L
Dimethylphthalate	#EPA 625/8270	0-6	88-94	5
2-4-Dinitrophenol	#EPA 625/8270	0-61	62-108	34
2,6-Dinitrotolulene	#EPA 625/8270	0-15	81-96	11
2,4-Dinitrotolulene	#EPA 625/8270	0-10	85-95	8
Fluoranthene	#EPA 625/8270	0-26	82-105	18
Fluorene	#EPA 625/8270	0-5	87-92	4
2-Fluorobiphenyl (Surrogate)	#EPA 625/8270	0-16	88-105	13
2-Flurophenol (Surrogate)	#EPA 625/8270	0-18	37-45	6
Hexachlorobenzene	#EPA 625/8270	0-18	85-105	15
Hexachlorobutadiene	#EPA 625/8270	0-22	67-84	13
Hexachlorocyclopentadiene	#EPA 625/8270	0-30	63-86	17
Hexachloroethane	#EPA 625/8270	0-33	63-90	20
Indeno(1,2,3-cd)pyrene	#EPA 625/8270	0-32	69-97	21
Isophorone	#EPA 625/8270	0-14	74-86	9
2-Methyl-4,6-Dinitrophenol	#EPA 625/8270	0-46	66-108	31
1-Methylnapthalene	#EPA 625/8270	0-17	71-86	10
2-Methylnapthalene	#EPA 625/8270	0-15	74-87	10
2-Methylphenol	#EPA 8270	0-16	69-81	10
4-Methylphenol	#EPA 8270	0-17	66-78	9
N-Nitrosodi-n-propylamine	#EPA 625/8270	0-14	86-100	11
N-Nitrosodimethylamine	#EPA 625/8270	0-66	26-51	19
N-Nitrosodiphenylamine	#EPA 625/8270	0-16	83-99	12
Napthalene	#EPA 625/8270	0-23	69-86	13

Note: Water includes surface waters and wastewaters. Also included are wastes in both solid, semisolid, or sludge.
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6000, 7000, and 8000 Series Methods used for both soil and aqueous.
245.5 used for solids and sediment.
* Value based on EPA published data.
**PEL QC Goal.
D = Detected.
^Estimated precision, accuracy, and detection limits for HPLC Method until sufficient QC data generated. QC goals until sufficient data generated.

FOR THE ANALYSIS OF WATER, GROUNDWATER, AND OTHER AQUEOUS SAMPLES				
Component	Analytical Method #	Precision % RPD	Accuracy % Recvy	MDL ug/L
4-Nitroaniline	#EPA 8270	0-3	84-87	2
3-Nitroaniline	#EPA 8270	0-8	80-87	5
2-Nitroaniline	#EPA 8270	0-12	78-90	9
Nitrobenzene	#EPA 625/8270	0-15	70-83	10
Nitrobenzene-d5 (Surrogate)	#EPA 625/8270	0-16	74-84	10
4-Nitrophenol	#EPA 625/8270	0-10	38-42	3
2-Nitrophenol	#EPA 625/8270	0-22	71-88	13
Pentachlorophenol	#EPA 625/8270	0-21	88-111	17
Phenanthrene	#EPA 625/8270	0-26	76-100	18
Phenol	#EPA 625/8270	0-14	30-35	3
Phenol-d6 (Surrogate)	#EPA 625/8270	0-14	29-34	4
Pyrene	#EPA 625/8270	0-26	78-101	17
4-Terphenyl-d14 (Surrogate)	#EPA 625/8270	0-23	82-105	17
2,4,6-Tribromophenyl (Surrogate)	#EPA 625/8270	0-3	100-103	2
1,2,4-Trichlorobenzene	#EPA 625/8270	0-21	69-87	13
2,4,6-Trichlorophenol	#EPA 625/8270	0-9	85-94	6
2,4,5-Trichlorophenol	#EPA 8270	0-9	84-92	6
Acenaphthene	#EPA 610/8310 HPLC	0-82^	38-105^	1.8^
Acenaphthylene	"	0-84^	30-89^	2.3^
Anthracene	"	0-74^	47-103^	.66^
Benzo(a)anthracene	"	0-80^	43-108^	.013^
Benzo(a)pyrene	"	0-81^	42-106^	.023^
Benzo(b)fluoranthene	"	0-82^	42-114^	.018^

Note: Water includes surface waters and wastewaters. Also included are wastes in both solid, semisolid, or sludge.
#NOTE: 100, 200, 300, 600, and SM 407A Series Methods used for aqueous samples.
6000, 7000, and 8000 Series Methods used for both soil and aqueous.
245.5 used for solids and sediment.
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**PEL QC Goal.
D = Detected.
^Estimated precision, accuracy, and detection limits for HPLC Method until sufficient QC data generated. QC goals until sufficient data generated.

FOR THE ANALYSIS OF WATER, GROUNDWATER, AND OTHER AQUEOUS SAMPLES				
Component	Analytical Method #	Precision % RPD	Accuracy % Recvy	MDL ug/L
Benzo(ghi)perylene	"	0-85^	41-110^	.076^
Benzo(k)fluoranthene	"	0-85^	41-104^	.017^
Chrysene	"	0-81^	42-106^	.15^
Dibenzo(ah)anthracene	"	0-80^	41-109^	.030^
Fluoranthene	"	0-80^	40-107^	.21^
Fluorene	"	0-81^	40-102^	.21^
2-Fluorobiphenyl (Surrogate)	"	0-89^	31-92^	.48^
Ideno(123-cd)pyrene	"	0-82^	42-111^	.043^
Naphthalene	"	0-80^	32-88^	1.8^
Nitrobenzene d5 (Surrogate)	"	0-82^	34-92^	.46^
Phenanthrene	"	0-75^	42-106^	.64^
Pyrene	"	0-78^	42-109^	.27^
Terphenyl d14 (Surrogate)	"	0-92^	37-112^	.59^
Formaldehyde	EPA 8315	0-60**	68-117*	7.2*

Note: Water includes surface waters and wastewaters. Also included are wastes in both solid, semisolid, or sludge.

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6000, 7000, and 8000 Series Methods used for both soil and aqueous.
245.5 used for solids and sediment.
* Value based on EPA published data.
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Table 5-2B

QUALITY ASSURANCE OBJECTIVES

FOR THE ANALYSIS OF SOLIDS, SEMI-SOLIDS, AND SEDIMENT

Component	Analytical Method #	Precision % RPD	Accuracy % Recvy	MDL ug/kg
TRPH	EPA 9071 (PREP) and EPA 9073	0-30	59-145	10
Aluminum	#EPA 6010	0-17	79-128	4000
Arsenic	"	0-25	70-126	100
Barium	"	0-13	85-116	733
Beryllium	"	0-8	80-110	66
Cadmium	"	0-14	83-110	266
Calcium	"	0-14	66-129	1466
Chromium	"	0-11	80-114	600
Copper	"	0-6	77-120	1133
Iron	"	0-16	90-109	666
Lead	"	0-16	83-119	3800
Magnesium	"	0-14	79-119	133
Manganese	"	0-14	88-115	200
Nickel	"	0-6	82-116	2000
Potassium	"	0-20	70-114	18860
Selenium	"	0-25	75-133	100
Silver	"	0-15	75-110	933
Sodium	"	0-17	49-142	6066
Vanadium	"	0-20	86-113	1266
Zinc	"	0-3	87-109	400
Antimony	#EPA 7041	0-20	80-119	135

Note: Water includes surface waters and wastewaters. Also included are wastes in both solid, semisolid, or sludge.
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6000, 7000, and 8000 Series Methods used for both soil and aqueous.
245.5 used for solids and sediment.
* Value based on EPA published data.
**PEL QC Goal.
D = Detected.
^Estimated precision, accuracy, and detection limits for HPLC Method until sufficient QC data generated. QC goals until sufficient data generated.

FOR THE ANALYSIS OF SOLIDS, SEMI-SOLIDS, AND SEDIMENT

Component	Analytical Method #	Precision % RPD	Accuracy % Recvy	MDL ug/kg
Arsenic	#EPA 7060	0-14	65-133	213
Cadmium	#EPA 7131	0-63	75-121	15
Chromium	#EPA 7191	0-38	72-140	20
Lead	#EPA 7421	0-67	78-125	66
Mercury	#EPA 245.5	0-24	75-129	200
Selenium	#EPA 7740	0-40	88-116	73
Silver	#EPA 7761	0-23	48-137	13
Thallium	#EPA 7841	0-30	70-131	80
Vanadium	#EPA 7911	0-19	85-108	100
Bromodichloromethane	#EPA 8010	0-16	87-118	.65
Bromoform	"	0-19	82-124	.58
Bromomethane	"	0-14	60-126	1.90
Carbontetrachloride	"	0-69	20-153	.95
Chloroethane	"	0-28	46-145	2.65
2-Chloroethylvinylether	"	0-20	70-135	1.25
Chloroform	"	0-13	82-120	.95
Chloromethane	"	0-28	12-171	2.85
Cis-1,3-Dichloropropene	"	0-39	84-117	.60
Dibromochloromethane	"	0-16	79-120	.70
Dichlordifluoromethane	"	0-81	D-156	2.25
1,1-Dichloroethane	"	0-20	69-128	2.75
1,2-Dichloroethane	"	0-10	78-125	1.20
1,1 Dichloroethene	"	0-56	20-150	1.70
1,2-Dichloropropane	"	0-14	82-120	.50

Note: Water includes surface waters and wastewaters. Also included are wastes in both solid, semisolid, or sludge.

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245.5 used for solids and sediment.
* Value based on EPA published data.
**PEL QC Goal.
D = Detected.
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FOR THE ANALYSIS OF SOLIDS, SEMI-SOLIDS, AND SEDIMENT

Component	Analytical Method #	Precision % RPD	Accuracy % Recvy	MDL ug/kg
Methylene Chloride	"	0-14	89-120	2.4
Tetrachloroethene	"	0-53	40-139	1.1
1,1,2,2-Tetrachloroethane	"	0-9	77-127	.8
Trans-1,2-Dichloroethene	"	0-47	53-132	.75
Trans-1,3-Dichloropropene	"	0-18	83-120	1.0
Trichloroethene	"	0-29	47-141	.95
1,1,1-Trichloroethane	"	0-43	33-143	.60
1,1,2-Trichloroethane	"	0-15	86-121	.45
Trichlorofluoromethane	"	0-70	D-195	2.45
Vinyl Chloride	"	0-55	14-159	3.50
Benzene	#EPA 8020	0-26	53-146	.65
Chlorobenzene	"	0-13	83-121	2.10
1,2-Dichlorobenzene	"	0-22	82-124	.30
1,3-Dichlorobenzene	"	0-15	85-117	2.3
1,4-Dichlorobenzene	"	0-15	66-141	.15
Ethylbenene	"	0-18	51-139	.4
Toluene	"	0-22	45-143	1.35
Acetone	EPA 8240	0-20**	80-120**	100**
Acrolein	"	"	"	10**
Acrylonitrile	EPA 8240	0-20**	80-120**	10**
Benzene	"	"	"	5**
Bromodichloromethane	"	"	"	5**
Bromoform	"	"	"	5**
Bromomethane	"	"	"	10**

Note: Water includes surface waters and wastewaters. Also included are wastes in both solid, semisolid, or sludge.
#NOTE: 100, 200, 300, 600, and SM 407A Series Methods used for aqueous samples.
6000, 7000, and 8000 Series Methods used for both soil and aqueous.
245.5 used for solids and sediment.
* Value based on EPA published data.
**PEL QC Goal.
D = Detected.
^Estimated precision, accuracy, and detection limits for HPLC Method until sufficient QC data generated. QC goals until sufficient data generated.

FOR THE ANALYSIS OF SOLIDS, SEMI-SOLIDS, AND SEDIMENT

Component	Analytical Method #	Precision % RPD	Accuracy % Recvy	MDL ug/kg
2-Butanone (MEK)	"	"	"	100**
Carbon Disulfide	"	"	"	5**
Carbon Tetrachloride	"	"	"	5**
Chlorobenzene	"	"	"	5**
Chloroethane	"	"	"	10**
2-Chloroethylvinylether	"	"	"	10**
Chloroform	"	"	"	5**
Chloromethane	"	"	"	10**
Dibromochloromethane	"	"	"	5**
1,2-Dichlorobenzene	"	"	"	5**
1,3-Dichlorobenzene	"	"	"	5**
1,4-Dichlorobenzene	"	"	"	5**
Dichlorodifluoromethane	"	"	"	5**
1,1-Dichloroethane	"	"	"	5**
1,2-Dichloroethane	"	"	"	5**
1,1-Dichloroethene	"	"	"	5**
Trans-1,2-Dichloroethene	"	"	"	5**
1,2-Dichloropropane	"	"	"	5**
Cis-1,3-Dichloropropene	"	"	"	5**
Trans-1,3-Dichloropropene	EPA 8240	0-20**	80-120**	5**
Ethylbenzene	"	"	"	5**
2-Hexanone	"	"	"	50**
4-Methyl-2-Pentanone	"	"	"	50**
Methylene Chloride	"	"	"	5**

Note: Water includes surface waters and wastewaters. Also included are wastes in both solid, semisolid, or sludge.

#NOTE: 100, 200, 300, 600, and SM 407A Series Methods used for aqueous samples.
6000, 7000, and 8000 Series Methods used for both soil and aqueous.
245.5 used for solids and sediment.

* Value based on EPA published data.

**PEL QC Goal.

D = Detected.

^Estimated precision, accuracy, and detection limits for HPLC Method until sufficient QC data generated. QC goals until sufficient data generated.

FOR THE ANALYSIS OF SOLIDS, SEMI-SOLIDS, AND SEDIMENT				
Component	Analytical Method #	Precision % RPD	Accuracy % Recvy	MDL ug/kg
Styrene	"	"	"	5**
Tetrachloroethene	"	"	"	5**
1,1,2,2,-Trichloroethane	"	"	"	5**
Toluene	"	"	"	5**
1,1,1-Trichloroethane	"	"	"	5**
1,1,2-Trichloroethane	"	"	"	5**
Trichloroethene	"	"	"	5**
Trichlorofluoromethane	"	"	"	5**
Vinyl Acetate	"	"	"	50**
Vinyl Chloride	"	"	"	10**
Total Xylenes	"	"	"	5**
Aldrin	#EPA 8080	0-20	99-133	6.00
alpha-BHC	"	0-21	72-98	4.67
Aroclor-1016	"	0-30**	55-111**	33.3
Aroclor-1221	"	0-72***	44-150**	33.3
Aroclor-1232	"	0-54**	28-196**	33.3
Aroclor-1242	"	0-36**	50-140**	33.3
Aroclor-1248	"	0-48**	60-140**	33.3
Aroclor-1254	"	0-42**	44-115**	33.3
Aroclor-1260	"	0-30**	37-109**	33.3
beta-BHC	"	0-13	80-98	3.00
Chlordane	"	0-38	54-110	.47
DBC (Surrogate)	"	0-32	60-103	7.66
4-4'-DDD	"	0-14	50-66	3.00

Note: Water includes surface waters and wastewaters. Also included are wastes in both solid, semisolid, or sludge.

#NOTE: 100, 200, 300, 600, and SM 407A Series Methods used for aqueous samples.
6000, 7000, and 8000 Series Methods used for both soil and aqueous.
245.5 used for solids and sediment.
* Value based on EPA published data.
**PEL QC Goal.
O = Detected.
^Estimated precision, accuracy, and detection limits for HPLC Method until sufficient QC data generated. QC goals until sufficient data generated.

FOR THE ANALYSIS OF SOLIDS, SEMI-SOLIDS, AND SEDIMENT

Component	Analytical Method #	Precision % RPD	Accuracy % Recvy	MDL ug/kg
4-4'-DDE	"	0-16	92-129	6.34
4-4'-DDT	"	0-28	68-112	7.67
delta-BHC	"	0-41	59-140	14.0
Dieldrin	"	0-40	73-143	12.34
Endosulfan I	"	0-10	79-94	2.67
Endosulfan II	"	0-72	75-182	18.67
Endosulfan Sulfate	"	0-62	36-154	20.33
Endrin	"	0-8	95-107	2.00
Endrin Aldehyde	"	0-54	45-131	15.00
gamma-BHC	"	0-21	76-109	5.67
Heptachlor epoxide	"	0-10	95-117	6.00
Heptachlor	"	0-6	65-71	1.00
Methoxychlor	EPA 8080	0-25	83-139	9.67
Toxaphene	"	0-38**	54-110**	8.00
Acenaphthene	#EPA 8100	0-82	38-105	17.34
Acenaphthylene	"	0-84	30-89	15.34
Anthracene	"	0-74	47-103	14.66
Benzo(a)anthracene	"	0-80	43-108	17.00
Benzo(a)pyrene	"	0-81	42-106	16.67
Benzo(b)fluoranthene	"	0-82	42-114	18.34
Benzo(ghi)perylene	"	0-85	41-110	17.67
Benzo(k)fluoranthene	"	0-85	41-104	16.34
Chrysene	"	0-81	42-106	17.00
Dibenzo(ah)anthracene	"	0-80	41-109	17.67

Note: Water includes surface waters and wastewaters. Also included are wastes in both solid, semisolid, or sludge.
#NOTE: 100, 200, 300, 600, and SM 407A Series Methods used for aqueous samples.
6000, 7000, and 8000 Series Methods used for both soil and aqueous.
245.5 used for solids and sediment.
* Value based on EPA published data.
**PEL QC Goal.
D = Detected.
^Estimated precision, accuracy, and detection limits for HPLC Method until sufficient QC data generated. QC goals until sufficient data generated.

FOR THE ANALYSIS OF SOLIDS, SEMI-SOLIDS, AND SEDIMENT

Component	Analytical Method #	Precision % RPD	Accuracy % Recvy	MDL ug/kg
Fluoranthene	"	0-80	40-107	17.67
Fluorene	"	0-81	40-102	16.00
2-Fluorobiphenyl (Surrogate)	"	0-89	31-92	16.00
Ideno(123-cd)pyrene	"	0-82	42-111	18.00
Naphthalene	"	0-80	32-88	15.00
Nitrobenzene d5 (Surrogate)	"	0-82	34-92	15.33
Phenanthrene	"	0-75	42-106	17.00
Pyrene	"	0-78	42-109	17.67
Terphenyl d14 (Surrogate)	"	0-92	37-112	19.67
Acenaphthene	#EPA 8270	0-13	77-89	300
Acenaphthylene	#EPA 8270	0-15	76-89	333
Aniline	#EPA 8270	0-11	58-65	200
Anthracene	#EPA 8270	0-24	78-100	533
Benzidine	#EPA 8270	0-161	5-67	1533
Benzo(a)anthracene	#EPA 8270	0-25	81-105	600
Benzo(a)pyrene	#EPA 8270	0-29	80-107	700
Benzo(b)fluoranthene	#EPA 8270	0-33	79-112	833
Benzo(ghi)perylene	#EPA 8270	0-38	64-96	800
Benzo(k)fluoranthene	#EPA 8270	0-33	99-138	1000
Benzoic Acid	#EPA 8270	0-35	D-71	1530
Benzyl Alcohol	#EPA 8270	0-18	65-78	333
Bis(2-chloroethoxy)methane	#EPA 8270	0-13	75-86	267
Bis(2-Chloroethyl)ether	#EPA 8270	0-11	74-83	233
Bis(2-ethylhexyl)phthalate	#EPA 8270	0-25	80-103	600

Note: Water includes surface waters and wastewaters. Also included are wastes in both solid, semisolid, or sludge.
#NOTE: 100, 200, 300, 600, and SM 407A Series Methods used for aqueous samples.
6000, 7000, and 8000 Series Methods used for both soil and aqueous.
245.5 used for solids and sediment.
* Value based on EPA published data.
**PEL QC Goal.
D = Detected.
^Estimated precision, accuracy, and detection limits for HPLC Method until sufficient QC data generated. QC goals until sufficient data generated.

FOR THE ANALYSIS OF SOLIDS, SEMI-SOLIDS, AND SEDIMENT

Component	Analytical Method #	Precision % RPD	Accuracy % Recvy	MDL ug/kg
Bis(2-Chloroisopropyl)ether	#EPA 8270	0-68	58-118	1500
4-Bromophenyl Phenyl Ether	#EPA 8270	0-19	86-105	467
Butyl Benzyl Phthalate	#EPA 8270	0-28	77-101	600
4-Chloro-3-Methylphenol	#EPA 8270	0-18	81-97	400
4-Chloroaniline	#EPA 8270	0-5	70-74	100
2-Chloronapthalene	#EPA 8270	0-14	76-88	300
2-Chlorophenol	#EPA 8270	0-11	69-77	200
4-Chlorophenyl Phenyl Ether	#EPA 8270	0-5	92-97	100
Chrysene	#EPA 8270	0-24	81-104	600
Di-n-Butylphthalate	#EPA 8270	0-46	85-134	1233
Di-n-octylphthalate	#EPA 8270	0-33	78-108	767
Dibenzo(a,h)anthracene	#EPA 8270	0-32	72-98	633
Dibenzofuran	#EPA 8270	0-9	83-92	200
1,3-Dichlorobenzene	#EPA 8270	0-31	57-78	533
1,2-Dichlorobenzene	#EPA 8270	0-25	65-84	467
1,4-Dichlorobenzene	#EPA 8270	0-30	59-80	500
3,3'-Dichlorobenzidine	#EPA 8270	0-19	82-100	433
2,4-Dichlorophenol	#EPA 8270	0-12	79-91	300
Diethylphthalate	#EPA 8270	0-8	88-96	200
2,4-Dimethylphenol	#EPA 8270	0-11	72-82	233
Dimethylphthalate	#EPA 8270	0-6	88-94	167
2-4-Dinitrophenol	#EPA 8270	0-61	62-108	1133
2,6-Dinitrotolulene	#EPA 8270	0-15	81-96	367
2,4-Dinitrotolulene	#EPA 8270	0-10	85-95	267

FOR THE ANALYSIS OF SOLIDS, SEMI-SOLIDS, AND SEDIMENT				
Component	Analytical Method #	Precision % RPD	Accuracy % Recvy	MDL ug/kg
Fluoranthene	#EPA 8270	0-26	82-105	600
Fluorene	#EPA 8270	0-5	87-92	133
2-Fluorobiphenyl (Surrogate)	#EPA 8270	0-16	88-105	433
2-Flurophenol (Surrogate)	#EPA 8270	0-18	37-45	200
Hexachlorobenzene	#EPA 8270	0-18	85-105	500
Hexachlorobutadiene	#EPA 8270	0-22	67-84	433
Hexachlorocyclopentadiene	#EPA 8270	0-30	63-86	567
Hexachloroethane	#EPA 8270	0-33	63-90	667
Indeno(1,2,3-cd)pyrene	#EPA 8270	0-32	69-97	700
Isophorone	#EPA 8270	0-14	74-86	300
2-Methyl-4,6-Dinitrophenol	#EPA 8270	0-46	66-108	1033
1-Methylnapthalene	#EPA 8270	0-17	71-86	333
2-Methylnapthalene	#EPA 8270	0-15	74-87	333
2-Methylphenol	#EPA 8270	0-16	69-81	333
4-Methylphenol	#EPA 8270	0-17	66-78	300
N-Nitrosodi-n-propylamine	#EPA 8270	0-14	86-100	367
N-Nitrosodimethylamine	#EPA 8270	0-66	26-51	633
N-Nitrosodiphenylamine	#EPA 8270	0-16	83-99	400
Napthalene	#EPA 8270	0-23	69-86	433
4-Nitroaniline	#EPA 8270	0-3	84-87	67
3-Nitroaniline	#EPA 8270	0-8	80-87	167
2-Nitroaniline	#EPA 8270	0-12	78-90	300
Nitrobenzene	#EPA 8270	0-15	70-83	333
Nitrobenzene-d5 (Surrogate)	#EPA 8270	0-16	74-84	333

Note: Water includes surface waters and wastewaters. Also included are wastes in both solid, semisolid, or sludge.
#NOTE: 100, 200, 300, 600, and SM 407A Series Methods used for aqueous samples.
6000, 7000, and 8000 Series Methods used for both soil and aqueous.
245.5 used for solids and sediment.
* Value based on EPA published data.
**PEL QC Goal.
D = Detected.
^Estimated precision, accuracy, and detection limits for HPLC Method until sufficient QC data generated. QC goals until sufficient data generated.

FOR THE ANALYSIS OF SOLIDS, SEMI-SOLIDS, AND SEDIMENT

Component	Analytical Method #	Precision % RPD	Accuracy % Recvy	MDL ug/kg
4-Nitrophenol	#EPA 8270	0-10	38-42	100
2-Nitrophenol	#EPA 8270	0-22	71-88	433
Pentachlorophenol	#EPA 8270	0-21	88-111	567
Phenanthrene	#EPA 8270	0-26	76-100	600
Phenol	#EPA 8270	0-14	30-35	100
Phenol-d6 (Surrogate)	#EPA 8270	0-14	29-34	133
Pyrene	#EPA 8270	0-26	78-101	567
4-Terphenyl-d14 (Surrogate)	#EPA 8270	0-23	82-105	567
2,4,6-Tribromophenyl (Surrogate)	#EPA 8270	0-3	100-103	67
1,2,4-Trichlorobenzene	#EPA 8270	0-21	69-87	433
2,4,6-Trichlorophenol	#EPA 8270	0-9	85-94	200
2,4,5-Trichlorophenol	#EPA 8270	0-9	84-92	200
Acenaphthene	#EPA 8310 HPLC	0-82^	38-105^	17.34^
Acenaphthylene	"	0-84^	30-89^	15.34^
Anthracene	"	0-74^	47-103^	14.66^
Benzo(a)anthracene	"	0-80^	43-108^	17.00^
Benzo(b)pyrene	"	0-81^	42-106^	16.67^
Benzo(b)fluoranthene	"	0-82^	42-114^	18.34^
Benzo(ghi)perylene	"	0-85^	41-110^	17.67^
Benzo(k)fluoranthene	"	0-85^	41-104^	16.34^
Chrysene	"	0-81^	42-106^	17.00^
Dibenzo(ah)anthracene	"	0-80^	41-109^	17.67^
Fluoranthene	"	0-80^	40-107^	17.67^

Note: Water includes surface waters and wastewaters. Also included are wastes in both solid, semisolid, or sludge.
#NOTE: 100, 200, 300, 600, and SM 407A Series Methods used for aqueous samples.
6000, 7000, and 8000 Series Methods used for both soil and aqueous.
245.5 used for solids and sediment.
* Value based on EPA published data.
**PEL QC Goal.
D = Detected.
^Estimated precision, accuracy, and detection limits for HPLC Method until sufficient QC data generated. QC goals until sufficient data generated.

FOR THE ANALYSIS OF SOLIDS, SEMI-SOLIDS, AND SEDIMENT

Component	Analytical Method #	Precision % RPD	Accuracy % Recvy	MDL ug/kg
Fluorene	"	0-81^	40-102^	16.00^
2-Fluorobiphenyl (Surrogate)	"	0-89^	31-92^	16.00^
Ideno(123-cd)pyrene	"	0-82^	42-111^	18.00^
Naphthalene	"	0-80^	32-88^	15.00^
Nitrobenzene d5 (Surrogate)	"	0-82^	34-92^	15.33^
Phenanthrene	"	0-75^	42-106^	17.00^
Pyrene	"	0-78^	42-109^	17.67^
Terphenyl d14 (Surrogate)	"	0-92^	37-112^	19.67^

Note: Water includes surface waters and wastewaters. Also included are wastes in both solid, semisolid, or sludge.
#NOTE: 100, 200, 300, 600, and SM 407A Series Methods used for aqueous samples.
6000, 7000, and 8000 Series Methods used for both soil and aqueous.
245.5 used for solids and sediment.
* Value based on EPA published data.
**PEL QC Goal.
D = Detected.
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TABLE 5-2C

QUALITY ASSURANCE OBJECTIVES FOR FIELD PARAMETERS

FOR THE ANALYSIS OF WATER, GROUNDWATER, AND OTHER LIQUIDS				
Component	Analytical Method #	Precision % RPD	Accuracy % Recvy	MDL ug/L
Conductivity	#EPA 120.1	0 - 0.24	90-102	1 umho/cm
Ph	#EPA 150.1	0 - 0.6	99.5-100.5	.1 pH
Temperature	#EPA 170.1	0 - 0.1	0.2	0.1 deg. C
Dissolved Oxygen	#EPA 360.1	0 - 5*	95-105	0.001**

***NOTE: Water includes surface waters, wastewaters, and groundwaters.

* Value based on EPA published data .

**PEL QC Goal.

REFERENCES

1. 40CFR, Part 136

2. SM — Standard Methods for the Examination of Water and Waste Water, 16th ed., 1985.

3. "Test Methods for Evaluating Solid Waste," Physical Chemical Methods, 3rd ed. (EPA SW-846), 1986 and Revision 1, Dec. 1987.

4. Methods for Chemical Analysis of Water and Wastes, Revised March 1983 (EPA-600/4-79-020.

5. CLP SOW 7/88, Section III, pp. D5-D8. CLP SOW 7/88 is used for analytes listed in the "Sample Preparation for These Methods" column.

6.0 SAMPLING PROCEDURES

This section deals with the capabilities, equipment and procedures used in sampling operations at PEL. The appropriate sampling references are available to personnel in the field. General precautions are observed in all sampling operations for safety and minimization of contamination. First, safety equipment such as new latex gloves are worn at each sampling point to prevent potential exposure and minimize contamination. In certain circumstances, respirators or other protective clothing may be required. As a second general precaution, sampling sites should be evaluated and sampled in relation to the likely potential for contamination. Wells with free product will not be sampled for trace chemical analysis. Sample points with the highest potential of contaminants should always be sampled last to minimize cross contamination. In collection of samples, it is preferred to rinse sample containers with sample prior to filling containers, unless premeasured preservative is used. Exceptions are oil and grease, volatiles and TRPH.

Collection of samples is performed based on the following preferred order:

I. Volatile Organic Carbons
II. Total Halogenated Compounds
III. Total Organic Carbon
IV. Extractable Organics (TRPH, Oil and Grease)
V. Total Metals
VI. Dissolved Metals
VII. Microbiological
VIII. Phenols
IX. Cyanide
X. Inorganics
XI. Turbidity
XII. Radionucleides

6.1 Sampling Capabilities

The following chart describes the parameter groups and sample sources sampled and analyzed by PEL.

Table 6-1

Parameter Group	Sample Source
pH, Specific Conductance TSS, TDS, Turbidity, TOC	Surface water wastewater, groundwater
Nutrients	Surface water, wastewater, groundwater
Trace Metals	Surface water, wastewater, groundwater, soils, hazardous wastes
Volatile Organics	Surface water, wastewater, groundwater, soils, hazardous wastes
Pesticides & Herbicides	Surface water, wastewater, groundwater, soils, hazardous wastes
Semivolatile (extractable) organics	Surface water, wastewater, groundwater, soils, hazardous wastes

6.2 Descriptive List of Equipment

6.2.1 Table 6-2 provides the list of equipment used for purging and sampling operations, the use and restrictions of each equipment type, and construction of each type. Additional guidelines for materials used in construction of sampling equipment can be found in Table 1 WW/SW SOP; Revision date October 25, 1991; pp. 8.

TABLE 6-2

Equipment Type	Construction		Use	Permissible Parameter Group	Restrictions/Precautions
Groundwater					Reference: DER QAS 91-05
	Housing	Tubing			
1. Peristaltic (Suction Lift)	N/A	Teflon	Purging	All Parameter Groups	b; foot value or continuous pumping required.
			Sampling	Demands, Nutrients	None
				Metals	b; medical grade silicone tubing in pump head
				Extractable Organics	b; configured as specified figure 4.10 of DER-QA-001/90
2. Diaphragm (Suction Lift)	N/A	Teflon	Purging	All Parameter Groups	Check valve uses when purging complete
3. Bailer	Stainless Steel		Purging	All Parameter Groups	None, not recommended
			Sampling	All Parameter Groups	None
Wastewater/ Surface Water	Collected into sampling containers only			All Parameter Groups	None
SOILS/SEDIMENT/WASTEPILE					
1. Scoop, Spoon, Spatula	Stainless Steel, Teflon, or Teflon Coated Non-Inert		Sampling/Compositing	All Parameter Groups	VOC may not be taken from composite samples
				(Demands,Nutrients) Metals	(None) Must be non metallic if not stainless steel.

Table 6-2 Continued

Equipment Type	Construction	Use	Permissible Parameter Group	Restrictions/Precautions
				<u>Reference:</u> <u>DER QAS 91-05</u>
2. Mixing Tray	Stainless Steel, Teflon, Glass, Teflon Coated, or Aluminum	Compositing/ Homogenizing	All Parameter Groups (Except VOC)	Aluminum foil, trays, or liners may be used if aluminum is not an analyte of interest.
3. Shovel, Hand Auger, Bucket Auger	Stainless Steel	Sampling	All Parameter Groups	None
	Non-Stainless Steel		Demands, Nutrients	None
SLUDGE/DRUM SAMPLING				
1. Colowissa Tube	Glass	Grab/Profile	All Parameter Groups	None
2. Thief/Tube	Glass	Profile Sampling	Volatiles, Metals, VOC's, and Extractable Organics	None
	PVC		Metals only	None

***NOTE: Wells with free product will not be sampled for trace chemical analysis if applicable.

Table 6-2 (Cont)

SAMPLING EQUIPMENT - RESTRICTIONS, MATERIALS, AND APPROPRIATE USE

Key to Restrictions/Precautions

A. If used as a non-dedicated system, pump must be completely disassembled and cleaned between wells.

B. Delivery tubing must be precleaned and precut at the base of operations or laboratory. If the same tubing is used during the sampling event, it must be cleaned and decontaminated between use.

C. If samples are sealed in the liner for transport to the laboratory, the sample for VOC analysis must be taken from the interior part of the core.

D. Liners must be constructed of stainless steel or a suitable non-metallic material. If a metallic (carbon steel, aluminum) liner is used with the core barrel, the samples for metals shall be taken from the interior part of the core sample.

E. Aluminum foil, trays, or liners may be used only if aluminum is not an analyte of interest.

6.2.2 Auxiliary Equipment/Miscellaneous Equipment

The following equipment may be utilized on a sampling program.

a. Sample storage and transport is accomplished using commercially available coolers made of plastic or styrofoam. Wet ice is used to preserve samples in sample coolers until arrival at the laboratory.
b. Field instrumentation includes a Cole-Parmer pH meter and a YSI Conductivity meter with associated electrodes and Foxboro Model 128 OVA Meter.
c. Miscellaneous equipment used in sampling events include latex gloves, measuring tape, sounding devices, plastic (ziplock) bags, and typically paper towels.
d. Sample preservation reagents, standards, and cleaning materials.
    1) Sample preservation reagents used in field sampling events include concentrated sulfuric and nitric acid stored in low density polyethylene bottles.
    2) Standards used in field sampling events include pH buffers (pH 4, 7, 10), standard conductivity solution and metals spiking solutions. Storage is in low density polyethylene.
    3) Cleaning materials in use in the field include organic free 18 megohm water, pesticide grade isopropanol, 10% nitric acid solution, reagent grade detergent (Liquinox or equivalent), and aluminum foil. Water, isopropanol, and nitric acid solution are stored in low density polyethylene, teflon, and glass.
e. Cleaning and decontamination equipment used in the field include a brush for removing particulate matter, teflon wash bottles, and clean 5-gallon plastic buckets with lids (for waste). Storage of DI water, isopropanol and acid solutions is in low density polyethylene, teflon, or original glass containers.

6.3 Specific Decontamination and Cleaning Procedures For Sampling Equipment

General

Decontamination and cleaning protocols are conducted in accordance with DER SOP for cleaning and decontaminating sampling equipment, October 29, 1991. It is important to note that in the event of heavily contaminated equipment, an acetone rinse or acetone-hexane-acetone rinses before regular decontamination may be required.

Cleaning Materials

The cleaning materials referred to in this section are defined in the following paragraphs.

The laboratory detergent shall be a standard brand of phosphate-free laboratory detergent such as Liquinox®. The use of any other detergent must be justified and documented in the field logbooks and inspection or investigative reports.

The nitric (or HCl for nutrients) acid solution (10 percent) (or 10% HCl) shall be made from reagent-grade acid and deionized water. The standard cleaning solvent shall be pesticide-grade isopropanol. However, isopropanol may be substituted for a particular investigation if needed. Pesticide-grade acetone or methanol are both acceptable. However, it should be noted that if pesticide-grade acetone is used, the detection of acetone in samples collected with acetone rinsed equipment is suspect.

Pesticide-grade methanol is much more hazardous to use than either pesticide-grade isopropanol or acetone, and its use is discouraged. Pesticide-grade hexane and petroleum ether are not miscible in water; therefore, these two solvents are not effective rinsing agents unless equipment is dry. The use of any solvent other than pesticide-grade isopropanol for equipment for equipment cleaning purposes must be justified and its use must be documented in field logbooks and inspection or investigation reports.

Hot tap water may be used from any municipal water treatment system. The use of an untreated potable water supply is not an acceptable substitute for tap.

Deionized water is defined as tap water that has been treated by passing through a standard deionizing resin column. The deionized water should contain no heavy metals or other inorganic compounds.

Analyte-free water is defined as tap water that has been treated with activated carbon and deionizing units. Analyte-free water should contain no pesticides, herbicides, or extractable organic compounds. Analyte free water can be boiled deionized water if used for organic sampling of pugeable organics.

During cleaning operations, the substitution of a higher grade water (i.e., deionized or analyte-free water for tap water) is permitted and need not be noted as a variation of this SOP.
Air dry completely all equipment for a minimum of 12 to 24 hours then wrap in clean aluminum foil for storage and transportation. The brushes used to clean equipment as outlined in the various sections of this section shall not be of the wire-wrapped type.

The solvents, nitric acid solution, Liquinox detergent, and rinse waters used to clean equipment shall not be reused, except as specifically permitted.

Marking of Cleaned Sampling Equipment and Containers

All equipment and sample containers that are cleaned utilizing these procedures shall be tagged, labeled, or marked with the date that the equipment was cleaned. Also, if there was a deviation from the standard cleaning procedures outlined in the section, this fact should be noted on the label.

Marking and Segregation of Used Field Equipment

Field or sampling equipment that needs to be repaired shall be identified with a red tag. Any problems encountered with the equipment and needed repairs shall be noted on this tag. Field equipment or reusable sample containers needing cleaning or repairs shall not be stored with clean equipment, sample tubing, or sample containers. Field equipment, reusable sample containers, disposable sample containers, and sample tubing that are not used during the course of an investigation may not be replaced in storage, without being recleaned, if these materials are transported to a facility or study site where herbicides, pesticides, organic compounds, or other toxic materials are present or suspected of being present, if in the opinion of the field investigator, they may have become contaminated during the course of the field investigation.

Decontamination of Equipment Used to Collect Samples of Toxic or Hazardous Waste

Equipment that is used to collect samples of hazardous materials, petroleum contaminated, or toxic wastes or materials from hazardous waste sites, RCRA facilities, or in-process waste streams shall be decontaminated before it is returned from the field. At a minimum, this decontamination procedure shall consist of washing with laboratory detergent and rinsing with tap water. More stringent decontamination procedures may be required, depending on the waste sampled. (i.e.) Hexane rinse or soak) If sampling equipment can not be effectively cleaned then proper disposal methods should be followed.

Proper Disposal of Cleaning Materials

Waste disposal will be conducted in accordance with DER General Sampling Protocols IV, October 29, 1991.

Use of Safety Procedures to be Utilized During Cleaning Operations

The materials used to implement the cleaning procedures outlined in this section can be dangerous if improperly handled. Due caution must be exercised by all Progress Environmental Laboratories' personnel and all applicable safety procedures shall be followed. At a minimum, the following precautions shall be taken in the washroom and in the field during these cleaning operations:

1. Safety glasses with splash shields or goggles, neoprene gloves and a neoprene laboratory apron should be worn during all cleaning operations

2. All solvent rinsing operation will be conducted under a fume hood or in the open (never in a closed room) with proper ventilation.

3. No eating, smoking, drinking, chewing, or any hand to mouth contact shall be permitted during cleaning operations.

Storage of Field Equipment and Sample Containers

All field equipment and sample containers shall be stored in a contaminant free environment after being cleaned using the procedures outlined in the section.

All sample containers are purchased from subcontractor utilizing Level I decontamination, records of shipments (lot #, certification statements, analytical rinse results are maintained.

6.3.1 Equipment Decontamination

Equipment decontamination procedures will follow DER SOP for cleaning, Oct. 29, 1991; Sections 1 and 3-8.

- Acetone rinse or acetone-hexane-acetone rinses before regular decontamination may be necessary for heavily contaminated equipment.

Ice Chests and Shipping Containers

All ice chests and reusable containers will be washed with laboratory detergent (interior and exterior) and rinsed with tap water and air dried before storage. In the event that an ice chest becomes severely contaminated, in the opinion of the field investigator, with concentrated waste or other toxic material, it shall be cleaned as thoroughly as possible, rendered unusable, and disposed of properly.

Vehicles

All vehicles utilized by Progress Environmental Laboratories should be washed (if possible) at the conclusion of each field trip. This routine maintenance should minimize any chance of contamination of equipment or samples due to contamination of vehicles. When vehicles are used in conjunction with hazardous waste site inspections, or on studies where pesticides, herbicides, organic compounds or other toxic materials are known or suspected to be present, a thorough interior and exterior cleaning is mandatory at the conclusion of such investigations. It shall be the responsibility of the project leader and/or field investigators to see that this procedure is followed.

All vehicles shall be equipped with trash bags and/or trash containers to facilitate vehicle cleaning. All Progress Environmental Laboratories' personnel are responsible for keeping field vehicles clean by removing all trash and other debris before it accumulates. All contaminated trash and equipment must be kept separate from ordinary trash and must be disposed of properly on-site or upon return to the environmental laboratory facility for proper disposal.

6.3.2 Sample Container Cleaning Procedures:

Sample containers are cleaned in accordance with DER SOP for cleaning, October 29, 1991; Section 2.

6.3.3 Prepacked sample containers can be shipped to clients upon request. Sampling containers are pre-preserved according to the protocol found in Table 6-4. Instructions as to the packing of samples insuring minimal breakage is provided.

In the event that samples require excess preservation, preservative bottles containing the actual preservative used in the bottle preparation is provided.

6.4 Sampling Protocols:

Section 6.4 illustrates protocols utilized by Progress Environmental Laboratories. These protocols are available to field personnel. General sampling protocols will follow DER General Sampling Protocols I, October 29, 1991.

6.4.1 Groundwater Monitoring Wells, Potable Well Sampling, and Potable Water Sampling.

Sample Collection for Groundwater Monitoring Wells, Potable Well Sampling, and Drinking Water Sampling will be performed in accordance with the "Standard Operating Procedure for Groundwater." This SOP (Standard Operating Procedures) is included in the "DER QUALITY ASSURANCE INTERIM STANDARD OPERATING PROCEDURES," October 28, 1991. Potable water will also follow EPA Revision IV SOP, Section 4.10.2, pp. 1 and 2; February, 1991.

6.4 Sampling Protocols (Continued):

6.4.2 Soil Sampling Procedures:

Sample Collection for Soil Sampling will be performed in accordance with the "Soil Sampling Procedures." This SOP (Standard Operating Procedures) is included in the "DER QUALITY ASSURANCE INTERIM STANDARD OPERATING PROCEDURES," October 28, 1991 and DER General Sampling Protocols III.D, October 29, 1991.

6.4.3 WASTE WATER SAMPLING PROCEDURES

Wastewater Sampling will follow DER SOP for Wastewater and Surface Water, October 25, 1991 and DER General Sampling Protocols III.F, October 29, 1991.

6.4.4 SURFACE WATER AND SEDIMENT SAMPLING

Surface water sampling will follow procedures outlined in the DER SOP for Wastewater and surface water, October 25, 1991 and DER General Sampling Protocols III.A, October 29, 1991 and EPA Region IV, Section 4.8.3, pages 7-8.

Sediment will follow DER General Sampling Protocols III.B, October 29, 1991 and EPA Region IV SOP, Section 4.8.3.3, February, 1991, pages 8-11.

6.4.5 WASTE SAMPLING

Waste Sampling will follow the following procedures.

6.4.6 SLUDGES

Domestic waste residuals will be sampled in accordance with EPA POTW Sludge Sampling and Analysis Guidance Document; August, 1989.

6.4.7 SLUDGES

Solid and hazardous waste sites will be sampled in accordance with EPA Region IV SOP, Section 4.12.3, 4.12.5; February, 1991.

6.4.8 LIQUID HAZARDOUS WASTES

Liquid hazardous waste will be sampled in accordance with EPA Region IV SOP, Section 4.12.3, 4.12.4; February, 1991.

6.5 SPECIAL SAMPLE CONSIDERATIONS

Special sampling consideration will follow procedures outlined in the SOP for DER General Sampling Protocols, IV. A, Section IV - A,B,C,D, & F; October 29, 1991.

Areas of consideration include:

Section IV-A.	Sample compositing and homogenization
Section IV-B.	Duplicates and split samples
Section IV-C.	Field filtration
Section IV-D.	VOC sample collection
Section IV-F.	Oil and grease

6.6 SAMPLE DISPATCH

Sample dispatch will follow procedures outlined in DER General Sampling Protocols V.C., October 29, 1991.

6.7 WASTE DISPOSAL

Field waste disposal will follow procedures outlined in DER General Sampling Protocols IV, Section A and B, October 29, 1991.

6.8 SAMPLING RECORDS AND AUXILIARY DATA COLLECTION

All data collected in the field must be recorded in a bound notebook written in black waterproof ink. Field sample numbers must be assigned at the time of collection and the appropriate identification written on the bottle and in the field book. If errors occur, corrections should be made by drawing a single line through the error and entering the correct information. Such corrections should be initialed and dated. Chain of custody protocol is followed during all sample record and data collecting activities. Sample labels should also be completed during sampling. Information on the labels includes date, time, and location of sampling. Preservation is also noted.

Preferably, a notebook should be dedicated to an individual project. The investigator's name, project name, and project code should be entered on the inside front cover of the logbook. All entries should be dated and time of entry recorded. At the end of each days's activities, or entry of a particular event if appropriate, the investigator should draw a diagonal line at the conclusion of the entry and initial indicating the conclusion of the entry for the day's activity.

All aspects of sample collection and handling as well as visual observations shall be documented in the field logbooks. All sample collection equipment (where appropriate), field analytical equipment, and equipment utilized to make physical measurements shall be identified in the field logbooks. All calculations, results, and calibration data for field sampling, field analytical, and field physical measurement equipment shall also be recorded in the field logbooks. All field analysis and measurements must be traceable to a specific piece of field equipment utilized and to the field investigator collecting the samples, making the measurements or analyses.

All entries into the logbooks shall be dated, shall be legible, and shall contain accurate and inclusive documentation of an individual's project activities. Once completed, the field logbooks become accountable documents and must be maintined as part of the project files.

6.9 CONTAINERS AND HOLDING TIMES

Correct holding time and preservation chart for water matrix is included as Table 6-4 as listed in Table II 40 CFR Part 136 of FAC Chapter 17-160. The correct holding time and preservation chart for soils per FDER QAS #90-02 and Table 5 of Chapter 17-160 is also included as Table 6-4 of this text.

All preservatives and reagents utilized for sample preservation are listed in Table 6-5 and discussed in Section 6.10.

le 6-3

.0 CFR Part 136 TABLE II: REQUIRED CONTAI..RS, PRESERVATION TECHNIQUES, AND HOLDING .IMES (WATER/WASTEWATER SAMPLES)

Parameter Number/Name	Container	Preservation	Max Hold Time
Table 1A-Bacterial Tests:			
1-4. Coliform, fecal and total	P,G	Cool 4 °C, 0.008% $Na_2S_2O_3$[5]	6 hours
5. Fecal streptococci	P,G	Cool 4 °C, 0.008% $Na_2S_2O_3$[5]	6 hours
Table 1B-Inorganic Tests:			
1. Acidity	P,G	Cool 4 °C	14 days
2. Alkalinity	P,G	Cool 4 °C	14 days
4. Ammonia	P,G	Cool 4 °C, H_2SO_4 to pH<2	28 days
9. Biochemical oxygen demand	P,G	Cool 4 °C	48 hours
11. Bromide	P,G	None required	28 days
14. Biochemical oxygen demand carbonaceous	P,G	Cool 4 °C	48 hours
15. Chemical oxygen demand	P,G	Cool 4 °C, H_2SO_4 to pH<2	28 days
16. Chloride	P,G	None required	28 days
17. Chlorine, total residual	P,G	None required	Analyze immediately
21. Color	P,G	Cool 4 °C	48 hours
23-24. Cyanide, total and amenable to chlorination	P,G	Cool 4 °C, NaOH to pH<12, 0.6g ascorbic acid[5]	14 days[6]
25. Fluoride	P	None required	28 days
27. Hardness	P,G	HNO_3 to pH<2, H_2SO_4 to pH<2	6 months
28. Hydrogen ion (pH)	P,G	None required	Analyze immediately
31, 43. Kjeldahl and organic nitrogen	P,G	Cool 4 °C, H_2SO_4 to pH<2	28 days
Metals:[7]			
18. Chromium VI	P,G	Cool 4 °C	24 hours
35. Mercury	P,G	HNO_3 to pH<2	28 days
3. 5-8, 10, 12, 13, 19, 20, 22, 26, 29, 30, 32-34, 36, 37, 45, 47, 51, 52, 58-60, 62, 63, 70-72, 74, 75. Metals, except chromium VI and mercury	P,G	HNO_3 to pH<2	6 months

Table 6-3 Cont'd.
40 CFR Part 136 TABLE II: REQUIRED CONTAINERS, PRESERVATION TECHNIQUES, AND HOLDING TIMES

Parameter Number/Name	Container	Preservation	Max Hold Time
Table 1C-Organic Tests (cont'd):[8]			
3, 4, Acrolein and acrylonitrile	"	Cool 4 o C, 0.008% $Na_2S_2O_3$[5] Adjust pH to 4-5 [10]	14 days
23, 30, 44, 49, 53, 67, 70, 71, 83, 85, 96, Phenols[11]	G, Teflon lined cap	Cool 4 o C, 0.008% $Na_2S_2O_3$[5]	7 days until extraction, 40 days after extraction
7, 38. Benzidines[11]	"	Cool 4 o C, 0.008% $Na_2S_2O_3$[5]	7 days until extraction.[13]
14, 17, 48, 50-52. Phthalate esters[11]	G, Teflon lined cap	Cool 4 o C	7 days until extraction
72-74. Nitrosamines[11, 14]	"	Cool 4 o C, store in dark, 0.008% $Na_2S_2O_3$[5]	"
76-82. PCBs[11] acrylonitrile	"	Cool 4 o C	"
54, 55, 65, 69. Nitroaromatics and isophorone[11]	"	Cool 4 o C, 0.008% $Na_2S_2O_3$[5] store in dark	"
1, 2, 5, 8-12, 32, 33, 58, 59, 64, 68, 84, 86. Polynuclear aromatic hydrocarbons[11]	"	"	"
15, 16, 21, 31, 75. Haloethers[11]	"	Cool 4 o C, 0.008% $Na_2S_2O_3$[5]	"
29, 35-37, 60-63, 91. Chlorinated hydrocarbons[11]	"	Cool 4 o C	"
87. TCDD[11]	"	Cool 4 o C, 0.008% $Na_2S_2O_3$[5]	"
Table 1D-Pesticides Tests:			
1-70. Pesticides[11]	"	Cool 4 o C, pH 5-9[15]	"
Table 1E-Radiological Tests:			
1-5. Alpha, beta and radium	P,G	HNO_3 to pH<2	6 months

Table II Notes

[1] Polyethylene (P) or Glass (G).

[2] Sample preservation should be performed immediately upon sample collection. For composite chemical samples each aliquot should be preserved at the time of collection. When use of an automated sampler makes it impossible to preserve each aliquot, then chemical samples may be preserved by maintaining at 4 o C until compositing and sample splitting is completed.

6-3 Cont'd.

40 CFR Part 136 TABLE II: REQUIRED CONTAINERS, PRESERVATION TECHNIQUES, AND HOLDING TIMES

Table II Notes (cont'd.)

[3] When any sample is to be shipped by common carrier or sent through the United States Mails, it must comply with the Department of Transportation Hazardous Materials Regulations (49 CFR Part 172). The person offering such material for transportation is responsible for ensuring such compliance. For the preservation requirements of Table II, the Office of Hazardous Materials, Materials Transportation Bureau, Department of Transportation has determined that the Hazardous Materials Regulations do not apply to the following materials:
Hydrochloric acid (HCl) in water solutions at concentrations of 0.04% by weight or less (pH about 1.96 or greater); Nitric acid (HNO_3) in water solutions at concentrations of 0.15% by weight or less (pH about 1.62 or greater); Sulfuric acid (H_2SO_4) in water solutions at concentrations of 0.35% by weight or less (pH about 1.15 or greater); and Sodium hydroxide (NaOH) in water solutions at concentrations of 0.080% by weight or less (pH about 12.30 or less.)

[4] Samples should be analyzed as soon as possible after collection. The times listed are the maximum times that samples may be held before analysis and still be considered valid. Samples may be held for longer periods only if the permittee, or monitoring laboratory, has data on file to show that the specific types of samples under study are stable for the longer time, and has received a variance from the Regional Administrator under Part 136.3(e). Some samples may not be stable for the maximum time period given in the table. A permittee, or monitoring laboratory, is obligated to hold the sample for a shorter time if knowledge exists to show that this is necessary to maintain sample stability. See Part 136.3(e) for details.

[5] Should only be used in the presence of residual chlorine.

[6] Maximum holding time is 24 hours when sulfide is present. Optionally all samples may be tested with lead acetate paper before pH adjustments in order to determine if sulfide is present. If sulfide is present, it can be removed by the addition of cadmium nitrate powder until a negative spot test is obtained. The sample is filtered and then NaOH is added to pH 12.

[7] Samples should be filtered immediately on-site before adding preservative for dissolved metals.

[8] Guidance applies to samples to be analyzed by GC, LC, or GC/MS for specific compounds.

[9] Sample receiving no pH adjustment must be analyzed within seven days of sampling.

[10] The pH adjustment is not required if acrolein will not be measured. Samples for acrolein receiving no pH adjustment must be analyzed within 3 days of sampling.

[11] When the extractable analytes of concern fall within a single chemical category, the specified preservative and maximum holding times should be observed for optimum safeguard of sample integrity. When the analytes of concern fall within two or more chemical categories, the sample may be preserved by cooling the 4 o C, reducing residual chlorine with 0.008% sodium thiosulfate, storing in the dark, and adjusting the pH to 6-9; samples preserved in this manner may be held for seven days before extraction and for forty days after extraction.
Exceptions to this optional preservation and holding time procedure are noted in footnote 5 (re requirement for thiosulfate reduction of residual chlorine), and footnotes 12, 13 (re the analysis of benzidine).

[12] If 1,2-diphenylhydrazine is likely to be present, adjust the pH of the sample to 4.0 ± 0.2 to prevent rearrangement to benzidine.

[13] Extracts may be stored up to 7 days before analysis if storage is conducted under an inert (oxidant-free) atmosphere.

[14] For the analysis of diphenylnitrosamine, add 0.008% $Na_2S_2O_3$ and adjust pH to 7-10 with NaOH within 24 hours of sampling.

[15] The pH adjustment may be performed upon receipt at the laboratory and may be omitted if the samples are extracted within 72 hours of collection. For the analysis of aldrin, add 0.008% $Na_2S_2O_3$.

Reference: This table is reprinted from 40 CFR Chapter I, Revised as of July 1, 1988. According to Federal Register of Thursday, September 3, 1987, preservation for Oil and Grease may also be performed with HCl.

40 CFR Part 136 TABLE II: REQUIRED CONTAI , PRESERVATION TECHNIQUES, AND HOLDING TIMES

Parameter Number/Name	Container	Preservation	Max Hold Time
38. Nitrate	P,G	Cool 4 o C	48 hours
39. Nitrate-nitrite	P,G	Cool 4 o C, H_2SO_4 to pH<2	28 days
40. Nitrite	P,G	Cool 4 o C	48 hours
41. Oil and grease	G	Cool 4 o C, H_2SO_4 to pH<2	28 days
42. Organic carbon	P,G	Cool 4 o C, HCl or H_2SO_4 to pH<2	28 days
44. Orthophosphate	P,G	Filter immediately, Cool 4 o C	48 hours
46. Oxygen, Dissolved Probe	G (Bottle & top)	None required	Analyze immediately
47. Oxygen, Winkler	*	Fix on site and store in dark	8 hours
48. Phenols	G only	Cool 4 o C, H_2SO_4 to pH<2	28 days
49. Phosphorus (elemental)	G	Cool 4 o C	48 hours
50. Phosphorus, total	P,G	Cool 4 o C, H_2SO_4 to pH<2	28 days
53. Residue, total	P,G	Cool 4 o C	7 days
54. Residue, Filterable	P,G	Cool 4 o C	7 days
55. Residue, Nonfilterable (TSS)	P,G	Cool 4 o C	7 days
56. Residue, Settleable	P,G	Cool 4 o C	48 hours
57. Residue, volatile	P,G	Cool 4 o C	7 days
61. Silica	P	Cool 4 o C	28 days
64. Specific conductance	P,G	Cool 4 o C	28 days
65. Sulfate	P,G	Cool 4 o C	28 days
66. Sulfide	P,G	Cool 4 o C add zinc acetate plus sodium hydroxide to pH<9	7 days
67. Sulfite	P,G	None required	Analyze immediately
68. Surfactants	P,G	Cool 4 o C	48 hours
69. Temperature	P,G	None required	Analyze
73. Turbidity	P,G	Cool 4 o C	48 hours
Table 1C-Organic Tests: [8]			
13, 18-20, 22, 24-28, 34-37, 39-43, 45-47, 56, 66, 88, 89, 92-95, 97. Purgeable Halocarbons	G, Teflon-lined septum	Cool 4 o C, 0.008% $Na_2S_2O_3$[5]	14 days
6, 57, 90 Purgeable aromatic hydrocarbons	*	Cool 4 o C, 0.008% $Na_2S_2O_3$[5] HCl to pH2[9]	14 days

Required Containers, Preservation Techniques, And Holding Times For Parameters Not Included Under 40 CFR Part 136 TABLE II.

Parameter Number/Name	Container	Preservation	Max Hold Time
Formaldehyde	G, Teflon-lined septum	Cool 4°C	5 Days until extraction 3 Days after extraction

5-3 Cont'd.

RECOMMENDED SAMPLE CONTAINERS, SAMPLE VOLUMES, PRESERVATION TECHNIQUES AND HOLDING TIMES FOR RESIDUALS, SOIL AND SEDIMENT SAMPLES (1)

Parameter Group	Methods	References	Container	Preservation	Maximum Holding Time
Volatile Organics	Purge-and-Trap GC and GC-MS.	8010, 8015, 8020, 8021, 8230, 8040, and 8260.	Glass, 40 ml vial or 4 oz widemouth, with Teflon/silicone septum. (2)	(3)	14 days
Semivolatile Organics	GC, HPLC, and GC-MS.	8040, 8060, 8080, 8090, 8100, 8120, 8140, 8150, 8250, 8270, 8280, and 8310.	Glass, 8 oz widemouth with Teflon lined cap (50 grams sample).	(3)	14 days until extraction, 40 days after extraction.
Total Metals - except mercury and chromium VI	Flame AA, Furnace AA, Hydride and ICP.	All 7000-series methods (except 7195, 7196, 7197, 7198, 7470, and 7471) and 6010 (ICP).	Glass or plastic, 8 oz widemouth (200 grams sample).	Cool, 4 o C	6 months
Chromium VI	Colorimetric, Chelation with Flame AA.	7196 and 7197	Glass or plastic, 8 oz widemouth (200 grams sample).	Cool, 4 o C	24 hours
Mercury	Manual Cold Vapor AA	7471	Glass or plastic, 8 oz widemouth (200 grams sample).	Cool, 4 o C	28 days

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(1) Adapted from table 3-1 and 4-1 in Test Methods for Evaluating Solid Waste, SW-846, EPA, Third Edition, 1986, and First Update in 1987. The term residuals includes:
(i) concentrated waste samples and (ii) sludges of domestic or industrial origin.

(2) Sample should not be homogenized (mixed) prior to filling container. Container should be filled by packing as much sample into it leaving minimal headspace. Field samples can not be composited for analysis.

(3) Soils, sediments and sludges should be kept cool at 4 o C from collection time until analysis. No preservation is required for concentrated waste samples.

6.10 SAMPLE PRESERVATION, REAGENTS

Sample preservation is done in accordance with DER General Sampling Protocols V.A.2, V.A.1, V.B.3, October 29, 1991.

6.11 REAGENT AND STANDARD STORAGE

Chemicals are stored in accordance with DER General Sampling Protocols, Section IV A, pp 5 and 6.

6.12 Analyte-free Water

Analyte-free water is water which all interferences and analytes of interest must be below detection limits.

Analyte-free water is generated at PEL by use of mix bed resins and carbon filtration. Integrity of water is assured by monitoring equipment blank readings.

Analyte free water is used in preparation of blanks and for all final decontamination rinses.

7.0 SAMPLE CUSTODY

A sample or other physical evidence is defined as "in custody" if:

- it is in the field investigator's or the transferee's actual possession; or
- it is in the field investigator's or the transferee's view, after being in his/her physical possession; or
- it was in the field investigator's or the transferee's physical possession and then he/she secured it to prevent tampering; or
- it is placed in a designated secure area.

7.1 Objectives

Progress Environmental Laboratories (PEL) maintains records and forms which are designed to insure traceability of samples from point of collection to final disposal. Personnel associated with the steps of sample collection, preparation, analysis and disposal may be traced through these records. Examples of various tags, forms, logs, and notebooks are included in this section for reference.

Possession of samples can be accomplished by sample custody and/or legal chain of custody.

7.1.1 Sample Custody

All records and documentation that is required to trace a sample from point of origin through disposal after analysis.

Sample Custody Includes:

1) Field notebooks
2) Field sample ID tags
3) Laboratory transmittal forms
4) Laboratory sample receipt logs
5) Sample preparation/extraction log.
6) Analytical logs or worksheets.
7) Calibration and Q.C. data with sample set.
8) Instrument maintenance logs.
9) Sample disposition logs.
10) Final reports

7.1.2 Legal Chain of Custody

Special type of sample custody in which all events associated with a specific sample must be documented in writing. Copies of PEL's Chain of Custody Forms and/or Field Sheets are maintained with project records.

Legal Chain of Custody includes the sample custody information. In addition, the following information is included:

1) Sample transmittal forms or tags.
2) Laboratory storage logs that identify date, time, and individuals who remove samples from storage.
3) Secure limited access storage areas.

Legal Chain of Custody begins when field personnel receive sample containers. The Section Supervisor (i.e., Field Supervisor, Laboratory Supervisor) is responsible for assuring that the chain of custody protocol is maintained.

All entries must be made in waterproof ink. Errors can be omitted with a line through them. The supervisors assure that all documentation is signed, initialed and dated by the responsible party. All documentation /logs are signed/initialed by appropriate personnel.

Examples of Sample Labels, Sample Seals, Sample Login Sheets, Lab Sample Extraction Logs, Sample Preparation and Analysis Log, Analysis Log/Work Sheet, Sample Storage and Disposition Log, and Chain of Custody Forms are found in Figures 7-1, 7-2, 7-3, 7-4, 7-5, 7-6, 7-7, and 7-8 respectively.

7.2 Field Custody

PEL utilizes pre-cleaned sample containers. These are generally available for VOC and other organic samples. Bottles used for collection of metals and inorganics are cleaned at the laboratory prior to the sampling event. Preservative is added to the containers required prior to leaving the laboratory. Sample custody begins at this stage. Sample containers are signed for prior to leaving the laboratory.

Individual samples are traced by completing a sample label and affixing to each sample container. This label will include the identification unique to the sample, such as monitoring well location, boring number, site, client, sampler(s), date, time, remarks, or other information.

All samples shall be sealed immediately upon collection utilizing the PEL custody seal. The field investigator may write the date and his/her signature on the seal. This requirement shall be waived if the field investigator keeps the samples in his/her continuous custody form the time of collection until they are delivered to the laboratory analyzing the samples.

At the time of sample collection, entries are also made to the field notebook. This is a bound log book which is kept by the sampling supervisor. Entries relative to the collection of the sample may include, at minimum, the following type of information:

1) Unique and one time field ID Number generated consequently by field personnel.
2) Date of sample collection.
3) Specific description of sampling location, including site, address and a description of the sample point.
4) Names of sampling personnel.
5) Weather/site conditions.
6) Purging and sampling equipment used. Note if using field operated equipment, and if so, place equipment downwind at least 20 feet from sampling site.
7) Field identification for each sample and component type to be analyzed.
8) Sample sequence number—order of sample collection.
9) Time of sample collection.
10) Signatures (initials) of samplers
11) Preservatives and pH checks, including additional preservatives added are recorded.
12) Field Measurement data (pH, Conductance, etc.)
13) Types of QC collected (spikes, duplicates, blanks).
14) Monitoring well data for drilling or boring monitoring wells, including types of drilling muds.
    a. Well construction and casing diameter.
    b. Water table and well depth.
    c. Purge volume calculations and amount of water purged.
    d. Date and time of purging.

   e. Measurements (if used) to monitor stabilization. (If measurements are not used, at least five well volumes must be removed before sampling. A minimum of threevolumes are removed if measurements are taken.)
   f. Use of fuel powdered units.
   g. Drilling/boring method (if known), including type and name of drilling mud used.

15) Plumbing data
   a. Plumbing and tap construction.
   b. Flow rate at which well was purged.
   c. Time of purging well.
   d. Flow rate when samples were collected.

16) Sediments and soil data.
   a. Depths at which soils were collected.
   b. Drilling/boring method (if known), including type and name of drilling mud used.

17) Surface water data
   a. Depth of surface water sample.
   b. Notations of the use of fuel powered units for sampling and appropriate precautions.

18) Wastewater effluent
   a. Documentation of beginning and ending times for manual compositing.

19) Drum sampling
   a. Type of drum and a description of its contents
   b. Stratification present, yes or no. Indicate layers sampled.

20) Sampler remarks, such as noticeable odors, sheens, stains or other relative information. Names of field personnel and visitors on site at the time of sample collection. Notation if any field decontamination is performed.

Samples which are to be shipped are packaged in plastic (usually ziplock) bags and placed in a cooler. Wet ice is used to maintain temperature. A chain of custody form is completed and either affixed to the cooler or placed in a waterproof jacket inside. In all cases, every effort is made to package and seal samples and documents to prevent contamination. Coolers are sealed, usually by taping shut to prevent accidental opening. Coolers are shipped by overnight express for next day delivery to the laboratory.

7.3 Laboratory Custody

7.3.1 Sample Receipt

When samples are received at the laboratory, coolers are opened and samples are inspected for damage. Caps are checked for integrity, and samples are usually checked to be free of any water intrusion. Documentation is reviewed to determine that the proper samples and identifications were received. Once inventoried and verified, samples are checked to insure that preservatives were added correctly to appropriate samples. The temperature of sample containers is checked assuring that samples are stored at the appropriate holding temperature. Samples are then logged in and transferred to refrigerated storage. Samples can be rejected for the following criteria:

1. Improper sample labeling
2. Improper completion of the chain of custody record
3. Improper selection of sampling containers and/or preservation protocols
4. Sample integrity violated during transit. Sample leakage or spillage resulting in reduced sample volume or cross contamination

Sample rejection will consist of asking the client to resample and inform the client that the deficiency will be noted on the final report.

7.3.2 Sample Log In

Samples are logged into the computer and given a PEL laboratory identification number. A sample label is generated and affixed to the sample. Sample labels are generated via the laboratory LIMS System. The PEL laboratory ID numbers are assigned sequentially and automatically by the LIMS System. Figure 7-1 is an example of a sample label used at the PEL laboratory. The PEL lab number is on the sample label and also on the login sheet. The sample login sheet contains the following types of information.

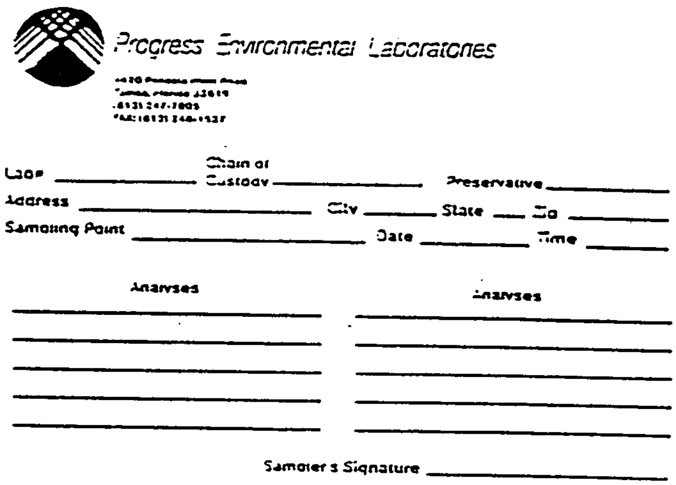
1. Lab number
2. Date received
3. Date and time collected
4. Preservation
5. Field identification or client identification
6. Analyses to be performed
7. Client
8. Storage location
9. Special instructions/Comments

Figure 7-3 is an example of a PEL Sample Login Sheet. The sample log-in sheets are maintained in a sample log-in book.

Figure 7-1

PEL SAMPLE LABELS

```
501191
Yates Dry Cleaning
Environmental Systems Management,
```



Progress Environmental Laboratories

Lab# ____ Chain of Custody ____ Preservative ____
Address ____ City ____ State ____ Zip ____
Sampling Point ____ Date ____ Time ____

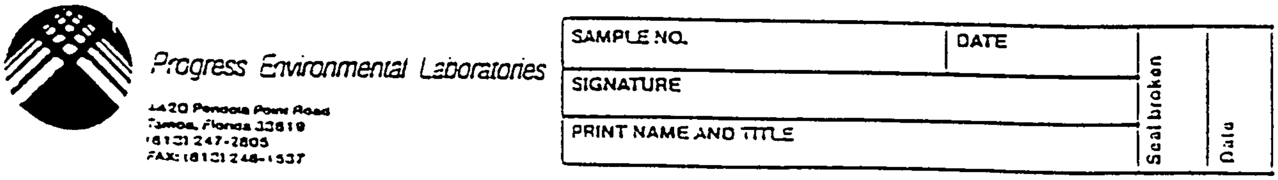
Analyses

Analyses

Sampler's Signature ____

Figure 7-2

PEL SAMPLE SEALS



Progress Environmental Laboratories

4420 Pendola Point Road
Tampa, Florida 33619
(813) 247-2805
FAX: (813) 248-1537

SAMPLE NO.	DATE	Seal broken	Date
SIGNATURE			
PRINT NAME AND TITLE			

Figure 7-3

PEL SAMPLE LOGIN SHEET

```
--------------------------------------------------------------------------
     Lab # 501191                                LOGIN  02/01/92 15:42  sys
Sample ID: Yates Dry Cleaning                    DUE    02/08/92 Days:   7
--------------------------------------------------------------------------
Account #                         ---- REPORT TO ----
9          Environmental Systems Management, Inc.
           6513 King Palm Way
           Apollo Beach Fl 33572
           Thomas A. Brislin (813) 641-1261

                                  ----- BILL TO -----
           Environmental Systems Management
           6513 King Palm Way
           Apollo Beach Fl 33572
           Thomas A. Brislin (813) 641-1261

--------------------------------------------------------------------------
COLLECTION ..... Date:     02/03/92             Time: 8:30am By: T.B.
                 Location: Northeast Corner
PRESERVATION ... Method:   Refrigerate at 4C
STORAGE ........ Location: Refrigerator #1
                 Keep for: 30   days            Discard on: 03/02/92
DISPOSAL ....... Method:   Wastedrum
Comment: RUSH Sample, 24 hour turnaround.
--------------------------------------------------------------------------

                Test                                          Section
--------------------------------------------------------------------------
501191         8020-1 Benzene                                  GC
               8020-2 Toluene                                  GC
               8020-3 Chlorobenzene                            GC
               8020-4 Ethylbenzene                             GC
               8020-5 1,3-Dichlorobenzene                      GC
               8020-6 1,4-Dichlorobenzene                      GC
               8020-7 1,2-Dichlorobenzene                      GC
               8020-8 o-Xylene                                 GC
               8020-9 m,p-Xylene                               GC
               802-10 Total Xylene                             GC
               802-11 MTBE                                     GC
```

7.3.3 Sample Security and Accessibility

Samples are stored in the laboratory refrigerators at 4°C. The refrigerators are locked in the laboratory and are accessible only to PEL laboratory personnel. The laboratory is locked when unattended. VOC samples are segregated from other samples.

Sample extracts are kept in the refrigerator (for metals) and the freezer (organic solvents) as required. These samples are accessible to PEL lab personnel and are locked up when unattended. Standards are stored in a separate refrigerator/freezer from samples.

7.3.4 Sample Preparation, Extraction, and Analysis Logs

Sample preparation and analysis logs are utilized to record the treatments samples are given at at the PEL laboratory. The sample preparation logs are in use at both inorganic and organic preparation areas of the laboratory.

7.3.4.1 Organic Sample Preparation/Extraction Log: Organic sample preparation consists of all pertinent information regarding the extraction of the sample. Information included in the extraction log is as follows:

1. Laboratory identification number: This number is previously assigned during the sample login. The ID Number section is also used to identify spikes and duplicates (ie. Lab #500178 Spike or Lab #500178 Duplicate).
2. Method of extraction: This section defines the method utilized for extraction.
3. Extraction date: The extraction date indicates the date the extraction of a sample is conducted.
4. Date sampled: The sample date indicates the date the actual sample was taken. A comparison of items 3 and 4 indicates the integrity of holding times.
5. Solvent notation of solvent used for extraction.
6. Surrogate extraction check that the surrogate was added to the sample.
7. Ph (acid base) section assures that extraction pH adjustments are recorded.
8. Final Volume: This section records the final volume of the sample extract.
9. Internal Standard assures the addition of internal standard is recorded.
10. Analyst initials: The initials of the analyst are recorded.
11. Remarks: This section records unusual occurrences during the sample extraction (ie. unusual appearance of sample, problems during extraction, losses of extract, precipitation and/or increase in viscosity during final evaporation).

Figure 7-4 is an example of a PEL Organic Sample Preparation/Extraction Log.

Figure 7-4

PEL ORGANIC SAMPLE PREPARATION/EXTRACTION LOG

LAB SAMPLE EXTRACTION LOG

EXTRACTION LOG

LAB NO.	METHOD	DATE EXTRACTED	DATE SAMPLED	VOLUME (ml) EXTRACTED	SOLVENT	SURROGATE ADDED (ml)	pH ACID	pH BASE	FINAL VOLUME (ml)	INT STD ADDED (ul)	ANALYST	REMARKS

7.3.4.2 Inorganic Sample Preparation/Extraction Log: Inorganic sample preparation logs are designed to record the events occurring during the preparation and extraction of samples for inorganic analysis. The information included in the inorganic preparation/extraction log is as follows. It is important to note that this information can also be entered into the analyst notebook.

1. Laboratory Identification Number: This number previously assigned during sample login. The ID Number Section is also used to identify spikes and duplicates (ie. Lab #500178 Spike or Lab #500178 Duplicate).
2. Method of Sample Preparation: This section defines the method used for the preparation of the sample.
3. Weight/Volume: This section records the sample weight or the sample volume used in the sample preparation.
4. Final Volume: This section records the final volume of the sample preparation.
5. Preparation Date: This section indicates the date the sample was prepared.
6. Sample Date: Indicates the date the sample was taken. A comparison of items 5 and 6 indicates the integrity of holding times.
7. Signature of Analyst.7.3.3.2

Figure 7-5 is an example of a PEL Inorganic Sample Preparation/Extraction Log.

Figure 7-5

PEL INORGANIC SAMPLE PREPARATION/EXTRACTION LOG

Preparation Date:____________________
Extraction Date:____________________

PEL SAMPLE ID NUMBER	DATE OF COLLECTION	ANALYSIS INSTRUMENT	PREP. METHOD	INITIAL SAMPLE VOLUME (ml)	INITIAL SAMPLE WEIGHT (g)	FINAL SAMPLE VOL.	SPIKE VOL.

SIGNATURE OF ANALYST:____________________________

COMMENTS:

7.3.4.3 Analysis Worksheets/Run Logs: Analysis worksheets are used to document the activities during the actual determination of the parameters of interest. The analysis logs are generated by the laboratory lims system. Figure 7-6 is an example of a PEL Analysis Worksheet. The analysis worksheet accompanies the sample through all of its preparation and analytical phases. Once the preparation of the sample is complete, the analysis worksheet is placed by the analytical station. At this point, the analyst determines the values for the parameters of interest and records the information on the analysis worksheet.

Once complete, the analysis worksheet is given to data entry personnel for entry into the laboratory lims system. The raw data chromatograph, stripcharts, AA, ICP printouts, laboratory notebook pages are attached to the analyst worksheet. The analysis worksheet/run log containes the following information:

1. Sample Identification Number (ID of sample which was previously assigned during login).
2. Date of Analysis
3. Signature of analyst line
4. Parameter of analysis
5. Parameter Value
6. Spike Value
7. Duplicate Value
8. Dilution
9. Sample Weight
10. Sample Volume
11. Comments

SMARTLAB Laboratory Information Management System
- ANALYSIS WORK SHEET -

February 2, 1992

RUN #
02000008

Lab#	Test	Init Result	SD	CV	Weight	Volume	Dilution	%Solids	Spike
501191	8020-1								
501191	8020-2								
501191	8020-3								
501191	8020-4								
501191	8020-5								
501191	8020-6								
501191	8020-7								
501191	8020-8								
501191	8020-9								
501191	802-10								
501191	802-11								

FIGURE 7.6

- ANALYSIS WORKSHEET/RUN LOG -

7.3.4.4 Sample Storage and Disposition Logs

Samples that are under analysis "active samples" are stored in refrigerators within the main laboratory building. Once analysis is complete, the samples are transferred into the sampling holding area where they are stored until holding times are expired or the clients have requested disposal. This process is documented by the use of the sample storage and disposal log. Figure 7-7 is an example of the PEL Sample Storage and Disposition Log.

FIGURE 7-7

- PEL SAMPLE STORAGE AND DISPOSITION LOG -

Sample #	Bottle Type/ Parameter	Out Date/Time	In Date/Time	Date Consumed	Date Disposed	Name

Progress Environmental Laboratories

CHAIN OF CUSTODY RECORD (ANALYSIS)

PROJ NO	PROJECT NAME & ADDRESS
SAMPLERS: (Signature)	

STA NO	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO OF CONTAINERS							REMARKS (TAG #/ PRESERVATIVE)

RELINQUISHED BY : (Signature)	DATE / TIME	RECEIVED BY: (Signature)	RELINQUISHED BY : (Signature)	DATE / TIME	RECEIVED BY: (Signature)
RELINQUISHED BY : (Signature)	DATE / TIME	RECEIVED BY (Signature)	RELINQUISHED BY (Signature)	DATE / TIME	RECEIVED BY (Signature)
RELINQUISHED BY : (Signature)	DATE / TIME	RECEIVED FOR LABORATORY BY (Signature)	DATE / TIME	REMARKS / COMMON CARRIER	

WHITE : Accompanies Shipment YELLOW To Coordinator Field Files

Figure 7-8

PEL CHAIN OF CUSTODY FORM

7.3.4.5 Sample Transport

Sample transport is accomplished in accordance with guidelines established in EPA Region IV SOP and QAM, Section No. C.3, 02/01/91, Page 1-3.

Samples collected by Progress Environmental Laboratories personnel and designated as environmental samples shall be shipped using the method described below. Sample shipments are subject to all federal state and local regulations. Records of sample shipping receipts are maintained in the laboratory supervisor's office.

Environmental samples shall be packed prior to shipment by air using the following procedures:

1. Select a sturdy cooler in good repair. Secure and tape the drain plug with fiber or duck tape. Line the cooler with a large heavy duty plastic bag.

2. Allow sufficient outage (ullage) in all bottles (except VOA's) to compensate for any pressure and temperature changes (approximately 10 percent of the volume of the container).

3. Be sure the lids on all bottles are tight (will not leak).

4. Place all bottles in separate and appropriately sized polyethylene bags and seal the bags with tape (preferably plastic electrical tape). Up to three VOA bottles may be packed in one Whirl-Pak container.

5. Optionally, place three to six VOA vials in a quart metal can and then fill the can with vermiculite.

6. Place two to four inches of vermiculite in the bottom of the cooler and then place the bottles and cans in the cooler with sufficient space between the bottles or cans with vermiculite. Securely fasten the top of the large garbage bag with tape (preferably plastic electrical tape).

7. Put ice (or ice that has been placed in heavy duty polyethylene bags and properly sealed) on top of or between the samples. Fill all remaining space between the bottles or cans with vermiculite. Securely fasten the top of the large garbage bag with tape (preferably plastic electrical tape).

8. Place the Progress Environmental Laboratories' Chain of Custody Form into a plastic bag, tape the bag to the inner side of the cooler's lid. Close the cooler and securely tape the top of the cooler shut (preferably with fiber tape). Chain of Custody seals should be affixed to the top and sides of the cooler within the securing tape so that the cooler cannot be opened without breaking the seal.

9. Mark the shipping containers with "THIS END UP," and affix arrow labels to the container to indicate the proper upward position. A label containing the name and address of the shipper shall be placed on the outside of the container. Labels used in the shipment of hazardous materials (such as Cargo Only Air Craft, Flammable Solids, etc.) are not permitted to be on the outside of the container used to transport environmental samples. These labels should not be used.

7.3.4.6 Sample Distribution and Tracking

The sampling distribution and tracking system at Progress Environmental Laboratories is designed to follow document and aid the analyst in the treatment of samples that enter the laboratory.

A key feature of the sample distribution and tracking system is the assurance that the samples are being processed in accordance with sample holding time protocols. Progress Environmental Laboratories has two mechanisms in place that assure holding times are followed:

1. The first mechanism involves sample login and the information on the login sheet. The login sheet contains information regarding the time and date the samples were taken. The lab supervisor at the beginning of the work day can scan these records for samples that are approaching holding time violation. Refer to Figure 7-3 for an example of a PEL Login Sheet.

2. The second mechanism and perhaps the primary mechanism for the assurance of sample holding times is the generation of the daily PEL Status Report which contains a list of the active samples within the lab and the critical dates (holding times). The list is distributed to all sample preparation personnel assuring the communication of holding times. A PEL Status Report is illustrated in Figure 7-9.

The preparation and analysis of the sample is documented by the use of sample extraction logs, preparation logs, analysis worksheets, and laboratory notebook entries. These documents are illustrated in figures 7-4, 7-5, 7-6, and 7-10 respectively. These records contain the sample handlers initials and laboratory ID number to assure the traceability of sample handling during these operations.

7.3.4.7 Disposal of Samples/Extracts/Digestates

Progress Environmental Laboratories is subject to regulation mandated by the FDER and HCEPC concerning the use of septictanks currently in operation at the PEL facility. The regulations state that the septic tanks can only be used for the collection of wastewater during glassware washing operations. Solvents and acids do not enter the septic system. Solvents and acid waste are segregated and placed in drums for future disposal.

The proceeding paragraph dictates that all aqueous samples and digestates be containerized and processed for hazardouswaste characteristics and then disposed of according to the appropriate waste regulations. Disposal records are maintained in the disposal files located in the laboratory supervisor's office.

Extracts from organic sample preparation, including saturated sample water with extraction fluids, spent solvents, etc. are containerized and classified according to their hazardous waste characteristics and shipped to ,the appropriate disposal area. Disposal records are maintained in a file in the laboratory supervisor's office.

Solid samples are characterized based on previous analysis. All efforts will be made to return regulated hazardous waste to the client. If the regulated solid waste cannot be returned to the client, then the sample is containerized and sent to the proper waste disposal firm. Records of disposal are maintained in the laboratory supervisor's office. Non-regulated solid waste will be disposed of in the dumpster.

7.3.4.8 Interlab Custody

Interlab Custody involves the necessary documentation necessary for the transfer of samples and extract to other laboratories for supplemental analysis.

The Chain of Custody form is utilized for interlab custody . At a minimum the COC form includes:

1. Collection data and time

2. Field ID #

3. Lab ID#

4. Date of Sample preparation

5. Analysis requested.

7.3.4.9 Electronic Data Records

Laboratory data is maintained in a Laboratory Information Management System (LIMS). The following is a description of measures to assure that data integrity is maintained throughout the data recording procedure.

Security access is achieved by assignment of user ID codes for computer access. Chemists and technicians can enter the data entry and sample log-in areas of the LIMS program. The laboratory supervisor and QA officer can access all areas of the LIMS system including data approval. The laboratory support specialist has access to all areas of LIMS operation excluding the approval portions of the software.

Forms routinely printed from the LIMS system include sample log-in sheet (Figure 7-3), sample preparation logs (Figure 7-4), and analysis worksheet (Figure 7-6).

Hard copies of the computer generated forms are stored and numbered in reference to run log numbers and filed in the laboratory supervisor's office.

The completed analysis data is entered on an Analysis Worksheet/Run Log (Figure 7-6) by the analyst responsible for the test or test series. It is the analyst's responsibility to assure that all pertinent information is included enabling accurate data entry into the lims system. Analysis data also includes pertinent laboratory notebook entries, Figure 7.10. The data is placed on the Analysis Worksheet for computer entry. Upon completion of the run log, the run log is given to the laboratory support specialist for manual data entry into the computer. The laboratory support specialist enters all determined values into the lims spreadsheet. At this point, concentration values calculated within the data entry section of the lims section are compared to manually derived values "by hand calculation" assuring the proper operation of the spread sheet.

Once data entry is accomplished, the data is assessed for final approval. The approval section of the lims section is only accessed by the laboratory QA officer or when not available the supervising chemist. At this stage of the data assessment, the final values are inspected assuring proper stoichiometry calculations. Also spike and duplicate data is inspected assuring proper adherence to QA protocols. Assuming that all of the above criteria are met, the sample is given approval status by the QA officer.

Once the sample has been given approval status, a final report may be generated. All final reports are signed and inspected by the Laboratory QA Officer/Laboratory Supervisor assuring that all details and reporting parameters have been generated correctly. For example, proper units, client ID information, and report format are inspected.

The final reports and analysis worksheets/run logs are then placed into the archive section of the LIMS system. The software is backed up once per day using a Maynard tape backup system. Hard copies of final reports, analysis worksheets/run logs and data used to generate run logs are maintained within the laboratory. Final reports are filed sequentionally according to their PEL ID Number. The analysis worksheets/run logs and their data are sequentially filed by reference to the analysis worksheet run number. Refer to Figures 7-6 and 7-11. Hard copies of these records are maintained for a period of five years while magnetic tape copies of final reports and laboratory analysis worksheets are maintained indefinitely.

Electronic data transmittal of final reports is accomplished via fax machine. The fax is followed by a hard copy of the final report sent by U.S. mail. The verification that data has been transmitted via fax to the client can be found by the "x" stamp found on final reports that have been faxed to clients.

The proceeding sections have discussed procedures utilized by PEL to verify data and software integrity. In the event that software versions are updated, the version of the update and the time and date of the update is recorded at a file located at the lims computer work station. Records are also maintained detailing software "crashes" and procedures used to fix the malfunctions.

FIGURE 7-9

- PEL STATUS REPORT -

```
                              SMARTLAB Laboratory Information Management System
                                  - STATUS REPORT : INCOMPLETE TESTS -                    February 2, 1992

Lab#        Due      Test    Hold       PREPARATION       Date      By       ANALYSIS     Run        Date     By
------------------------------------------------------------------------------------------------------------------
501191      02/08/92 8020-1  02/17/92   N/A                                  EPA 8020     02000008
                     8020-2  02/17/92   N/A                                  EPA 8020     02000008
                     8020-3  02/17/92   N/A                                  EPA 8020     02000008
                     8020-4  02/17/92   N/A                                  EPA 8020     02000008
                     8020-5  02/17/92   N/A                                  EPA 8020     02000008
                     8020-6  02/17/92   N/A                                  EPA 8020     02000008
                     8020-7  02/17/92   N/A                                  EPA 8020     02000008
                     8020-8  02/17/92   N/A                                  EPA 8020     02000008
                     8020-9  02/17/92   N/A                                  EPA 8020     02000008
                     802-10  02/17/92   N/A                                  EPA 8020     02000008
                     802-11  02/17/92   N/A                                  EPA 8020     02000008
```

FIGURE 7-10

- PEL LABORATORY NOTEBOOK -

PROJECT: TCLP 500866 Notebook No. ______ 57

Continued From Page ______

pH [illegible] Buffer Soln 10 = 10.10

Characterization

7 = 7.03

Final Calib Chk 4 = 4.39

Sample ID	Sample Wt	DI Water	Initial pH	[illegible]	[illegible]
500866	5.12 g	96.5 ml	10.32	[illegible]	[illegible]

Non Volatiles Analysis - Extraction Fluid # 1

Ext pH Chk - 4.95

[illegible] [illegible] [illegible]

Ext Blank 2000 ml

500866 100.2 g [illegible]

Time [illegible] [illegible] 10/10/[illegible]

Time stop [illegible] 10/11

pH 7.00 Buffer Chk (6.98)

Final pH

500866	4.98
Ext Blank	4.76

Continued on Page

Read and Understood By

[illegible]	11/[illegible]/91	[illegible]	11-31-91
Signed	Date	Signed	Date

8.0 ANALYTICAL PROCEDURES

8.1 Procedure methods are indicated in Section 5.

8.2 Field Screening Capabilities.

Field screening capabilities used at PEL include field Organic Vapor analysis. Field Screening procedures are conducted in accordance with procedures outlined in Chapter 17-770 of the FAC, page 4. The instrument utilized is Century/Foxboro OVA Model 128.

8.3 Approved modifications are used on the following EPA methods:

EPA 601/602/625	Capillary columns are substituted for packed columns.
EPA 601/602	The OI Analytical Photoionization and Electrolytic conductivity detectors are mounted in series.
EPA 602/8020	Analyses for Xylenes and MTBE have been included.
EPA 610/625/8270 and 8310	Analyses of l-methylnapthalene and 2-methylnapthalene are included.

8.4 Alternative or proposed new methods are not in use at this time.

8.5 Laboratory Operations

8.5.1 Laboratory Glassware

a. Lab Glassware Cleaning Procedures

The following Table (8-1) denotes cleaning procedures for laboratory glassware. Table 8-1 follows the protocols outlined in DER-QAS #90-05, November 20, 1990.

TABLE 8-1 LAB GLASSWARE CLEANING PROCEDURES (DER-QAS #90-05, November 21, 1990)

Analysis/Parameter	Cleaning Procedure (In Order Specified)
Extractable Organics (including Pesticides)	Solvents: 15, 1-4, 5 or 7, (6 or 8 optional if 19 is used) 17, 19 OR Muffle: 15, 1-4, 16, 17, 19 OR Oxidizer: 15, 1-3, 18, 3, 4, 17, 19
Purgeable Organics	1-4, (7 optional) 13 OR 1-4, (5 optional), (8 optional) 13
HPLC Analyses (non-extractables)	1-4, (10 optional if 19 is used) 19
Trace Metals	1-4, 12, 4
Nutrients	1-4, 11, 4
Minerals	1-4
Residues	1-4, 14
Petroleum Hydrocarbons Oil and Grease	1-5, (9 optional if 19 is used) 19

Cleaning Procedures (bottles and septa):

1. Remove all labels using sponge or acetone.
2. Wash with hot tap water and a brush to scrub inside of glassware, stopcocks, and other small pieces, if possible, using a suitable laboratory-grade detergent.
   - Organics - Liquinox, Alconox or equivalents
   - Inorganic anions - Liquinox or equivalent
   - Inorganic cations - Liquinox, Acationox, Micro or equivalents
   - Bacteriologicals - Must pass an inhibitory residue test
3. Rinse thoroughly with hot tap water.
4. Rinse thoroughly with deionized water.
5. Rinse thoroughly with pesticide grade Acetone.
6. Rinse thoroughly with pesticide grade Methylene Chloride.
7. Rinse thoroughly with pesticide grade Methanol.
8. Rinse thoroughly with pesticide grade Hexane.
9. Rinse thoroughly with freon.
10. Rinse with HPLC grade Acetonitrile and Methanol (if used).
11. Rinse or soak with 1:1 HCL (Hydrochloric acid).
12. Rinse or soak with 10% HNO_3 (Nitric Acid).
13. Bake at 105°C for 3-4 hours.
14. Bake at 180°C for 3-4 hours (prior to use as per method).
15. After use, rinse with last solvent used.
16. Drain, then heat in muffle furnace for 15-30 minutes. Class A glassware will not be muffled.
17. Store inverted or capped with suitable material or suitable container stopper.
18. Soak in oxidizing agent (Chromic acid or equivalent); preferably hot (40-50°C).
19. Last step (prior to use) should be a rinse with the solvent used in analysis.

Note: This sheet does not represent all possible cleaning procedures. Deviations are accepted on a case by case basis.

*** Note: Class A volumetric glassware should not be baked.

8.5.2 Reagent Storage

Reagents and chemicals are labeled with date received when they arrive. Once opened, an opening date is written on the reagent bottle. The following table outlines storage protocols.

TABLE 8 - 2

REAGENT AND STANDARD STORAGE

Chemical	Method of Storage
Nitric Acid	Stored in original containers in vented cabinet designed for acid storage.
Hydrochloric Acid	See above
Sulfuric Acid	See above
Hydrofluoric Acid	See above
Sodium Hydrodioxide Pellets	Stored in cabinet designated for standard and reagent storage. Cabinet in air-conditioned area of laboratory.
Sodium Chloride	See above
Potassium Chloride	See above
Hydroxylamine Sulfate	See above
Stannous Chloride	See above
Potassium Persulfate	See above
Potassium Permangenate	See above
Potassium Phosphate	See above
Sodium Carbonate	See above
Boric Acid	See above
Phosphor 3	See above
Potassium Persulfate Powder Pillow	See above
Sulfur	See above
Formazine Turbidity Standard	See above
Calibration Buffers Ph	See above

Chemical	Method of Storage
Ti Sab II	See above
Fluoride Standards	See above
Phenolphthalein	See above
Isopropanol	Stored in original containers in vented solvent storage cabinet. Note: Solvents used for VOC analysis are stored in cabinets in the VOC analysis area.
Methanol	See above
Hexane	See above
n Propanol	See above
Pentane	See above
Acetone	See above
112 Trichlorotrifluroethane	See above
Cyclohexane	See above
224 Trimethyletentane	See above
Flurosil	See above
Methylene Chloride	See above

8.5.3 Waste Disposal

Laboratory waste is segregated and stored for disposal. Wastes are characterized according to the following criteria:

a. Standards
    1) Inorganic
    2) Organic
b. Reagent Solutions
c. Process Wastes
d. Extraction Solvents Waste
    1) Methylene Chloride
    2) Hexane
    3) Acetone
e. Sample Extracts (organic)
f. Sample Digestates (inorganic)
g. Sample Wastes
h. Acid/Base Wastes

Disposal protocol for inorganic wastes (standards, reagents, process wastes, and sample waste) includes collection in a 55-gallon DOT approved drum and disposal by a commercial waste disposal company.

Acid/Base wastes also are placed into the 55 gallon inorganic waste drum.

Organic wastes are segregated as to chlorinated and non-chlorinated solvents and collected in DOT approved 55-gallon drums for disposal by a commercial waste disposal company. For example, all methylene chloride is segregated into its own drum. The drum includes methylene chloride saturated water water from extractions, excess methylene chloride from extractions, and waste standards in a methylene chloride matrix.

Freon drums would include waste freon from TRPH and oil and grease operations. Hexane wastes are included with the methylene chloride drums. All drums are characterized for hazardous waste characteristics before disposal.

Flammability is also evaluated for waste streams and disposed of accordingly.

Samples may be returned to the customer for disposal, or alternatively collected into DOT approved 55-gallon drums for disposal by a commercial disposal company.

PEL maintains conditionally exempt small generator status with FDER (ID FLD 984197285). Records, including shipping manifests, certificates of disposal, analyses, and inventory are maintained at Progress Environmental Laboratories.

Sample disposal is discussed in Section 7.3.4.7.

9.0 CALIBRATION PROCEDURES AND FREQUENCY

9.1 Instrumentation List

The following table presents a list of instrumentation utilized at PEL Central Laboratory. Standardization frequency and preparation standard sources are also presented.

Table 9 - 1

Instrument List - Laboratory

Instrument	Manufacturer and Model No.
pH Meter	Orion SA 720
Dissolved Oxygen Meter	YSI Model 57
Thermometer	F-51041-D
Conductivity, Temperature Meter	YSI 32-FL
Combustion Fluoride Electrode	Orion Model 96-09
Cold Vapor Mercury Analyzer	Buck Scientific Model 400
Inductively Coupled Plasma Spectrometer	6500XR Perkin Elmer
Graphite Furnace Atomic Absorption Spectrometer	Z 30/30 Perkin Elmer
Drying Oven	Blue M (Stabil Therm)
Turbidimeter	Hach 2100A
Spectrophotometer (240-1000 NM)	Hach DR/3000
Gas Chromatograph (volatiles)	Hewlett Parkard 5890, ELCD/PID OI Purge and Trap
Gas Chromatograph Pesticide, PCB, Polynuclear Aromatics	Hewlett Packard 5890 ECD, FID
Gas Chromatograph Mass Spectrometer Base/Neutral/Acid/Extractables and Volatiles	Hewlett Packard 5890, 5971A Purge and Trap 4560 Sample Concentrator, MPM 16
High Performance Liquid Chromatograph	Hewlett Packard 1050 Series UV-Vis and Fluorescence Detectors

Table 9 - 1 Continued

Instrument List - Laboratory

Instrument	Manufacturer and Model No.
TCLP Extractor	Progress Environmental Laboratories
ZHE Extractor	Associated Design 3745-ZHE
Pressure Filtration Device	Associated Design 3750-L-HFS
Analytical Balance	Mettler AE163 Sartorius 1601A AND ER 120A Sartorius 1364 MP
IR Analyzer	Buck IR HC404
Sonicator	Tekmar TM 375

9.2 Callibration of field analytical equipment will follow DER Standard Operating Procedures for Calibration and Use of Field Analytical Meters, pages 1-7, revised October 18, 1991.

9.2.1 The following equipment is in use for field measurements:

1. YSI Model 32 F/L Conductivity Temperature Meter (auto compensation for temperature)
2. Foxboro/Century 128 OVA
3. Ph Meter Model #HI9025C by Hannah Instruments (auto compensation for temperature) and Cole Palmer 5985-80.
4. Dissolved Oxygen Meter, YSI Model 57.

9.2 Standard Receipt and Traceability

When received, standards are logged in with supplier, lot number, date of receipt and expiration date. The date of receipt is written on the container for reference. Date opened is also logged on containers.

Field standards are received and traced in accordance with Calibration and Use of Field Analytical Meters, revised October 18, 1991, page 1.

Working standards are generally prepared from stock (purchased) solutions. Additional dilutions may be made from working standards. Aqueous standards are prepared using Eppendorf pipettes and Class A volumetric glassware. Organic standards are similarly prepared using syringes and screw cap vials for working solution storage. Working standards are dated, labeled with identification and concentration, and preparer's initials. Preparation is noted in the analyst's notebook, specifying stock used, lot numbers, manufacturer and other traceability information.

Manufacturers' certificates and traceability are maintained in QC standard material. Standards are dated and initialed at the time of arrival. How standards are received can be found in Table 9-2. Standard receipt and traceability for field calibration is done in accordance with Calibration and Use of Field Analytical Meters, revised October 18, 1991, page 1.

9.3 Standard Sources

Table 9 - 2 denotes standard sources, storage, general stock preparation and frequency.

9.4 Calibration

9.4.1 Field

Field meters will be calibrated in accordance with Calibration and Use of Field Analytical Meters, revised October 18, 1991, page 1. Field dissolved oxygen calibration is as indicated on Table 9-2.

9.4.2 Laboratory

Method calibration procedures are followed as a preference at PEL, particularly if more stringent than QAP guidelines. Calibrations are documented in the analyst's notebook and, in several cases, filed with daily run data. Table 9 - 3 outlines calibration criteria utilized. All calibration curves utilized at PEL are generated using linear regression equations as discussed in Section 12.1.3.

9.5 GC/MS Tuning (EPA 625/8270) and Daily Checks

Prior to analysis of samples, the GC/MS (EI MS Detector) is internally tuned using PFTBA. Mass Axis adjustments, peak widths, and other unit specific criteria are fine tuned.

To verify tuning, 50 ng of DFTPP is injected. The DFTPP peak is scanned and abundances are calculated (by computer). To pass method tuning requirements, the following abundance criteria must be met:

Mass	Abundance Criteria
51	30-60% of Mass 198
68	Less than 2% of Mass 69
70	Less than 2% of Mass 69
127	40-60% of Mass 198
197	Less than 1% of Mass 198
198	Base Peak, 100% of Relative
199	5-9% of Mass 198
275	10-30% of Mass 198
365	Greater than 1% of Mass 198
441	Present, less than Mass 443
442	Greater than 40% of Mass 198
443	17-23% of Mass 442

Once the instrument has passed the tuning criteria, a 50 ug/ml secondary standard is injected. Compound RF values must be within 30% of calibration RF values. Compounds over 20% from calibration RF values are considered over warning limits. Failure of compounds requires recalibration prior to analyzing samples. Tuning should also be repeated.

Benzidine tailing must be checked and SPCC compound RF values must exceed a value of 0.05.

Following EPA 8270 Protocol, the instrument may analyze samples within a 12-hour window from the time of injection of DFTPP provided mass abundance and CCV criteria are met.

9.5 GC/MS Tuning (EPA 624/8240) and Daily Checks

Prior to analysis of samples, the GC/MS is internally tuned using BFB. Mass axis adjustments, peak widths, and other unit specific criteria are fine tuned.

To verify tuning, 50 ng of BFB is injected. The BFB peak is scanned and abundances are calculated (by computer). To pass method tuning requirements, the following abundance criteria must be met:

Mass	Abundance Criteria
50	15-40% of Mass 95
75	30-60% 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 101% of mass 174
177	5 to 9 % of mass 176

Once the instrument has passed the tuning criteria, the SPCC and CCC are analyzed to assure validity of the calibration. The minimum response factor for volatile Spcc is .300 (.25 for Bromoform). After the SPCC is accepted the CCC compounds are examined. If the percent difference of the CCC is less than 25%, the initial calibration is assumed to be valid. The CCC consists of the following compounds: 1,1-Dichloroethene, Chloroform, 1,2-Dichloropropane, Toluene, Etyhylbenzene, and Vinyl chloride.

TABLE 9 - 2

Standard Sources and Preparation

Instrument Group	Standard Source(s)	How Received	Source Storage	Preparation from Source	Lab Stock Storage	Prep Frequency
Gas Chromatograph/ GCMS Volatiles	Supelco Restek Alltech Accustandard Chemservice	Multi compound and single compound 200 ppm 1 year holding time	Frozen	Intermediate stocks prepared from source stocks Working stocks are prepared from intermediates	Frozen NA	30 Days or fail acceptance Daily
Gas Chromatograph Pesticide, PCB	Supelco Restek Alltech Accustandard Chemservice	Multi compound and single compound 100, 200 ppm 1 year holding time	Frozen	Intermediate stocks prepared from source stocks Working stocks are prepared from intermediates	Frozen Frozen	1 Year 6 Months
Gas Chromatograph PAH	Supelco Restek Alltech Accustandard Chemservice	Multi compound 1 year holding time	Frozen	Intermediate stocks prepared from source stocks Working stocks are prepared from intermediates	Frozen Frozen	1 Year 30 Days
HPLC PAH	Supelco Restek Alltech Accustandard Chemservice	Multi compound 1 year holding time	Frozen	Intermediate stocks prepared from source stocks Working stocks are prepared from intermediates	Frozen Frozen	1 Year 30 Days
Formaldehyde		6 months				3 Days
Gas Chromatograph Mass Spectrometer Base/Neutral/Acid/ Extractable	Supelco Restek Alltech Accustandard Chemservice	Multi compound and single compound 2000 ug/ml 1 year holding time	Frozen	Intermediate stock prepared from source stocks Working stocks are prepared from intermediates	Frozen Frozen	30 Days 30 Days
Atomic Absorption Furnace	Inorganic Ventures/ SPEX	Solutions of 1000 ppm multi element standards 1 year holding time	Room Temp	Intermediate stocks (1-10 ppm) prepared from source Working stocks prepared from intermediates	Room Temp 15% HNO_3 N/A 15% HNO_3	30 Days Daily

Instrument Group	Standard Source(s)	How Received	Source Storage	Preparation from Source	Lab Stock Storage	Prep Frequency
ICP/Buck Mercury Analyzer	Inorganic Ventures/ SPEX	Solutions of 1000 ppm multi element standards 1 year holding time	Room Temp	Working standards prepared from source stocks	Room Temp	Daily
Spectrometer Hach DR/3000	Commercial ACS grade Reagent (Phosphorous & Sulfur)	99.99 Purity salt 1 year holding time	Room Temp	Gravimetric and dilution Working standards prepared daily from stock	Room Temp	Weekly Daily
FL Specfic Electrode	Orion	Solution of 100 ppm 1 year holding time	Room Temp	Primary stocks prepared from source stock Working standards from primary stock	Room Temp Room Temp	Daily Daily
Chloride Titration	Commercial ACS grade Reagent	99.99 Purity salt 1 year holding time	Room Temp	Gravimetric and dilution Working standard prepared from stock	Room Temp	1 Year Daily
ph Meter	Commercial	Ph, 401, 700, 1000 1 year holding time	Room Temp	Use direct	Room Temp	1 Year
Turbidimeter	Hach	4000 NTU formazine 1 year holding time	Room Temp	Working standard prepared from stock	Room Temp	Daily
Conductivity Meter	Commercial ACS grade salt	High purity salt 1 year holding time	Room Temp	Gravimetric and titration	Room Temp	1 year
Dissolved Oxygen Meter	Water saturated air Samples done by Winkler	High purity salt for Winkler check 1 year holding time	Room Temp	Gravimetric	Room Temp	As Utilized
Alkalinity	Commercially available ACS grade reagent	High purity salt 1 year holding time	Room Temp	Gravimetric	Room Temp	As Utilized
Ammonia Nitrogen	Orion	Solution of 100 ppm 1 year holding time	Room Temp	Primary stocks prepared for source stock Working standards from primary stock	Room Temp Room Temp	Daily Daily

Instrument Group	Standard Source(s)	How Received	Source Storage	Preparation from Source	Lab Stock Storage	Prep Frequency
TDS	Commericially available ACS grade reagent	High purity salt 1 year holding time	Room Temp	Gravimetric	Room Temp	As Utilized
Buck IR Unit	Supelco	500 ppm 1 year holding time	Refrigerate	Working standard prepared from stock.	Refrigerate	Monthly

TABLE 9 - 3

INSTRUMENT CALIBRATION

Instrument	Standard Source	# Standards Initial Calib.	Acceptance/Rejection Criteria-Initial Cal.	Frequency	Range/ # Standards Cont. Calib.	Acceptance/Rejection Criteria-Cont. Calib.	Frequency
Gas Chromatrography VOAs	Supelco, Restek Chemservice, Alltech	5	*RSD<10%, plot curve	Failure of cont. calib.	1 Midrange	Failure to achieve Table II criteria ****	10%
Gas Chromatrography Pesticide, PCB	Supelco, Restek Chemservice, Alltech	3	RSD<10% or plot curve	Failure of cont. calib.	1 Midrange	Difference must be less than 15% RF	10%
Gas Chromatrography PAH	Supelco, Restek Chemservice, Alltech	5	RSD<10% or plot curve	Failure of cont. calib.	1 Midrange	Difference must be less than 15% RF	10%
High Performance Liquid Chromatograph (HPLC) PAH Formaldehyde	Supelco, Restek Chemservice, Alltech	5	RSD<10% or plot curve	Failure of cont. calib.	1 Midrange	Difference must be less than 15% RF	10%
Gas Chromatrography Mass Spectrometer Base/Neutral/Acid/Extractable	Restek, Supelco, Chem Service Alltech	5	RSD<20% SPCC>.05 RF	Failure of cont. calib.	1 Midrange	Difference must be <30% for CCC SPCC>.05 RF	12 hours
Gas Chromatography Mass Spectrometer Volatiles	Supelco, Restek, Chem Service, Alltech	5	SPCC>.30 RF Bromoform > .25 RF CCC<.25 RPD	12 Hours	1 Midrange	<30% for CCC RPD < 25% on CCC	12 hours
Atomic Absorption Furnace	Inorganic Ventures, NBS	5 including blank	**±10% of secondary standard	Daily prior to use	1 Midrange	±10% of secondary standard **	Initial and every 10 samples
ICP	Inorganic Ventures	3 including blank	±10% of secondary standard	Daily prior to use	1 Midrange	±10% of secondary standard	Initial and every 10 samples
Spectrometer Hach 3000	Commercial ACS grade Hach	8 point for Sulfate 5 point for Phosphate	±10% of secondary standard	Daily prior to use	1 Midrange	±10% of known value mid range	Initial and every 10 samples
pH Specific Ion Electrode	Orion	3 Point for high ( ) 7 points for low ( )	±10% of secondary standard	Daily prior to analysis	1 Midrange	±10 % of known value mid range	Initial and every 10 samples

* = Rejection of calibration if correlation coefficient < 0.95. Construct new calibration curve.

** = STD generated from different source than primary.8

*** = STD closely resembles range of samples.

**** = Table II used for both 8000 and 600 series methods. If compound is not listed in the methods, then use ± 15% of acceptance criteria.

TABLE 9 - 3 Continued

INSTRUMENT CALIBRATION

Instrument	Standard Source	# Standards Initial Calib.	Acceptance/Rejection Criteria-Initial Cal.	Frequency	Range/ # Standards Cont. Calib.	Acceptance/Rejection Criteria-Cont. Calib.	Frequency
Chloride Titration	High purity salt commercialy available	1	±5% of secondary standard	Before use	1 Midrange	±5% known value	Initial and every 10 samples
Ph Meter	Thomas, Referee	2	±.1 Ph unit	Before use	***1	±.1 Ph unit	Initial and every 10 samples
Turbidity Meter	Hack, Formazine	1	40 NTU setpoint	Before use	1	40 NTU or range close to standards ±5%	Initial and every 10 samples
Conductivity Meter	High purity salt commercially available	1	±1% of known value	Before use	1400 umhos/cm	±1% known value	Initial and every 10 samples
Buck Mercury Analyzer	Inorganic Ventures	6	±10% of secondary standard	Before use	1	±10% known value	Initial and every 10 samples
Buck IR HC404	Supelco	7	RSD < 10%	Failure of cont. calib.	1	Check STD ±10%	Initial and every 10 samples
Dissolved Oxygen Meter	Water saturated Air and Winkler	1 2	> 0.2 mg/l difference	When used Annualy	N/A	N/A	N/A

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* = Rejection of calibration if correlation coefficient < 0.95. Construct new calibration curve.

** = ICV generated from different source than primary.

*** = ICV closely resembles range of samples.

**** = Table II used for both 8000 and 600 series methods. If compound is not listed in the methods, then use ±15% of acceptance criteria.

10.0 PREVENTATIVE MAINTENANCE

10.1 Routine Maintenance

*All equipment is checked for cleanliness before use (field & laboratory).

TABLE 10 - 1

Instrument/Equipment	Activity	Frequency
Field Equipment		
Dissolved Oxygen Meter	Inspect cell for damage Replace membrane cap	Before use
pH Meter	Check electrode Replace battery	Before use 3 Months as required
Peristaltic Pump	Check battery charge Replace teflon tubing	Before use Before use
Conductivity Meter	Check electrodes & connections Replace battery Check cell constant	Before use 3 Months as required Before use
Thermometer	Check against NBS Certified Thermometer	Monthly
Lab Equipment		
Z-30/30 A.A. Unit	Change carbon tube Clean furnace windows Check gases Check autosampler alignment Load wash bottle Empty drain bottle Check optics	Daily (appox. 50 runs) Daily Daily, change at 500 psi Daily Daily Daily Annually
PE 6500XR ICP	Check quartzware Change Pump tubing Check autosampler Check wash bottle Check drain Check gases Check optics	Daily Daily, as required Daily Daily Daily Daily, change at 500 psi Annually

Instrument/Equipment	Activity	Frequency
Gas Chromatograph (VOC's)	Check gas flows Check column Check purge and trap for leaks Change trap Change Ni tube Clean PID lamp Change PID lamp Change gases	Daily Daily Daily 6 Months, as required 1-3 Months, as required 1-3 Months, as required 1 Year, as required As required (under 50 psi)
HPLC PAH, Formaldehyde	Check pump rate Lubricate piston Check piston pump pressure	Daily Weekly Monthly
Gas Chromatograph (Pesticides/ PCB's/PNA)	Change septum Change injection port liner Check for leaks Check column Check gas flows/head pressure Change gases Change autosampler was solvents Check auto injector mount & needle Remove first 1' of column	Daily As required Daily Daily Daily As required (under 50 psi) Daily Daily As necessary
Gas Chromatograph (Mass Spectrometer)	Change septum Change injection port liner Check for leaks Check column fittings Check gas flows/head pressure Change autosampler wash solvents Check auto injector mount & needle Check vacuum pump oil level Change vacuum pump oil Change PFTBA vial Clean ion source Remove first 1' of column Check gas flows Check column Check purge and trap for leaks	Daily 1-2 Days Daily Daily Daily Daily Daily Daily 6 Months, as required 1 Year As required (low mass 502) As necessary Daily Daily Daily
Balance(s)	Clean pans and compartment Check alignment Check test weights Clean & calibrate (serviceman)	Daily, as necessary Before Use Weekly 6 Months
Water Bath	Add water Check bath temperature Check bath thermometer with NBS	Daily, as required Before use Monthly
Refrigerators	Check temperatures	Weekly
Ovens	Check temperature Check thermometer with NBS	Before use Monthly

Instrument/Equipment	Activity	Frequency
Hach 3000 Spectrometer	Clean windows Change lamp	Daily, as needed On failure
Hatch 2100 Turbiditymeter	Clean windows Replace lamp	Daily, as needed On failure
Buck IR HC404	Clean sample cells Clean optical window Check lamp	Daily
Buck Mercury Analyzer	Clean windows Change tubing Replace lamp	Daily Monthly On failure

10.2 Documentation

For major equipment within the laboratory, an instrument log book is kept to track major repair, non-routine maintenance items, and scheduled maintenance events. Typically, normal routine maintenance items, such as changes of consumable items (septa, carbon tubes, adjustment of flows) are noted only in the analyst's notebook.

10.3 Contingency Plans

In the event of major failure of equipment in the laboratory, EFC has two essential concerns which must be considered throughout the process of repairing the equipment. These priorities are:

1. At no time will samples be allowed to exceed holding times. Samples will be rushed to another certified laboratory as required to insure integrity of holding times. At request of our clients, samples requiring special turnaround times may also be sent to another certified laboratory. The certified lab will have an approved QAP for analysis, and checks will be made with the DER Program Manager regarding work being done for a site specific plan. All normal sample custody protocols are followed. Daily reassessment of holding times is necessary.

2. PEL shall initiate immediate steps to troubleshoot the source of the problem. If practical, in-house parts and manpower may be utilized to repair the equipment. In cases where redundancy exists, additional samples may be added to other equipment utilizing extra capacity, overtime, or varied working hours as required. If repairs are beyond in-house resources, a service call will be scheduled and repairs made as rapidly as prudently possible. Temporary reassignment of hours, shipping of samples to other certified labs, or other measures will continue until the equipment is repaired and passes all instrument check-out and normal QC criteria.

3. Samples which may have been in process at the time of failure will be repeated. Incomplete batch data accumulated during the failure will be considered invalid.

4. If possible, a sampling event may be delayed if critical equipment could place the project in jeopardy.

11.0 QUALITY CONTROL CHECKS, ROUTINES TO ACCESS PRECISION AND ACCURACY, AND CALCULATION OF METHOD DETECTION LIMITS

11.1 Quality Control Checks

11.1.1 Field Quality Control Checks

Field Quality Assurance/Quality Control Checks will follow DER QAS Guidance Documents #91-01, revised October 29, 1991 and #91-02, revised April 17, 1991. The QA data generated by methods outlined in the SOP are used to produce tables and charts outlining QC target values for precision and accuracy. The acceptance/rejection criteria is found in Section 13.

11.1.2 Laboratory Quality Control Checks

Laboratory Quality Control checks include the determination of precision and accuracy utilizing the formula found in Section 12, page 5. The precision and accuracy values are then compaired to QC tables illustrated in Section 5 for precision and accuracy to determine acceptance or rejection of the analytical data. The specific actions regarding control and warning limits are discussed in the following paragraphs.

Instrument calibration verification is accomplished with continuous callibration samples. The acceptance/rejection criteria for the pertinant analytical procedure can be found in Section 9, Table 9-3, pages 9 and 10.

Surrogate recoveries are calculated in the same manner as percent accuracy, Section 12, page 5. The data is used to construct schewert charts for percent recovery. Acceptance/rejection criteria follow the control and warning limit guidelines mentioned below.

Table 1 and 2 are examples of a Schewart Charts for accuracy and precision. Recovery and %RPD values are calculated in accordance with DER-QAS #91-02. An excellent discussion of interpretation of Schewart Charts can be found in the Standard Methods for the Examination of Water and Wastewater, 1989 17th Edition. QC Charts are updated for every new set of data points or annually, whichever comes first.

Control Limits: If one measurement exceeds a Control Limit (CL), repeat the analysis immediately. If the repeat is within the CL, then continue the analysis; if it exceeds the CL, then discontinue the analysis and correct the problem.

Warning Limits: If two out of three sucessive points exceed a Warning Limit (WL), analyze another sample. If the next point is less than the WL, then continue analysis; if the next point exceeds the WL, discontinue analysis and correct the problem.

Standard Deviation: If four out of five successive points exceed one standard deviation or are in decreasing or increasing order, then analyze another sample. If the next point is less than one standard deviation or changes the order, continue with the analysis, otherwise, discontinue the analysis and correct the problem.

Central Line: If six successive samples are above the central line, then analyze another sample. If the next point is below the central line, then continue with the analysis; if the next point is on the same side, then discontinue the analysis and correct the problem.

The PEL laboratory shall follow prescribed QC requirements as outlined in each of the USEPA approved methods which are used. In the absence of specific QC requirements under a method, Table 11-3 outlines the minimum checks which will be utilized. In the event that a particular method's QC requirement is in excess of PEL's normal QC requirements, the particular method QC will be followed.

TABLE 11-1

SCHEWART CHART FOR ACCURACY

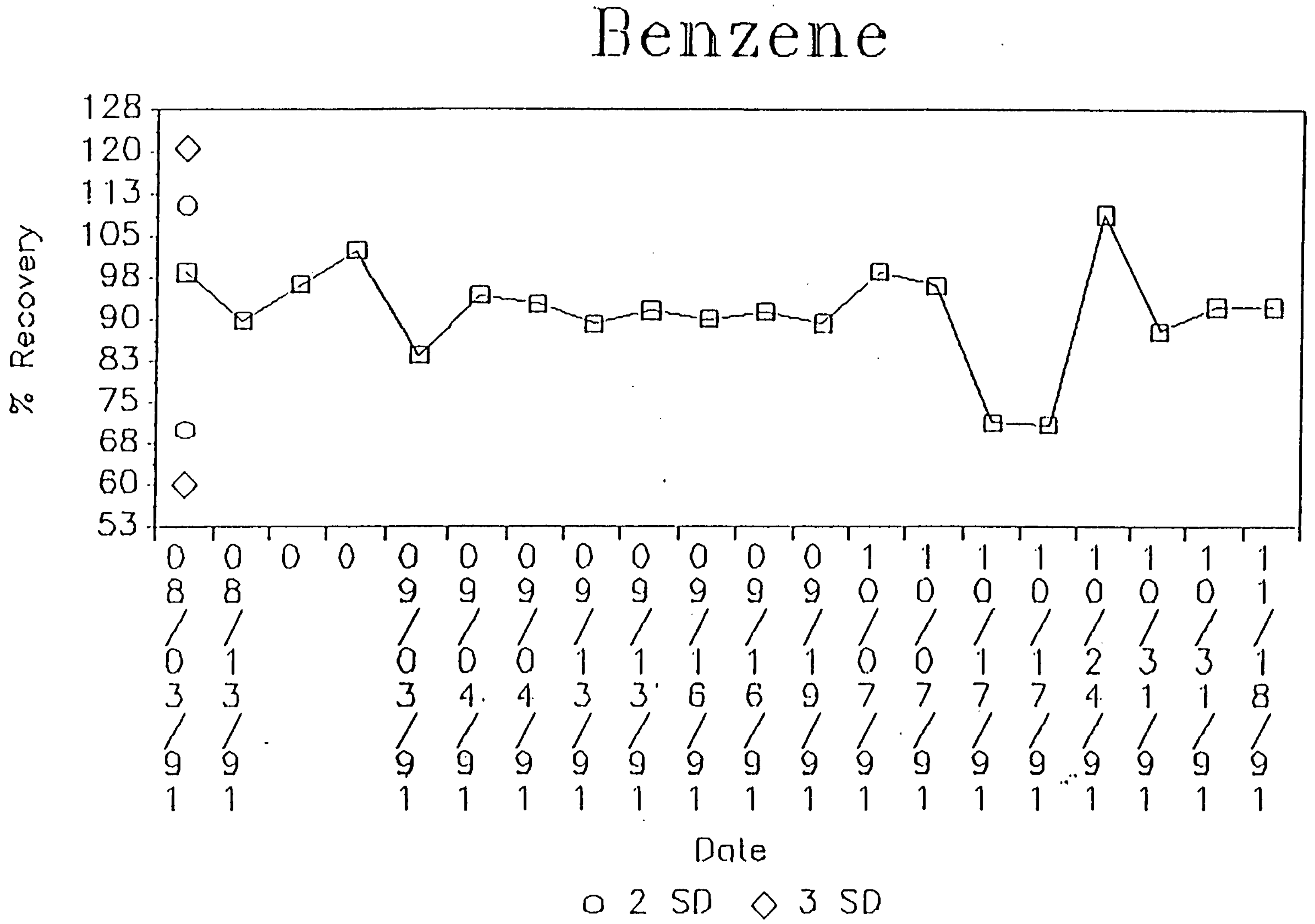
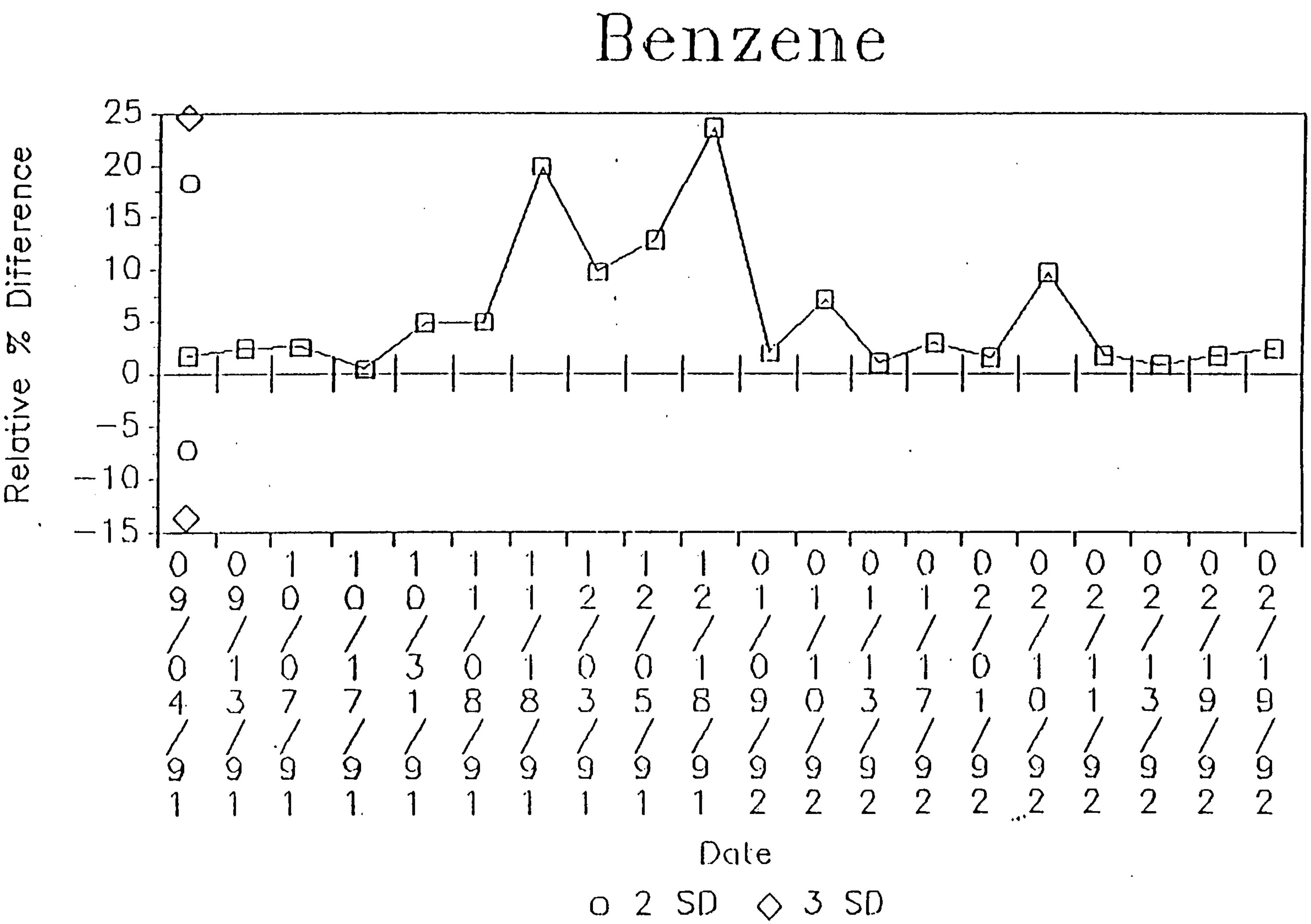


TABLE 11-2

SCHEWART CHART FOR PRECISION



Long Term Precision
X-BAR (Shewhart) CONTROL CHART

Benzene

lab#	testid	units	result	analdate
500555	60201	ug/l	2	09/04/91
500605	60201	ug/l	2	09/13/91
500688	60201	ug/l	3	10/07/91
500755	60201	ug/l	0	10/17/91
500797	60201	ug/l	5	10/31/91
500832	60201	ug/l	5	11/08/91
500874	60201	ug/l	20	11/18/91
500906	60201	ug/l	10	12/03/91
500944	60201	ug/l	13	12/05/91
500984	60201	ug/l	24	12/18/91
501030	60201	ug/l	2	01/09/92
501034	60201	ug/l	7	01/10/92
501109	60201	ug/l	1	01/13/92
501134	60201	ug/l	3	01/17/92
501189	60201	ug/l	2	02/01/92
501195	60201	ug/l	10	02/10/92
501216	60201	ug/l	2	02/11/92
501224	60201	ug/l	1	02/13/92
501248	60201	ug/l	2	02/19/92
501249	60201	ug/l	2	02/19/92
501250	60201	ug/l	3	02/19/92

Mean = 6
2 SD = 13
3 SD = 19

TABLE 11 - 3

Laboratory Checks	
Type	Frequency
Method Reagent Blanks	One per sample set
Matrix Spikes	Greater of one per set or 5% of samples for each matrix
Reagent Water/Reagent Matrix Spikes	If used, 5% of samples
QC Check Samples	Semiannually (in duplicate)*
QC Check Standards	5% of samples, used in each set to verify standard curve
Duplicate Samples or Matrix Spike Duplicates	Greater of one per set or 5% of samples for each matrix
Continuing Calibration Standards	Used in addition to above at 5% of samples
Reagent Purity Check	Each lot of supply reagents
Internal Standards	Each sample according to Method
Surrogate Spikes	Each sample according to method
Titration Solution Concentration Check	Verify concentration against standard solutions each sample batch and 10% frequency.

* *If Blind QC Check Samples are not acceptable, results must be reported in a QA Report to the DER.*

11.2 Routine Methods Used to Assess Precision and Accuracy

TABLE 11 - 4

Methods Used to Generate Precision and Accuracy Targets			
Method	Purpose	Concentration Level	EPA Method References
Duplicate Matrix Spikes	Precision & Accuracy	Mid	601, 602, 8010, 8020, 608, 8080, 610, 8100, 8310, 8315, 8240, 504, 418.1, 9073, 625, 8270, TCLP
Matrix Spikes	Accuracy	Mid	Inorganics
Duplicate Samples	Precision	Low/Mid/High	All metals, nutrients, general inorganics, & organics

Concentration levels in Figure 11-3 are defined as follows:

Low level is defined as concentrations from the minimum detection limit to a level five times the MDL.

Mid level is defined as the mean level between the minimum detection level and the upper end of the linear range.

High level is defined as the concentration at the upper end of the linear range.

11.3 Method Detection Limits and Practical Quantitation Limits

11.3.1 Method Detection Limits (MDL's)

MDL's are determined by the procedure outlined in 40 CFR Part 136, Appendix B.

11.3.2 Practical Quantitation Limits (PQL's)

PQL's are determined by standard format derived from *Principles of Quality Assurance of Chemical Measurements*, February 1985, by John Taylor. The PQL is defined as ten times the standard deviation derived from the MDL procedure outlined in 40 CFR Part 136, Appendix B.

11.3.3 Update Frequency

PEL verifies and updates its MDL and PQL values on an annual basis for each matrix. MDL's are checked routinely at the completion of each group of 20 QC spike samples.

MDL or PQL values are determined when new pieces of equipment are started up either by running a series of prepared spiked samples or through normal QC procedures.

12.0 DATA REDUCTION, VALIDATION AND REPORTING

The follwoing section presents the manner in which data is reduced, validated, and reported at Progress Environmental Laboratories. Figure 12-1 illustrates the manner in which information flows through the laboratory. Figure 12-1 also indicates the title of the individual responsible for the particular section of data handling.

12.1 Data Reduction

12.1.1 Responsibilities and Specific Duties of the Field Personnel

The responsibilities and duties of field personnel are designed with the objective of recreating a field sampling event by entries made into the field notebook. The requirements for data entries are completely dependent on the scope and the nature of the sampling event. Field meters are direct reading. Instruments automatically compensate for temperature. Upon completion of the sampling event, field parameters are manually transferred by the sampling technician to analysis worksheets. All calculations necessary in the sampling event such as well volume and flow measurement calculations are the responsibility of the sampling technician and upon completion, are reviewed by the QA Officer. The field data is then transferred into the laboratory LIMS system by the laboratory support specialist. The field data is subject to the same review process as the laboratory data.

Field activities other than the generation of numerical data such as site maps, weather conditions, and any pertinent data pertaining to the sampling event is reviewed by the technician and the laboratory supervisor before the data is included on the final reports.

12.1.1.1 Responsibilities and Specific Duties of the Analyst

The analyst's major responsibility is the conversion of raw data to reportable values. The following section describes various methods of data deduction utilized at PEL. The method of data deduction can vary depending on the type of equipment utilized for analysis. Analytical values can be generated by different methods (ie. internal microprocessor, computer based data packages, and laboratory notebook entries). It is the analyst's responsibility to place the data on the standard analysis worksheet in a form in which it is capable of being entered into the LIMS system by the laboratory support specialist. The laboratory support specialist is responsible for all raw data entry.

Each phase of this operation requires documentation, careful recording of results, and adherence to laboratory and QC procedures. Raw data reporting and deduction is a primary function of the analyst. Specific protocol for raw data reporting and deduction is listed below:

a. Metals

Data from the Perkin Elmer 6500XR ICP unit is correlated with emission via internal computer and printed directly in mg/l units. Results are checked for QC samples and valid data is recorded in the bench notebook. Printouts from the computer are filed as a supplement and backup documentation for the bench notebook.
Data obtained from the Perkin Elmer 3030 Zeeman Graphite Furnace A.A. is similarly correlated with absorbance via internal computer and printed in ug/l units. QC data is checked and valid results are converted to mg/l units and entered in the

bench notebook. Printouts are filed as a supplement to and backup documentation for the bench notebook.

b. **Mercury**
Data from a Buck Mercury analyzer is recorded on a strip chart recorder. Regression analysis is performed on calibration standard peak height measurements via Lotus 1-2-3 regression package. Strip charts and regression values are then reported.

c. **Fluoride, Ammonia Nitrogen**
Data from the Orion Specific Ion meter are internally correlated from millivolt readings to mg/l units via an internal microprocessor following calibration. QC data is plotted and valid data is entered in the bench notebook.

d. **Sulphate, Ortho Phosphorus, Total Phosphorus**
Hach Model 3000 spectrophotometer calibration is accomplished via an internal microprocessor utilizing linear regression. Data is recorded in the analyst's bench notebook.

e. **Chloride**
Data for Chloride is obtained via titration against a standardized Silver Nitrate ($AgNO_3$) solution. The Chloride value is calculated according to the following formula:

$$\text{Chloride (mg/l)} = (Ml_1 - Ml_2) \times N \times \frac{35450}{Ml_3}$$

Where Ml_1 = Ml of $AgNO_3$ Required for Sample
Ml_2 = Ml of $AgNO_3$ Required for Blank
Ml_3 = Ml of Sample
N = Normality of $AgNO_3$ Solution

Data is recorded in the analyst's notebook.

f. **Turbidity**
Following calibration of the Hach 2100A turbidimeter, turbidity is read directly in NTU. Correlation of millivolts to NTU are performed via internal microprocessor. QC samples are plotted and valid data are entered in the bench notebook.

g. **Residue, Gravimetric Oil and Grease**
The weight of residue obtained after treatment of the sample is volumetrically corrected and reported in mg/l. Calculation is performed according to the formula:

$$\text{Total Residue (mg/l)} = \frac{W_1 - W_2}{V} \times 10^6$$

Where : W_1 = Weight of Residue and Dish (grams)
W_2 = Weight of Dish (grams)
V = ml of Sample

Results of weights, volumes, and calculated results are recorded in the bench notebook.

h. **Specific Conductance**
Specific conductance is obtained by direct reading from a YSI-32-FL conductivity meter in umhos/CM. Results and temperature are recorded in the field notebook. A cell constant of 1 is utilized. Temperature compensation is automatic.

i. **pH**

PH is obtained directly from a pH meter following calibration to buffer solution standards pH units are recorded to the field/bench notebook. Temperature compensation is adjusted automatically by pH meters.

j. **Temperature**
Temperature is read directly from an NBS traceable thermometer. Corrections, if specified by the manufacturer, are to be applied. Temperature measurements in degrees centigrade are recorded in the field/bench Notebook.

k. **Alkalinity**
Data for alkalinity is obtained via titration against a standardized H_2SO_4 solution to pH 4.5. The alkalinity value is calculated according to the following formula. Data is collected in the analyst's notebook.

$$\text{Alkalinity (mg/l)} = (Ml_1 - Ml_2) \times N \times \frac{50000}{Ml_3}$$

Where Ml_1 = Ml of Acid Required for Sample
Ml_2 = Ml of Acid Required for Blank
Ml_3 = Ml of Sample
N = Normality of Acid

l. **GC HPCL Chromatograms (VOC, Pesticides and PCB's, PNA, Formaldehyde)**
Raw data is processed utilizing HP chemstation software to integrate and calculate peak areas. Calibration curves are prepared utilizing regression analysis capabilities of the software conforming to formulas in Section 12.1.3 for linear regression. Alternatively, if the relative standard deviation exhibited by RF values (see 12.1.3) are below 10%, an average RF calculation is permissible instead of a calibration curve.

m. **GC/MS Chromatograms (EPA 625/8270)**
Raw data is processed utilizing the HP MS chemstation software to integrate and tabulate areas of target and qualifier ions. Calibration and quantification is achieved using the internal standard method and average RF calculations. RF calculation is outlined in 12.1.3. Quantitation is achieved by the following formula:

$$\text{Concentration (ug/l)} = \frac{A_s \, I_s}{A_{is} \, RF \, V_s}$$

Where A_s = Area of sample target ion
A_{is} = Area of internal standard target ion
I_s = Amount of internal standard added to extract (ug)
V_s = Volume of water extracted (L)
RF = Response factor (See 12.1.3)

n. **TRPH**
Data from the Buck Scientific Model No. HC404 (Seriel No. 162) is correlated by linear regression to a 7 point standardization curve. Hard copies of the analytical data and QC values are attached to the analysis worksheets for data entry and approval.

o. **Hardness**
Hardness is analyzed by the ICP determination of Calcium and Magnesium. The following equation is used:

$$\text{Hardness (mg/l)} = 2.497\ [\text{Ca (mg/l)}] + 4.118\ [\text{Mg (mg/l)}]$$

12.1.2 Documentation of Raw Data and Other Records

a. Laboratory and field notebooks are maintained by analyst and field personnel. Information necessary to re-create an analytical or sampling event is recorded. Pages are signed and dated by the analyst.

b. The raw data associated with the analysis worksheet (ie. chromatograms, stripcharts, etc.) are identified at the time of generation by the analysis worksheet number. The chromatograms and strip charts also contain the date and analyst signature. The computer generated chromatogram also contains a unique alpha-numeric code number which is assigned to every chromatograph run. The raw data is attached to the analysis worksheet for review by the laboratory QA Officer. Chromatograms/chart identification are identified via sample numbers and date of analysis.

c. Computer record files are identified by sample ID number, the date of the analysis, and the analysis worksheet number including analyst's signature.

d. Work sheets and spread sheets used to calculate values are generated via computer hard copies and are stored in the analyst's notebook. The hard copies are signed and dated.

12.1.3 Formulas

a. RF (Response Factor) Values

$$RF = \frac{A_s C_{is}}{A_{is} C_s}$$

Where A_s = Area of target compound (or ion)
A_{is} = Area of internal standard (or ion of internal standard)
C_{is} = Concentration of internal standard (ug/l)
C_s = Concentration of parameter to be measured (ug/l)

*b. Standard Deviation, S

$$s = \frac{\Sigma (x - \bar{x})^2}{n - 1}$$

Where s = Standard deviations
x = Individual measurement
$\bar{x}$ = Mean of measurement
n = Number of measurement

*c. Relative Standard Deviation, RSD %

$$RSD\ \% = \frac{s}{x} \times 100$$

Where s = Standard deviation (above)
$\bar{x}$ = Mean of observations

* - Indicates formulas also referenced in Section 11.

**d. Relative Percent Difference (RPD)

$$\text{RPD \%} = \frac{|x_1 - x_2|}{\frac{1}{2}(x_1 + x_2)} \times 100$$

Where x_1 = Measurement of parameter
x_2 = Duplicate measurement

*e. Recovery Percent, R %

$$\text{R \%} = \frac{S_p - S_s}{S_A} \times 100$$

Where s_p = Result of sample with spike added (ug/l)
s_s = Result of sample (ug/l)
s_a = Amount of spike added (ug/l)

f. Linear Regression

The general formula utilized for a calibration line is:

$$y = a + bx$$

Where y = Dependent variable, such as concentration (ug/l)
x = Independent variable, such as peak area
a = A constant (y intercept)
b = Slope of the line

The formulas used to calculate this line are:

$$a = \bar{y} - b\bar{x}$$

and

$$b = \frac{\Sigma(x - \bar{x})(y - \bar{y})}{\Sigma(x - \bar{x})^2}$$

Where $\bar{x}$ = Mean of independent variables (peak areas) (See g below)
$\bar{y}$ = Mean of dependent variables (concentration) (See g below)
x = Same as above
y = Same as above

g. Mean Value, $\bar{x}$

$$\bar{x} = \frac{\Sigma x}{n}$$

Where x = Measurement value
n = Number of measurements

NOTE:

* - Indicates formulas also referenced in Section 11.

** - Used for charting precision (Refer to Section 11).

12.1.4 Data Entry into Computer or Paper Records Forms

Data entry into computer is accomplish by the laboratory support specialist.

12.2 Data Validation

Data validation is a two stage process. The data is initially reviewed by the analyst, then the data is validated and confirmed by the laboratory QA Officer. Careful review of data entries, calculations, and final results by the analyst is a requirement. Double checking of all data entered against computer printouts is essential to eliminate errors of transposition.

Upon completion, the lab supervisor must evaluate QC as well as sample data. Any suspected rogue analysis may be repeated at this time. Completed results are then placed in final report form.

12.2.1 Data Integrity

a. Laboratory Activities
   1. Raw data entries and calculations are confirmed by the analyzing chemists and checked by QA officer.
   2. Checking extraction logs confirmed by analyst and checked by QA officer.
   3. Checking instrument/analytical logs confirmed by analyst and checked by QA officer.
   4. Checking calibration integrity confirmed by analyst and checked by QA officer.
   5. Checking internal chain of custody; monitored by lab supervisor and QA officer.

b. Field Activities
   1. Checking raw data entries and calculation is monitored by lab supervisor and QA officer.
   2. Checking calibration integrity is monitored by lab supervisor and QA officer.
   3. Checking sample custody integrity is checked by QA officer.

12.2.2 Data Validation

a. Laboratory Activities
   1. **Chemist, Analyst.** Perform analytical run with appropriate QC protocol spike, duplicate, etc. Assure QC samples meet previously determined QC objective accuracy and precision.
   2. **QC Supervisor, Lab Supervisor.** Recheck analyst, chemist calculations on precision and accuracy targets, assuring correct protocol is followed.

b. Laboratory Control Checks
   1. Method Reagent Blank: Value must be less than method detection limit.
   2. Matrix Spike: Values must be within calculated accuracy values.
   3. Reagent Water or Reagent Matrix Spikes: ±10% of known values.
   4. QC Check Standards: ±10% of known value.
   5. Duplicate Sample or Duplicate Spike: Values must be within calculated precision values.
   6. Continuing Calibration Sample: Value must be ±10% of known value.
   7. Surrogate Spikes: Values must be within calculated precision and accuracy values.
   8. Internal Standards: Verify recovery within calculated accuracy values.
   9. Titration Solution Concentration Check: Agreement with standard solutions. Accuracy verified using calculated accuracy values.

c. Field Activities
  1. Sampling personnel conduct field measurements and sampling following appropriate QC practices. Laboratory supervisor or QA officer monitors performance of field QA system.
  2. Field Instrument QA Checks
    a) Temperature: Temperature probe is referenced to NBS certified thermometer before sampling event.
    b) Ph: Ph meter calibration in field utilizing a two buffer system. Ph 7.00 buffer is monitored between samples to assure minimal instrument drift.
    c) Conductivity: Conductivity solution of known value monitored before and after a sampling event. Response factors are calculated and probe reconditioned if factor falls outside .9 to 1.1.
  3. The QC of field parameters is assured by use of check standards and duplicate analysis during all sampling events.

d. Project Data Validation

Project data is reviewed by QA officer and laboratory supervisor. The review involves inspection of documentation of sampling and laboratory analysis. Checks are made that appropriate chain of custody procedures are documented and adequate field entries have been maintained in the field notebook. Laboratory and field analytical data is reviewed assuring proper analytical QC data has been completed. Laboratory and field analytical data is also gleaned assuring erroneous entries of rogue data are eliminated.

12.3 Data Reporting:

Reports are generated by the laboratory support specialist. The laboratory support specialist is responsible for all data entered into the report format. Reports are generated only after the data has been given final approval by the QA Officer. Figure 12-2 is an example of a PEL Final Report. After the final reports are generated, the reports are reviewed by the lab supervisor, final signatures are attached, and the report is distributed to the client.

Data for specific projects can be easily retrieved within the LIMS. If requested, QA Reports detailing precision and accuracy values can be delivered within the data package. Reports can also be presented in a disk deliverable format. Figure 12-3 gives examples of Progress Environmental Laboratories' QA Summary Reports.

12.4 Data Storage

Raw data in the form of strip charts, computer printouts, chromatograms, and laboratory notebook entries are stored in batch analysis worksheet files. Photocopies of all final reports are also stored in batch files. The files are maintained in the laboratory supervisor's office. These files are maintained for a period of three to five years. Archived records are indexed and accessed via the LIMS system. Via the LIMS system, a client, specific project, or ID number can be accessed and retrieved. Once accessed, all client information, test information, and raw data associated with each sample is retrieved. Data from the LIMS system also references the hard copies of the raw data, final reports, etc. making it easy to retrieve all information associated with a specific project. Backups of the LIMS system are conducted daily on magnetic tape. Computer files in the form of magnetic backup copies of analysis worksheets and final reports are stored indefinately. The magnetic tape storage system is located at the laboratory support specialist's work area. Weekly magnetic tape backups are stored in the St. Petersburg corporate office. This feature allows for data protection in the event of fire, etc..

FIGURE 12-1

- PEL Flow Chart for Laboratory Data -

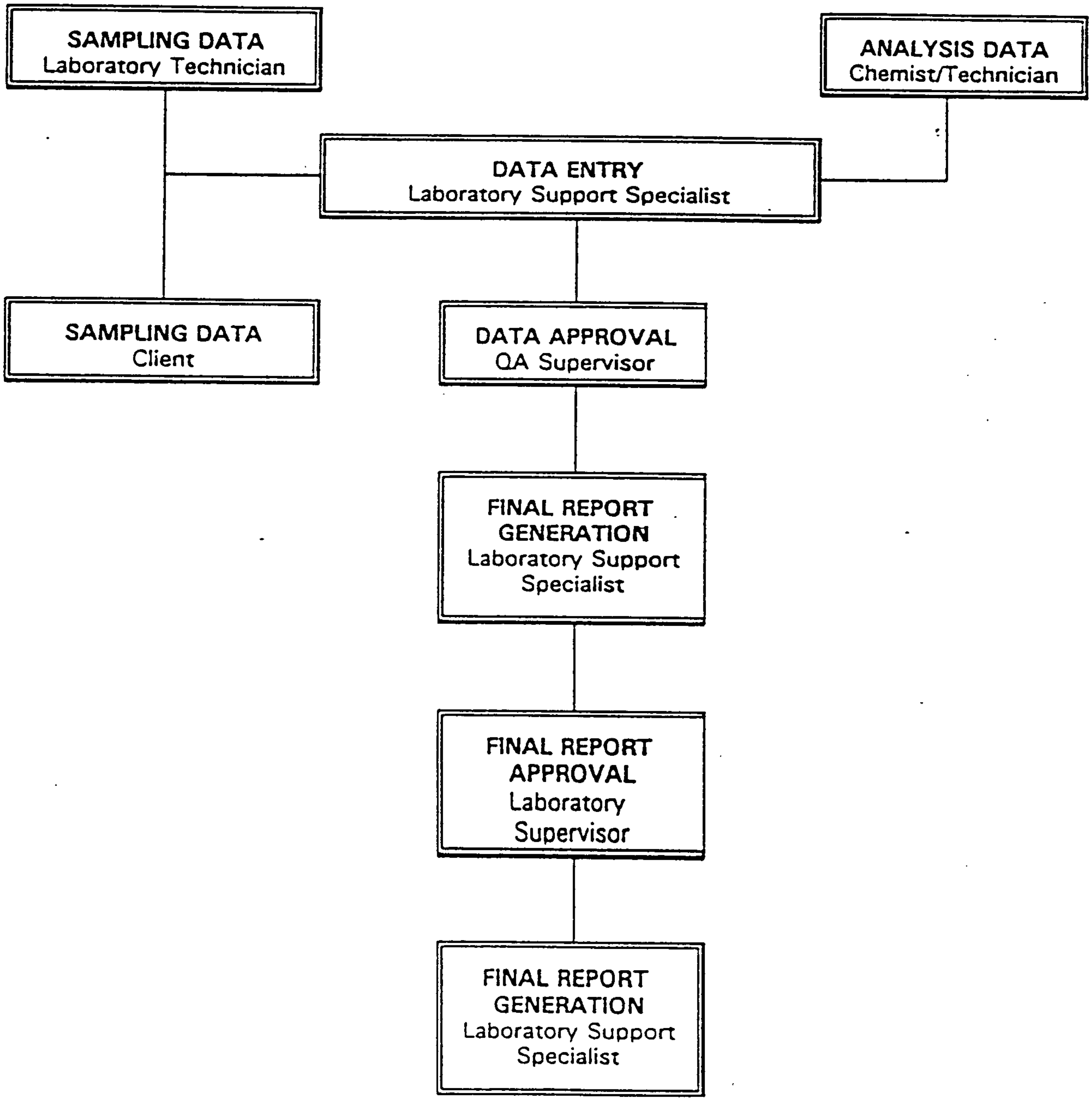


FIGURE 12-2

PEL Final Report

Progress Environmental Laboratories
4420 Pendola Point Road
Tampa, Florida 33619
(813) 247-2805
FAX: (813) 248-1537

- SAMPLE ANALYSIS REPORT -

To: Environmental Systems Management, Inc.
6513 King Palm Way
Apollo Beach Fl 33572

Attn: Thomas A. Brislin

PEL ID # : 501191
Customer ID : Yates Dry Cleaning
Sample Matrix : soil
Location : Northeast Corner

Report Date: 02/01/92
Sample Date: 02/03/92
Sampled By : T.B.
Time : 8:30am

lab#	Parameter	Method	Result	
501191	Benzene	EPA 8020	47.10	ug/kg
	Toluene	EPA 8020	51.65	ug/kg
	Chlorobenzene	EPA 8020	U 18.77	ug/kg
	Ethylbenzene	EPA 8020	U 3.57	ug/kg
	1,3-Dichlorobenzene	EPA 8020	U 1.34	ug/kg
	1,4-Dichlorobenzene	EPA 8020	U 1.34	ug/kg
	1,2-Dichlorobenzene	EPA 8020	U 2.68	ug/kg
	o-Xylene	EPA 8020	126.54	ug/kg
	m,p-Xylene	EPA 8020	29.54	ug/kg
	Total Xylene	EPA 8020	156.08	ug/kg
	MTBE	EPA 8020	578.46	ug/kg

U =Results less than stated value.
HRS#E84207, FDER ComQap #900306G
Approved By: Vincent M. Giampa, Signature of Approval: Vincent M. Giampa

A Florida Progress Company

FIGURE 12-3

PEL QA Summary Reports

Progress Environmental Laboratories

4420 Pendola Point Road
Tampa, Florida 33619
(813) 247-2805
FAX: (813) 248-1537

- QUALITY CONTROL REPORT -

To: Collier Mosquito Control District
P.O. Box 7069
Naples, FL 33941

Attn: Don Hogan

PEL ID #	: 501133	Report Date:	01/17/92
Customer ID	: QC Spike #501122	Sample Date:	
Sample Matrix	:	Sampled By :	
Location	:	Time :	

lab#	Parameter	Method	% Accuracy
501133	Benzene	EPA 602	81.6
	Toluene	EPA 602	80.8
	Chlorobenzene	EPA 602	83.4
	Ethylbenzene	EPA 602	82.7
	1,3-Dichlorobenzene	EPA 602	87.9
	1,4-Dichlorobenzene	EPA 602	79.8
	1,2-Dichlorobenzene	EPA 602	86.0
	o-Xylene	EPA 602	74.1
	m,p-Xylene	EPA 602	84.0
	Total Xylene	EPA 602	79.0
	MTBE	EPA 602	87.3

U =Results less than stated value.
HRS#E84207, FDER ComQap #900306G
Approved By: Vincent M. Giampa, Signature of Approval: Vincent M Giampa

FIGURE 12-3 Continued

Progress Environmental Laboratories
4420 Pendola Point Road
Tampa, Florida 33619
(813) 247-2805
FAX: (813) 248-1537

- QUALITY CONTROL REPORT -

To: Collier Mosquito Control District
P.O. Box 7069
Naples, FL 33941

Attn: Don Hogan

PEL ID #	: 501134	Report Date:	01/17/92
Customer ID	: QC Spike/Duplicate	Sample Date:	
Sample Matrix	:	Sampled By	:
Location	:	Time	:

Lab#	Parameter	Method	%diff
501134	Dichlorofluoromethane	EPA 601	7.3
	Chloromethane	EPA 601	6.6
	Vinyle Chloride	EPA 601	11.3
	Bromomethane	EPA 601	0.3
	Chloroethane	EPA 601	6.3
	Trichlorofluoromethane	EPA 601	5.6
	1,1-dichloroethene	EPA 601	3.6
	Methylene Chloride	EPA 601	1.4
	trans-1-2-dichloroethene	EPA 601	2.5
	1,1-Dichloroethane	EPA 601	1.1
	Chloroform	EPA 601	6.5
	1,1,1-trichloroethane	EPA 601	10.1
	Carbontetrachloride	EPA 601	10.0
	1,2-Dichloroethane	EPA 601	0.3
	Trichloroethene	EPA 601	6.4
	1,2-Dichloropropane	EPA 601	2.0
	Bromodichloromethane	EPA 601	6.4
	2-Chloroethylvinylether	EPA 601	0.5
	cis-1,3-dichloropropene	EPA 601	1.3
	trans-1,3-dichloropropene	EPA 601	0.5
	1,1,2-trichloroethane	EPA 601	0.4
	tetrachloroethene	EPA 601	11.3
	dibromochloromethane	EPA 601	0.9

U =Results less than stated value.
HRS#E84207, FDER ComQap #900306G
Approved By: Vincent M. Giampa, Signature of Approval:

A Florida Progress Company

FIGURE 12-3 Continued

Progress Environmental Laboratories
4420 Pendola Point Road
Tampa, Florida 33619
(813) 247-2805
FAX: (813) 248-1537

- QUALITY CONTROL REPORT -

To: Standard Lab
2315 Glenview Drive
Evansville, IN 47720

Attn: Toni Eagleson

PEL ID # : 501230
Customer ID : 40 Check Standard
Sample Matrix :
Location :

Report Date: 02/13/92
Sample Date:
Sampled By :
Time :

lab#	Parameter	Result		Standard
501230	Naphthalene	37.71	ug/ml	40.00
	2-Methyl naphthalene	37.40	ug/ml	40.00
	1-Methyl naphthalene	37.45	ug/ml	40.00
	Acenaphthylene	36.33	ug/ml	40.00
	Acenaphthene	37.03	ug/ml	40.00
	Fluorene	36.96	ug/ml	40.00
	Phenanthrene	38.32	ug/ml	40.00
	Anthracene	37.35	ug/ml	40.00
	Fluoranthene	39.33	ug/ml	40.00
	Pyrene	39.51	ug/ml	40.00
	Benzo(a)Anthracene	38.04	ug/ml	40.00
	Chrysene	38.27	ug/ml	40.00
	Benzo(b)Fluoranthene	37.67	ug/ml	40.00
	Benzo(k)Fluoranthene	37.42	ug/ml	40.00
	Benzo(a)pyrene	37.61	ug/ml	40.00
	Indeno(123)pyrene	37.92	ug/ml	40.00
	Dibenzo(a,h)Anthracene	36.97	ug/ml	40.00
	Benzo(ghi)Perylene	37.57	ug/ml	40.00

U =Results less than stated value.
HRS#E84207, FDER ComQap #900306G
Approved By: Vincent M. Giampa, Signature of Approval:

13.0 CORRECTIVE ACTION

13.1 The following table describes typical corrective actions which are undertaken on metals, inorganic, and organic tests. The methods include their individual QC practices.

TABLE 13-1

CORRECTIVE ACTIONS

QC Activity	Acceptance Criteria	Recommended Corrective Action
Instrument Blank and Reagent Blank	Response <MDL	Recheck blank. Prepare another blank. If same response, check reagents, glassware, or for equipment failure.
Calibration Standards and QC Check Standards	Coefficient of variation less than acceptable value, or standard value ±10% of expected value	Reanalyze standards. If still unacceptable, remake standards.
Secondary Standard	±10% of expected value	Reanalyze. If still unacceptable, remake all standards.
Continuing Calibration Standard	±10% of expected value	Reanalyze. If still unacceptable, recalibrate and rerun samples from last CC standard check.
QC Spike (Matrix Spike)	Inside warning limits	Investigate source of problem.
	Inside control limits	Repeat analysis. If still unacceptable, redigest sample or reanalyze.
QC Duplicate (Duplicate Samples or Matrix Spike Duplicates)	Inside warning limits	Investigate source of problem.
	Inside control limits	Repeat analysis. If still unacceptable, redigest sample set.
Quarterly Round Robin and QC Check Samples	Within warning and control limits	Evaluate round robin results and investigate the problem.
Semi-annual USEPA "WP" Samples	Within warning and control limits	Evaluate results and investigate the problem.
Blind QC Samples (spikes & duplicates)	Within warning and control limits	Evaluate results and investigate the problem.

13.2 Responsibility

At PEL, the analyst is typically responsible for corrective actions associated with the analysis of a sample batch for a given parameter. The analyst must collect and log data, initialize entries, and verify QC acceptance criteria. If criteria are not met the QA supervisor (lab supervisor) is consulted prior to redigestion of sample sets, purchase of new standards, or troubleshooting of equipment. The QA supervisor (lab supervisor) determines the probable source of the problem and a course of action.

Once sample sets are completed they are turned in to the QA officer. Entries, calculations, and QC checks are verified by the QA officer and results are put into final report form.

13.3 Specific Corrective Action

a. Recalibration. This performed whenever standard curves obtained in the calibration process do not exhibit a coefficient of variation indicating adequate linearity (typically 0.99) or when secondary standards do not fall within 10% of their expected value. The necessity to recalibrate is not necessarily indicative of equipment malfunction as instrument drift may also occur.

b. Rerun of QC Samples (spikes, duplicates, CCS, blanks). Prior to undertaking further corrective actions such as recalibration, remaking of standards, redigestion of samples, or troubleshooting of equipment, the sample in question should be reanalyzed (if possible) to verify a problem exists which warrants further action.

c. Remaking of Calibration and Check Standards. In the event the QC check standard, continuing calibration standards, or general calibration curve do not meet acceptance criteria, the standards should be remade and reanalyzed. If performance is still unacceptable, new standards should be obtained.

d. Redigestion of Samples. If problems with digestion blanks, QC spikes, or duplicates cannot be resolved by reanalyzing the samples or recalibration then it may be necessary to completely redigest all the samples, duplicates, spikes, and blanks. Prior to this, all reagents including DI water should be checked for possible contamination.

e. Rerun of Samples. All samples which are effected by unacceptable QC acceptance criteria (duplicates, spikes, blanks, or CCS) should be rerun. If redigestion of samples is necessary, then original samples should be considered invalid.

f. Correction Action for Control Charts.

   1. Control Limits: If one measurement exceeds a Control Limit (CL), repeat the analysis immediately. If the repeat is within the CL, then continue the analysis; if it exceeds the CL, then discontinue the analysis and correct the problem.
   2. Warning Limits: If two out of three sucessive points exceed a Warning Limit (WL), analyze another sample. If the next point is less than the WL, then continue analysis; if the next point exceeds the WL, discontinue analysis and correct the problem.
   3. Standard Deviation: If four out of five successive points exceed one standard deviation or are in decreasing or increasing order, then analyze another sample. If the next point is less than one standard deviation or changes the order, continue with the analysis, otherwise, discontinue the analysis and correct the problem.
   4. Central Line: If six successive samples are above the central line, then analyze another sample. If the next point is below the central line, then continue with the analysis; if the next point is on the same side, then discontinue the analysis and correct the problem.

13.4 External Sources

PEL's participation in both mandatory (USEPA) and non-mandatory Round Robin programs and split samples provide information of our status relative to other laboratories. Any result which is outside warning or control limits established in the Round Robin programs will trigger investigation into the reasons for discrepancy. Specifically, the documentation with respect to the sample run is reviewed first for calculation or human error. Second, the procedures are reviewed to insure adherence to our standard USEPA protocol. Third, new standards are obtained and checked against existing standard. If possible, another sample will be analyzed to check sample contamination.

Audits initiated by customers, FDER, or other sources may trigger corrective action.

13.5 Notification Procedures

Typically, at PEL it is the analyst who detects most routine problems requiring corrective action. The majority of corrective actions (recalibration, new standards, etc.) are routinely undertaken by the experienced analyst.

If a problem is detected by the QA officer, the problem is marked on the sample batch sheets and returned to the analyst with instructions.

Any problem which is detected by the QA officer which may have impact on results or analysis times on a project will require notification of the project manager in writing, outlining the problem and any effected results.

The procedure to notify laboratory personnel of problems and corrective action required are outlined in the Corrective Action Report. The corrective action report provides a hard copy of the procedures undertaken for the correction of analytical problems.

It is important to note that the Corrective Action Report will be used for analytical problems that are reoccurring. The Corrective Action Report provides formal documentation on problems which are inherent within an analytical system. Examples of problems which would require corrective actions are:

1. Reagent Contamination
2. Biased equipment repair problem
3. Standard inconsistancies (ie. Calibration standard quality)
4. Inadequate training of personnel

Refer to Figure 13-1 for an example of PEL's Corrective Action Report.

13.6 DER Recommended Corrective Actions

PEL shall immediately initiate any corrective actions which are recommended by DER, HRS or USEPA as a result of audits, split samples, or data validation review. In the unlikely event of a conflict in policies, the respective agencies will be notified, advised of the conflict, and guidance requested if necessary.

FIGURE 13-1

CORRECTIVE ACTION REPORT (C.A.R.)

Date Prepared:____________________
Analysis:____________________
Date of Analysis:____________________
Department Manager:____________________

Sample ID:____________
SL Project ID:____________
Analyst:____________
Project Manager:____________

Description of Nonconformance/Condition:____________________

Corrective Action Implemented:____________________

QA Manager's Initials:____________________

Date of Approval:____________

NOTE: Copies of this report should be filed in the Laboratory Corrective Action Notebook.

14.0 PERFORMANCE AND SYSTEMS AUDITS

Performance and systems audits are routinely performed to review procedures and equipment and the accuracy of the measuring system. Performance and systems audits are conducted by the laboratory QA Officer.

Figures 14-1 and 14-2 are examples of the forms utilized for the conduction of system audits. Audits are separated into field and laboratory sections. Both field and laboratory audits are conducted on a quarterly basis.

14.1 Systems Audits

14.1.1 Internal Systems Audits

Systems audits are conducted annually to review the components associated with the measurement and sample collection systems. Proper selection and use is stressed. These may take several forms including the following:

a. Training of employees. When a new employee is trained, knowledge and ability to perform the test or sampling is reviewed.
b. Start-up audit. When a new analyst is trained, or a new test is set up, the procedure is reviewed and procedures distributed for the test. The audit may include known samples which are used to familiarize the analyst with the procedure and its sensitivities. Results are reviewed with the analyst and QA officer.
c. Audits due to corrective action. The most frequently used audit is as a result of the need to review a test or analysis for potential problems due to a routine unacceptable QC result. While very limited in scope, the system is thoroughly reviewed in that particular area. These are conducted as required.
d. Internal PEL audit. The QA officer is responsible for a full audit of the laboratory and field practices on a yearly basis. Specific areas of deficiencies are addressed to the appropriate analyst or supervisor responsible for that immediate test or area. This audit also serves as the basis for updating this QA plan. A checklist is not completed at this time (5/91).

Each component in field and lab should be reviewed, including elements of decontamination, sample log-in, cleaning procedures, field measurements, documentation, chain of custody protocols, sample preparation, standards traceability, calibration procedures, current MDL's and other parameters.

Each component should be checked against approved procedures, methods, and the PEL QA Plan. A list of deficiencies should be developed that are to be corrected or improved.

14.1.2 External Systems Audits

Audits may be conducted upon request by our customers, or county, state or federal agencies. The DER or HRS audits are typically conducted annually. The QA officer is responsible for initiating corrective actions immediately upon the request of DER or HRS.

14.2 Performance Audits

Accuracy of measurements is audited by means of performance audits. These are conducted both in the field and laboratory. These are available internally and externally.

14.2.1 Internal Performance Audits

Internal audits may take several forms. These are performed at least semi-annually in the laboratory. The following checks are initiated by the QA officer.

a. **Blind Samples.** The QA officer includes a prepared sample in the analyst's batch to ascertain the accuracy. Only the QA officer is aware of the "known" results.
b. **Blind Spike Samples.** Field spikes for metals are accomplished by placing a known amount of analyte into a sample bottle containing HNO_3 preservative. The bottle is treated as a duplicate sample in the field. This is accomplished on an anual basis. Only metals are of interest. This is a non-mandatory QA practice.
c. **QC Samples.** Known samples may be submitted to the analyst as normal samples by the QA officer. This may be an NBS Standard water sample, USEPA sample or an APG Round Robin sample. Other QC samples may be typical duplicate and spiked samples. The analyst is aware of expected results of normal duplicates and spikes.

Results of performance audits are maintained in the laboratory supervisor's office. Corrective Action Reports resulting from audits are also maintained at this location.

14.2.2 External Performance Audits

The following performance checks are based on external programs:

a. **Split Samples.** Samples split with another laboratory can provide assurances of accuracy. This procedure is deemed of marginal statistical value, however, serves as a "sanity" check until sufficient data is obtained.
b. **Round Robins.** PEL participates in a quarterly Round Robin program (APG). These results are based on a large number of participants and offer more detailed statistical information.
c. **Performance Evaluation Samples.** USEPA (WP) performance samples are analyzed semiannually. These provide also a large base from which to generate statistical information. These results are evaluated by the state agencies and any corrective actions are noted at time of receipt of data at PEL.
d. **USEPA Performance Samples.** USEPA known samples or commercially available knowns which may be substituted due to availability. These are the responsibility of the analyst. These samples are an extra check of calibration integrity.

PEL is subject to on-site audits by customers, HRS and the FDER on request. Typically, HRS audits are annual.

Results of performance audits are maintained in the laboratory supervisor's office. Corrective Action Reports resulting from audits are also maintained at this location.

FIGURE 14-1

LABORATORY AUDIT

Laboratory Audit Check List:

I. Sample Recieving:

Has the appropriate chain of custody protocol been followed? Yes/No

Comments ____

Has the condition of the samples upon arrival been documented? Yes/No

Comments ____

Has the proper preservation protocol been documented? Yes/No

Comments ____

Has the sampling location and ID information been properly recorded? Yes/No

Comments ____

Has the laboratory sample storage location been properly recorded? Yes/No

Comments ____

Has the refrigerated area been properly monitoreed for temperature control? Yes/No

Comments ____

Are volatile samples stored in a separate refrigerator? Yes/No

Comments ____

Have sensitive dates "holding times" been made available to the sample preparation personnel? Yes/No

Comments ____

Have sensitive dates "holding times" been made available to the analytical personnel? Yes/No

Comments ____

Are the samples stored in a contaminant free environment? Yes/No

Comments ____

FIGURE 14-1 (Continued)

Are the appropriate sample preparation techniques selected by the sample preparation personnel? Yes/No

Comments______________________________

Is the appropriate glassware washing protocol being adhered to? Yes/No

Comments______________________________

Are sample weights and sample volumes properly recorded? Yes/No

Comments______________________________

Have analytical balances been inspected semi-annually? Yes/No

Comments______________________________

Are Class S weights used to verify balance accuracy? Yes/No

Comments______________________________

Are digestion/extraction blanks prepared in conjunction with the samples? Yes/No

Comments______________________________

Are check digestion standards prepared with the digestion batch? (for metals analysis) Yes/No

Comments______________________________

Are adequate documentation maintained recording all phases of the digestion extraction procedures? Yes/No

Comments______________________________

Are temperatures of all water baths monitored and checked for accuracy? Yes/No

Comments______________________________

Are temperatures of ovens monitored and checked for accuracy? Yes/No

Comments______________________________

Are surrogates added to the samples prior to extraction? Yes/No

Comments______________________________

Are the addition of surrogates and internal standards recorded in the analyst notebook? Yes/No

Comments______________________________

FIGURE 14-1 (Continued)

Once samples are completed, are the sample bottles properly labeled?	Yes/No
Comments______________________________	
If samples are not immediately run after preperation, are they properly stored until the time of analysis?	Yes/No
Comments______________________________	
Are all reagents used for standard verification and standard preparation documented for traceability and age?	Yes/No
Comments______________________________	
Are appropriate techniques utilized for the making of analytical standards?	Yes/No
Comments______________________________	
Are method protocols being adhered to for calibration verification?	Yes/No
Comments______________________________	
Is the appropriate frequency of spikes and duplicates being analyzed?	Yes/No
Comments______________________________	
Is the raw data generated being initialed by the analyst?	Yes/No
Comments______________________________	
Is the final data being recorded on the analysis worksheets in a form that can be easily understood for data entry?	Yes/No
Comments______________________________	
Are QC values being properly recorded on the analysis worksheet?	Yes/No
Comments______________________________	
If QC values are found to be out of specification, is the analyst taking appropriate steps for the correction of the problem?	Yes/No
Comments______________________________	
When samples are not being manipulated for analysis, are they stored in refrigeration?	Yes/No
Comments______________________________	

FIGURE 14-1 (Continued)

When results are presented for data entry and approval, is the data package complete? (ie. raw data, calculations, chromatograms, laboratory notebook pages, computer printouts, etc.) Yes/No

Comments____

Is the data being entered into the LIMS accurately? Yes/No

Comments____

Are there redundant QC checks assuring data entry integrity? Yes/No

Comments____

Are the appropriate signatures attached to the analysis run logs during the data entry and the review process? Yes/No

Comments____

Are Q.C values, spikes, duplicates, and controls properly entered into the data system? Yes/No

Comments____

Is the data being checked for completeness and accuracy during all phases of the data approval process? Yes/No

Comments____

Once data has been approved, is the raw data properly filed and labelled according to analysis run numbers for easy reference? Yes/No

Comments____

Do the final reports contain all the pertinant information pertinant to the sample? Yes/No

Comments____

Are final reports signed by the laboratory suoervisor? Yes/No

Comments____

Once samples are completed, are they stored in the done sample storage area? Yes/No

Comments____

FIGURE 14-1 (Continued)

Is the transfer of samples from the active storage area to the done sample storage area documented?	Yes/No

Comments____

Are samples segregated for disposal based on thier hazard classification?	Yes/No

Comments____

Are the appropriate records maintained documenting time and date and method of sample disposal?	Yes/No

Comments____

FIGURE 14-2

FIELD PERFORMANCE AUDIT

SECTION 1 - GENERAL PROCEDURES - SAFETY, RECORDS, QA/QC, CUSTODY, ETC.

1) Type samples collected?____________________________

2) Were sampling locations properly selected? Yes____ No____

Comments____________________________________

3) Were sampling locations adequately documented in a bound field log book using indelible ink? Yes____ No____

Comments____________________________________

4) Were photos taken and a photolog maintained? Yes____ No____

5) What field instruments were used during this study?____________

____

____

6) Were field instruments properly calibrated and calibrations recorded in a bound field log book? Yes____ No____

Comments____________________________________

7) Was sampling equipment properly wrapped and protected from possible contamination prior to sample collection? Yes____ No____

Comments____________________________________

8) Was sampling equipment constructed of Teflon®, glass, or stainless steel?

____

9) Were samples collected in proper order? (least suspected contamination to most contaminated?) Yes____ No____

Comments____________________________________

10) Were clean disposable latex or vinyl gloves worn during sampling? Yes____ No____

Comments____________________________________

11) Were gloves changed for each sample station? Yes____ No____

Comments____________________________________

FIGURE 14-2 (Continued)

12) Was any equipment field cleaned? Yes____ No____

13) Type of equipment cleaned?________________________________

14) Were proper field cleaning procedures used? Yes____ No____

Comments____

15) Were equipment rinse blanks collected after field cleaning?
Yes____ No____

Comments____

16) Were proper sample containers used for samples? Yes____ No____

Comments____

17) Were split samples offered to the facility owner or his representative?
Yes____ No____

Comments____

18) Was a receipt for samples form given to facility representative?
Yes____ No____

19) Were any duplicate samples collected? Yes____ No____

Comments____

20) Were samples properly field preserved? Yes____ No____

Comments____

21) Were preservative blanks utilized? Yes____ No____

Comments____

22) Were field and/or trip blanks utilized? Yes____ No____

Comments____

23) Were samples adequately identified with labels or tags? Yes___ No___

Comments____

24) Were samples sealed with custody seals after collection? Yes___ No___

Comments____

FIGURE 14-2 (Continued)

25) What security measures were taken to insure custody of the samples after collection?

____

26) Were chain-of-custody and receipt for samples forms properly completed? Yes____ No____

Comments______________________________

27) Were any samples shipped to a laboratory? Yes____ No____

28) If yes to No. 27, were samples properly packed? Yes____ No____

Comments______________________________

29) What safety monitoring equipment, protection, and procedures were used prior to and during sampling?______________________________

____

30) Was safety monitoring equipment properly calibrated and calibrations recorded in a bound field log book? Yes____ No____

Comments______________________________

SECTION 2 - SAMPLING - GROUND WATER WELLS

1) Type of wells sampled? (monitoring, potable, industrial,etc.)_______

____

2) Were wells locked and protected? Yes____ No____

Comments______________________________

3) Were identification marks and measurement points affixed to the wells? Yes____ No____

Comments______________________________

4) What were the sizes and construction materials of the well casings?

____

5) Were the boreholes sealed with a concrete pad to prevent surface infiltration? Yes____ No____

Comments______________________________

6) Was there a dedicated pump in the well? Yes____ No____

FIGURE 14-2 (Continued)

7) Was clean plastic sheeting placed around the wells to prevent contamination of sampling equipment and containers? Yes____ No____

8) Were total depths and depths to water determined before purging?
Yes____ No____

9) What device was used to determine depths?____________________

10) Were measurements made to the nearest 0.01 ft? Yes____ No____

11) Was the measuring device properly cleaned between wells?
Yes____ No____

Comments____

12) Was the standing water volume in each well determined?
Yes____ No____

13) How was the volume determined?___________________________

14) Was a sufficient volume purged prior to sampling? Yes____ No____

Comments____

15) How many volumes?____________________________________

16) How was the purged volume measured?________________________

17) What was the method of purging?___________________________

____

18) Were pH, conductivity, and temperature measurements taken and recorded at least once during each well volume purged? Yes____ No____

Comments____

19) Were pH, conductivity, and temperature readings stable prior to sampling? Yes____ No____

Comments____

20) How many wells were sampled?_____Upgradient?____Downgradient?_____

21) How were the samples collected? Bailer_____Pump_____Other_____

Comments____

22) If pump was used, what type?_____________________________

FIGURE 14-2 (Continued)

23) If a pump was used, was it properly cleaned before and/or between wells?
Yes____ No____

Comments____________________________________

24) What were the cleaning procedures?______________________

____

25) Did bailers have Teflon® coated wire leaders to prevent rope from coming into contact with water? Yes____ No____

26) Were bailers open or closed top?______________________

27) Was a clean bailer and new rope used at each well? Yes____ No____

Comments____________________________________

28) Were samples properly transferred from the sampling device to the sample containers? (i.e., purgeable sample first - not aerated, etc.)
Yes____ No____

Comments____________________________________

29) Was pH of preserved samples checked to insure proper preservation?
Yes____ No____

Comments____________________________________

30) Were samples iced immediately after collection? Yes____ No____

31) For what analyses were the samples collected?________________

________________________ ________________

32) If samples were split, what were the sample/station numbers for these?

____

____

Other comments or observations________________________

____

____

____

FIGURE 14-2 (Continued)

SECTION 3 - SAMPLING - SOIL, SEDIMENT, SLUDGE, ETC. (Non-containerized)

1) Type of samples collected?________________________

2) General description of samples?______________________

____

3) How many samples were collected?______________________

4) Were background and/or control samples collected? Yes____ No____

Comments___________________________________

5) Were representative samples collected? Yes____ No____

Comments___________________________________

6) Were grab or composite samples collected?_________________

7) Were composite samples areal or vertical?_________________

8) How many aliquots were taken for the composite sample?__________

9) What procedures and equipment were used to collect samples?_______

____

____

10) Were samples thoroughly mixed prior to putting them into the sample containers? Yes____ No____

Comments___________________________________

11) Were samples properly placed into sample containers? Yes____ No____

Comments___________________________________

12) Were samples iced immediately after collection? Yes____ No____

13) For what analyses were the samples collected?_______________

14) If samples were split, what were the sample/station numbers for these?

____

15) Was a drilling rig, back hoe, etc., used to collect soil samples? ____

16) Were the drilling rig(s), backhoe(s), etc., properly cleaned according

to the ESD SOP, Appendix B, prior to arriving on site? Yes____ No____

Comments ____

17) What was the condition of the drilling and sampling equipment when it arrived on site?____

____

18) Was a decontamination area located where the cleaning activities would not cross-contaminate clean and/or drying equipment? Yes____ No____

Comments____

19) Was clean equipment properly wrapped and stored in a clean area? Yes____ No____

Comments____

20) Was the drilling rig(s) properly cleaned between well borings? Yes____ No____

Comments____

21) Were the cleaning and decontamination procedures conducted in accordance with the ESD SOP? Yes____ No____

Comments____

22) Other comments or observations______________________________

____

____

SECTION 4 - SAMPLING - SURFACE WATER (Pond, Stream, River, Leachate, Etc.)

1) Type of samples collected?______________________________

2) General description of samples?______________________________

3) How many samples were collected?______________________________

4) Were background and/or control samples collected? Yes____ No____

Comments____

5) Were grab or composite samples collected?______________________

6) How many aliquots were taken for the composite sample?____________

FIGURE 14-2 (Continued)

7) What procedures and equipment were used to collect the samples?

____

____

8) Were samples collected directly into sample containers? Yes___ No___

Comments____

9) Did the sampler wade in the stream to collect the samples? Yes___ No__

Comments____

10) Were the samples collected upstream from the sampler? Yes____ No____

Comments____

11) Did the sampler insure that roiled sediments were not collected along with the water samples? Yes____ No____

Comments____

12) Were representative samples collected? Yes____ No____

Comments____

13) Was the pH of preserved samples checked to insure proper preservation? Yes____ No____

Comments____

14) Were samples iced immediately after collection? Yes____ No____

15) For what analyses were the samples collected?_________________

____

16) If samples were split, what were the sample/station numbers for these?

____

____

Other comments or observations__________________________

FIGURE 14-2 (Continued)

SECTION 5 - OTHER SAMPLING - DRUMS, TANKS, BARRELS, ETC. (Containerized)

1) Type of samples collected? (Oil, sludge, waste?)______________

____

2) Description of containers or sources sampled?________________

____

3) How many samples were collected?______________________

4) What type of equipment was used to collect the samples?__________

____

5) What procedures were used to collect the samples?______________

____

6) For what analyses were the samples collected?________________

____

7) If samples were split, what were the sample/station numbers for these?

____

____

____

8) Were any special safety measures taken during collection of the samples?

____

9) What level of safety protection was required for collection of the samples?

____

Other comments or observations________________________

____

____

____

____

15.0 QUALITY ASSURANCE REPORTS

For non-project specific operations, quarterly quality assurance reports are generated by the QA officer. These reports are distributed to PEL's manager, laboratory supervisor, and chemists. The quality control report consists of the following requirements:

1. One page execution summary of incomplete corrective actions which are more than one month old.
2. Summaries of external system audits and responses/corrective actions to the problems.
3. Reporting of external QA Samples such as quarterly round robin values and performance audits.
4. Summaries of internal system audits including corrective actions.
5. Recommendations for the incorporation of changes in the laboratory standard operating procedures.
6. Accuracy and Precision. At minimum, upon completion of each 20 QC duplicates and spikes, warning and control limits are updated. This function is performed by the analyst and approved by the QA Officer. New limits are incorporated immediately into the analyst's QC procedures.
7. Method detection limits. Method detection limits are updated on an annual basis. This is the responsibility of the analyst under the supervision of the QA Officer. Method detection limits for new procedures are initiated as soon as possible after start-up and verification of the method are accomplished.
8. Outcome of Corrective Active. The analyst and technical services manager are advised by the QA Officer by the report of major results of corrective actions, as required. The summary of these actions is included in annual updates.

15.1 Specific reports, prepared by the QA Officer, will be submitted to DER at a frequency in accordance with Table VI QA Report to the Department of Environmental Regulation DER QA-001/90, August 20, 1990, Section D, page 2 of 5, or as otherwise required under the specific project plan. The external QA Reports will be performed in accordance with DER QA-001/90, August 20, 1990, Section D. If no significant problems exist for a project, a letter will be sent to that effect in lieu of a QA Report.

PETER D. HAY

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Tampa, FL 33613

Home Phone (813) 961-2026 Business Phone (813) 824-6693

EDUCATION: Clarkson College of Technology, Potsdam, N.Y., B.S. Civil Engineering (1968)

University of South Florida, Tampa, FL, M.B.A. (1984)

EXPERIENCE:

1986 To Present **Progress Materials Inc., a Florida Progress Company**
St. Petersburg, Florida

President. Developing, commercializing, and managing activities related to utilization of coal combustion by-products.

Manager, Progress Environmental Laboratories. Management of an analytical laboratory testing groundwater, surface water, and soils.

1981 to 1986 **COMCO of America, Inc., a Florida Progress Company**
Tampa, Florida

Operations Manager. Constructed and operated the nation's largest and most successful coal oil mixture alternative fuel processing plant.

1978 to 1981 **Dravo Corporation**
Weeks Island SPR Site, Louisiana

Project Engineer and Project Manager. Responsible for engineering and construction activities for developing a 75 million barrel underground oil storage site for the DOE. Project won the AGC "Build America" award for the most dangerous and technically challenging project of 1979. Awarded Letter of Commendation by DOE.

1973 to 1978 **Dravo Corporation**
Bou Namoussa Irrigation Project, Algeria

Chief Field Engineer. Directed all field engineering activities for 25,000 acre project incorporating roads, canals, bridges, pipelines, pump stations and reservoirs.

1971 to 1973 **Dravo Corporation**
Newburgh Dam, Indiana

Chief Quality Control Engineer. Developed and directed all contractor's Q.C. program for a 250,000 cy concrete gravity dam on the Ohio River for the USCOE.

1969 to 1971 **U.S. Marine Corp**

Honorable discharge at rank of E-5.

1968 to 1971

Dravo Corporation
Jones Bluff Lock & Dam, Alabama

Field Engineer. Survey, design, cost, and scheduling activities. Performed final Q.C. check prior to each pour.

PROFESSIONAL MEMBERSHIPS

Professional Engineer - Pennsylvania

Professional Engineer - Louisiana

VINCENT M. GIAMPA

Progress Environmental Laboratories
4420 Pendola Point Road
Tampa, Florida 33619
(813) 247-2805

EDUCATION:

Edinboro State College, Edinboro, PA. B.S., Biology (1976)

Post Graduate Study: Environmental Engineering, 30 credits completed.

Currently enrolled MBA Program, University of Tampa.

EXPERIENCE:

1990 to Present

Progress Environmental Laboratories, a Florida Progress Company
Tampa, Florida

Laboratory Supervisor. Supervise the purchase, installation and start-up of all equipment and materials needed for establishing an environmental laboratory. Develop and implement a Comprehensive QC Plan. Train personnel. Install laboratory management software system. Supervise laboratory staff to ensure accurate, on-time, and cost-effective sampling and analytical operations.

1986 to 1990

Electric Fuels Corporation, a Florida Progress Company
Tampa, Florida

Laboratory Supervisor. Supervisory of laboratory personnel in the construction and development of fuels testing laboratory. Areas of activity include environmental monitoring, physical testing, sampling, sampling theory, fuel characterization and spectroscopy.

1981 to 1987

COMCO of America, Inc., a Florida Progress Company
Tampa, Florida

Technical Supervisor. Responsible for the quality assurance of coal and petroleum coke derived alternate fuels. Established Quality Control Lab and techniques enabling COMCO to produce two million barrels of coal-oil mixture without major contract disputes.

Developed mix designs which enabled COMCO to economically continue production in adverse fuel markets. Developed method for accurate volume/temperature relationships for coal-oil mixtures. This project allowed COMCO to gain $.5 million of lost revenue. Established research and development effort; projects include mineral recovery from fly ash and slurry fuels from wastes. Prepared environmental permits pertaining to COMCO's production facility. Interfaced with regulatory agencies to expedite permitting.

1979 to 1981

COMCO/Dravo Corporation
Pittsburgh, Pennsylvania

Engineering and Development Staff. Supervision of Pilot Plant operations during processing of experimental COM shipments, maintaining boiler, fluid mills, coal classifiers, purchasing materials, collecting and analyzing operation data.

Responsible for the analysis of samples obtained during production and testing.

1977 to 1979	**Dravo Corporation** Research Center Pittsburgh, Pennsylvania **Analytical Chemist.** Responsibilities included chemical and data analysis of samples pertaining to ongoing research projects, primarily coal, water and thiosorbic lime, by the use of ASTM and EPA wet methods.
1976 to 1977	**City of Cape Coral** Utilities Division Cape Coral, Florida **Laboratory Technician.** Conducted survey of Cape Coral area to determine the severity of chloride intrusion in the upper and lower Hawthorn Aquifer.

PATENTS:

Patent No. 4,762,527 - Improved Slurry Fuel Comprised of a Heat Treated, Partially Dewatered Sludge with a Particulate Solid Fuel and Method of Manufacture Thereof.

PUBLICATIONS:

International Coal Testing Conference, Proceedings of the 7th Conference, March 1989, "Coal Ash Analysis by Inductively Coupled Plasma".

Spectroscopy, March 1989, Vol. 4, No. 2. "Recent Advances in the Dissolution of Zeolites and Coal Ash for Flame AA and ICP Analyses."

Spectroscopy, February 1988, Vol. 3, No. 2. "A Novel Dissolution Technique for the Preparation of Coal Ash and Fly Ash for Analysis by Inductively Coupled Plasma Spectrometry."

Wilson Bulletin, March 1979. Research project concerning avian winter energetic in adverse environmental conditions and developed original method for the quantification of avian population.

PROFESSIONAL MEMBERSHIPS:

Alpha Chi Chapter of Beta National Biological Honor Society
ASTM

D. OLIVER MANSUR

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EDUCATION:

Central Connecticut State University, New Britain, CT. Bachelor of Arts-Biology; Minor: Philosophy, Chemistry, and English (1970).

Saint Joseph College, West Hartford, CT. Master of Arts - Chemistry. (1976)

West Coast University, Los Angeles, CA. Master of Science - Business Management. (1978)

EXPERIENCE:

September, 1991 to Present:	**Progress Environmental Laboratories; Tampa, Florida** (Chemist) Responsible for performing all phases of organic sample preparations and analysis. Organic analysis includes oil and grease, TRPH, EPA Methods 608/8080, 610/8100, and 625/8270. Technical Experience: Gas Chromatograph and Mass Spectrometer.
January to May, 1991:	**Davis Analytical Laboratory; Tallevast, Florida** (Director of Analytical Services). Responsible for Florida Certifications, EPA Methods compliance, QA/QC, Chain of Custody, Final Reports to clients, and direct marketing. Technical experience: Management of GC/MS, GC, and HPLC Methods compliance for organic chemistry.
June to December, 1990:	**P.E. LaMoreaux and Associates, Inc.; Lakeland, Florida** (Environmental Laboratory Director). Responsibilities same as above.
May, 1979 to May, 1990:	**Critikon (a Johnson & Johnson Company); Tampa, Florida** Responsible for Research and Developement Chemistry. Involved in materials and product development for medical devices, polymer analysis, analytical chemistry, and characterization of materials. •Technical Experience: Instron, Infrared (IR), ultraviolet-visible spectrum (UV-Vis), Gas Chromatography (GC), GC/Mass Spec. (GC/MS), Differential Scanning Calorimetry (DCS), Thermal Gravimetric Analysis (TGA), Atomic Absorption Spec. (AA), High Pressure Liquid Chromatography (HPLC), and Standard Methods. •Successfully implemented a customer service program to solve engineering and production problems. •Created a cardiovascular catheter test method for anticoagulant surfaces. •Budgeted for analytical chemistry laboratory. •Developed initial Critikon Quality Assurance Program Material, Test Specification, Standard Operating Procedures, and Methods Development.

October, 1977-March, 1979 **Jacobs Engineering P.J.B. Laboratory; Pasadena, CA**

Chemist-Special Projects Chemist for U.S. Government Projects and local industries.
•AA, GC, IR, UV-Vis., and Emission Spec. (ES).
•Instituted Quality Assurance Program for Environmental Protection Agency (EPA) priority pollutant trace analysis projects and instituted a lab safety program.

May, 1977-October, 1977 **Truesdail Laboratories, Inc.; Los Angeles, CA**
Chemist.
•Air pollution analysis on flue gas by GC and classical wet methods.
•Analysis of water and waste water by UV-Vis. and classical methods.
•Analysis of ore.

February, 1973-August, 1976 **The Minges Environmental Laboratory; Farmington, CT**
Environmental Chemist.
Biological and chemical analysis using: AA, UV-Vis, Column Chromatograph, complete microbiological assessment by indicator organisms, phycological (algea) taxonomy.
•Control and treatment of industrial effluents, field biology, and EPA biological impact statements.
•Conducted Pilot Plant for sewage treatment plant criteria for redesign.

Membership: Presently a member of the American Chemical Society and the American Association for the Advancement of Science.

Interests: Personal computing, jogging, swimming, and creative writing.

BRIAN SPANN

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Lutz, Florida 33549

Home Phone: (813) 265-8414 Business Phone: (813) 247-2805

EDUCATION: University of South Florida, Tampa, Florida, B.S., Chemistry (1990)

EXPERIENCE:

1992 to Present **Progress Environmental Laboratories, a Florida Progress Company**
Tampa, Florida

Chemist. Responsible for performing all phases of organic sample preparations and analysis. Organic analysis includes oil and grease, TRPH, EPA Methods 608/8080, 610/8100, and 625/8270. Technical Experience: Gas Chromatograph and Mass Spectrometer.

1990 to 1992 **Southern Analytical Labs, Oldsmar, Florida**

Organic Chemist. Supervised Semi-Volatile section of the Organic Department. Responsible for method calibration, extraction and chromatography of samples, data reduction, quality control and maintenance. Involved in preparation and maintenance of calibration standards, analysis of Organic Constituents in environmental matrices, and design and implementation of S.O.P.'s for various lab procedures.
*Technical Experience: Perkin Elmer Sigma 2000 series Gas chromatography, P.E. Nelson software, P.E. Series 780 Infrared Spectrometer.

1983 to Present **U.S. Air Force Reserves**

Staff Sergeant - Air Frame Repair Specialist.

- Supervised a dormitory of sixty to seventy Airman.
- Coordination, maintenance and compilation of data required for Security Clearance authorization.
- Completed NCO Supervisory Development course.
- Inspection and repair of aircraft components.
- Have maintained SECRET Security Clearance since 1983.
- Awarded highest possible position for student leader.
- Medal for Meritorious Service with one bronze cluster.
  Medal for Humanitarian Service.

APPENDIX E

ENVIRONMENTAL CONSULTING & TECHNOLOGY, INC.
FIELD DATA FORMS

ECT FIELD TRIP INFORMATION SHEET

PROJECT INFORMATION (Complete PRIOR to Field Trip)

roject & Task #: ____________________

lient & Project Name:

FIELD TRIP STARTING AND ENDING DATE AND TIME

Start Date: ____________________ End Date: ____________________

Start Time: ____________________ End Time: ____________________

LOCATION (Complete Prior to Field Trip)

Site Name: ____________________

Street Address (if applicable): ____________________

City or Town (if applicable): ____________________

County (optional) & State: ____________________ Postal Code: ____________________

Country (if not USA): ____________________

ECT PERSONNEL

Role	Name (Printed) (Enter names prior to field trip, if known)	Signed Initials	Date	
			Arrive	Depart
Team Leader				

NON-ECT PERSONS PRESENT

Name (Printed)	Affiliation	Arrive	Depart

COMMENTS

SIGNATURES (Sign PRIOR to Field Trip)

corded by: ____________________ Date: ____________________

viewed by: ____________________ Date: ____________________

ECT DAILY FIELD LOG

PROJECT INFORMATION

Project & Task #: Date:

DAY LOG

Time	Comments

SIGNATURES (Signed Initials)

Recorded by: Date:

Reviewed by: Date:

SITE SPECIFIC EQUIPMENT USE REPORT

PROJECT INFORMATION

EMPLOYEE NAME______________________________ REPORTING PERIOD ____________ to ____________
Saturday Friday

PROJECT NO.____________________ TASK__________ DEPT__________ ACT.CODE______ LOCATION______________________________

DATA

Date	Serial Number	Equipment Item	Item Code	No. of Units

SIGNATURES (Signed Initials)

EMPLOYEE SIGNATURE____________________________________ APPROVED BY:_______________ DATE:_______________

EQUIPUSE.WK4-08/04/94

ECT SOIL BORING LOG

Project & Task #:
Boring #:
Sheet of

Date:
Project Name/Description:

Contractor:
Drilling Method[1]: (Circle One) HSA SSA MR BA

Driller:
Drilling Rig:

Start:
Completed:

Surf. Elev: ft
Logged by:

SAMPLE TYPE	SAMPLE INT (ft)	DEPTH SCALE 1"=	DESCRIPTIONS OF MATERIALS AND CONDITIONS	CONTAMINANT OBSERVATION Instrument (Circle) OVA[2] PID Units: ppm (Corrected for background)	GENERAL OBSERVATION NOTES

Borehole Diameter (inches):
Well Installation (Circle One): Y or N
Abandonment Method (Circle One):
Backfill Grout N/A Other (Specify:)

Instrument ID #:

Challenge Time:			
Std. 1 (ppm):			
Std. 2 (ppm):			

[1] HSA-hollow stem auger SSA-solid stem auger
MR-mud rotary BA-bucket auger

[2] If OVA used, report readings as follows:
TOTAL - METHANE = PETROLEUM

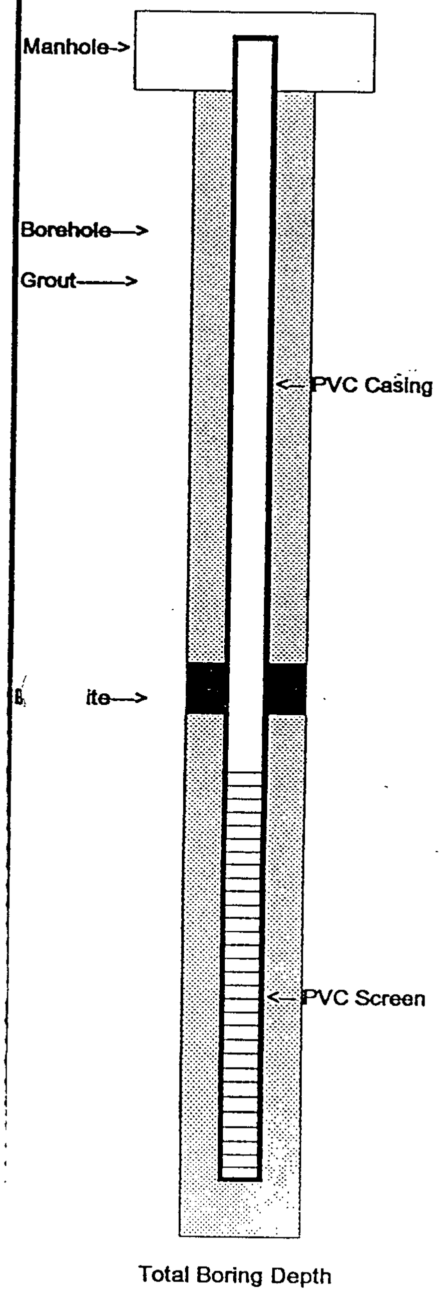
SIGNATURES (Signed Initials)

Recorded by: Date:
Reviewed by: Date:

ECT WELL CONSTRUCTION & DEVELOPMENT FORM

Project & Task #:	Date(s) of Installation:
ior Well No.:	Site Location:

Monitor Well Sketch



Construction Materials (Circle One or Fill In)

Manhole Diameter (in): 8 12 Vault (Dimensions): ____________

Pad Dimensions (ft X ft): 1.5 X 1.5 2 X 2 Other: ____________

Surface Casing Material: PVC Steel Other: ____________

Diameter of Surface Casing (in): ____________ Length of Casing (ft): ____________

Casing Material: Threaded PVC Threaded Steel Other: ____________

Screen Material: Threaded PVC Threaded Steel Other: ____________

Casing/Screen Diameter (in): 2 4 6 Other: ____________

Casing Length (ft): ____________ Screen Length (ft): ____________

Screen Slot Size (in) 0.010 0.020 Other: ____________

Backfill Used: Sand Cuttings Grout Thickness: ____________

Seal Installed: Y N Type: ____________ Thickness: ________

Filter Pack Size: 6-20 20-30 Other: ____________

Filter Pack Depth Interval (ft): ____________ to ____________

Depth of Monitor Well Boring (ft): ____________ (If different than well depth)

Borehole Diameter (in): ____________

Monitor Well Development Details

Development Method: Surge Pump Other: ____________

Pump type (if used): Centrifugal Submersible Other: ____________

Length (time) of well development: ____________ minutes hours (circle)

Initial Water Condition: ____________

Turbidity: ____________

Final Water Condition: ____________

Turbidity: ____________

Well pumping information: Steady flow rate Intermittent flow rate

Sustained flow rate: ____________ GPM

Recharge rate (optional): ____________ (ft/min)

General Notes or Comments

SIGNATURES (Signed Initials)

Reviewed By: Date:

ECT GROUNDWATER LEVEL DATA FORM

PROJECT INFORMATION

Project & Task #:

Date:

LEVEL DATA

Well #	Time ( )	Ref. Elevation ( )	Depth to GW ( )	GW Elevation ( )	Observations/Comments

SIGNED INITIALS

Measured by: ____________ Date: ____________

Recorded by: ____________ Date: ____________

Reviewed by: Date:

EQUIPMENT DESCRIPTION & DECONTAMINATION

Description ID or S/N: ____________

Decontaminate between wells? Y or N (Circle One)

Procedure 4.1.9.1 (Y or N) or other (describe):

GWWLLOG.WK4-08/04/94

ECT FIELD EQUIPME[illegible] CALIBRATION FORM

PROJECT INFORMATION

Project & Task #: Calibration Date:

CALIBRATION DATA

Instrument Description	ID # or Serial #	Parameter Description	Time	Standard (Y)	Reading (X)	Units	Comments

NIST Traceable Thermometer No. ____________________

Standard __________________ Lot No.__________ Exp. Date__________

Standard __________________ Lot No.__________ Exp. Date__________

Standard __________________ Lot No.__________ Exp. Date__________

Standard __________________ Lot No.__________ Exp. Date__________

Standard __________________ Lot No.__________ Exp. Date__________

Standard __________________ Lot No.__________ Exp. Date__________

Standard __________________ Lot No.__________ Exp. Date__________

Standard __________________ Lot No.__________ Exp. Date__________

SIGNATURES (Signed Initials)

Calibrated by: **Date:** **Reviewed by:** Date:

ECT WELL SAMPLING DATA FORM

PROJECT INFORMATION

Project & Task No. Date:

SAMPLING INFORMATION

Well Number: ____________________

Total Depth of Well (ft): ____________________

Depth to Water (ft): ____________________

Column of Water in Well: ____________________

Well Casing Diameter: ____________________

Volume of Water in Well: ____________________

Method of Purging (pump, bailer, etc.): ____________________

Pump Rate: ____________________

Bailer No.: ____________________

VOLUME/LINEAR FT. OF PIPE

I.D.(in)	Gal	Liter
2	0.163	0.618
4	0.663	2.47
6	1.47	5.56

FIELD PARAMETERS

Volume of Water to be Removed					
Time					
pH					
Conductivity					
Temperature					
Actual Volume of Water Removed					
Sediment/Turbidity					
Color		None / Natural Organic / Chemical Organic / Gasoline / Diesel (Oil) / Other			
Odor					

Method of Determining Purged Volume ____________________

OBSERVATIONS: ____________________

SIGNATURES (Signed Initials)

Signed/Sampler: ____________________ Date: ____________________

Signed/Reviewer: ____________________ Date: ____________________

WELLSAMP.WK4-08/08/94

PAGE _____ OF _____

APPENDIX F

SERVICES AND QUALIFICATIONS
META ENVIRONMENTAL, INC.
49 CLARENDON STREET
WATERTOWN, MASSACHUSETTS 02172

1.0 INTRODUCTION

1.0 INTRODUCTION

META Environmental, Inc. (META) is recognized by power utilities, the Electric Power Research Institute (EPRI), the Gas Research Institute (GRI), and the Institute of Gas Technology (IGT) as an innovative company that specializes in the development of site investigative methodologies and treatability studies to advance the understanding of contaminant extent, fate, and remediation at former manufactured gas plant (MGP) sites and sites contaminated with creosote wood preservatives. In addition, we are leaders in developing methods of MGP sample analysis to reduce costs and increase the speed of site investigations.

META personal are experienced in conducting phased site investigations and evaluating remediation alternatives under a variety of site settings and regulatory climates. Our staff of environmental professionals has over 100 years of combined experience in the fields of engineering and chemistry, in addition to a working knowledge of the environmental regulations that govern site investigation and remediation. META's approach to MGP investigations, which is discussed in more detail in Section 6.0, has streamlined the site assessment/remediation process for our clients, reducing costs and project duration.

META's approach to former MGP site investigations is multidisciplinary, recognizing the importance and complementary nature of engineering, chemistry, geology, hydrology, biology, risk assessment, law, and communication. In order to assure that no one area receives insufficient attention, we often complement our in-house expertise with subcontractors who are recognized experts on MGP issues.

2.0 COMPANY PROFILE

2.0 COMPANY PROFILE

META is a small, ***woman-owned*** (certified as a WBE in the Commonwealth of Massachusetts) environmental services company specializing in the fields of environmental engineering and chemistry. Our staff includes engineers, chemists, geologists, biologists, and scientists. We are located in Watertown, Massachusetts, in close proximity and access to centers of state government, U.S. EPA regional offices and library, and major universities.

Our focus has been to service utility company needs. To this end, we have collected and analyzed samples from dozens of utility sites across the country. One of our specialties has been former MGP sites and we have collected and analyzed thousands of samples of soil, tar, sludge, groundwater, surface water, and sediments from more than two dozen MGP sites. We design our sampling plans to take advantage of our rapid, cost-saving site characterization approaches whenever possible.

META's office is fully equipped with many networked 386- and 486-based PCs, printers, plotters, modem, and office communication equipment. We have advanced CAD and geologic logging software, as well as statistical and site modelling software. META has a workshop for the storage, testing, and maintenance of field equipment.

We provide a wide range of both routine and special analytical services. Our laboratory is equipped with the latest models of analytical instrumentation, as well as all the supporting equipment necessary to provide our clients with reliable analytical data. We routinely set-up and operate field laboratories.

3.0 SUMMARY OF SERVICES

META is committed to providing its clients with ***personalized and responsive services*** that are based on proven technical competence and sound managerial practices. Our areas of expertise include the fields of environmental engineering and chemistry. Our staff members have participated in projects that include:

- multiphase site investigations at industrial and commercial properties in 20 states, including more than two dozen former manufactured gas plant (MGP) sites
- treatability studies for the evaluation of remediation alternatives
- development and use of methods for on-site extraction of organic compounds from environmental samples in varied matrices
- development of microscale solvent extraction methodologies for PAHs, PCP, TPH, and PCBs
- real time chemical analysis at fixed and mobile laboratories
- data evaluation, interpretation, and validation
- preparation of SAPs, QAPPs, and HASPs
- sampling of all forms of environmental media
- underground storage tank (UST) management
- Massachusetts Contingency Plan (MCP) investigations
- evaluation of remediation alternatives, remediation design, and monitoring

We have provided these services to utilities, industrial clients, lending institutions, engineering firms, law firms, and federal, state, and local government agencies.

Our project management skills and technical excellence have been recognized by our clients:

> META staff were commended by the Electric Power Research Institute (EPRI) for their innovation and management of a large, multiyear, multidisciplinary research project at MGP sites. ***"I wish to compliment you on your outstanding achievements and innovations in field sampling - chemical analysis methods"*** and ***"EPRI is indeed fortunate to have such outstanding contractors working on its team."***
>
> A law firm commended META for the litigation support relative to a former MGP site: ***"thank you again for the extraordinary litigation assistance ... I could not have asked for better service and certainly could not have asked for a better result. I am deeply indebted."***
>
> Several META staff members were commended by the New York State Department of Law (NYSDOL) for their management, rapid completion, and ***"rock solid"*** review of 3 years of historical analytical data in preparation for litigation concerning the Love Canal in New York. According to the NYSDOL, the opposition ***"... was unable to reveal, under cross-examination, any significant shortcomings in [META's staff] product"*** and ***"people ... who worked on this case should deservedly feel proud."***

4.0 KEY PERSONNEL AND RESUMES

4.0 KEY PERSONNEL AND RESUMES

The following key personnel form the core of META's site assessment and remediation team. They are supported by an experienced group of engineers, chemists, geologists, and scientists. Their detailed resumes are provided on the following pages.

B. Taylor, Ph.D.	President, Senior Environmental Engineer
D. Mauro	Vice President, Quality Assurance Officer
I. Silverstein, Ph.D., P.E., LSP	Director, Environmental Engineering
M. Young, Ph.D.	Senior Chemist

BARBARA BAUM TAYLOR, Ph.D.

EDUCATION

Ph.D. - 1978 - Harvard University - Environmental Engineering
S.M. - 1972 - Harvard University - Environmental Engineering
B.S. - 1971 - Clarkson College of Technology - Chemical Engineering

EXPERIENCE

META ENVIRONMENTAL, INC.
February 1990 - Present
President and Majority Owner

Manages day to day operations of company.
Manages major contract involving two other technical companies and several universities concerning the fate and transport of coal tar constituents from manufactured gas plant (MGP) sites and the toxicology of those compounds, pentachlorophenol contamination, PCB contamination and treatability, and other utility-related environmental problems.
Provides expert technical consulting to private clients concerning PCB and PCDD/PCDF contamination, and MGP site contamination problems.
Served on EPA Peer Review Panel for PCB treatability studies.
Serves as exterior reviewer for the Civil Engineering Graduate Programs at Northeastern University

CAMBRIDGE ANALYTICAL ASSOCIATES, INC.
September 1988 - February 1990
Consulting Service Department, Director
[1989 - Outstanding Service Award]

January 1986 - September 1988
Consulting Services Department, Project Manager to Associate Director
[1987 - Outstanding Service Award]

Managed and directed all aspects of Consulting Services Department including financial and technical considerations.
Managed major EPA contract for the Love Canal hazardous waste site.

Barbara B. Taylor **Page 2**

Managed major contract concerning fate and transport of utility waste products at various sites.
Provided expert technical assistance for PCB transformer and capacitor incidents throughout the U.S. and Canada.
Supervised technical staff on a variety of other environmental projects.
Conducted and reviewed site investigations and chemical data audits.
Coordinated and prepared multidisciplinary proposals.

NORTHEASTERN UNIVERSITY
September 1984 - 1987
Departments of Chemical and Civil Engineering, Part-time Teaching

September 1977 - July 1984
Department of Civil Engineering, Assistant to Associate Professor

Developed over 200 pages of typed class notes for a new course, Chemical Process Pollution Control.
Taught graduate and undergraduate courses, including: Chemical Process Pollution Control, Environmental Engineering I, Environmental Chemistry I and II, Environmental Microbiology, and Pollution Control in the Chemical Industries.
Conducted independent research and wrote a chapter for a book, Organic Carcinogens in Drinking Water, published in winter of 1986.
Created two new courses in Technology Assessment for engineers.
Developed typed class notes for all major non-laboratory courses taught, including: Environmental Engineering I, Technology Assessment (one graduate, one undergraduate level), Environmental Chemistry I and II, and Environmental Microbiology.
Taught environmental chemistry lab courses (graduate and undergraduate) covering AA, TOC, BOD, COD, GC, and other typical techniques and tests used in environmental analyses.
Served as chairman or group leader on several major departmental to university level committees including: Environmental Committee, Undergraduate Curriculum Committee, College of Engineering Planning Committee and University Council on Research and Scholarship. While on Planning Committee for two years, worked with management experts from Arthur D. Little, Inc. on techniques for managing efficient meetings, effective planning and problem-solving in a structured environment.

Barbara B. Taylor

UNITED STATES DEPARTMENT OF STATE (DOS)
August 1980 - September 1981
Bureau of Oceans and International Environmental and Scientific Affairs (OES)
Office of Food and Natural Resources, Physical Sciences Administrative Officer

Coordinated work with Council on Environmental Quality and appropriate line agencies on international environmental issues.
Managed the Scholar-Diplomat Program for OES.
Evaluated global resource models for futures forecasting.
Represented OES/DOS at conferences, meetings, and symposia.
Wrote, reviewed, or edited government material on environmental matters.

HARVARD UNIVERSITY
June 1975 - January 1978
Research Assistant to Dr. J. Carrell Morris

Conducted research on disinfection resulting in Ph.D. thesis: "Formation of Chlorinated Organic Compounds in the Chlorination of Natural and Polluted Waters".
Prepared and presented papers at national and international gatherings concerning research efforts.
Supervised junior graduate students and lab assistants.
Provided consulting expertise for local companies on such topics as: chlorinated organic compounds, chlorination of drinking water, technology assessment, and advanced robotics in the future.

HARVARD UNIVERSITY/BERMUDA BIOLOGICAL STATION FOR RESEARCH
May 1973 - September 1974
Research Assistant to Dr. James N. Butler

Conducted research on uptake of oil pollutants by and effects of those pollutants on the members of an ecosystem in the Sargasso Sea surrounding the island of Bermuda.

HONORS AND AFFILIATIONS

Board of Governors of Clarkson College of Technology, 1981-1983.
Science, Engineering and Diplomacy Fellowship, DOS/AAAS, 1980-1981.
Member of American Association for the Advancement of Science.

COLLEGE YEARS - Tau Beta Pi, Omega Chi Epsilon, Dean's List, Phalanx, National Wildlife Federation/American Petroleum Institute (Fellowship in Environmental Conservation), EPA Fellowship, and Seven Teaching Fellowships at Harvard

SELECTED PAPERS AND PRESENTATIONS

Taylor, B.B., D.M. Mauro, M.S. Young, and J.A. Staub, **"The Use of Microscale Solvent Extraction (MSE) Methods at Former Manufactured Gas Plant (MGP) Sites,"** presented at the IGT Conference, Hazardous Waste and Environmental Management in the Gas Industry, in Albuquerque, NM, January, 1994.

"Microscale Solvent Extraction (MSE) Methods for Analysis of Soils and Waters, Volumes I & II", EPRI Report, In press.

Ripp, J., B. Taylor, D. Mauro, M. Young, **"Field Pan Studies on Treatment of Manufactured-Gas Plant (MGP) Soils Using Commercially Grown Fungus"**, EPRI Report TR-102185, July 1993.

Mauro, D. M., J. A. Schneider, M. S. Young, B. B. Taylor, and I. P. Murarka, **"Microscale Solvent Extraction (MSE) Methods for Tarry Soils from Former Manufactured Gas Plant (MGP) Sites"**, Proceedings of the Ninth Annual Waste Testing and Quality Assurance Symposium, Arlington, Virginia, July 1993.

Murarka, I. P., E.F. Neuhauser, M. W. Sherman, B. B. Taylor, D. M. Mauro, J. A. Ripp, and T. D. Taylor, **"Characterization and Remediation of a Former Manufactured Gas Plant (MGP) Disposal Site"**, presented at the 86th Annual Meeting and Exhibition of the Air and Waste Management Association in Denver, Colorado, June 13-18, 1993.

"Chemical and Physical Characteristics of Tar Samples from Selected Manufactured Gas Plant (MGP) Sites", EPRI Report TR-102184, May 1993.

Barbara B. Taylor

Taylor, B.B., **"Site Investigation Methods Development", "Application of Rapid Field Techniques to MGP Site Residuals", "RCRA Characteristics of MGP Site Residuals", and Correlation of RCRA Characteristics with Chemical Composition of MGP Site Residuals"**, presented at the Management of Manufacture Gas Plant Sites Technology Transfer Seminar in Orlando, FL, March 23-24, 1993.

"Treatability of PCB-Contaminated Soils with Quicklime (CaO)", EPRI Report TR-101778, December 1992.

Murarka, I., E. Neuhauser, M. Sherman, B. Taylor, D. Mauro, J. Ripp, and T. Taylor, **"Organic Substances in the Subsurface: Delineation, Migration, and Remediation"**, Journal of Hazardous Materials, 1992, Vol. 32, pp. 245-261, presented by B. Taylor at the GCHSRC Fourth Annual Symposium on Groundwater The Problems and Some Solutions, Lamar University, Beaumont, TX, April 2-3, 1992.

Weyand, E., Y. Wu, S. Patel, B. Taylor, and D. Mauro, **"Biochemical Effects of Coal Tar Components in Mice Following Ingestion"**, Proceedings of the Thirteenth International Symposium on Polynuclear Aromatic Hydrocarbons, Bourdeaux, France, October 1-4, 1991.

Taylor, B., **"Presence and Partitioning of Organic Compounds at MGP Sites"**, presented at Management of Manufactured Gas Plant Sites, Technology Transfer Seminar, Atlanta, Georgia, April 1991.

Weyand, E., Y. Wu, S. Patel, B. Taylor, and D. Mauro, **"Urinary Excretion and DNA Binding of Coal Tar Components in B6C3F1 Mice Following Ingestion"**, Chem. Res. Toxicol., 1991, 4.

Taylor, B., D. Mauro, **"Analysis of Groundwater for Selected Organic Compounds at Trace Levels: A Case Study of Quality Assurance/Quality Control (QA/QC) at EBOS Site 24"**, presented at the 1990 International Conference on Measuring Waterborne Trace Substances, held in Baltimore, Maryland, August 28-30, 1990.

Taylor, B., D. Mauro, M.B. Hayes, B. Holmen, and M. Young, **"Composition and Migration of Coal Tar-Derived Organic Compounds in a Sandy Aquifer"**, presented at the Environmental Research Conference: Groundwater Quality and Waste Disposal, Washington, D.C., May 1989, published proceedings.

Taylor, B.B., **"Hydrogeological, Geochemical and Microbial Investigations of a Tar-Waste**

Disposal Site", presented at Management of Manufactured Gas Plant Sites Technology Transfer Seminar, Pittsburgh, PA, April 1989.

Taylor, B.B., "**The Relative Risks Associated with Ingesting Organic Contaminants**", in Organic Carcinogens in Drinking Water: Detection, Treatment and Risk Assessment, John Wiley & Sons, Inc., NY, NY, 1986.

"**The Limitations of Engineering Education**", Keynote Speech at the Society of Women Engineers, Women in Engineering Seminar at Clarkson University, Potsdam, N.Y., March 1984.

"**The Hazards of Risk Assessment**", presented at NEWPCA meeting and panel member on risk assessment of hazardous waste sites, Boston, MA, January 1984.

Hays, L.M., B.M. Baum, R.A. Isaac and J.C. Morris, "**Control of Haloform Production During Chlorination of Naturally Occurring Compounds through pre-Ozonation**", Publication # 131, Water Resources Research Center, University of Massachusetts, Amherst, MA, October 1982.

"**The Formation of Trihalogenated Methanes During Drinking Water Chlorination and Their Importance**", presented as a two part seminar in the series, "Carcinogens in Drinking Water, Detection, Treatment and Risk Assessment" at the University of Massachusetts, Amherst, MA, September 1982.

"**Global Futures**", presented as a Convocation, in the series "Caring for the Earth", to the faculty and student body of Gordon College, Wenham, A, November 1981.

"**The Global 2000 Report to the President: Its Results and Implications**", presented as the Keynote Speech at Global 2000 Seminars held at Manchester, Mattatuck and Mohegan Community Colleges in Connecticut, 1981.

Baum, B.M., "**Formation of Chloroform During Aqueous Chlorination**", presented before the American Society of Civil Engineers, Boston, MA, April 1979.

"**Technology Assessment in Engineering**", presented before the Society of Women Engineers (SWE), Northeastern University, Boston, MA, October and before SWE, Clarkson College of Technology, Potsdam, NY, March 1979.

Baum, B.M., "**Drinking Water Chlorination and Regulation of Organic Compounds**", in Environmental Issues of 1978, Harvard Environmental Law Review Publication, Harvard University, Spring 1979.

Baum, B.M. and J.C. Morris, "**Model Organic Compounds as Precursors of Chloroform Formation in the Chlorination of Water Supplies**", presented at the Division of Environmental Chemistry, ACS, Anaheim, CA, March 1978.

Morris, J.C. and B.M. Baum, "**Precursors and Mechanisms of Haloform Formation in the Chlorination of Water Supplies**", in Water Chlorination: Environmental Impact and Health Effects (Vol. II), proceedings of the Environmental Impact of Water Chlorination, Gatlinburg, TN, Fall 1977.

CERTIFICATION

OSHA Certified Health and Safety Trained
OSHA Supervisory Training - 1993
OSHA Refresher Course - 1991, 1992, and 1993

DAVID M. MAURO

EDUCATION

Ph.D. Candidate - Boston University - Chemistry
M.S. - 1982 - Florida Institute of Technology - Environmental Science
B.S. - 1977 - Southampton College - Biology and Environmental Science

EXPERIENCE

META ENVIRONMENTAL, INC.
February 1990 - Present
Vice President, co-founder and part owner

Assists in the management of day to day operations.
Principal investigator for a major contract concerning the fate and transport of coal tar constituents from manufactured gas plant sites and the toxicology of those compounds.
Manages data validation projects.
Serves as company quality assurance officer.
Serves as company health and safety officer.
Provides expertise in quality assurance and chemical analyses to clients.
Principal Investigator for a laboratory study of the treatability of PCB-containing soil by quicklime and other reagents.
Senior chemist and manager of a study to develop a method to measure low levels of chlorinated phenols in soil in the presence of a large hydrocarbon background.
Managed a study of methods to measure low levels of nitrogen- and sulfur-containing petroleum products from that caused by coal tar in mixed waste samples.
Reviewed GC/MS and PCB data in support of litigation.

CAMBRIDGE ANALYTICAL ASSOCIATES, INC.
October 1988 - February 1990
Consulting Services Department, Assistant Director
[1989 - Outstanding Service Award]

David M. Mauro

March 1986 - October 1988
Consulting Services Department, Senior Chemist

April 1985 - March 1986
Environmental Services Division, Environmental Scientist

Senior chemist and manager of the data validation group, completing numerous projects for EPA, NYSDEC, NJDEP, and private clients.
Played a lead role in the historical data validation effort under a major EPA contract for the Love Canal hazardous waste site.
Senior chemist for a major contract concerning fate and transport of utility waste products; designed and operated on-site chemical laboratories at two sites in different parts of the country.
Managed contract concerning investigation and remediation of major hazardous waste sites in New York State.
Served as a consultant for the U.S. EPA's CLP Program and other special analytical projects.
Developed sensitive analytical methods for the determination of metabolites from the biodegradation of chlorinated organic compounds.
Worked with AAS and ICP instrumentation for inorganic analysis.

BOSTON UNIVERSITY
September 1982 - May 1986
Teaching Assistant

Taught courses in chemistry and chemistry laboratory.
Developed experiments to be used in university teaching laboratories.

MEDICAL RESEARCH INSTITUTE
September 1981 - August 1982
Research Associate

Managed a small organic and analytical chemistry research laboratory.
Designed, operated, and evaluated a bench-scale vapor scrubbing system for improved methods for the removal of hypergolic rocket fuel vapors for NASA.

FLORIDA INSTITUTE OF TECHNOLOGY
September 1980 - May 1981
Teaching Assistant

Taught undergraduate chemistry laboratory courses.

HONORS AND AFFILIATIONS

Certificate of Recognition - National Aeronautics and Space Administration, 1982
President's Scholarship - Southampton College of Long Island U., 1973
New York State Regents Scholarship - New York State, 1973-1977
Certificate of Award - Sigma XI, The Research Society, 1982
Member - American Chemical Society, 1977 to present
Member - Board of Directors, Hamilton Children's Center, 1988 to 1990
Member - Society for Applied Spectroscopy, 1983 to present

SELECTED PAPERS AND PRESENTATIONS

Taylor, B.B., D.M. Mauro, M.S. Young, and J.A. Staub, **"The Use of Microscale Solvent Extraction (MSE) Methods at Former Manufactured Gas Plant (MGP) Sites,"** presented at the IGT Conference, Hazardous Waste and Environmental Management in the Gas Industry, in Albuquerque, NM, January, 1994.

"Microscale Solvent Extraction (MSE) Methods for Analysis of Soils and Waters, Volumes I & II", EPRI Report, In press.

Ripp, J., B. Taylor, D. Mauro, M. Young, **"Field Pan Studies on Treatment of Manufactured Gas Plant (MGP) Soils Using Commercially Grown Fungus"**, EPRI Report TR-102185, July 1993.

Mauro, D. M., Schneider, J. A., Young, M. S., Taylor, B. B., Murarka, I. P., **"Microscale Solvent Extraction (MSE) Methods for Tarry Soils from Former Manufactured Gas Plant (MGP) Sites"**, Proceedings of the Ninth Annual Waste Testing and Quality Assurance Symposium, Arlington, Virginia, July 1993.

Thomas, J.J., Kim, J.H., and Mauro, D.M., **"4-(4-Nitrobenzyl) Pyridine Tests for Alkylating**

Agents Following Chemical Oxidative Activation", Archives of Environmental Contamination and Toxicology, Vol. 22, 1992.

Weyand, E., Wu, Y., Patel, S., Taylor, B., and Mauro, D.M., "**Biochemical Effects of Coal Tar Components in Mice Following Ingestion"**, Polycyclic Aromatic Compounds", in Press, Spring 1992.

Weyand, E.H., Wu, Y., Patel, S., Taylor, B., and Mauro, D., "**Urinary Excretion and DNA Binding of Coal Tar Components in B6C3F1 Mice Following Ingestion"**, Chem. Res. Toxicol., 1991, 4.

Taylor, B., D. Mauro, "**Analysis of Groundwater for Selected Organic Compounds at Trace Levels: A Case Study of Quality Assurance/Quality Control (QA/QC) at EBOS Site 24"**, in press.

Taylor, B., D. Mauro, M.B. Hayes, B. Holmen, and M. Young, "**Composition and Migration of Coal Tar-Derived Organic Compounds in a Sandy Aquifer"**, in Proceedings: Environmental Research Conference on Groundwater Quality and Waste Disposal, EPRI/EPA, EPRI EN-6749, March 1990.

Mauro, D.M. and M.F. Delaney, "**Resolution of Infrared Spectra of Mixtures by Self-Modeling Curve Resolution Using a Library of Reference Spectra with Simplex Assisted Searching"**. Analytical Chemistry, Nov. 1987.

Mauro, D.M. and M.F. Delaney, "**Extension of Multi-Component Self-Modeling Curve Resolution Using a Library of Reference Spectra"**. Analytical Chimica Acta, Vol. 172, 1985.

Delaney, M.F., K.M. Pasko, D.M. Mauro, D.S. Gsell, P.C. Korologos, J. Morawski, L.J. Krolikowski, and F.V. Warren, "**Determination of Aspartame, Caffeine, Saccharin and Benzoic Acid in Beverages by High Performance Liquid Chromatography"**. J. Chemical Education, July, 1985.

Thomas, J., R. Barile, D. Mauro, and L. Osborne, "**Improved Hypergolic Vapor Removal Systems"**. National Aeronautics and Space Administration, Document NAS 10-10106, September, 1982.

Thomas, J., R. Barile, D. Mauro, "**Alumina Packed Bed Removes Hypergol Vapors from Gas Stream"**. NASA Tech Briefs, 1984.

SEMINARS

"Determination of Toxic Heterocyclic Components of Coal Tar by Gas Chromatographic Methods Suitable for Field or Laboratory Use", The Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, March 1991.

"Analytical Techniques for Characterization of MGP Site Soils, Wastes, and Waters", Manufactured Gas Plant Technology Transfer Seminar, April 1991.

"Improved Methods for Field GC Analysis for Priority Pollutants", The Pittsburgh Conference Exposition, March 1990.

"Multicomponent Self-Modeling Curve Resolution", Eastern Analytical Symposium, November, 1985.

"Spectral Compound Identification - Qualitative Chemometrics", Federation of Analytical Chemistry and Spectroscopy Societies, September, 1985.

"Separating Overlapped Spectro-Chromagrams Using Self-Modeling Curve Resolution with Library Searching", The Pittsburgh Conference and Exposition, February, 1985.

"Determination of Ethylene Dibromide by Capillary Gas Chromatography with Microwave Induced Helium Plasma Detection", Twenty-fourth Annual College Research Symposium, April, 1984.

"Examination of Gallium and Indium Alkyl Compounds by GC - Microwave Emission Detector", Federation of Analytical Chemistry and Spectroscopy Societies meeting, September, 1983.

"Gas Chromatography with Infrared Spectrometric Detection", New England Regional Meeting of the American Chemical Society, June, 1983.

IRWIN SILVERSTEIN, Ph.D., P.E., L.S.P.

EDUCATION

Ph.D. - 1986 - Northeastern University - Civil Engineering
M.S. - 1976 - Northeastern University - Civil Engineering
B.S.M.E. - 1971 - The City College of New York - Mechanical Engineering

EXPERIENCE

META ENVIRONMENTAL, INC.

October 1992 - Present
Director, Environmental Engineering

Serves as project manager for environmental investigations at sites that have been impacted by industrial and commercial activities.

Directs investigations at sites undergoing property transfer or foreclosure throughout Massachusetts, New Hampshire, and Rhode Island.

Responsible for underground storage tank replacement specifications, closure monitoring, and assessment.

Provides licensed site professional expertise in conjunction with Massachusetts General Law Chapter 21E and the Massachusetts Contingency Plan.

GALE ASSOCIATES, INC.

October 1985 - October 1992
Director, Environmental Division

Responsible for the administration and supervision of all personnel involved in site investigations and remedial actions as they related to State Superlien Laws.

Responsible for development of underground storage tank (UST) removal/replacement specifications and closure plans.

Directly oversaw the chemical, physical, and biological analysis of ecological systems for Clean Lakes and Pond Programs.

Responsible for the design of wastewater collection and treatment facilities.

Irwin Silverstein

NORTHEASTERN UNIVERSITY

1993
Center for Continuing Education, Instructor

Taught review section for Principles and Practice (PE) License Exam in Civil Engineering - Design and Analysis of Solid/Hazardous Waste Systems.

1980 - 1985
Department of Civil Engineering, Instructor

Developed research projects in the areas of point-of-use treatment of drinking water and groundwater contamination.
Taught undergraduate and graduate courses in the environmental and structural disciplines.

1982 - 1984
Department of Mechanical Engineering, Part-time Instructor

Taught undergraduate courses in the structural discipline.

TUFTS UNIVERSITY

1980 - 1982
Department of Civil Engineering, Instructor

Taught undergraduate courses in the structural discipline.

NYC Department of Air Resources, New York

1972 - 1977

Evaluated air emission control technologies for fossil fuel burning facilities.

SELECTED PAPERS AND PRESENTATIONS

Silverstein, I. **"The Role of Specifications and Construction Period Services in Underground Storage Tank Replacement"**, New England Environmental Expo, 1993.

Irwin Silverstein

Silverstein, I. **"Underground Storage Tank Replacement Specifications"**, United States Navy, 1992.

Silverstein, I. **"Underground Storage Tank Issues at Airport Facilities"**, Massachusetts Association of Municipal Airports, 1992.

Silverstein, I. **"The Impact of Off-Site Releases on Real Estate Transactions"**, Association of Groundwater Scientists and Engineers Second Annual Environmental Site Assessments Conference: Case Studies and Strategies, 1991.

Silverstein, I. **"Closure of Underground Storage Tanks"**, Ninth Annual Hazardous Materials Management Conference/International, 1991.

Silverstein, I. Underground Storage Tank Seminar: **"Removal, Replacement, and Closure Issues"** - GALE Associates, Inc., 1990.

Silverstein, I. **"Cyclic Heat Treatment to Inhibit Bacterial Growth in Activated Carbon Point-of-Use Treatment Devices"**, CSCE-ASCE National Conference on Environmental Engineering, 1988.

PROFESSIONAL SOCIETIES AND AFFILIATIONS

National Society of Professional Engineers
American Association of Groundwater Scientists and Engineers
American Society of Civil Engineers
Licensed Site Professional Association

PROFESSIONAL REGISTRATIONS

Registered Professional Engineer in Massachusetts and Maryland
Licensed Site Professional in the Commonwealth of Massachusetts

Irwin Silverstein **Page 4**

CERTIFICATION

OSHA Certified Health and Safety Trained
OSHA Supervisory Training - 1993
OSHA Refresher Course - 1993

MICHAEL S. YOUNG, Ph.D.

EDUCATION

Ph.D. - 1988 - University of Massachusetts at Amherst - Chemistry
M.S. - 1983 - University of Massachusetts at Amherst - Chemistry
B.S. - 1977 - University of Massachusetts at Amherst - Chemistry

EXPERIENCE

META ENVIRONMENTAL, INC.
October 1992 to Present
Senior Chemist

Serves as principle research chemist.
Developed methods for determination of biodegradation products of coal tar in soils and waters.
Developed unique derivitization GC/MS methods for determination of active organic substrates in various environmental matrices
Characterized petroleum and related materials using novel GC and GC/MS techniques.
Directed in-house air and personnel monitoring project.
Manages analytical projects for characterization of dielectric fluids used in the power industry.
Served as consulting scientist for clients in support of remediation projects.
Served as consulting scientist in support of chlorination studies by a local municipal drinking water plant.

April 1990 to October 1992
Outside Consultant

Assisted in development of methods for phenolic compounds and other creosote-related materials.
Developed derivitization GC/MS method for acidic coal tar-related compounds.

Michael S. Young

TOXIKON, INC.
April 1992 to October 1992
Director of Analytical Chemistry Services

Directed analytical chemistry laboratory providing support of product validation studies, stability and other physical testing, method development, and other services for projects under FDA and FIFRA GLP requirements.

Supervised environmental laboratory. Performed analysis of samples by EPA analytical methods utilizing GC and HPLC procedures.

Supervised chemists and technicians in their daily duties.

Reviewed data, wrote reports, and certified release of analytical data to clients.

NET ATLANTIC - CAMBRIDGE DIVISION
1989 to April 1992
Senior Staff Scientist

Developed new methods for determination of various coal and petroleum related pollutants, water soluble volatile organics, and various pesticides, herbicides, and biocides.

Served as project manager for soil gas and other field analytical projects involving portable instrumentation.

Developed rapid turn around on site methods and directed site laboratory projects.

Supervised CLP organics GC laboratory.

Provided analytical consulting support to clients.

Provided expert testimony.

CAMBRIDGE ANALYTICAL ASSOCIATES, INC.
1986 to 1989
Bioremediation Department, Project Scientist

Served as senior chemist supervising other technical staff.

Developed sensitive small scale methods for analysis of coal tar, petroleum, and volatile organic contaminated water and soil.

Provided analytical support to field remediation projects and laboratory treatability studies.

Developed methods for determination of metabolities related to biodegradation of chlorinated solvents.

UNIVERSITY OF MASSACHUSETTS AT AMHERST
1981 to 1985
Graduate Research and Teaching Assistant

Taught lecture and laboratory courses in general, organic, and analytical chemistry.
Provided GC and GC/MS support to the analytical and organic divisions.
Developed sensitive GC and GC/MS methods for determination of various drinking water contaminants.
Studied the interaction of aqueous chlorine with nitrogenous biomolecules with regard to chlorination by-product formation from a mechanistic standpoint.

KOCH ABCOR
1977 to 1981
QC Chemist and Industrial Hygiene Chemist

Validated the passive sampling procedure for air analysis of many organic pollutants with Gasbadge Dosimeter.
Developed the hydrogen fluoride passive sampler (HF Gasbadge).
Was principle investigator for site demonstration and validation of HF Gasbadge at Oak Ridge Gaseous Diffusion Plant.
Supervised industrial hygiene chemistry laboratory.
Served as QC chemist.

HONORS AND AFFILIATIONS

Massachusetts Board of Higher Education Honor Scholarship, 1971 to 1975.
Member - American Chemical Society, 1975 to Present.
Member - American Association for the Advancement of Science, 1987 to 1992.
Member - Advisory Board, Center for Analytical Chemistry Development, University of Massachusetts at Amherst, 1990.

SELECTED PAPERS AND PRESENTATIONS

Young, M.S., and P.C. Uden, "**By-Products of the Aqueous Chlorination of Purines and Pyrimidines**". submitted for publication, January 1994.

Taylor, B.B., D.M. Mauro, M.S. Young, and J.A. Staub, **"The Use of Microscale Solvent Extraction (MSE) Methods at Former Manufactured Gas Plant (MGP) Sites,"** presented at the IGT Conference, Hazardous Waste and Environmental Management in the Gas Industry, in Albuquerque, NM, January, 1994.

Ripp, J., B. Taylor, D. Mauro, M. Young, **"Field Pan Studies on Treatment of Manufactured Gas Plant (MGP) Soils Using Commerically Grown Fungus"**, EPRI Report TR-102185, July 1993.

Mauro, D. M., Schneider, J. A., Young, M. S., Taylor, B. B., Murarka, I. P., **"Microscale Solvent Extraction (MSE) Methods for Tarry Soils from Former Manufactured Gas Plant (MGP) Sites"**, Proceedings of the Ninth Annual Waste Testing and Quality Assurance Symposium, Arlington, Virginia, July 1993.

Taylor, B., D. Mauro, M.B. Hayes, B. Holmen, and M. Young, **"Composition and Migration of Coal-Tar Derived Organic Compounds in Sandy Aquifer"**, in Proceedings: Environmental Research Conference on Groundwater Quality and Waste Disposal, EPRI/EPA, EPRI EN-6749, March 1990.

Fogel, S., M. Leahy, M. Fogel, M. Young, and M. Danna, **"Final Report to the National Science Foundation: The Biodegradation of Chlorinated, Aliphatic Compounds by Methane-Oxidizing Bacteria: Mechanisms and Products"**. Cambridge Analytical Associates, 1986.

Young, M.S. and J.P. Monat, **"Estimating Gaseous Diffusion Coefficients from Passive Dosimeter Sampling Rates, with Application to HF"**. Ind. Eng. Chem. Fund., Vol. 21:413, 1981.

Young, M.S. and J.P. Monat, **"Development of a Passive Dosimeter for Hydrogen Fluoride Monitoring"**. Am. Ind. Hyg. Assoc. J., Vol. 43:890, 1982.

Young, M.S. and J.P. Monat, **"Final Report to the U.S. Department of Energy: The Development and Demonstration of a Personal Monitoring Device for Hydrogen Fluoride Exposure"**. Abcor Division of Koch Engineering, 1981.

Michael S. Young

SEMINARS

Young, M.S. and P.C. Uden, **"By-Products of the Aqueous Chlorination of Purines and Pyrimidines"**, 26th ACS National Meeting, Chicago, IL, 1993.

Young, M.S., J.A. Ripp, and F. Dumont, **"A Sorbent Trapping Procedure for High Resolution Soil Gas Analysis"**. 202nd ACS National Meeting, New York, NY, 1991

"Determination of Toxic Heterocyclic Components of Coal Tar by GC Methods Suitable for Field or Laboratory Use", Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, 1991.

"Improved Methods for Field GC Analysis for Priority Pollutants", Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, 1990.

"Gas Chromatographic Determination of Polar Halogenated Organics in Drinking Water and Related Samples", Pittsburgh Conference, 1988.

"Epoxide Intermediate Formation from the Biodegradation of *cis*- and *trans*-1,2-Dichloroethene by a Methanotrophic Consortium", Annual Meeting of the American Society for Microbiology, 1987.

"Microwave Induced Plasma Spectral Gas Chromatographic Detection of Trace Level Halo-Organics in Drinking Water", Pittsburgh Conference, 1986.

"The Performance of Gasbadge Organic Vapor Dosimeters for Monitoring Aliphatic, Aromatic, and Chlorinated Materials", ACS Annual Meeting, 1979.

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