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ENVIRONMENTAL MONITORING REPORT FOR THE TANK FARM AT CRANE DIVISION NAVAL SURFACE WARFARE CENTER

SEPTEMBER, 2000

PREPARED FOR:
CRANE DIVISION, NAVAL SURFACE WARFARE CENTER
300 HIGHWAY 361
CRANE, IN 47522-5000

PREPARED BY:
SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
(SAIC)
R.R. 6, BOX 28
BLOOMFIELD, IN 47424

DEPARTMENT OF THE NAVY
CRANE DIVISION
NAVAL SURFACE WARFARE CENTER
300 HIGHWAY 361
CRANE, INDIANA 47522-5000

IN REPLY REFER TO:
5090
Ser 095/0207

15 [illegible]

U.S. Environmental Protection Agency, Region V
Waste, Pesticides, & Toxics Division
Waste Management Branch
Illinois, Indiana, and Michigan Section
Attn: Mr. Peter Ramanauskas (DW-8J)
77 West Jackson Blvd.
Chicago, IL 60604

Dear Mr. Ramanauskas:

Crane Division, Naval Surface Warfare Center (NAVSURFWARCENDIV Crane) submits, as enclosure (1), the Draft Environmental Monitoring Report for the Tank Farm, Solid Waste Management Unit (SWMU) 32/00 for review and approval. The required certification statement is included as enclosure (2).

NAVSURFWARCENDIV Crane point of contact is Ms. Christine D. Freeman, Code 09511, telephone 812-854-4423.

Sincerely,

James M. Hunsicker

JAMES M. HUNSICKER
Director Environmental Protection Department
By Direction
of The Commander

Encls:
(1) Draft EMR SWMU 32/00
(2) Certification Statement

Copy to:
ADMINISTRATIVE RECORD
IDEM (D. Griffin)
SOUTHNAVFACENGCOM (Code 1864)

ENVIRONMENTAL MONITORING REPORT
FOR THE
TANK FARM
AT
CRANE DIVISION
NAVAL SURFACE
WARFARE CENTER

SEPTEMBER, 2000

PREPARED FOR:
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300 HIGHWAY 361
CRANE, IN 47522-5000

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BLOOMFIELD, IN 47424

ENVIRONMENTAL MONITORING REPORT FOR THE TANK FARM SOLID WASTE MANAGEMENT UNIT 32/00 AT CRANE DIVISION NAVAL SURFACE WARFARE CENTER

SEPTEMBER 15, 2000

PREPARED FOR:
CRANE DIVISION, NAVAL SURFACE WARFARE CENTER
300 HIGHWAY 361
CRANE, IN 47522-5000

PREPARED BY:
SCIENCE APPLICATIONS INTERNATIONAL CORPORATION (SAIC)
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PREPARED/APPROVED BY:

SAIC — Date

APPROVALS:

SAIC Management — Date

CLIENT ACCEPTANCE:

U.S. Navy Responsible Authority — Date

NSWC Crane Public Works Officer — Date

U.S. EPA ACCEPTANCE:

U.S. EPA Region 5 RCRA Project Coordinator — Date

ENVIRONMENTAL MONITORING REPORT FOR THE TANK FARM SOLID WASTE MANAGEMENT UNIT 32/00 AT CRANE DIVISION NAVAL SURFACE WARFARE CENTER

SEPTEMBER 15, 2000

PREPARED FOR:
CRANE DIVISION, NAVAL SURFACE WARFARE CENTER
300 HIGHWAY 361
CRANE, IN 47522-5000

PREPARED BY:
SCIENCE APPLICATIONS INTERNATIONAL CORPORATION (SAIC)
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PREPARED/APPROVED BY:

SAIC — Date: January 24, 2001

APPROVALS:

SAIC Management — Date: 29 JANUARY, 2001

CLIENT ACCEPTANCE:

Christine D. Freeman
U.S. Navy Responsible Authority — Date: 01/30/2001

N/A
~~NSWC Crane Public Works Officer~~ — ~~Date~~: N/A

U.S. EPA ACCEPTANCE:

U.S. EPA Region 5 RCRA Project Coordinator — Date: 10/19/2000

EXECUTIVE SUMMARY

The Environmental Monitoring Report for Crane Division, Naval Surface Warfare Center, Crane, Indiana, was prepared by Science Applications International Corporation (SAIC), pursuant to the scope of work defined in Delivery Order # 0277, TDL 008.

The objective of the Environmental Monitoring Report was to summarize the previous work completed at the Tank Farm, near Building 2760, including the determination of possible contamination, and various remediation plans at the site.

The Tank Farm was constructed after World War II, and was expanded in 1952. As many as 17 large capacity, above ground storage tanks were located in six cells, consisting of poured concrete sections bolted together and sunk four feet into the ground. The tanks rested on a concrete foundation ringwall with the steel interior tank bottom resting on a bed of sand. In addition, several smaller, horizontal tanks were located within the tank farm, including an underground tank that was used as part of a steam heating system. It should also be noted that two additional 42,000-gallon storage tanks were located outside of the containment walls.

The first study to determine any area of fuel leakage and possible contamination was undertaken by PEDCo E & A Associates of Cincinnati, Ohio, in 1989. PEDCo contracted ATEC Environmental Services of Indianapolis, Indiana, to perform soil sampling that would help to determine the amount of possible soil contamination within the tank farm. Analyses for total petroleum hydrocarbons (TPH) were run on two soil samples from each of five cells and three samples from one cell. Two sites were found to be contaminated above the state recommended cleanup level of 100 ppm. These, plus six others that were below the state recommended cleanup level, were recommended for proper disposal, in order to protect against future liabilities. In addition to soil removal, PEDCo suggested several other remediations, to physically improve the site and the operation of the facility.

In 1993, Howard, Needles, Tammen, and Bergendoff (HNTB) of Indianapolis, Indiana were contracted by Crane to complete a soil investigation in, and around, the tank farm site. Results suggested the removal of 1,300 – 1,650 cubic yards of contaminated soils, the removal of contaminated groundwater in Cell 6, the removal of abandoned pipelines and tanks, further soil testing in cells 1 and 2, and the erection of a concrete barrier for replacement tanks in Cells 5 and 6.

Crane Division, Naval Surface Warfare Center, reviewed all previous work completed on the Tank Farm to date, in 1996. It was decided that because of the drop in the use of bulk fuel for the heating of buildings, the best alternative for the tank farm was the demolition of the tanks and the cleanup of the site.

Later in 1996, a meeting was held between the Supply Directorate and the Public Works Directorate to determine the action to be taken to dismantle the tank farm. The facility had been identified in previous environmental inspections as an environmental liability due to inadequate spill containment.

In 1997, Sverdrup Environmental of Maryland Heights, Missouri, was contracted to perform a three-phase work program at the Tank Farm which included the removal of both above ground and underground storage tanks, the removal of interior concrete structures, and a final soil analysis and subsequent contaminated soil removal.

The final phase of work at the Tank Farm was performed in 1998, when the Public Works Department was brought in to repeatedly plow the contaminated zone to expose the soil to the air. Three soil samples taken after six weeks of plowing were below the state cleanup level of 100 ppm. The Public Works Department also removed an Oil Water Separator, along with the associated pipelines, which was sold for scrap. Finally, all remaining concrete and other debris was removed and disposed of, either at the DRMO (Defense Reutilization and Marketing Office) or at the Crane Solid Fill Site.

The Tank Farm site has been reported to be considered clean, with the only remnants being a concrete containment surrounding a force main to a sanitary sewer line, and the perimeter fence. However, after studying the reports, it is evident that the site needs to be further characterized and more samples need to be taken in order to determine the actual extent of buried contamination, particularly in Cell 6.

Table of Contents

EXECUTIVE SUMMARY ..... *i*

1.0 INTRODUCTION 1

2.0 SITE BACKGROUND 1

2.1 Site Description 1

2.2 Environmental Setting 7

3.0 WORK EXECUTION 9

3.1 1989 ATEC Associates – Preliminary Fuel Oil Contamination Study for PEDCo E & A Services, Inc., of Cincinnati, Ohio. 9

3.2 1993 Howard, Needles, Tammen, and Bergendoff, Indianapolis, Indiana – Site Remediation Study, Tank Farm. 15

3.3 1996 – Evaluation of Environmental Issues Associated with the Bulk Fuel Storage Facilities, Crane Division, Naval Surface Weapons Center, Memorandum to J. Hunsicker. 25

3.4 1996 – Supply Directorate, Naval Surface Warfare Center, Tank Farm Memorandum. 26

3.5 1997 Sverdrup Environmental, Maryland Heights, Missouri – Closure Report, Tank Farm Decontamination, Storage Tank Removal and Installation Program. 27

3.6 1998 – Department of the Navy – Tank Farm Demolition and Cleanup Summary 30

4.0 SUMMARY AND CONCLUSIONS 31

5.0 REFERENCES 32

6.0 ATTACHMENTS 33

Attachment A – Howard, Needles, Tammen, and Bergendoff – 1993 Site Remediation Study

Attachment B – 1996 Evaluation of Environmental Issues Memorandum

Attachment C – 1996 Tank Farm Memorandum

Attachment D – 1997 Sverdrup Environmental Tank Farm Closure Report

Attachment E – 1997 Sverdrup Environmental Work Performed, Tank Farm

Attachment F – 1998 Department of the Navy Tank Farm Demolition and Clean Up Summary

List of Figures

Figure 1 – Crane Location Map 3
Figure 2 – Tank Farm Location Map 4
Figure 3 – Tank Farm Plan 1977 5
Figure 4 –Tank Farm Layout with ATEC Soils Gas Survey Points 8
Figure 5 – Howard, Needles, Tammen, and Bergendoff Sample Location Map 10

Acronyms and Abbreviations

AAA Administrative Adjudicatory Act
AFFF Aqueous Film Forming Foam
DM Design Manual
DRMO Defense Reutilization and Marketing Office
FAAS Flame Atomic Absorption Spectrophotometer
Ft^2 Square Feet
GC:FID Gas Chromatograph:Flame Ionization Detector
GPM Gallons Per Minute
HNTB Howard, Needles, Tammen, and Bergendoff
ID Inner Diameter
IDEM Indiana Department of Environmental Management
Kg Kilograms
Mg Milligrams
NEMA National Electrical Manufacturers Association
NPDES National Pollutant Discharge Elimination System
NRA No Record Available
NSWC Naval Surface Warfare Center
OD Outer Diameter
OWS Oil/Water Separator
PCB Polychlorinated Biphenyls
PID Photoionization Detector
PPM Parts Per Million
PVC Polyvinyl Chloride
TCLP Toxicity Characteristic Leaching Process
TCV Total Combustible Vapors
TDH Total Discharge Head
TPH:IR Total Petroleum Hydrocarbons:Infrared
U.S. EPA United States Environmental Protection Agency
VOC Volatile Organic Compound
Yds^3 Cubic Yards

ENVIRONMENTAL MONITORING REPORT FOR THE TANK FARM

1.0 INTRODUCTION

An Environmental Monitoring Report is required for the Tank Farm site at Crane Division, Naval Surface Warfare Center (NSWC) Crane. This report summarizes the work done to investigate the site, including sampling, excavation and disposal of materials from the Tank Farm site, draining and demolition of both above ground and underground storage tanks, and final testing of the site for any residual petroleum contaminants.

This report includes a summary of all investigative work completed within, and around, the Tank Farm site since the first investigation in 1989. The summary will detail the sampling procedures, the recommendations of each subsequent contractor, and the measures taken to fulfill suggested recommendations.

2.0 SITE BACKGROUND

2.1 Site Description

NSWC Crane covers an area of 62,463 acres in south central Indiana, approximately 75 miles southwest of Indianapolis, Indiana, as shown in Figure 1. The NSWC lies in the northern portion of Martin County and small portions of Greene, Daviess, and Lawrence Counties.

The Tank Farm site is located in the northwestern part of the NSWC Crane, near the Crane gate on Highway H-5, approximately 1,700 feet due west of the Lake Greenwood dam, as shown in Figure 2.

The Tank Farm originally consisted of two 39,500 gallon, army surplus tanks, that were put in place in 1947. These tanks were the first of 35 tanks planned for the site. In 1953, the two original tanks were removed, the elevation of the land was raised, up to five feet in some places, and the same tanks were replaced in almost their original position. In addition, 15 large capacity, above ground storage tanks were added to the tank farm, all within six cells consisting of poured concrete sections, bolted together and sunk four feet into the ground. The cells were roughly 58 feet by 210 feet in size. Figure 3 shows the plan of the Tank Farm with the original tanks. The tanks rested on a concrete foundation ringwall with the steel interior tank bottom resting on a bed of sand. In addition, several smaller horizontal tanks were located within the tank farm, including an underground tank that was used as part of a steam heating system. Two

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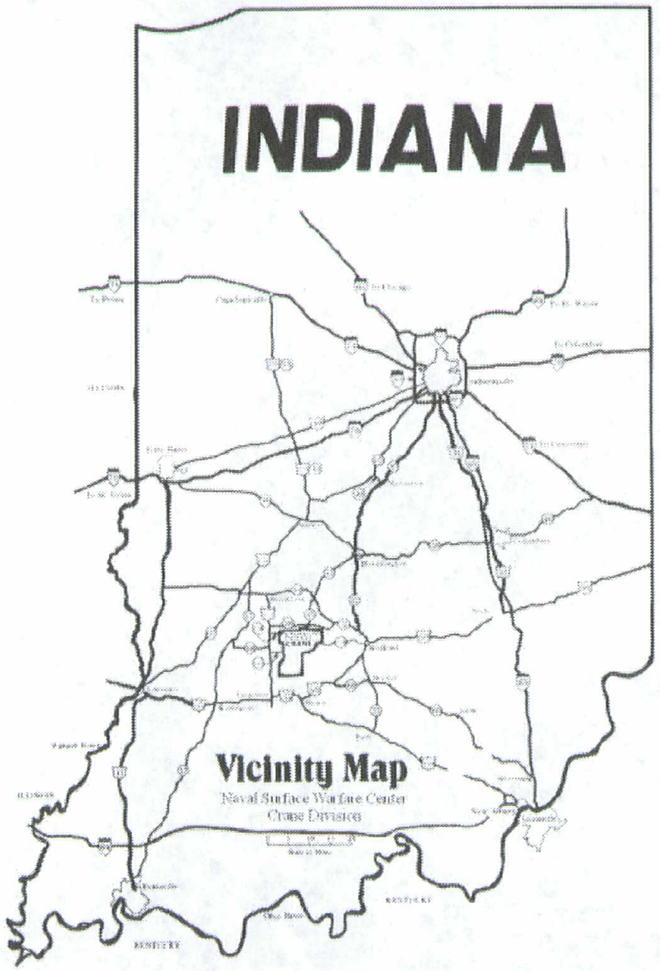

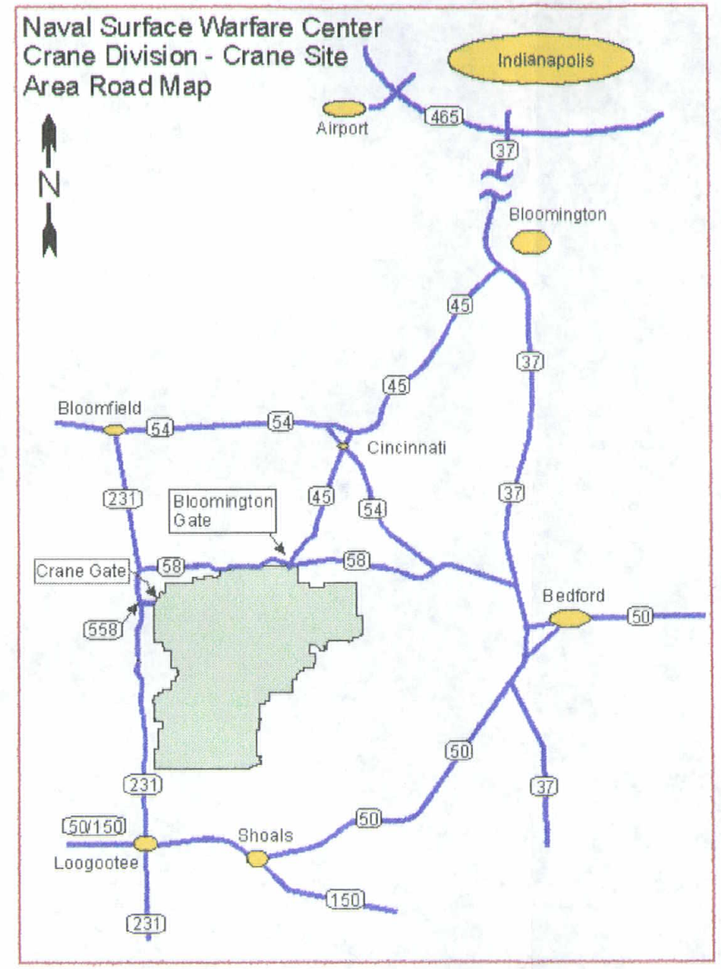

Figure 1 – Crane Location Map

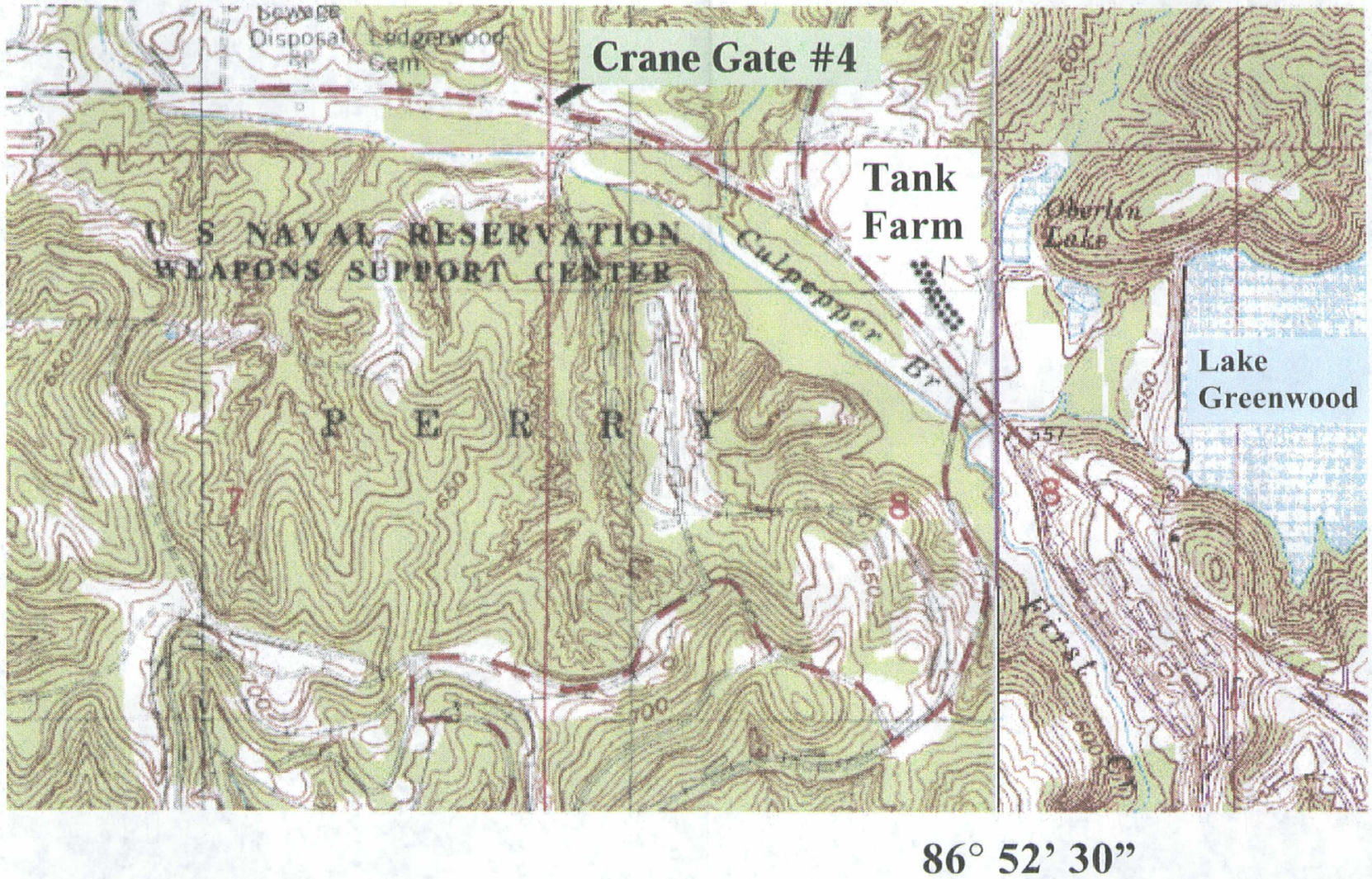

Figure 2 – Tank Farm Location Map

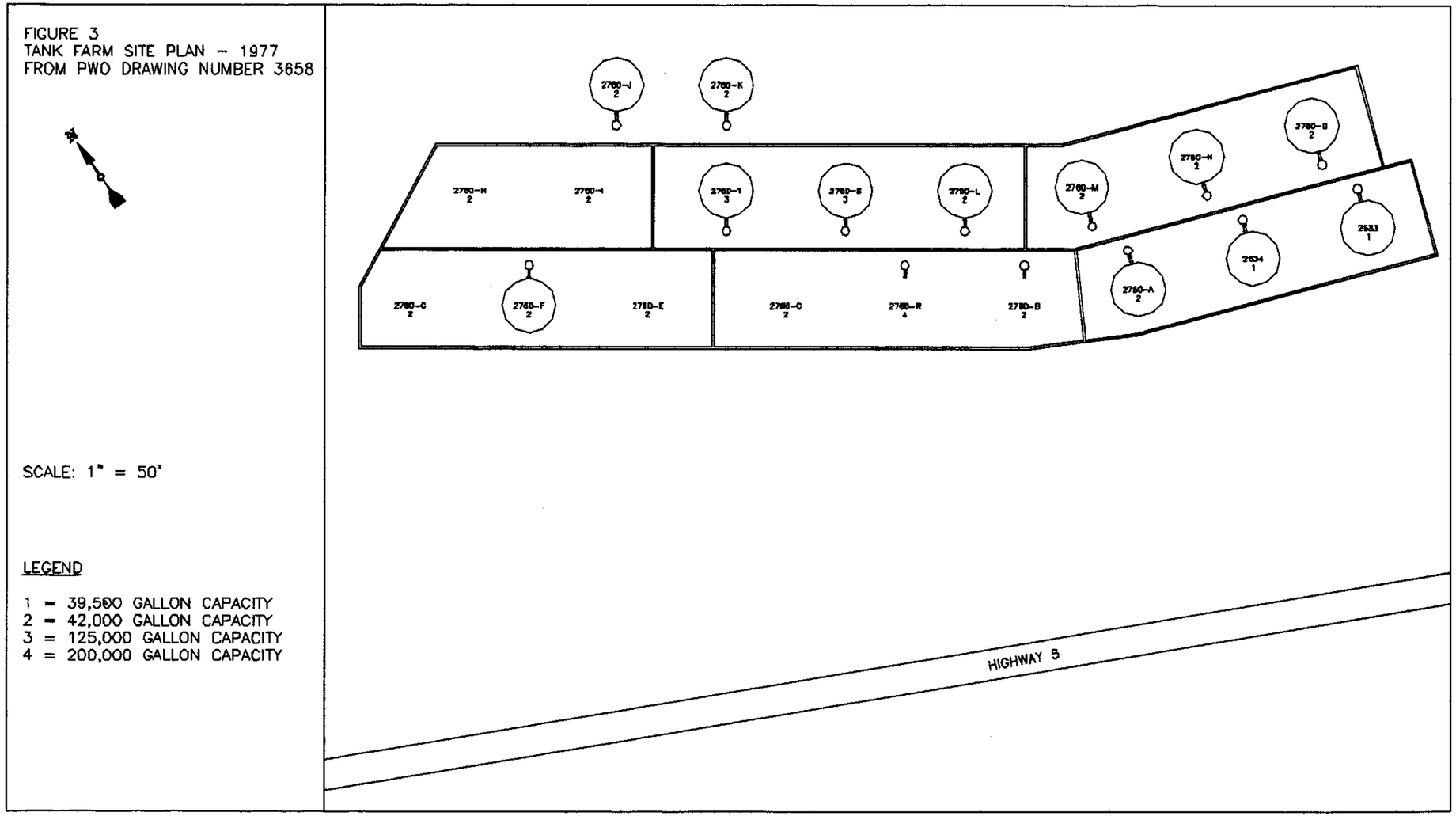

Figure 3 – Tank Farm Plan 1977

additional 42,000-gallon tanks, 2760-J and K, were placed outside of the containment walls, as seen in Figure 3. This made a total of 19 above ground storage tanks at the tank farm site.

The soils within the tank farm are primarily clays or silty clays, which tend to hold water and become highly saturated producing muddy, inaccessible areas. Gravel was placed throughout to provide a walking surface.

Fuel piping to and from the tanks was located primarily underground. These were bare steel, single walled pipes without corrosion protection, other than paint.

Fuel oil was delivered to the site by tanker trucks and off-loaded into a dedicated four-inch fuel oil fill pipe. The off-loaded fuel was run through a three-inch rotary fuel pump rated at 300 gpm at 115 feet TDH. The fuel pumps delivered the oil to one of three tanks for storage. The simultaneous loading of fuel into the storage tanks and unloading from the tanks into tanker trucks was not possible. NSWC owned tankers were loaded from the tanks for local transport using this same system. An air eliminator on the fuel oil meter vented at the northeastern corner of the pump building. Fuel was released via the vent and deposited on the ground. Considerable fuel staining at the building had occurred.

Spills and leaks have occurred accidentally through the operation of the tank farm. The majority of these are the result of the overfilling of tankers or spills occurring during the disconnection of fill lines. Physical features to contain any possible spills include concrete curbing, and a perimeter trench drain on the west side of the tanker loading station. Collected rainwater and leaked fuel which does not sink into the soil flows to the trench drains and to a sump and then to an underground 3,000 gallon oil/water separator. In 1987, a substantial spill (approximately 4000 gallons) occurred when a valve was inadvertently left open. Clean-up crews collected 500 gallons of fuel oil, but 400 gallons of fuel oil reached First Creek, near the village of Crane, Indiana. The rest soaked into the ground at Cell 6 over a 5,000-ft^2 area (65 feet x 70 feet). A spill report notification response and a newspaper article about the spill are shown in Appendix A of Attachment A.

In 1975, a new 200,000-gallon tank was put in place of one of the original 42,000-gallon tanks, 2760 R. In 1977, nine tanks, including the two outside of the containment were excessed and removed from the site. In 1987, an additional six tanks were removed, 2760 A, B, I, M, N, and O. The final phase of demolition was completed in 1997, when the final four tanks were removed from the premises. Several smaller horizontal tanks were also located at the Tank Farm, including an 8,000 gallon waste oil tank, a 10,000 gallon No.1 fuel oil tank,

a 1,000 gallon gasoline tank, and an abandoned underground storage tank, which can be seen on Figure 4. All tanks were finally removed in 1997.

2.2 Environmental Setting

NSWC Crane lies within the unglaciated Crawford Upland physiographic province of southern Indiana, a rugged, dissected plateau bordered on the west by the Wabash Lowland and on the east by the Mitchell Plain. Elevations range from 500 feet mean sea level to 850 feet mean sea level, with the higher elevations generally occurring in the eastern part of the NSWC. Surface drainage trends to the south and southwest, and empties into the East Fork of the White River (Hunt, 1988).

The bedrock geology is mapped as Pennsylvanian and Mississippian sandstones, limestones, and shales, overlain by unconsolidated Quaternary age deposits. The surficial deposits are made up of residual clay and silt from the Pennsylvanian Raccoon Creek Group and the Mississippian Stephensport and West Baden Groups. The Quaternary deposits are a mixture of alluvial, colluvial, and paludal silt, sand, and gravel; lacustrine clay, silt, and sand; and outwash plain gravel, sand, and silt (NEESA, 1988). Bedrock units dip gently to the southwest away from the Cincinnati Arch and into the Illinois Basin.

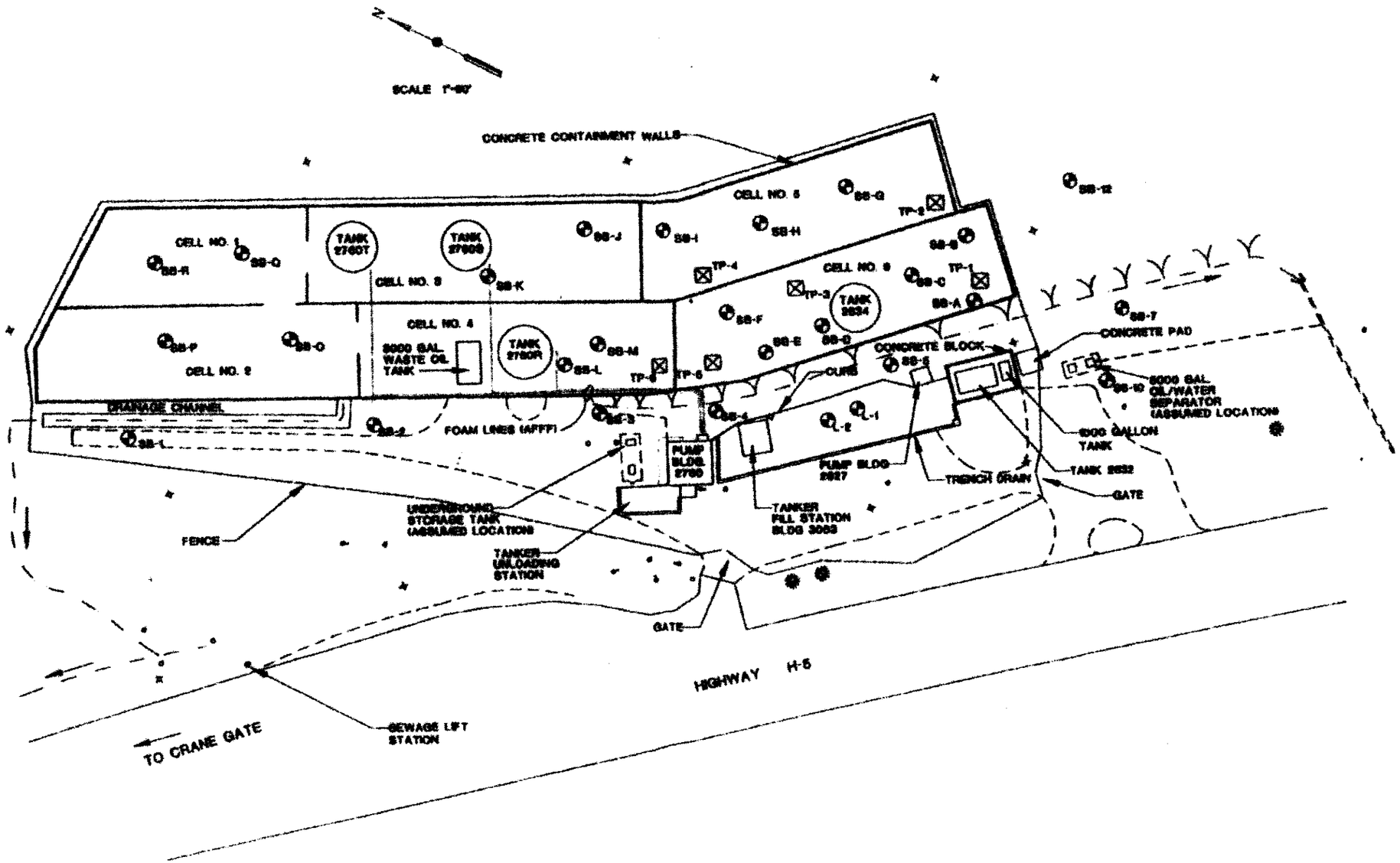

Figure 4 – Howard, Needles, Tammen, and Bergendoff Sample Location Map

3.0 WORK EXECUTION

Several studies have been undertaken to delineate any areas of leakage and possible contamination within, and surrounding, the six cells that make up the Fuel Oil Tank Farm. Each study is summarized here with regard to purpose of the study, sampling procedures, recommendations, and remedial action taken.

3.1 1989 ATEC Associates – Preliminary Fuel Oil Contamination Study for PEDCo E & A Services, Inc., of Cincinnati, Ohio.

In 1989, NSWC Crane contracted with PEDCo E & A Associates, Inc., of Cincinnati, Ohio, to conduct a study of the Tank Farm site that addressed needed improvements. One aspect included a fuel oil contamination study, for which PEDCo retained ATEC Associates of Indianapolis, Indiana. A copy of the ATEC Associates report can be found in Appendix B of Attachment A.

The study assigned to ATEC involved the preliminary assessment of possible soil contamination within the six cells that made up the Tank Farm that can be seen in Figure 5. In order to carry out the assessment, a two-phase program was established; the first phase consisted of a soils-gas survey and the second phase included a soil sampling and analysis program in areas with the highest soils-gas readings in each cell.

The soils-gas survey consisted of 71 sampling points that were established to locate petroleum contaminated soils. Each sampling point consisted of a three-foot long temporary PVC pipe monitoring port with a slotted screen that measured the amounts of total combustible vapors (TCV's) in the soil. Photographic documentation of the soils-gas monitoring ports can be found in Appendix A of Appendix B of Attachment A.

In order to place the temporary ports, a hole was drilled with a power auger that was equipped with a 2-¼ inch O.D. auger, to a depth of three feet. The auger was removed and the three-foot long temporary soils-gas monitoring port was positioned into the annulus of the borehole. The port consisted of two inch I.D. Schedule 40 polyvinyl chloride (PVC) pipe, the bottom half of which was slotted to allow the entrance of soil vapors. The top of the pipe was equipped with compression fitting which allowed an airtight connection to the silicon tubing sampling line. The air within the sampling port was purged with a small portable field pump prior to sampling in order to eliminate any stagnant vapors and to provide a representative sample.

It should be noted that the soils-gas survey technique is a screening tool only, and field and laboratory modifications are often necessary to yield useful

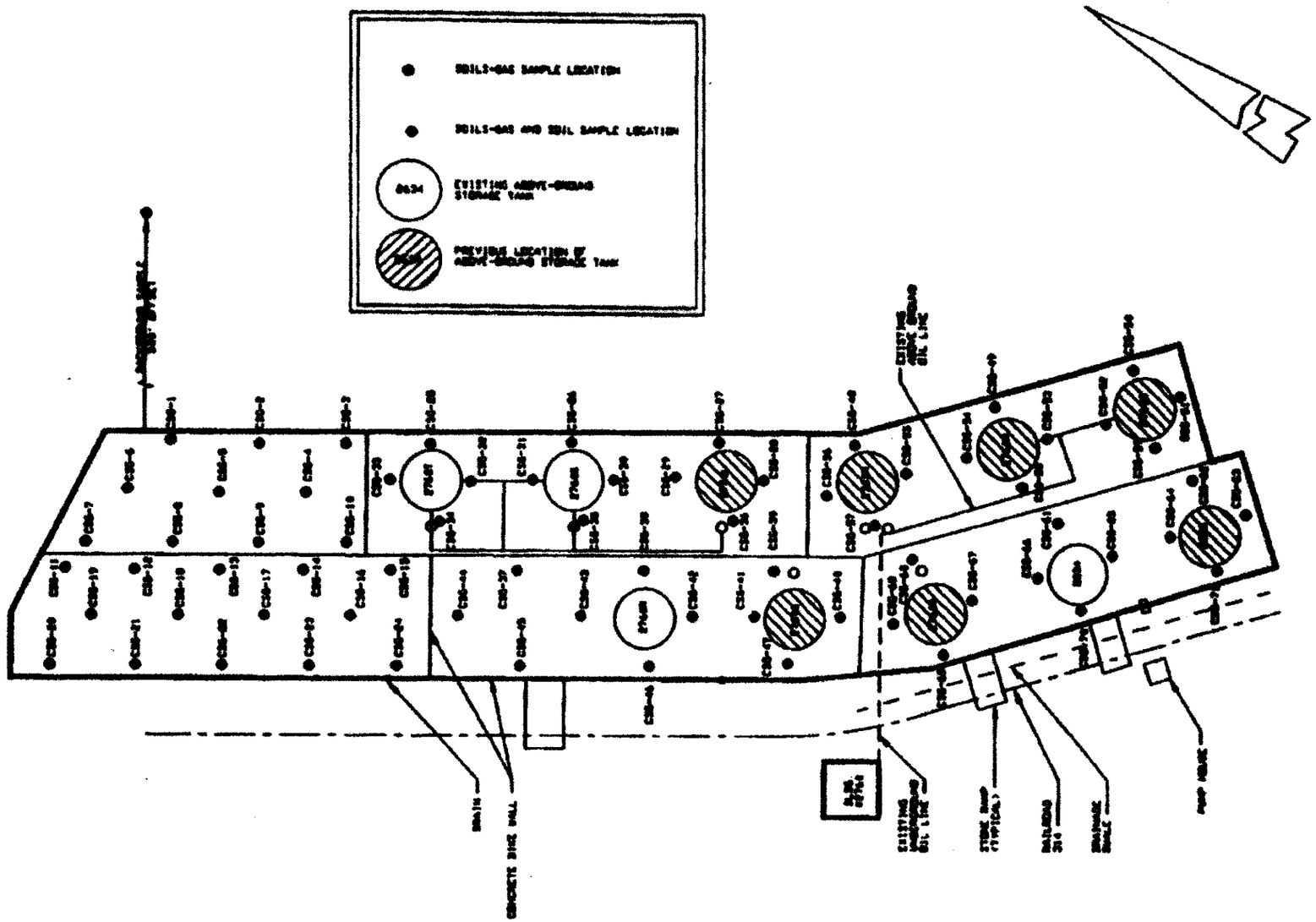

Figure 5 – Tank Farm Layout with ATEC Soils Gas Survey Points

results. While the survey serves to identify the existence of subsurface contamination, it illustrates only relative distribution of petroleum vapors in the soil. In addition, there are no standardized methods for performing these surveys, and no standardized guidelines established by regulatory agencies regarding TCV limits in the subsurface. In general, the background levels of TCV's at an undeveloped site would be 25 ppm or less while background values at an industrial site would be 50 to 200 ppm. For the purpose of establishing the background levels at this site, a vapor port was installed 500 feet from the above ground storage tanks. The TCV from this site was reported to be 350 ppm.

Representative vapor samples were drawn through the sampling ports and analyzed for TCV's in parts per million (ppm) with a Gastechtor Hydrocarbon Survey Model 1314 Gas Indicator. The Gastechtor's built-in pump continuously draws air samples into a reaction chamber, which is equipped with a heated, catalytic, platinum element. The indications of the catalytic element are reported on a dial display on the instrument in ppm. Once the pump has purged the sampling port, the tubing is connected and the measurements are noted, with the highest value recorded. For screening purposes, ATEC calibrated the instrument to 400-ppm hexane, and the reported values represent ppm as hexane. There are no established Indiana Department of Environmental Management (IDEM) or U.S. EPA standards for TCV levels. The highest TCV readings from each sampling location can be found in Appendix D of Appendix B of Attachment A.

The second phase of the project consisted of soil sampling using a hand auger in areas within each cell with the highest TCV readings. Two hand auger borings, up to five feet in depth, were completed in each cell. Samples were collected at six-inch intervals down each boring. The samples were inspected for any visual indication of petroleum contamination and were also analyzed for TCV's using the Gastechtor. All samples selected for analysis were placed in four ounce glass jars with Teflon lined caps, labeled, and put on ice immediately following collection. Chain-of-custody documentation was used to track the samples from collection to the final destination. A soil lithology log was completed for each drill hole, copies of which can be found in Appendix D of Appendix B of Attachment A. The soils in each cell are predominantly fill material consisting of gray and brown, fine to medium sands, brown silty clays, and fine to medium gravels. Several borings encountered black tar or a diesel odor. A summary of the findings is seen in Table 1.

Table 1 – Soil Sample Findings

Number	Findings	TCV values
CSG-11	Black tar layer	> 500 ppm
CSG-41	Diesel odor and staining	50 - >500 ppm
CSG-47	Same	50 - >500 ppm
CSG-50	Diesel odor and staining	100 - >500 ppm
CSG-53	Same	100 - >500 ppm
CSG-60	Diesel odor, green stain	>500 ppm
CSG-70	Same	>500 ppm
CSG-71	Same	>500 ppm
Background	None	Non-detectable

A complete list of TCV values can be found in Appendix B of Appendix B of Attachment A.

Areas of high total combustible vapors (TCV's) were targeted for soil sampling and analysis. Of the 71 sample sites, laboratory soil analyses for total petroleum hydrocarbons (TPH) were run on two samples from each of cells 1-5, and three samples from cell 6, for a total of 13 samples. Figure 5 shows the location of the ATEC soil gas survey points and sampling sites. Appendix B of Appendix B of Attachment A shows the results of the soils-gas survey, and Table 2 shows laboratory results of the 13 Total Petroleum Hydrocarbon Analysis samples. All soil samples were collected and handled using protocols from the U.S. EPA guidelines established in "Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods", SW-846. Analysis was performed on a Varian 3700 Gas Chromatograph using flame ionization detection via SW-846 Method 8015, Revised.

Table 2 - Soil Laboratory Results

Sample Location	Cell No.	Total Hydrocarbon (ppm)	Quantitation Limit
CSG-1	1	<1.0	1.0
CSG-6	1	<1.0	1.0
CSG-11	2	12*	2.0
CSG-24	2	<1.0	1.0
CSG-29	3	<1.0	1.0
CSG-36	3	<1.0	1.0
CSG-41	4	5.3**	1.0
CSG-47	4	<1.0	1.0
CSG-50	5	1.4**	5.0
CSG-53	5	<1.0	1.0
CSG-60	6	<1.0	1.0
CSG-70	6	**120***	4.0
CSG-71	6	**1800*****	10
Background		<1.0	1.0

* Hydrocarbon identified as weathered diesel fuel
** Hydrocarbon most closely resembles weathered diesel fuel
*** Hydrocarbon pattern is a mixture of gasoline and diesel fuel

Laboratory analysis sheets are provided in Appendix E of Appendix B of Attachment A.

The Indiana Department of Environmental Management (IDEM) requires cleanup of soils contaminated to a level of 100-ppm TPH. As can be seen in Table 2, only two soil samples, both in Cell 6, showed a level of TPH above 100 ppm. The results showed little contamination other than in Cell 6. ATEC personnel reported strong diesel fuel odors at many sites but the laboratory data did not substantiate heavy contamination.

In spite of the laboratory analyses that showed TPH levels below the State cleanup level, it was recommended by ATEC that soils near sample sites CSG-11, 41, 47, 50, 53, and 60 be removed for proper disposal, in order to protect against future liabilities. This was in addition to the recommended removals at the two sites, CSG-70 and CSG-71, which were contaminated above the State's recommended limit.

PEDCo made several recommendations based upon the ATEC results. These include both site and operational improvements that are summarized as follows:

Site Improvements:

- **Removal of Contaminated Soil**
- **Repair or Replacement of Existing Containment**
- **Drainage Improvements North of the Tank Farm**
- **New Fencing**
- **Exterior Lighting Upgrade**
- **Relocation of Tank B-30**
- **Miscellaneous Items**

Operational Improvements:

- **Pumping System for Existing Tanks**
- **Pumping System for New Tanks**
- **Replacement of Existing 42,000-Gallon Storage Tank**
- **Waste Oil Storage Tank**
- **Jet Fuel Storage Tank**

While numerous suggestions for improving the tank farm site were made, none of the work was immediately carried out.

3.2 1993 Howard, Needles, Tammen, and Bergendoff, Indianapolis, Indiana – Site Remediation Study, Tank Farm.

In 1993, Howard, Needles, Tammen, and Bergendoff (HNTB), of Indianapolis, Indiana, were contracted by NSWC Crane to complete a soil investigation at the fuel oil storage Tank Farm. As part of the improvements to be constructed at the Tank Farm, HNTB was directed to study the nature and extent of soil contamination through soil borings and analytical testing. This study was to expand on the previous soil contamination study completed by PEDCo E & A Services and ATEC Associates in 1989. A copy of the Howard, Needles, Tammen, and Bergendoff report can be found as Attachment A.

Table 3 gives a summary of the amount of soils that PEDCo recommended be removed. The cell surface area and soil volume was estimated by HNTB because PEDCo did not indicate either in their original study.

Table 3 – Soil Removal Summary

CELL NUMBER	CELL SURFACE AREA (FT^2)	PEDCO EXCAVATION DEPTH	ESTIMATED SOIL VOLUME (YDS^3)
1	8,500	2	630
2	11,500	2	850
3	12,900	3	1430
4	12,500	2	930
5	11,300	5	2090
6	11,300	5	2090
TOTAL			8020

Crane wanted to replace the existing Tank Farm containment with new concrete dikes. As part of the work, other Tank Farm improvements, such as replacement tanks, new piping, leak detection, spill prevention and disposal of contaminated soil off base, were requested. On site disposal costs were estimated by PEDCo to be $266,000. Off site disposal would significantly increase this cost because of the additional hauling, disposal, and administration. HNTB estimated the total disposal cost to be $65 per cubic yard for up to 10,000 cubic yards of soil. The total amount of soil to be disposed of was increased from 8020 cubic yards to 10,000 cubic yards because previous sampling results showed contamination below five feet in depth. Previous sampling depths were limited by the use of a hand auger. The ATEC study concentrated only on the Tank Farm area within the containment walls and did not look at the tanker loading area, or any areas outside of the containment.

Given the potential large volume of contaminated soil and the associated high cost for disposal, HNTB's proposed scope of work included a site remediation study with the following objectives:

1. Characterize on site soils through soil borings and analysis to determine the nature and extent of petroleum contamination.
2. Determine the volume of soil to be excavated for off site disposal.
3. Develop and review contaminated soil handling options per IDEM requirements.
4. Conduct testing to enable waste classification for contaminated soil disposal.
5. Determine the impact of tank painting residues on soils by analyzing for chromium and lead.
6. Review remediation options for soil and groundwater including vapor extraction procedures.

HNTB developed a sampling plan to collect samples from both inside and outside the containment area. It was decided to dig several backhoe pits within the containment walls in order to obtain samples from greater depths and to provide better visual access to the area of contamination. Upon completion of the test pits inside the containment areas, seven soil borings outside the containment and two borings at the loading station and with a greater knowledge of the extent of the contamination, it was decided to modify the original sampling plan. This was based on the fact that no contamination was found outside of the containment, the soils outside of the containment were tight clays, and the contamination inside the cells was limited mainly to Cell 6.

Sampling Locations – The HNTB survey crew marked 10 soil boring locations outside the containment walls, 13 soil boring locations, six test pit locations, and four surface soil sampling locations within the containment walls, and tied them to known positions in order to establish their exact locations. Figure 4 shows the sampling locations.

Outside Testing – A drill crew from Engineering and Testing Services (ETS) brought in a conventional drill rig to begin the boring and sampling of nine holes outside of the containment walls. It was determined that borings SB-1, 2, 3, 4, 5, 7, and 10 would be drilled to a depth of 15 feet and L-1 and L-2 would be drilled to a depth of five feet. Split spoon sampling was completed at five-foot intervals for a total of 18 samples collected outside the containment walls. Boring logs are seen in Appendix D Appendix B of Attachment A. The auger cuttings were placed back in the holes and the holes were plugged with bentonite as per State guidelines. A visual observation was made of each soil sample

to identify soil type and any discoloration or odor that might indicate apparent contamination. Grab samples from selected intervals were placed in new, six-ounce, glass jars and transported to Louis B. Astbury Company, Inc., for testing. These samples were analyzed for Total Petroleum Hydrocarbons (TPH) using infrared detection. Three of the samples were chosen for confirmation THP analysis using a gas chromatograph with a flame ionization detector (GC:FID). All soil samples appeared to be free of petroleum contamination. A list of sample locations, hole depth and results is seen in Table 4.

Table 4 – Total Petroleum Hydrocarbons at Indicated Depths – Outside Sampling

Sample Loc.	0'-2'	3.5'-5'	8.5'-10'	13.5'-15'
SB-1	-	9.2	11.8	NS
SB-2	-	17.5	ND @ 5	NS
SB-3	-	111*	6.7	NS
SB-4	-	9.7	13.3	NS
SB-5	-	40.2	18.8	NS
SB-7	-	116*	252*	NS
SB-10	-	15.4	8.7	NS
SB-12	-	23.2	5.8	NS
L-1	242*	50.4	-	NS
L-2	ND @ 10*	100	-	NS

*TPH analysis by GC/FID. All other TPH analyses by TPH:IR.
L-1 and L-2 samples are from the tanker loading areas.
ND means not detected.
NS means not submitted for analysis.
Shaded values exceed IDEM's cleanup standard of 100 mg/kg.
SB-12 was taken during inside testing but is outside of the containment wall.

Inside Testing – 13 boring locations were surveyed within the containment walls, along with one site outside the walls. On the basis of soil types encountered during test pit excavation, it was decided three borings would be drilled to a depth of 15 feet and all others to a depth of 10 feet unless contamination was noted. Split spoon samples were collected every five feet with a total of 38 samples collected for analysis. A visual observation was made of each soil sample to identify soil type and any discoloration or odor that might indicate apparent contamination. Grab samples from selected intervals were placed in new, six-ounce, glass jars and transported to Louis B. Astbury, Inc., for analysis. The samples were submitted for analysis of Total Petroleum Hydrocarbons (TPH) using either an infrared detector (IR) or a gas chromatograph with a flame ionization detector (GC: FID). Lists of sample locations, hole depth, and results are seen in Table 5.

Table 5 – Total Petroleum Hydrocarbons at Indicated Depths – Inside Sampling

Sample Loc.	Cell No.	0'-2'	3.5'-5'	8.5'-10'	13.5'-15'
SB-A	6	2170	1090	40	23
SB-B	6	40	ND @ 10*	64.3	13.6
SB-C	6	1070	19*	14.3	-
SB-D	6	368	ND @10*	22.3	-
SB-E	6	82.3	ND @ 10*	5.3	-
SB-F	6	251	49*	7.8	-
SB-G	5	-	ND @ 10*	33.5	NRA
SB-H	5	-	107	ND @ 5	-
SB-I	5	-	8.7	22.1	-
SB-J	3	-	ND @ 10*	6.4	-
SB-K	3	-	6.0	5.0	-
SB-L	4	-	ND @ 10*	5.4	-
SB-M	4	-	8.7	23.1	-
SB-0+	2	1260	-	-	-
SB-P+	2	543	-	-	-
SB-Q+	1	140	-	-	-
SB-R+	1	173	-	-	-

+ Surface soil samples only TPH values believed caused by organic matter since no petroleum odor detected on site.
* TPH analysis by GC/FID. All other analyses by TPH: IR.
Shaded values exceed IDEM's cleanup standard of 100 mg/kg.
NRA – No record available from original report.

Surface soil samples were collected from Cells 1 and 2. Four samples were collected from four soil boring locations from a depth of one foot. These samples were submitted for TPH/IR analysis. These samples are included with the results in Table 5.

Six test pits were excavated within Cells 4, 5, and 6 by Van Hoy Excavation. The pit number, cell number, sample depth and results are summarized in Table 6. Sixteen samples were collected for analysis of TPH using IR or GC: FID methods. These samples included one groundwater sample, one composite sample from Pit 3, and 14 grab samples. Grab samples were placed in new, six-ounce, glass sample jars, while the composite sample was placed in a new, one-quart, glass sample jar before being transported to Louis B. Astbury Company, Inc., for analysis.

Table 6 – Total Petroleum Hydrocarbons at Indicated depths – Pit Samples

TEST PIT	CELL NO.	2.5'	3'	6'	7'	9'	10'	11'
1*	6	-	-	2370	-	-	10	-
2	5	-	86.7	-	141	-	-	-
3	6	-	22.1	ND @ 10	-	11.4	-	-
4	5	-	28.7	13.8	-	-	-	-
5	6	12.0	-	-	32.2	-	-	36.9
6	4	96.8	-	-	54.3	-	-	-

- A groundwater sample taken from a gravel layer.

Shaded values exceed IDEM's cleanup standard of 100 mg/kg.

All drill sites and backhoe pits were filled in upon completion of the work.

Analytical Testing Methods – Grab samples from split spoons, composite samples, and surface samples were submitted to Louis B. Astbury Company, Inc., for analytical testing. Tests run on these samples include the following:

Parameter	***EPA Test Method***
Hydrocarbons	
Total Petroleum Hydrocarbons (TPH) By Infrared Scan	EPA Method 418.1 Modified
Total Petroleum Hydrocarbons (TPH) By Gas Chromatography/ Flame ionization Detection (GC/FID)	EPA Method SW846-8015 Mod.
Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX) by GC/MS	EPA Method SW846-8260
Flashpoint	EPA Method SW846-1010

Metals

Total Lead	EPA Method SW846-6010 Flame Atomic Absorption Spectrophotometer (FAAS)
Total Chromium	EPA Method SW846-7190 Flame Atomic Absorption Spectrophotometer (FAAS)
TCLP Lead with Matrix Spike Corrections	EPA Method SW846-1311 and 6010, Zero Headspace Extraction-Flame Atomic Absorption Spectrophotometer (FAAS)

PCB's

Polychlorinated Biphenyls (PCB's)	EPA Method SW846-8080

SPECIAL WASTE DETERMINATION

Toxicity Characteristic Leaching Procedure (TCLP)	EPA Method SW846-1310 (Excludes Pesticides and Herbicides)
Ignitability	EPA Method SW846-1010
Corrosivity	EPA Method SW846-9040
Reactivity	EPA Method SW846-7.3.3.2, 7.3.4.2
PCB's	EPA Method SW846-8080
Total Solids	APHA 2540B

Total Petroleum Hydrocarbon (TPH) analysis utilized two methods. The Infrared Scan (IR) is used as an inexpensive screening tool to detect areas of possible contamination. This tool is used in conjunction with field observations (staining, odor, etc.) plus the results of a field organic vapor scan to select samples for laboratory testing. The Infrared Scan is about half of the cost of what the GC/FID test costs, thereby enabling more tests within the same budget.

However, the IR scan picks up interference from vegetation and other organic matter, resulting in higher values than those determined by the GC/FID method. For cleanup confirmations and underground storage tank removals, IDEM requires the more expensive GC/FID test.

QA/QC Record Keeping and reporting

The management, transfer, and disposal of all samples were controlled by chain-of-custody documentation. Field log sheets were used to record pertinent field information and sample collection data. Sample labels were used on each sample with identifying sample information such as location, depth of sample, and date of collection. Each sample location is identified numerically on a site map showing field locations. The chain-of-custody reports can be found in the HNTB report in Appendix F of Attachment A.

Sample Results

Soil samples were collected at regular intervals in the drill holes and the test pits within the containment walls to determine the vertical extent of any contamination. The sampling done by ATEC was limited to depths of five feet because of their use of a hand auger. Since contamination was found in Cell 6 at a depth of five feet, it was decided to open the test pits and the deeper drill holes and collect samples below the five-foot level. Of interest is the gravel layer found at the five foot level in Cell 6, which is believed to be an old tank pad used as a base for tanks when they were first constructed during World War II. It is now believed to be a horizontal conduit for fuel contamination. As can be seen from the data in Table 5, the contamination appears to be limited to shallow depths in Cell 6, except for SB-A where the contamination ends between five and ten feet.

The soil borings outside of the containment walls were concentrated on the west, or down gradient, side of the Tank Farm. It was believed that the contamination detected in Cell 6 had possibly migrated outside of the containment walls. No fuel odor was detected in these samples and no organic vapors were detected on the photoionization detector (PID) used to screen samples. TPH analyses showed a slight contamination outside of the containment walls most likely due to soil organic components and not petroleum. Soil boring SB-3 showed TPH levels slightly above 100 mg/kg (ppm) with the TPH: IR test, while sample SD-7 showed TPH levels above the cleanup standard using the GC: FID test (IDEM required). Sample SD-7 was located adjacent to a drainage ditch flowing from the Tank Farm and a 3,000-gallon oil/water separator. It was believed that this contamination may be from the July 14, 1987, fuel oil spill. It was suggested that the deep layers of clay and silty clay outside of the containment walls have served to limit the spread of pollutants.

Soil samples taken by hand from the surface were collected in Cells 1 and 2 for hydrocarbon analysis. None of the samples showed any visual indication of petroleum contamination, which confirmed results of the ATEC study. Because no indication of fuel oil was present, TPH analysis was done by the TPH: IR method. Results were unusually high as is seen in Table 5. It was possible that either organic material mixed in with the surface samples or weathered fuels with no visible indications remaining caused the high readings. If this were true, it would contradict the earlier findings. It was suggested that another set of samples be taken and analyzed using the TPH: GC/FID method.

Heavy metals contamination was also a concern during this investigation. Lead based paint was used on the above ground storage tanks to prevent corrosion. Sandblasting of the tanks in preparation for repainting deposited paint particles on the ground surface. Sampling of the surficial material for chromium and lead contamination indicated lead concentrations above the typical background levels. However, leaching tests using the TCLP protocol showed the soil to be non-hazardous.

Testing also included other parameters in addition to the main concerns regarding petroleum hydrocarbons and heavy metals. Off-site disposal requires that a hazardous waste determination be made to show that the waste is non-hazardous.

EPA's and IDEM's criteria for identification of hazardous wastes are covered in 40 CFR 261 and 329 IAC 3, respectively. In order for a waste to be considered a hazardous waste, it first must meet the definition of a "solid waste." Petroleum contaminated soil, such as that found in Cell 6 was classified as a solid waste. According to both federal and state regulations, two basic criteria identify whether a solid waste is a hazardous waste:

1) if it exhibits any of the "characteristics" of a hazardous waste, and/or
2) if it is a "listed" waste.

Hazardous waste characteristics were based on four parameters:

1) Ignitability (flashpoint less than 140 F)
2) Corrosivity (pH greater than 12.5 or less than 2.0)
3) Reactivity (unstable, explosive, or forms toxic gases of cyanide or sulfides)
4) Toxicity Characteristic Leaching procedure (TCLP) (Leachate exceeds maximum contaminant levels)

Petroleum contaminated soils that were non-hazardous (e.g., were not ignitable or TCLP toxic for lead) were considered special wastes in Indiana. Disposal can occur only at permitted sanitary landfills. Samples tested confirmed that the waste soils were non-hazardous and acceptable for landfilling.

Site Remediation

Several soil disposal alternatives were developed that were both easily implementable and cost effective.

Excavation/Off-Site Disposal

- **Soil Vapor Extraction**
- **Landfarming**
- **No Action**

Groundwater Remediation

- **Pump/Haul off-Site for Disposal**
- **Pump and Treat/NPDES Discharge**
- **Carbon Treatment**
- **Air stripping**

Each of the above alternatives requires a waiting period for the permitting process to be completed. The estimated turn around time for the NPDES permits was 180 to 240 days. This time frame assumed that there would be no objections to the selected alternative filed under the Administrative Adjudicatory Act (AAA) which allows for public hearings and legal procedures to challenge IDEM's decision to issue permits for the project. Any public opposition would significantly delay the project. Given the long permitting time and the small volume of water to be treated, it was recommended that the water be hauled off-site for disposal.

- **Pump and Treat/WWTP Discharge**
- **Two Phase Vapor Extraction**

Summary and Recommendations

Howard, Needles, Tammen, and Bergendoff performed this study, with environmental soil borings conducted by Engineering and Testing Services, Inc. (ETS), and Louis B. Astbury Company, Inc., conducted laboratory testing.

The purpose of the study was to determine the nature and extent of petroleum contaminated soil at the Tank Farm in order to determine the

appropriate remediation options and the costs for clean up. Clean up is necessary to comply with environmental regulations and to clear the area of contaminated soil prior to further construction at the site. The Indiana Department of Environmental Management (IDEM) does not have guidelines for the clean up of contaminated soil from an above ground storage tank facility. However, future guidelines will undoubtedly require such clean up. Therefore, it is recommended that the soils with Total Petroleum Hydrocarbon (TPH) above 100 mg/kg be targeted for clean up.

The study found that the contamination present at the Tank Farm was more limited than previously thought. The soils are non-hazardous, acceptable for landfilling, and confined principally to the surficial clay soils. Therefore, the following options were recommended:

1) Remove only the soils contaminated above 100 mg/kg (ppm). It was estimated that less than 2000 cubic yards of soil needed to be removed (contaminated soil plus a 20% contingency). The total cost of soil removal at $65.00 per cubic yard was $130,000.

2) Contaminated groundwater in Cell 6 needed to be removed and hauled off-site at a cost of $25,000. The above two recommendations require careful excavation done in layers with soil testing used to confirm that the cleanup standards were achieved.

3) All tanks and piping abandoned under the replacement tank project need to be removed and the soil tested to confirm that cleanup was complete.

4) Apparent contamination was detected in Cells 1 and 2 but these results were not substantiated by previous studies, or by smell or visual observations. It was recommended that further testing be performed in these two cells. All testing should be done by the more costly, but more reliable, TPH by GC/FID system.

5) It was suggested that new concrete containment for replacement tanks in Cells 5 and 6 be constructed. A barrier should also be installed between soils left in place and the containment. Monitors should be placed between the two barriers to monitor the clean fill and not background petroleum levels.

3.3 1996 – Evaluation of Environmental Issues Associated with the Bulk Fuel Storage Facilities, Crane Division, Naval Surface Weapons Center, Memorandum to J. Hunsicker.

Various reports regarding the Tank Farm were reviewed. Since the primary function of the Tank Farm was the storage of bulk fuel, and the use of bulk fuel for heating buildings has dropped since the installation of natural gas, the best alternative for the site is the demolition of the tanks and the cleanup of the site. Soil clean up would have to be performed regardless of whether the tank farm is upgraded or dismantled. It was suggested that the cost of upgrading the site would be higher than dismantling the tanks.

A copy of the 1996 Evaluation of Environmental Issues Memorandum can be found in Attachment B.

3.4 1996 – Supply Directorate, Naval Surface Warfare Center, Tank Farm Memorandum.

A meeting was held 22 August 1996 between the Supply Directorate and the Public Works Directorate (Codes 112, 115, 095, and 097) to determine the action to be taken to eliminate the Tank Farm. This facility had been identified in previous environmental inspections as an environmental liability due to inadequate spill containment. The estimated cost to bring the site up to acceptable standards was well over one million dollars. In addition, usage of number 2 burner oil from the Tank Farm has decreased significantly since the change over to natural gas. Any buildings needing number 2 fuel oil in the future will be supplied under the contract as multiple drop.

It was recommended that the use of the Tank Farm bulk storage facility is discontinued and the site cleaned and dismantled.

A copy of the 1996 Draft Tank Farm Memorandum can be found in Attachment C.

3.5 1997 Sverdrup Environmental, Maryland Heights, Missouri – Closure Report, Tank Farm Decontamination, Storage Tank Removal and Installation Program.

In 1997, Sverdrup Environmental of Maryland Heights, Missouri, was contracted to perform a three-phase work project at the Tank Farm. Phase I involved the removal of both above ground and underground storage tanks from the Tank Farm at Crane Naval Surface Warfare Center. Phase II included the removal of interior concrete structures which consisted of an interior wall and the above ground storage tank footers. Phase III was the final soil analysis and contaminated soil removal. A summary of each phase follows.

A copy of the 1997 Sverdrup Environmental Tank Farm closure report can be found in Attachment D.

Phase I – During April, May, and June 1997,one underground storage tank and seven above ground storage tanks were removed, cleaned, cut up, and stacked for later removal. Tank information showing tank number, size, and contents is shown in Table 7.

Table 7 – Tank Summary

Tank Number	Tank Size (gallons)	Tank Contents
2632	15,000	#1 Fuel Oil
2634	43,000	Empty
2760R	200,000	#2 Fuel Oil
2760S	125,000	#2 Fuel Oil
2760T	125,000	#2 Fuel Oil
WASTE OIL – Horizontal	8,000	Waste Oil
GASOLINE – Horizontal	2,000	Gasoline
UST	10,000	#6 Fuel Oil

During the removal of the contents of the tanks, a total of 22,950 gallons of product, sludge, water, and oily residue were removed and transported off-site to either E.S.I. Recycling facility in Indianapolis or Warrior Oil Services facility in Franklin, Indiana.

The underground storage tank was partially uncovered to allow access to the contents. Approximately 3,100 gallons of #6 fuel oil and sludge were removed and transported off-site. After the tank was fully exposed, another 800 gallons of sludge were removed from the tank using a vacuum truck. The interior of the tank was cleaned in place before removal. During this time, air-monitoring devices detected no significant readings during or after the removal. Soil contamination was not observed.

Eight hundred cubic yards of soil were removed during the tank removal activities. In addition, seven soil samples were collected and analyzed for Total

Petroleum Hydrocarbons (TPH) using EPA method 8015. The samples were collected from the walls, floor, and stockpiled material. Analyses indicated no discernible TPH contamination. Following analysis, the 800 cubic yards of soil was returned to the excavation along with an additional 15 cubic yards of granular backfill. No additional removal of soils is indicated.

Phase II – The second phase of work involved the removal of interior concrete structures consisting of an interior wall and the above ground storage tank concrete footers. The outside wall, which was approximately three feet high and six inches thick, was not included in this phase of demolition in order to contain any potential contamination that may exist within the Tank Farm.

Phase III – The third phase of work included the collection and testing of selected soil samples and subsequent contaminated soil removal.

A sampling grid of 25' X 50' was developed to collect 38 samples within the Tank Farm containment area. Two samples were collected at each of 19 sites, one at one foot in depth and one at the two-foot level. The two samples from each location were then combined into one sample and submitted for analysis. The purpose of the sampling was to determine if shallow, subsurface soils could be used for excavation backfilling. The samples were analyzed for TPH and those having values below 100 mg/kg (ppm) were used to backfill the excavation.

A preliminary study by the United States Army Corps of Engineers showed areas of contamination. These areas were overexcavated and the soils were stockpiled within the Tank Farm containment area. A total estimated volume of approximately 2,750 cubic yards of contaminated soil was removed and stockpiled. After excavation, another 27 samples were collected, one for each 250 square feet of excavation bottom. The soil samples were analyzed for TPH using USEPA Method 8015 – Indiana. One sample (SW Corner-8) was also analyzed for TCLP using USEPA Method 6010. Sample LOC-35-3' was analyzed for VOC's using USEPA Method 8260. Laboratory results are found in Attachment F. It was determined that TPH concentrations in soil samples from the excavations are below levels indicative of environmental soil contamination.

The excavations were backfilled with the clean soil obtained from the northwest quadrant of the containment area. The on-site government representative, Mr. Lee Benson, determined that the stockpiled contaminated soils could be handled within the containment area. It was decided that to facilitate natural attenuation, the stockpiled contaminated soils were spread over the southeastern two-thirds of the containment area to a depth of 1.5 to 2.0 feet.

A gravel layer was encountered at a depth of seven feet in the extreme southern corner of the containment area. Mr. Lee Benson decided not to excavate the 62' X 58' area, because the volume of contaminated soil that would

require excavation was determined to exceed the scope of work for the current delivery order. In addition, it was found that the gravel layer extends beyond the containment area. The area was segregated from the rest of the containment area with a berm of clean soil and will be addressed during a subsequent phase of work at the Tank farm.

3.6 1998 – Department of the Navy – Tank Farm Demolition and Cleanup Summary

Beginning in June, 1997, 3000 cubic yards of fuel oil contaminated soil and sand were excavated from the Tank Farm site and transported to the Crane Sanitary Landfill (Landfill Permit 51-2) by a contractor of Sverdrup Environmental. This soil was considered a special waste and disposed of through Special Waste Certification No. 40689 and reported to the Indiana Department of Environmental Management (IDEM) on the first quarter, quarterly report for 1998, dated 8 January 1998.

After the work by Sverdrup was completed, the heavy equipment section of the Public Works Department was brought in to repeatedly plow the excavated zone, so that the contaminated soil was exposed to the air for a six week period. After three plowings, once every two weeks for six weeks, three soil samples were taken, and their analyses came back clean, meaning less than 1 mg/liter of PCB's detected and less than 0.1 mg/liter total metals present. The analytical results are available in Attachment F, which is a complete copy of the Department of the Navy Tank Farm Demolition and Cleanup Summary.

The heavy equipment section of the Public Works Department completed the removal of the Oil Water Separator (OWS) in May 1998. The OWS was located outside of the fenced in area near the site entrance. The equipment was sold as scrap, along with all of the associated piping. The Environmental Protection Department inspected the site and found it to be free of visible contamination.

The last phase of work involved the removal of all concrete associated with the containment footers and any other left over debris. This material was taken to the Crane Solid Fill site (Solid Waste Facility Permit 51-6) by the Heavy Equipment Section of the Public Works Department. Final removal of concrete from containing walls and the extraction of an exposed pipe from an emergency sprinkler system was completed in April 1999. All material was taken to the Construction/Demolition site on Center for disposal.

According to this report, the Tank Farm site is now clean. The only remnants are a concrete containment surrounding a force main to a sanitary sewer line, and the perimeter fence, which is in disrepair. No further clean up activities are planned for the Tank Farm at this time.

4.0 SUMMARY AND CONCLUSIONS

The Tank Farm Site at the Crane Division, Naval Surface Warfare Center, has been studied repeatedly over the last eleven years.

The first study in 1989 by PEDCo E and A Services found contamination limited primarily to Cell 6. No samples were collected outside of the containment area and no samples taken within the containment area were from deeper than five feet. In spite of the low concentration of petroleum contaminants detected, PEDCo recommended excavating soil from every containment cell for landfilling at the base sanitary landfill at a cost of $266,000. In addition, they recommended several physical changes to the Tank Farm, including new pumping systems for existing tanks, replacement of older tanks with new and larger tanks, and the upgrading of containment walls, fencing, and exterior lights.

Howard, Needles, Tammen, and Bergendoff (HNTB) completed the next study in 1993. They were directed to study the nature and extent of soil contamination and expand on the previous PEDCo study. They took more samples and deeper samples both inside and outside of the containment. HNTB found that the contamination was less extensive that was previously thought and recommended the removal of less soil from with the containment area. In addition, HNTB recommended the removal of 50,000 gallons of contaminated ground water in Cell 6 and the erection of a new concrete containment for replacement tanks in Cells 5 and 6.

In 1997, Sverdrup Environmental began the actual remediation of the site. They removed one underground and seven above ground storage tanks, along with most of the associated concrete structures. Approximately 2750 cubic yards of contaminated soil was removed and stockpiled, and later returned to the surface of the containment. A gravel layer thought to be a conduit for petroleum contaminated water was encountered during the soil removal. However, it was not removed because it was not within the scope of the work order.

The Public Works Department removed 3000 cubic yards of petroleum contaminated soils in 1998 and transported it to the landfill at Crane. In addition, they removed all remaining concrete barriers. According to this report, the site was believed to be clean of contaminants.

After studying the aforementioned reports, it has become apparent that the Tank Farm site at Crane cannot be considered a clean site. Based on the existing evidence, the site needs to be further characterized. Additional samples need to be taken to determine if further contamination exists both inside and outside of the containment walls. In addition, the buried gravel layer encountered in Cell 6 must be addressed.

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6.0 ATTACHMENTS

Attachment A – Howard, Needles, Tammen, and Bergendoff – 1993 Site Remediation Study

Attachment B – 1996 Evaluation of Environmental Issues Memorandum

Attachment C – 1996 Tank Farm Memorandum

Attachment D – 1997 Sverdrup Environmental Tank Farm Closure Report

Attachment E – 1997 Sverdrup Environmental Work Performed, Tank Farm

Attachment F – 1998 Department of the Navy Tank Farm Demolition and Clean Up Summary

ATTACHMENT A

CRANE DIVISION, NAVAL SURFACE WARFARE CENTER
CRANE, INDIANA

HNTB

SITE REMEDIATION STUDY
TANK FARM

MARCH 30, 1993

HOWARD NEEDLES TAMMEN & BERGENDOFF
ARCHITECTS ENGINEERS PLANNERS

SITE REMEDIATION STUDY
TANK FARM

CRANE DIVISION
NAVAL SURFACE WARFARE CENTER
CRANE, INDIANA

MARCH 30, 1993

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TABLE OF CONTENTS

Page No.

LIST OF TABLES iii

LIST OF FIGURES iv

LIST OF ABBREVIATIONS v

LIST OF REFERENCES vi

CHAPTER 1 - INTRODUCTION

1.1 Background 1-1
1.2 Previous Study 1-8
1.3 Objectives 1-11

CHAPTER 2 - FIELD INVESTIGATIONS

2.1 Sampling Locations 2-1
2.2 Sampling Methods and Equipment 2-1

2.2.1 Soil Borings 2-1
2.2.2 Test Pits 2-4

2.3 Analytical Testing Methods 2-7
2.4 QA/QC Recordkeeping and Reporting 2-9

CHAPTER 3 - SITE CHARACTERIZATION

3.1 Analytical Results 3-1

3.1.1 Total Petroleum Hydrocarbons 3-1
3.1.2 Heavy Metals 3-4
3.1.3 Other Pollutants 3-4

3.2 Soil Contamination 3-9

TABLE OF CONTENTS
(continued)

Page No.

CHAPTER 4 - SITE REMEDIATION

4.1 Soil Remediation Alternatives 4-1

4.1.1 Excavation/Off-Site Disposal 4-1
4.1.2 Soil Vapor Extraction 4-1
4.1.3 Landfarming 4-2
4.1.4 No Action 4-3

4.2 Groundwater Remediation Alternatives 4-3

4.2.1 Pump/Haul Off-Site for Disposal 4-3
4.2.2 Pump and Treat/NPDES Discharge 4-4
4.2.3 Pump and Treat/WWTP Discharge 4-5
4.2.4 Two Phase Vapor Extraction 4-5

CHAPTER 5 - SUMMARY AND RECOMMENDATIONS 5-1

APPENDICES

A Spill Reports

B Preliminary Fuel Oil Contamination Study - ATEC Environmental Consultants, Inc.

C Tank Farm Study - PEDCo E & A Services, Inc.

D Soil Boring Logs

E Analytical Test Results

F Sample Chain of Custody

G Landfarming Guidelines

LIST OF FIGURES

Figure No.		Page No.
1.1	Tank Farm Location	1-2
1.2	Site Photographs - Tank Farm	1-4
1.3	Site Photographs - Tank Farm	1-5
1.4	Tank Farm Layout - 1993	1-6
1.5	1952 Tank Farm Construction	1-7
1.6	Soil Gas Survey and Sampling Points ATEC Environmental Consultants, Inc. - June 30, 1989	1-9
2.1	Sampling Locations - Site Remediation Study - Tank Farm	2-2
2.2	Site Photographs - Containment Area Sampling - All Terrain Vehicle	2-5
2.3	Site Photographs - Tank Farm Soils	2-6
3.1	Contaminated Soil Areas	3-11

CHAPTER 1

INTRODUCTION

This report presents the results of a soil investigation at the fuel oil storage tank farm located at the Crane Division, Naval Surface Warfare Center near Crane, Indiana. The investigation was conducted during January and February 1993 and focused on the area within the tank farm containment walls and around the perimeter of the tank farm. The work was performed by Howard Needles Tammen & Bergendoff (HNTB) for the Naval Facilities Engineering Command, Department of the Navy.

1.1 BACKGROUND

As part of base operations at the Naval Surface Warfare Center, Crane Division, No. 2 fuel oil is stored in aboveground storage tanks at a tank farm located near the Crane gate on highway H-5. The tank farm is situated approximately 1,700 feet due west of the Lake Greenwood dam. The Lake Greenwood dam was constructed by the Works Progress Administration (WPA) in 1937. Figure 1.1 shows the tank farm location. The fuel oil is used for heating base buildings. Recently, natural gas has been provided by Indiana Gas Company, diminishing the need for heating oil. Previously, as many as 17 large capacity aboveground tanks were located at the tank farm with storage volumes of 42,000 gallons. Tank replacements in the 1970's included larger tanks with volumes up to 200,000 gallons. Most of the tanks have been retired from service and dismantled. Only three (3) tanks are in active use for No. 2 fuel oil today. These tanks, which are all welded steel with fixed roofs that conform to the American Petroleum Institute (API) Standard 650, are as follows:

Tank	Capacity [gals]	Cell	Year Erected
2760 R	200,000	4	1975 (new)
2760 S	125,000	3	1971 (used)
2760 T	125,000	3	1971 (used)

A fourth tank is located in cell No. 6, but has been emptied and taken out of service. This tank is a 42,000 gallon capacity riveted steel tank which was typical of many of the storage tanks at the tank farm. Several smaller horizontal tanks are also located at the tank farm, including an 8,000 gallon waste oil tank in cell No. 4, a 10,000 gallon No. 1 fuel oil tank, a 1,000 gallon gasoline tank, and an abandoned underground storage tank.

The underground tank, located north of pump building 2760, was used as part of a steam heating system. In the past, steam was used to heat the heavier burner fuel oils (such as No. 6) in order to get them to flow during cold weather. The steam boilers have since been removed from Building 2760 and the underground tank and steam circulating system are abandoned but still in place.

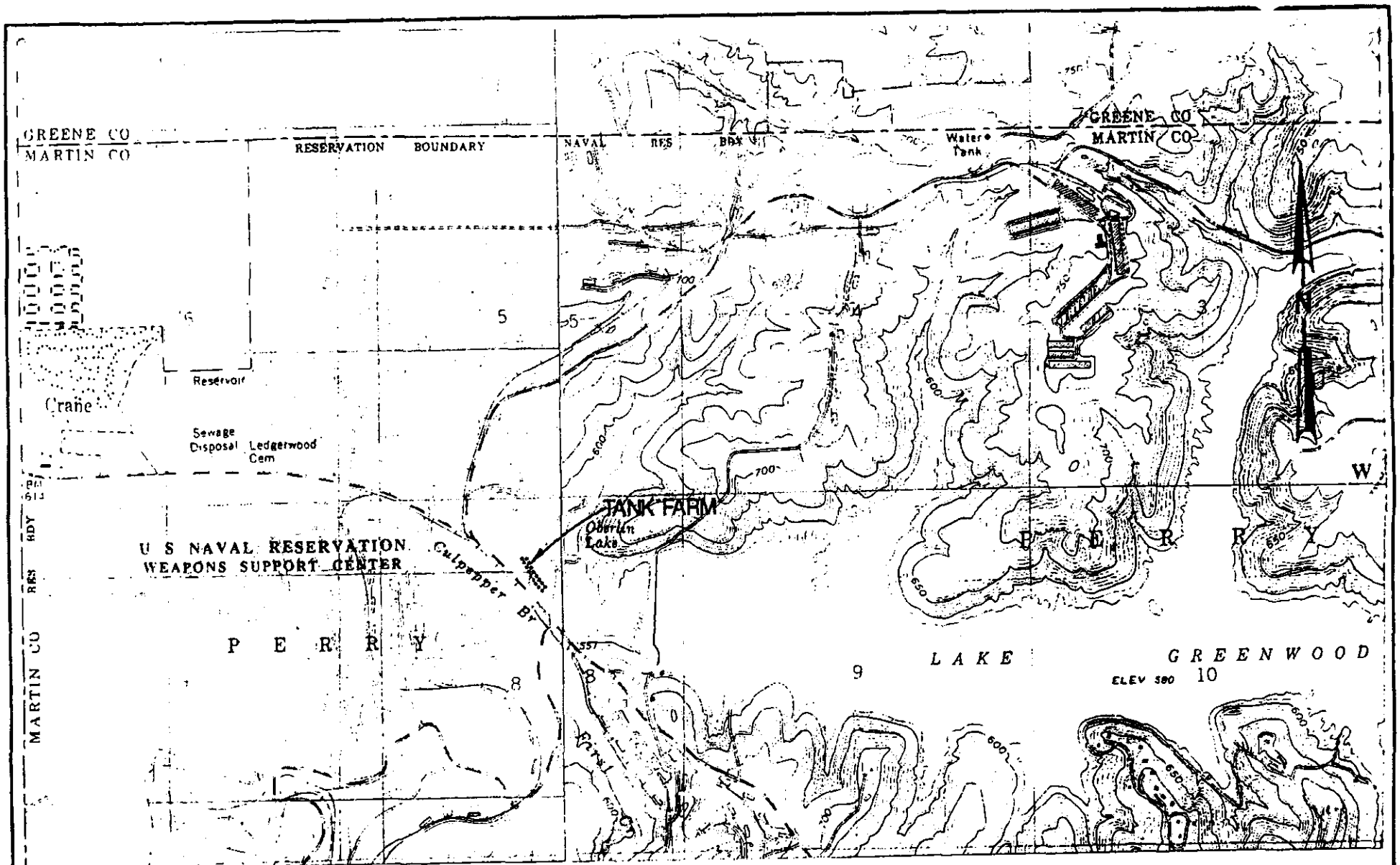

FIGURE 1.1
TANK FARM LOCATION
NAVAL SURFACE WARFARE CENTER
CRANE, INDIANA
MARCH, 1993

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ARCHITECTS ENGINEERS PLANNERS
INDIANAPOLIS, IND.

Fuel piping to and from the tanks is located primarily underground. Based on facility drawings, these pipes are bare steel single walled pipes without corrosion protection other than paint. The condition of the buried piping is unknown. Abandoned piping which still contains fuel oil is also present in cells 5 and 6. This piping served aboveground tanks which were removed in the 1980's. Part of the tank farm improvements under this project includes replacing the inaccessible piping with double walled pipe or piping contained in a concrete walled pipe gallery that allows visual inspection and provides containment of spills and leaks. Figures 1.2 and 1.3 show photographs of the tanks, containment, buildings and loading station.

Figure 1.4 shows the tank farm layout. The tank farm consists of six cells which previously held three tanks each. Cell No. 1 contained only two tanks. Containment is by poured concrete sections bolted together and sunk four feet into the ground. There is no concrete floor. The concrete walls are topped with a concrete cap. The tanks rest on a concrete foundation ringwall with the steel interior tank bottom resting on a sand bed. Base soils are primarily clays or silty clays. Some gravel has been placed on the surface to provide a walking surface. Due to the clay soils, water ponding leads to saturated soil conditions that produce muddy, unwalkable areas.

Fuel oil is delivered to the tank farm in tankers and off-loaded into a dedicated 4-inch fuel oil fillpipe (FOF) on the northwest corner of Pump Building 2760. The off-loaded fuel is run through 3-inch rotary fuel pumps rated at 300 gpm at 115 feet TDH. The fuel pumps deliver the fuel oil to one of three tanks. Simultaneous loading of fuel into the storage tanks and unloading from the tanks into base tankers is not possible. An air eliminator on the fuel oil meter vents at the northeast corner of the building. Entrained fuel is also released via the vent and deposited on the ground. Considerable fuel staining of the building has also occurred.

Fuel oil from the aboveground storage tanks is loaded into base tankers using the same pumping system. Valving located in the pump building and at the tanks is operated to permit loading. The tanker loading station, building 3063, is situated due south of the pump building. Physical features to contain spills include concrete curbing and a perimeter trench drain on the west side. Collected rainwater and leaked fuel which does not soak into the soil flows to the trench drains and to a sump and then to an underground 3,000 gallon oil/water separator. The base of the loading station consists of small sized gravel over the clay soils.

As with any fuel tank farm, fuel spills and leaks have occurred during operation. Base operations began during World War II with heating provided by No. 2 and No. 6 fuel oil stored at the tank farm. Prior to tank farm expansion in 1952, the two existing 42,000 gallon tanks were located in the area of Cell No. 6 at the original ground elevation. From test pit sampling, it appears that a 6-inch gravel base layer supported the original tanks. This gravel base layer can be found approximately 5 feet below the current ground elevation. As part of the 1952 improvements that included concrete containment walls, the ground elevation was raised 3.5 to 5.5 feet and the tanks were repositioned. Figure 1.5 shows the construction notes raising the ground elevation. This gravel layer appears to have served as a pathway for the spread of petroleum contamination as discussed in Chapter 3.

View of aboveground storage tanks and containment.

View looking north of tanker fill station 3063, pump building 2670 and containment.

FIGURE 1.2
SITE PHOTOGRAPHS
TANK FARM
NAVAL SURFACE WARFARE CENTER
CRANE, INDIANA
MARCH, 1993

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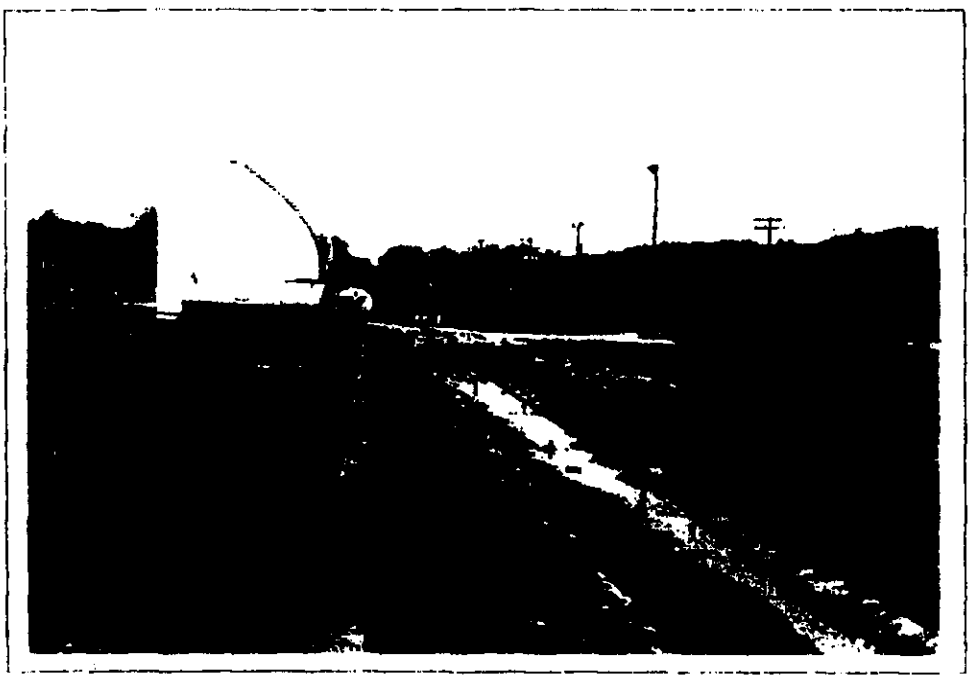
View looking south of 42,000 gallon riveted steel tank, containment, building 2627, and tanker fill station 3063.



View looking south along containment. Pump building 2760 is at right. The waste oil tank is in front of tank 2760R.

FIGURE 1.3
SITE PHOTOGRAPHS
TANK FARM
NAVAL SURFACE WARFARE CENTER
CRANE, INDIANA
MARCH, 1993

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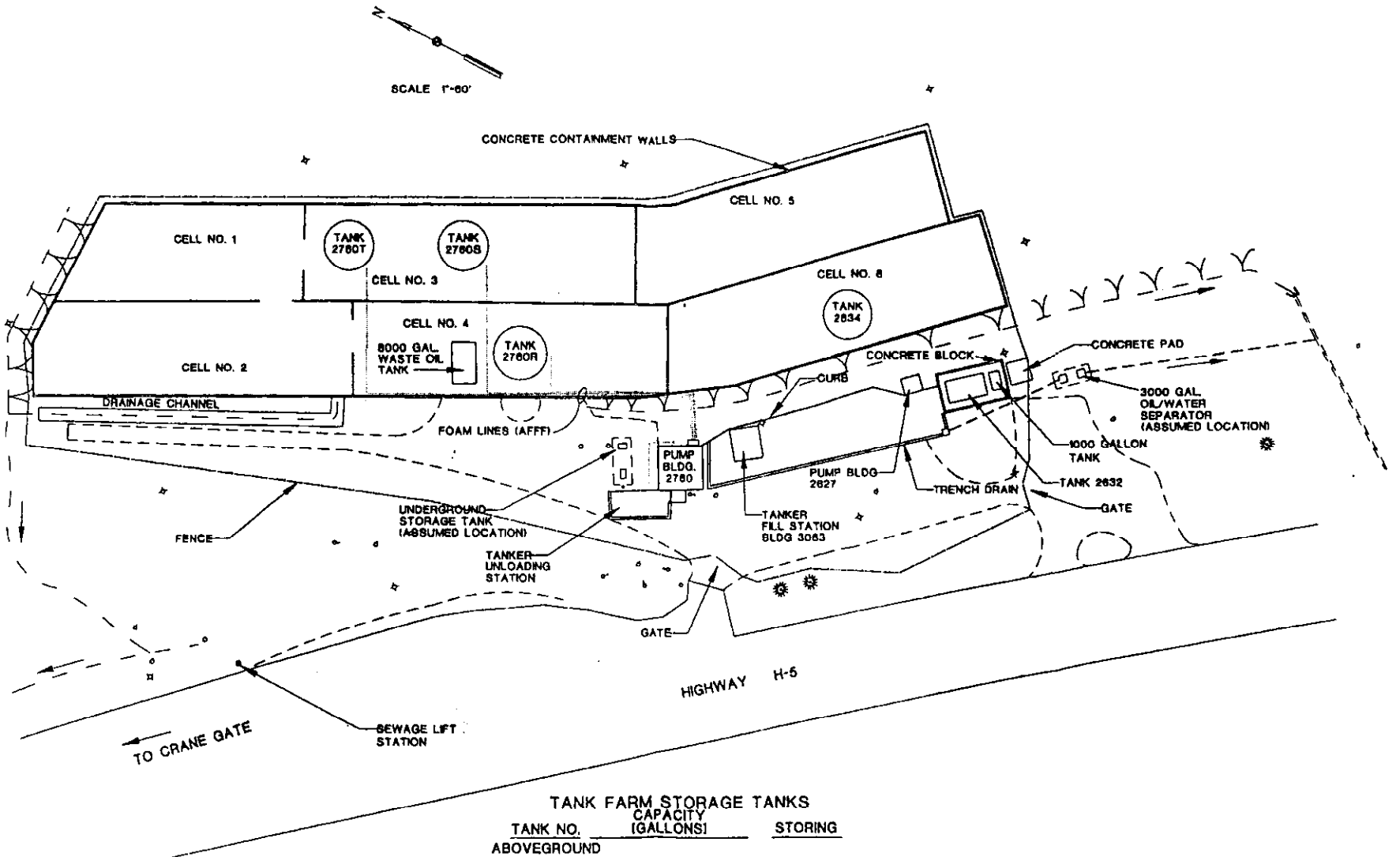

TANK FARM STORAGE TANKS

TANK NO.	CAPACITY (GALLONS)	STORING
ABOVEGROUND		
2760R	200,000	NO. 2 FUEL OIL
2760S	175,000	NO. 2 FUEL OIL
2760T	125,000	NO. 2 FUEL OIL
2634	42,000	EMPTY
2632	10,000(est.)	NO. 1 FUEL OIL
UNKNOWN	8,000	WASTE OIL
UNKNOWN	1,000(est.)	GASOLINE
UNDERGROUND		
UNKNOWN	UNKNOWN	UNKNOWN

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FIGURE 1.4
TANK FARM LAYOUT - 1993
NAVAL SURFACE WARFARE CENTER
CRANE, INDIANA
MARCH, 1993

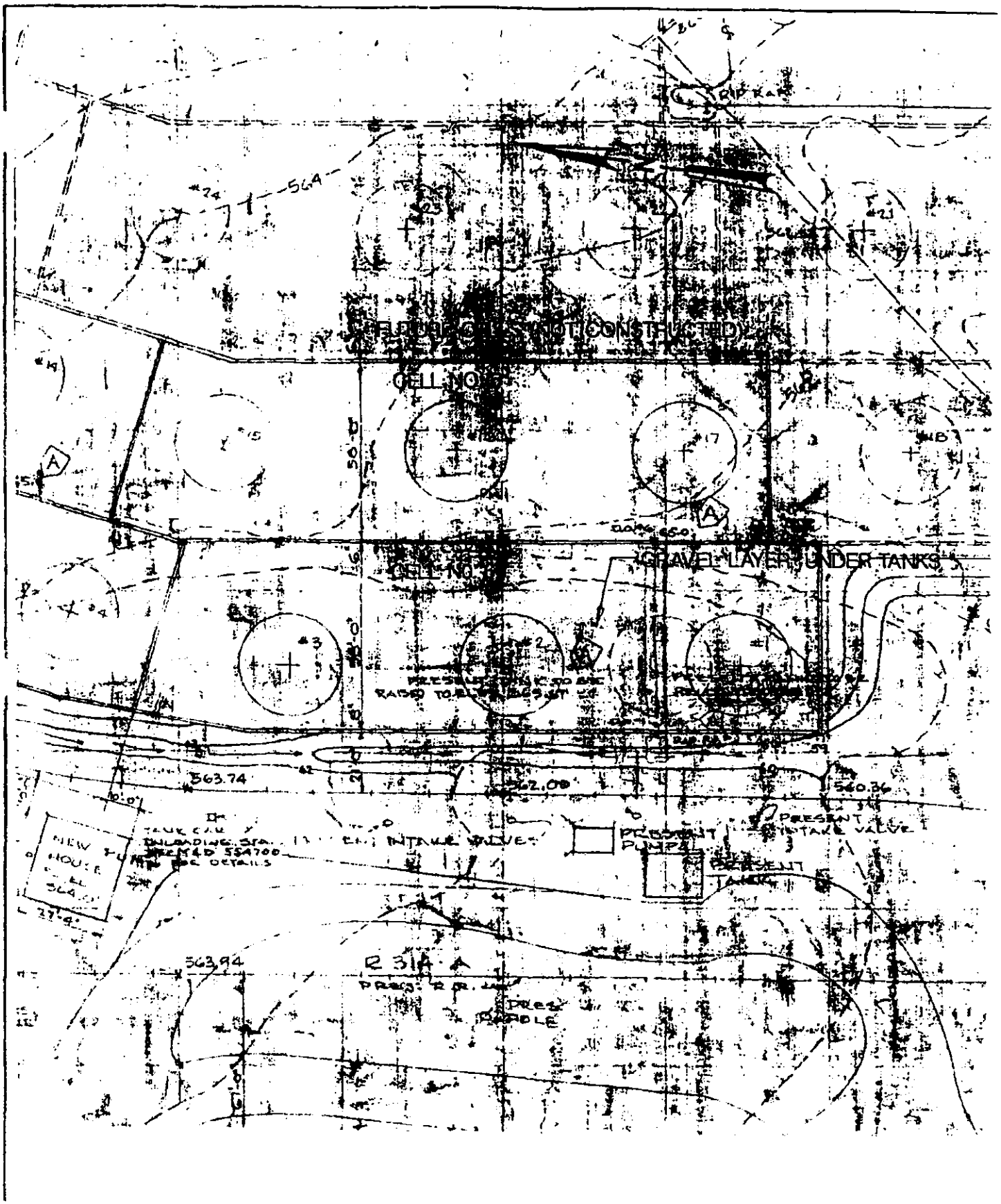

FIGURE 1.5
1952 TANK FARM CONSTRUCTIO!
CRANE NAVAL AMMUNITIONS DEPOT
CRANE, INDIANA
MARCH, 1983

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The majority of fuel spills at the tank farm have been caused by overfilling tankers or from spills occurring during disconnecting of the tanker fill lines. Other leaks have occurred from leaking manway covers and open valves. On July 14, 1987, approximately 4,000 gallons of No. 2 fuel oil was released to the ground with approximately 400 gallons reaching First Creek near Crane, Indiana. The spill was caused by a valve being left open inadvertently. Response crews collected about 500 gallons of fuel oil but the rest saturated the soil in Cell No. 6 over a 5,000 ft^2 area (65 ft x 70 ft). Spill reports for the July 14, 1987, spill are shown in Appendix A.

As part of the improvements to be constructed at the tank farm, HNTB was directed to study the nature and extent of soil contamination through soil borings and analytical testing. The study was to build on a previous soil contamination study.

1.2 PREVIOUS STUDY

Im 1989, Crane Division contracted with PEDCo E & A Services, Inc., (PEAS) of Cincinnati, Ohio, to conduct a tank farm study that addressed needed improvements. One of the tasks was to conduct a fuel oil contamination study. PEAS retained ATEC Environmental Services of Indianapolis, Indiana, to perform the study.

The purpose of the study assigned to ATEC was to make a preliminary assessment of possible soil contamination within the six diked concrete cells. The assessment consisted of constructing 71 soil gas survey sampling points. The sampling points were 3.0 feet long temporary PVC pipe monitoring ports with a slotted screen. The soil gas survey was used as a screening technique to locate petroleum contaminated soils. Areas with high readings of total combustible vapors (TCV) were then selected for soil sampling and analysis. Hand augured samples were collected to a maximum depth of 5 feet. Of the 71 soil gas survey points, laboratory analysis for total petroleum hydrocarbons (TPH) were run on 13 samples (2 samples from cells 1 through 5, plus 3 samples from Cell No. 6). Figure 1.6 shows the location of ATEC's soil gas survey points and sampling sites.

Laboratory results are summarized in Table 1.1. As can be seen from the data, only soil samples from Cell No. 6 showed hydrocarbons above 100 mg/kg (or ppm). For most sites, the Indiana Department of Environmental Management (IDEM) requires cleanup of petroleum contaminated soil to a level of 100 mg/kg. ATEC's sampling results showed little contamination except for Cell No. 6. No other analyses were reported. ATEC personnel reported strong diesel odors at many sites, but these observations were not supported by the lab data. In spite of the analytical findings that showed TPH concentrations below the State cleanup level, ATEC recommended in their report to PEAS that soils near sample sites CSG-11, 41, 47, 50, 53 and 60 be removed for proper disposal. These areas are in addition to the soils at sites CSG-70 and 71 which were contaminated above the State's cleanup standards. No indication was made in the ATEC study of the estimated total volume of contaminated soil nor how the limits of excavation around these other areas would be determined.

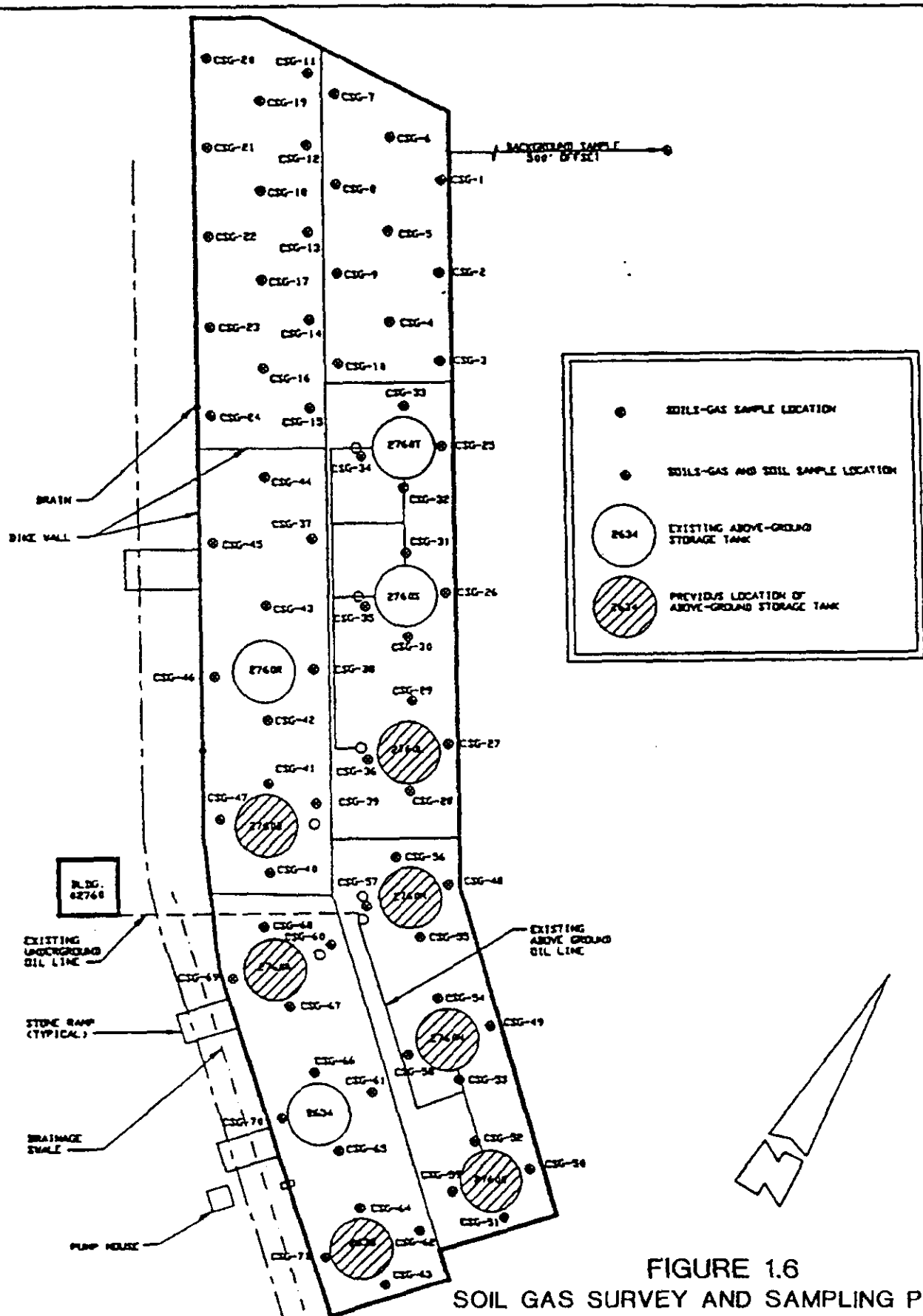

FIGURE 1.6
SOIL GAS SURVEY AND SAMPLING POINTS
ATEC ENVIRONMENTAL CONSULTANTS
JUNE 30, 1989
NAVAL SURFACE WARFARE CENTER
CRANE, INDIANA
MARCH, 1993

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TABLE 1.1

SUMMARY OF PREVIOUS ANALYTICAL RESULTS
TOTAL PETROLEUM HYDROCARBONS
ATEC SOIL CONTAMINATION STUDY
JUNE 30, 1989

SAMPLE LOCATION	CELL NO.	SAMPLE DEPTH [ft]	TOTAL PETROLEUM HYDROCARBONS [ppm]
CSG-1	1	Comp.	ND @ 1.0
CSG-6	1	Comp.	ND @ 1.0
CSG-11	2	3	12
CSG-24	2	3.5	ND @ 1.0
CSG-29	3	4	ND @ 1.0
CSG-36	3	3	ND @ 1.0
CSG-41	4	4	5.3
CSG-47	4	2.5	ND @ 1.0
CSG-50	5	2.5	1.4
CSG-53	5	2.5	ND @ 1.0
CSG-60	6	5	ND @ 1.0
CSG-70	6	4	120
CSG-71	6	1	1800
Background	-	2.5	ND @ 1.0

Notes:

1. Total Petroleum Hydrocarbon analysis was by SW-846 Method 8015 Modified.

2. Detected hydrocarbons reported to resemble weathered diesel fuel (No. 2 fuel oil).

3. Sampling and analysis done by ATEC Environmental Consultants, Inc. of Indianapolis, Indiana.

4. TPH values above the State cleanup limit of 100 mg/kg are shown highlighted.

The PEAS Tank Farm Study report dated July 31, 1989, followed the ATEC recommendations but increased the soil excavation quantity to include additional soils with hydrocarbons below IDEM's cleanup standards. This was recommended in order to "avoid non-compliance should the standards become more restrictive in the future". PEAS recommended that a minimum of 2 feet of soil be removed from all cells with greater depths removed in cells 3, 5 and 6, as shown in Table 1.2.

TABLE 1.2

RECOMMENDED SOIL EXCAVATION DEPTHS
PEDCo E & A SERVICES, INC.
JULY 31, 1989

CELL NO.	CELL SURFACE AREA *[ft²]	PEAS RECOMMENDED EXCAVATION DEPTH [ft]	ESTIMATED SOIL VOLUME* [cu. yds.]
1	8,500	2	630
2	11,500	2	850
3	12,900	3	1,430
4	12,500	2	930
5	11,300	5	2,090
6	11,300	5	2,090
TOTAL			8,020

The estimated cost in 1989 by PEAS to excavate the contaminated soil and dispose of it in the base landfill was $266,000. It is unknown what unit costs were assigned to the cost estimate for excavation, hauling and disposal. Based on 8,020 cubic yards of soil, the overall unit cost was $33.00 per cubic yard. Copies of the ATEC and PEAS studies are provided in Appendices B and C.

* Cell surface areas and contaminated soil volumes were estimated by HNTB based on PEAS recommended depths.

1.3 OBJECTIVES

The Naval Facilities Engineering Command has initiated work to replace the existing tank farm containment with new concrete dikes. As part of the work, other tank farm improvements, such as replacement tanks, new piping, leak detection, spill prevention and disposal of contaminated soil off station, have been requested. HNTB estimated the quantity of contaminated soil at approximately 8,020 cubic yards, based on PEAS recommended

depths. On-site disposal costs were estimated by PEAS at $266,000. Off-site disposal including removal, hauling, disposal and administration would increase costs significantly, especially for hauling and disposal. Total disposal costs were estimated by HNTB at $65.00 per cubic yard for up to 10,000 cubic yards of contaminated soil for a total cost of $650,000. The volume estimate was increased by HNTB from 8,020 to 10,000 cubic yards based on ATEC sampling results which showed contamination present at depths exceeding 5 feet in Cell No. 6. The sample depths achieved by ATEC were limited by the hand auger. The PEAS cost estimate assumed removal down to 5 feet only. The ATEC report also indicated that the soils in each cell were "predominantly fill material consisting of gray and brown fine to medium sands, brown silty clays, and fine to medium gravels." These soils are permeable and would permit petroleum spills to migrate over a wide area. The ATEC study also addressed only the tank farm area within containment. It did not include the tanker unloading and loading areas which are also contaminated from spills, and areas outside the tank farm which may have been contaminated.

Given the potential large volume of contaminated soil and associated high cost for disposal, HNTB's proposed scope of work included a site remediation study with the following objectives:

1. Characterize on-site soils through soil borings and analysis to determine the nature and extent of petroleum contamination.

2. Determine the volume of soil to be excavated for off-site disposal.

3. Develop and review contaminated soil handling options per IDEM requirements.

4. Conduct testing to enable waste classification for contaminated soil disposal.

5. Determine the impact of tank painting residues on soils by analyzing for chromium and lead.

6. Review remediation options for soil and groundwater including vapor extraction procedures.

CHAPTER 2

FIELD INVESTIGATIONS

On the basis of information from previous reports by ATEC and PEAS, HNTB developed a sampling plan to collect soil samples from 15 soil borings taken outside the containment area to a depth of 15 feet, and 14 hand augured samples within the containment area taken to a depth of 5 feet. Upon review of the ATEC sample results, it was decided to use a backhoe to dig six test pits for sample collection. The test pits provided samples from greater depths (0-15 ft) than could be obtained with hand augers (0-5 ft), provided visual access to the area of contamination, and proved to be more cost effective than the hand augers. Upon completion of the test pits inside the containment areas, seven soil borings outside the containment and two borings at the loading station and with greater knowledge of the extent of contamination, it was decided to modify the sampling plans. This was based on the fact that contamination was not evident outside containment, the local soils were tight clays, and contamination inside the cells was mainly limited to Cell No. 6. To gain better information on the depth of petroleum contamination, 13 soil borings were taken inside the cells, one soil boring was taken outside the cells and four surface soil samples were collected.

2.1 SAMPLING LOCATIONS

On January 26 and 27, 1993, an HNTB survey crew marked 10 soil boring locations, outside the containment walls, 13 soil boring locations, six test pit locations and four surface soil sample locations within the containment walls, and tied them into known positions in order to establish their positions. Sampling locations are shown in Figure 2.1. Soil borings are designated by the letters SB or L with areas within the tanker fill station designated by L. Soil borings outside the containment area are noted by numbers (i.e., SB-1) and soil borings inside the containment area are noted by letters (i.e., SB-A). Surface soil samples in Cells No. 1 and 2 are also designated by the letters SB (i.e., SB-O through SB-R). Test pits are designated by the letters TP (i.e., TP-1 through TP-6).

The tank farm containment area consists of six cells, each roughly 58 feet by 210 feet. As illustrated in Figure 2.1, cells are designated by the numbers 1 through 6.

2.2 SAMPLING METHODS AND EQUIPMENT

2.2.1 Soil Borings

On January 26, 1993, field personnel from HNTB met with an Engineering and Testing Services, Inc., (ETS) drill crew with a conventional drill rig to begin soil boring and sampling nine surveyed boring locations positioned outside the containment walls. Soil borings for the nine locations were completed within two days. On the basis of the soil types encountered during the test pit excavations (primarily clay) and soil borings, it was decided that soil borings SB-1, 2, 3, 4, 5, 7 and 10 would be taken to a depth of 15 feet and soil borings L-1 and L-2 would be taken to a depth of 5 feet. The ETS drill crew performed split spoon sampling every five feet.

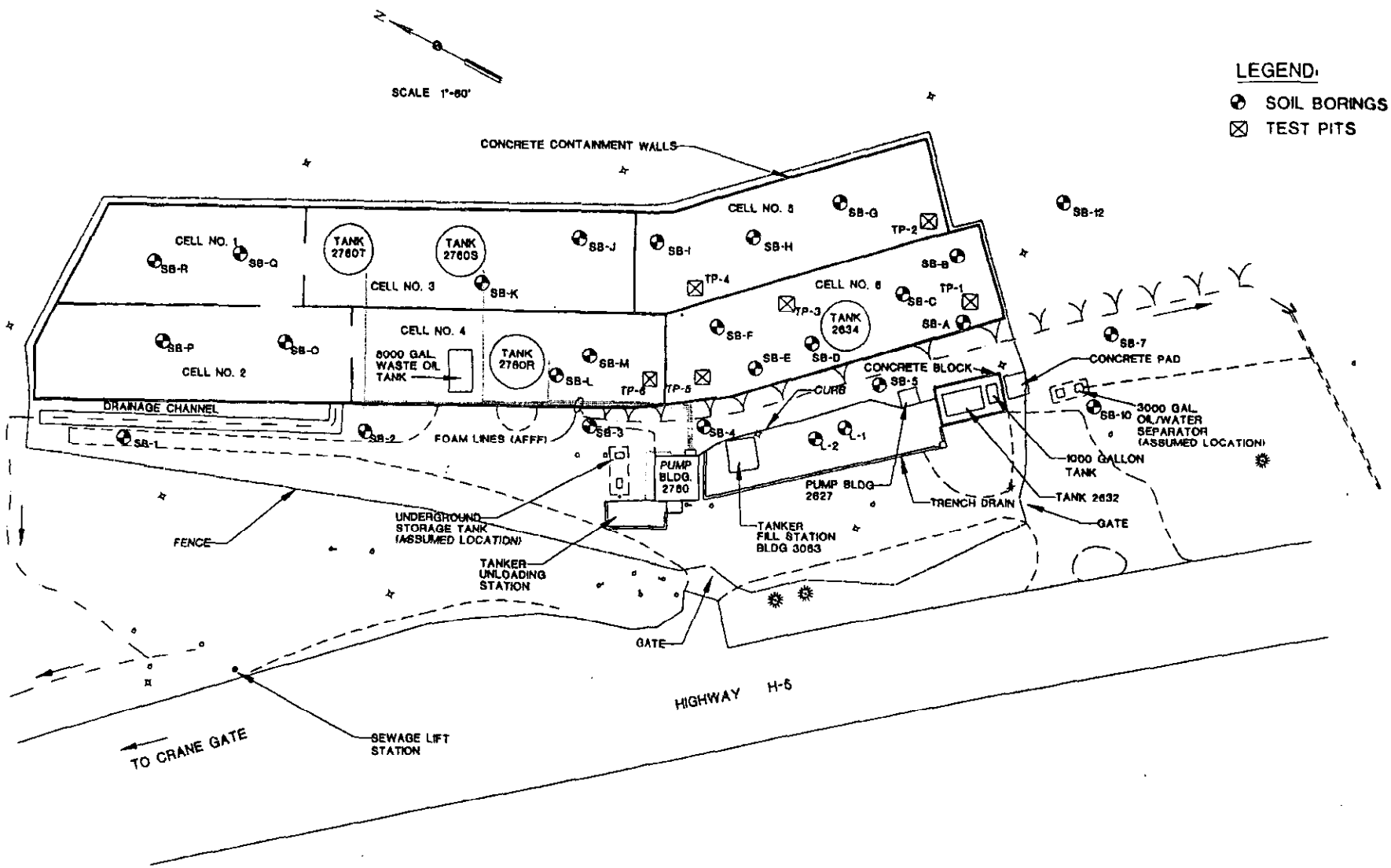

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FIGURE 2.1
SAMPLING LOCATIONS
SITE REMEDIATION STUDY
TANK FARM
NAVAL SURFACE WARFARE CENTER
CRANE, INDIANA
MARCH 30, 1993

Both the ETS geologist and HNTB field engineers made visual observation for each sample to identify (1) soil type and (2) zones of apparent contamination (such as discoloration, presence of oil, and incidental odors). Boring logs are located in Appendix D. A total of 18 samples were collected for analytical testing. Grab samples from the following intervals were placed in new six ounce glass sample jars and transported to Louis B. Astbury Company, Inc., for analysis of Total Petroleum Hydrocarbons (TPH) using an infrared detector:

Soil Boring	Sample Intervals Submitted for Analysis
SB-1	3.5'-5', 8.5'-10'
SB-2	3.5'-5', 8.5'-10'
SB-3	3.5'-5', 8.5'-10'
SB-4	3.5'-5', 8.5'-10'
SB-5	3.5'-5', 8.5'-10'
SB-7	3.5'-5', 8.5'-10'
SB-10	3.5'-5', 8.5'-10'
L-1	0'-2', 3.5'-5'
L-2	0'-2', 3.5'-5'

Upon completion of the above discrete TPH testing and evaluation of analytical data, three samples (SB-3/3.5'-5', SB-7/3.5'-5', and SB-7/8.5'-10') were selected, based on high TPH/IR concentrations, for confirmation TPH analysis using a gas chromatograph with a flame ionization detector (GC:FID). Analytical results are located in Appendix E and discussed in Chapter 3. All soil samples appeared free of petroleum contamination. The samples were composed of silty clays and clay soils.

On February 11, 1993, field personnel from HNTB met with an Engineering and Testing Services, Inc. (ETS) drill crew equipped with an all-terrain vehicle (ATV) drill rig to begin soil borings and sampling at 13 surveyed boring locations positioned inside the containment walls. In addition, a soil boring at SB-12 outside containment was drilled. On the basis of the soil types encountered during the test pit excavation (primarily clay), it was decided that soil borings SB-A, SB-B, and SB-G would be taken to a depth of 15 feet and the remaining soil borings would be taken to a depth of 10 feet unless contamination was detected. The ETS drill crew performed split spoon sampling at five intervals. The HNTB field engineer made visual observation for each sample length, to identify (1) soil type and (2) zones of apparent contamination (such as discoloration, presence of oil, and incidental odors). Boring logs are located in Appendix D. A total of 38 samples were submitted for analytical testing. Grab samples from the following intervals were placed in new six ounce glass sample jars and transported to Louis B. Astbury Company, Inc., for analysis of Total Petroleum Hydrocarbons (TPH) using either an infrared detector (IR) or a gas chromatograph with a flame ionization detector (GC:FID).

Following is a listing of the 38 samples by soil boring designation and depth:

Soil Boring	Sample Intervals Submitted for Analysis
SB-A	0'-10', 0'-2', 3.5'-5', 8.5'-10', 13.5'-15'
SB-B	0'-2', 3.5'-5', 8.5'-10', 13.5'-15'
SB-C	0'-2', 3.5'-5', 8.5'-10'
SB-D	0'-2', 3.5'-5', 8.5'-10'
SB-E	0'-2', 3.5'-5', 8.5'-10'
SB-F	0'-2', 3.5'-5', 8.5'-10'
SB-G	3.5'-5', 8.5'-10', 13.5'-15'
SB-H	3.5'-5', 8.5'-10'
SB-I	3.5'-5', 8.5'-10'
SB-J	3.5'-5', 8.5'-10'
SB-K	3.5'-5', 8.5'-10'
SB-L	3.5'-5', 8.5'-10'
SB-M	3.5'-5', 8.5'-10'
SB-12	3.5'-5', 8.5'-10'

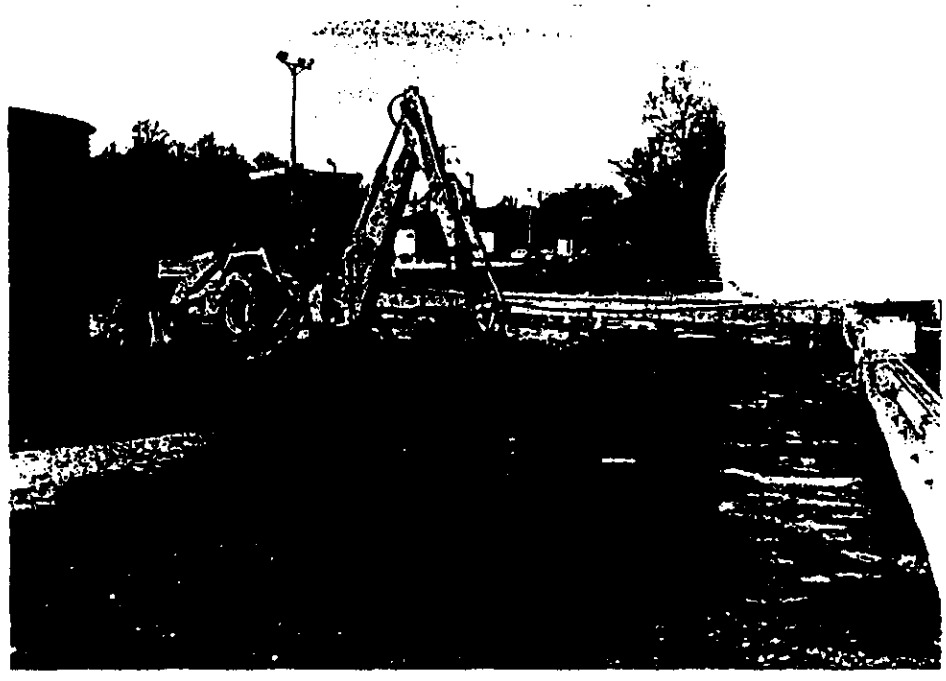
The auger cuttings were placed back in the boring holes and the holes plugged with bentonite grout upon completion of the sampling, per State guidelines. Photographs showing the drilling by the ATV are presented in Figure 2.2. The clay soils encountered are shown in Figure 2.3.

In addition to the soil boring samples, surface soil samples were collected from Cells No. 1 and 2. A total of four samples were collected via shovel from a depth of 1 foot at soil boring locations SB-O, SB-P, SB-Q, and SB-R for analysis. Grab samples were placed in six ounce glass sample jars and transported to Louis B. Astbury Company, Inc., for TPH/IR analysis. Analytical results are located in Appendix E.

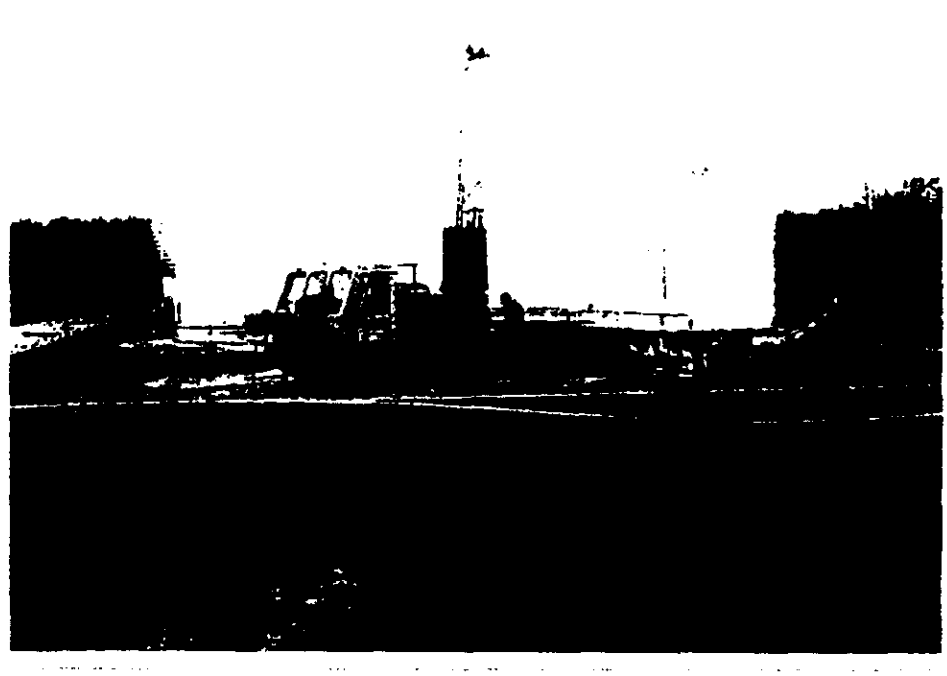
2.2.2 Test Pits

On January 26, 1993, field personnel from HNTB met with a crew from VanHoy Excavation to begin excavating test pits for sampling within cells 4, 5, and 6. Excavation and sampling of the test pits were completed within one day. A total of six test pits were excavated; one in Cell No. 4, two in Cell No. 5, and three in Cell No. 6. The test pits were excavated to the following total depths, while HNTB field personnel retrieved samples from the following sample depths:

Test Pit	Cell No.	Total Depth	Sample Depth
TP-1	6	10 ft	5'-6', 9'-10', groundwater
TP-2	5	7 ft	2'-3', 6'-7'
TP-3	6	9 ft	2'-3', 5'-6', 8'-9', 0'-9'
TP-4	5	6 ft	3', 6'
TP-5	6	11 ft	2.5', 7', 11'
TP-6	4	7 ft	2.5', 7'



Test pit 3 (TP-3) sampling in cell no. 6 near tank 2634. January 26, 1993



Soil boring with all terrain vehicle (ATV) in cell no. 4 . February 11, 1993

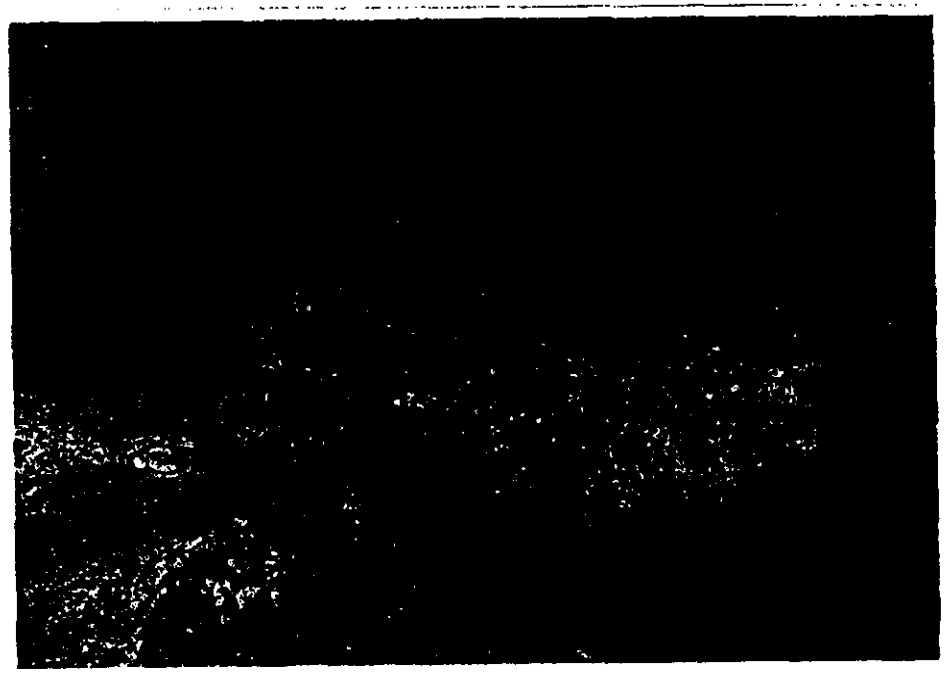
FIGURE 2.2
CONTAINMENT AREA SAMPLING
ALL TERRAIN VEHICLE

NAVAL SURFACE WARFARE CENTER
CRANE, INDIANA

MARCH 1993

HNTB

View of cuttings showing clay soils encountered. Soil borings taken inside containment areas.



View of clay and water from 5 ft. deep in cell No. 6. Perched water contains fuel oil

FIGURE 2.3
TANK FARM SOILS
NAVAL SURFACE WARFARE CENTER
CRANE, INDIANA
MARCH, 1993

HNTB

The HNTB field engineer made visual observations as each test pit was excavated to identify (1) soil type and (2) zones of apparent contamination (such as discoloration, presence of oil, and incidental odors). A total of 16 samples were collected for analytical testing. One groundwater sample (TP-1), one composite sample (TP-3/0'-9'), and the 14 remaining grab samples were collected and analyzed for Total Petroleum Hydrocarbons (TPH) by either IR or GC:FID methods.

Grab samples were placed in new six ounce glass sample jars, while the composite sample was placed in a new one quart sample jar before being transported to Louis B. Astbury Company, Inc., for TPH analysis. Analytical results are located in Appendix E.

The test pits were backfilled with the excavated soil and compacted upon completion of the sampling. In addition to the test pit samples, surface soil samples were collected from Cells No. 1, 3, 4, and 6. A total of five samples were collected via shovel from a depth of 1 foot at soil boring locations SB-A, SB-D, SB-K, SB-L, and SB-Q for analysis. Grab samples were placed in six ounce glass sample jars and transported to Louis B. Astbury Company, Inc., for TPH/IR analysis. Analytical results are located in Appendix E.

2.3 ANALYTICAL TESTING METHODS

Grab samples from split spoons, composite samples, and surface samples were submitted to Louis B. Astbury Company, Inc., for analytical testing. Tests run on the preselected samples (as described in Chapter 3) include the following:

Parameter	EPA Test Method
HYDROCARBONS	
Total Petroleum Hydrocarbons (TPH) by Infrared Scan (IR)	EPA Method 418.1 Modified
Total Petroleum Hydrocarbons (TPH) by gas chromatography/flame ionization detection (GC/FID)	EPA Method SW846-8015 Modified
Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX) by GC/MS	EPA Method SW846-8260
Flashpoint	EPA Method SW846-1010
METALS	
Total Lead	EPA Method SW846-6010 Flame Atomic Absorption Spectrophotometer (FAAS)

2.4 QA/QC RECORDKEEPING AND REPORTING

The management, transfer, and disposal of all samples was controlled by chain-of-custody documentation. Field log sheets were used to record pertinent field information and sample collection data. Sample labels were used on each sample identifying sampling location, depth (interval), and date of collection. Each sampling location is identified numerically on a site plan showing their field locations. The chain-of-custody records used for this project are shown in Appendix F.

Analytical results and soil boring data are presented in the next chapter and documented in Appendix E. Quality assurance/quality control (QA/QC) included sampling documentation, cleaning of sampling equipment between borings, and analytical QA/QC procedures employed by the laboratory. Analytical QA/QC information is available from Louis B. Astbury Company, Inc.

CHAPTER 3

SITE CHARACTERIZATION

As discussed in Chapter 2, field investigations consisted of test pits opened up by a backhoe, soil borings conducted by a standard drill rig and an all terrain vehicle (ATV) drill rig, and surface soil samples collected by hand. Sampling locations were shown in Figure 2.1.

3.1 ANALYTICAL RESULTS

3.1.1 Total Petroleum Hydrocarbons

Total petroleum hydrocarbons (TPH) were analyzed on soil samples collected at regular depth intervals to determine the vertical extent of the contamination. The original sampling plan called for hand auguring samples as was done during the ATEC study. However, hand auguring is limited to depths less than 5 feet. Since the ATEC sample results showed contamination in Cell No. 6 at 5 feet, it was unknown how deep below the five-foot level the contamination has spread. It was decided to use a backhoe to dig test pits for sample collection due to the ability to quickly expose sidewalls to 10 feet depths or more. Access was limited to cells 4, 5 and 6. These same cells were previously identified as the areas of greatest petroleum contamination.

Analytical results for TPH testing by the IR method for the test pits are summarized in Table 3.1. All of the test results are below the 100 mg/kg cleanup standard typically mandated by IDEM, except for Test Pit A, where strong diesel odors were detected. A gravel layer approximately 6 to 12 inches thick was found at 5 feet deep in Cell No. 6. It is believed that this layer served as a tank base for fuel tanks constructed during World War II. Tank farm expansion in 1952 raised the tanks 3.5 to 5 feet by adding silty clay fill soils over the gravel. This gravel layer is now believed to act as a horizontal route for fuel oil contamination.

At the same time test pits were being dug, soil borings were concurrently being drilled outside the tank farm containment on the downgradient (west) side. Numbered soil borings are outside containment while lettered soil borings are inside the containment. It was believed that the contamination detected in Cell No. 6 by ATEC probably had migrated out of the containment area. The soil borings drilled under this study were in a line about 10 feet west of the containment walls. There was no fuel oil odor detected in the samples and no organic vapors were detected on the photoionization detector (PID) used to screen samples. TPH analyses showed essentially no contamination outside the containment walls with very low levels which are believed to be non-petroleum related (i.e., organics in the soil). Soil boring SB-3 showed TPH levels slightly above 100 mg/kg with the TPH:IR test, while soil boring SB-7 showed TPH levels above the cleanup standard using the GC:FID test (IDEM required). Soil boring SB-7 is located adjacent to a drainage ditch flowing from the tank farm and a 3,000 gallon oil/water separator.

TABLE 3.1

SUMMARY OF TOTAL PETROLEUM HYDROCARBONS
TEST PITS - TANK FARM
JANUARY 26, 1993
NAVAL SURFACE WARFARE CENTER
CRANE, INDIANA

TEST PIT	CELL NO.	TOTAL PETROLEUM HYDROCARBONS [mg/kg] AT INDICATED DEPTH						
		2.5'	3'	6'	7'	9'	10'	11'
1*	6	-	-	2370	-	-	10	-
2	5	-	86.7	-	141	-	-	-
3	6	-	22.1	ND@10	-	11.4	-	-
4	5	-	28.7	13.8	-	-	-	-
5	6	12.0	-	-	32.2	-	-	36.9
6	4	96.8	-	-	54.3	-	-	-

Notes:

1. *A groundwater sample taken from a gravel seam at 5'-6' showed a TPH concentration of 2930 mg/L.

2. Total Petroleum Hydrocarbon tests by TPH:IR (Method 418.1).

3. Diesel odors were detected on the surface at Test Pits 1, 3 and 4. Test Pit 1 also had strong diesel odors at 6 feet corresponding to the gravel layer.

4. ND means not detected.

5. Shaded values exceed IDEM's cleanup standard of 100 mg/kg.

It is believed that the detected contamination may be from the July 14, 1987, fuel oil spill. A summary of TPH analyses for soil borings outside the containment area is given in Table 3.2.

TABLE 3.2

SUMMARY OF TOTAL PETROLEUM HYDROCARBONS SOIL BORINGS - OUTSIDE TANK FARM CONTAINMENT JANUARY 26, 27, 1993 AND FEBRUARY 11, 1993 NAVAL SURFACE WARFARE CENTER CRANE, INDIANA

SAMPLE LOCATION	CELL NO.	TOTAL PETROLEUM HYDROCARBONS [mg/kg] AT INDICATED DEPTH			
		0'-2'	3.5'-5'	8.5'-10'	13.5'-15'
SB-1	-	-	9.2	11.8	-
SB-2	-	-	17.5	ND @ 5	-
SB-3	-	-	111*	6.7	-
SB-4	-	-	9.7	13.3	-
SB-5	-	-	40.2	18.8	-
SB-7	-	-	116*	252*	-
SB-10	-	-	15.4	8.7	-
SB-12	-	-	23.2	5.8	-
L-1	-	242*	50.4	-	-
L-2	-	ND @ 10*	100	-	-

Notes:

1. Samples from SB-12 collected February 11, 1993. All other samples collected January 26 and 27, 1993.
2. *TPH analysis by GC/FID. All other TPH analyses by TPH:IR.
3. L-1 and L-2 samples are from the tanker loading areas.
4. ND means not detected.
5. Shaded values exceed IDEM's cleanup standard of 100 mg/kg.

Field observations showed minimal contamination in the soil borings outside the containment and the presence of deep layers of silty clays and clays that serve to limit the spread of the pollutants. Based on these observations and results from the test pits, it was decided to modify the sampling plan to include numerous soil borings to depths up to 15 feet inside the containment walls. To gain access to the area, the fences were opened and the containment

walls in four spots removed temporarily. This allowed an all terrain vehicle (ATV) drilling rig to reach the surveyed sampling points.

On February 11, 1993, an ETS crew with an ATV drill rig collected soil samples from 13 locations in Cell Nos. 3, 4, 5, and 6 at several depths. Analytical results are shown in Table 3.3. As can be seen from the data, the contamination appears to be limited to shallow depths in Cell No. 6 except for SB-A where the contamination ends between 5 and 10 feet deep.

Surface soil samples were collected by hand from Cells No. 1 and No. 2 for analysis of hydrocarbons. None of the samples smelled as though they were petroleum contaminated. Visual observations did not reveal any sheen or other indication of fuel. These observations confirmed the results from the 1989 ATEC Study which showed little contamination. Nearly all of the ATEC samples showed TPH values below the detection limit. Because there was no indication that fuel oil was present, TPH analysis was by the TPH:IR method. Results were unusually high as shown in Table 3.3 for unknown reasons. It is possible that organic matter in the top layers interfered with the test giving high readings or that weathered fuels such as No. 6 fuel oils are present. If this is true, this would contradict earlier ATEC results. To resolve this issue, HNTB would propose that another round of analysis at SB-O, SB-P, SB-Q and SB-R be conducted using the TPH:GC/FID method.

3.1.2 Heavy Metals

The storage tanks at the tank farm were protected from corrosion with lead based paints which also may have contained chromium. Sandblasting of the tanks in preparation for painting deposited abrasive material and paint particles on the ground surface. Due to concerns over possible lead and chromium contamination, representative surface soil samples were collected from areas surrounding tank locations. Lead concentration above typical background levels were detected, but leaching tests using the TCLP protocol show the soil to be non-hazardous. A summary of the surface soil test results is given in Table 3.4.

3.1.3 Other Pollutants

Testing also included other parameters in addition to the main concerns regarding petroleum hydrocarbons and heavy metals. Off-site disposal requires that a hazardous waste determination be made to show that the waste is non-hazardous.

EPA's and IDEM's criteria for identification of hazardous wastes are covered in 40 CFR 261 and 329 IAC 3, respectively. In order for a waste to be considered a hazardous waste, it must first meet the definition of a "solid waste." Petroleum contaminated soil, such as that found in Cell No. 6, is classified as solid waste. According to both federal and state regulations, two basic criteria identify whether a solid waste is a hazardous waste: (1) if it exhibits any of the "characteristics" of a hazardous waste, and/or (2) if it is a "listed" waste. Hazardous waste characteristics are based on four parameters:

TABLE 3.3

SUMMARY OF TOTAL PETROLEUM HYDROCARBONS
SOIL BORINGS - TANK FARM
FEBRUARY 11, 1993
NAVAL SURFACE WARFARE CENTER
CRANE, INDIANA

SAMPLE LOCATION	CELL NO.	TOTAL PETROLEUM HYDROCARBONS [mg/kg] AT INDICATED DEPTH			
		0'-2'	3.5'-5'	8.5'-10'	13.5'-15'
SB-A	6	2170	1090*	40	23
SB-B	6	40	ND @ 10*	64.3	13.6
SB-C	6	1070	19*	14.3	-
SB-D	6	368	ND @ 10*	22.3	-
SB-E	6	82.3	ND @ 10*	5.3	-
SB-F	6	251	49*	7.8	-
SB-G	5	-	ND @ 10*	33.5	-
SB-H	5	-	107	ND @ 5	-
SB-I	5	-	8.7	22.1	-
SB-J	3	-	ND @ 10*	6.4	-
SB-K	3	-	6.0	5.0	-
SB-L	4	-	ND @ 10*	5.4	-
SB-M	4	-	8.7	23.1	-
SB-O+	2	1260	-	-	-
SB-P+	2	543	-	-	-
SB-Q+	1	140	-	-	-
SB-R+	1	173	-	-	-

Notes:
1. +Surface soil samples only. TPH values believed caused by organic matter since no petroleum odor detected on-site.
2. *TPH Analysis by GC/FID. All other TPH analyses by TPH:IR.
3. Shaded values exceed IDEM's cleanup standard by 100 mg/kg.

TABLE 3.4

SUMMARY OF HEAVY METAL ANALYTICAL RESULTS
TANK FARM
NAVAL SURFACE WARFARE CENTER
CRANE, INDIANA

SAMPLE LOCATION	CELL NO.	TOTAL LEAD [mg/kg]	TCLP LEAD [mg/L]	TOTAL CHROMIUM [mg/kg]
SB-A	6	12.00	ND @ 0.50	-
SB-B	6	ND @ 12.5	-	-
SB-C	6	ND @ 12.5	-	-
SB-D	6	ND @ 5.0	ND @ 0.50	9.07
SB-E	6	ND @ 12.5	-	-
SB-F	6	ND @ 12.5	-	-
SB-K	3	75.00	ND @ 0.50	11.70
SB-L	4	85.00	ND @ 0.50	10.80
SB-O	2	ND @ 12.5	-	-
SB-P	2	18.60	-	-
SB-Q	1	ND @ 5.0	ND @ 0.50	-
SB-R	1	ND @ 12.5	-	-

Notes: ND means not detected

- Ignitability (flashpoint less than 140°F)
- Corrosivity (pH greater than 12.5 or less than 2.0)
- Reactivity (unstable, explosive, or forms toxic gases of cyanide or sulfides)
- Toxicity Characteristic Leaching Procedure (TCLP)
  (Leachate exceeds maximum contaminant levels)

Petroleum contaminated soils that are non-hazardous (e.g., are not ignitable or TCLP toxic for lead) are considered special wastes in Indiana. Disposal can occur only at permitted sanitary landfills. Based on conversations about disposal approval with Waste Management employees at the Danville Sanitary Landfill in Danville, Indiana, two composite samples were taken for waste screening. All test results confirmed that the waste soils are non-hazardous and acceptable for landfilling. The test results are summarized in Tables 3.5 and 3.6. All flashpoint test results exceeded 160°F, which is above the regulatory limit of 140°F.

TABLE 3.5

SUMMARY OF FLASHPOINT TESTING
TANK FARM SOILS
NAVAL SURFACE WARFARE CENTER
CRANE, INDIANA

SAMPLE LOCATION	CELL NO.	SAMPLE DEPTH [ft]	FLASHPOINT [°F]
TP-1	6	5-6'	> 160
TP-1	6	9-10'	> 160
TP-3	6	5-6'	> 160
L-1	-	0-2'	> 160
L-2	-	0-2'	> 160
TP-3	6	Composite 0-9'	> 160
SB-A	6	3.5-5'	> 160
SB-A	6	13.5-15'	> 160
SB-B	6	3.5-5'	> 160
SB-C	6	3.5-5'	> 160
SB-D	6	3.5-5'	> 160
SB-E	6	3.5-5'	> 160
SB-F	6	3.5-5'	> 160

TABLE 3.6

SUMMARY OF SPECIAL WASTE TESTING
TANK FARM SOILS
NAVAL SURFACE WARFARE CENTER
CRANE, INDIANA

PARAMETER	TEST PIT - 3 0-9'	SB-A 13.5-15'	REGULATORY LIMIT
Flashpoint [°F]	> 160	> 160	< 140
Reactive Cyanide [mg/kg]	ND @ 0.05	ND @ 0.05	
Reactive Sulfide [mg/kg]	ND @ 2.0	ND @ 2.0	
pH [std. units]	7.11	8.13	2.0 < pH < 12.5
Total Solids [%]	82	86	-
TCLP Metals [mg/L]			
Arsenic	ND @ 0.010	ND @ 0.020	5.0
Barium	1.01	2.17	100
Cadmium	ND @ 0.05	ND @ 0.05	1.0
Chromium	ND @ 0.50	ND @ 0.50	5.0
Lead	ND @ 0.50	ND @ 0.50	5.0
Mercury	ND @ 0.010	ND @ 0.010	0.2
Selenium	ND @ 0.010	ND @ 0.020	1.0
Silver	ND @ 0.10	ND @ 0.10	5.0
PCB [mg/kg]	ND @ 0.082	ND @ 0.082	50
TCLP Semi-volatiles [ug/L]	ND @ 50	ND @ 50	Various
TCLP Volatiles [ug/L]	ND @ 25	ND @ 25	Various

Testing for the BTEX components of fuels was also done on three samples. The BTEX components are benzene, toluene, ethylbenzene, and xylene. The sampling results are shown in Table 3.7.

TABLE 3.7

SUMMARY OF BTEX ANALYSES
TANK FARM SOILS
NAVAL SURFACE WARFARE CENTER
CRANE, INDIANA

PARAMETER	CONCENTRATION (mg/kg)	
	TEST PIT NO. 1 5'-6'	TEST PIT NO. 3 5'-6'
Benzene	58	ND @ 5
Toluene	54	6.4
Ethylbenzene	63	ND @ 5
Total Xylenes	790	7.7

3.2 SOIL CONTAMINATION

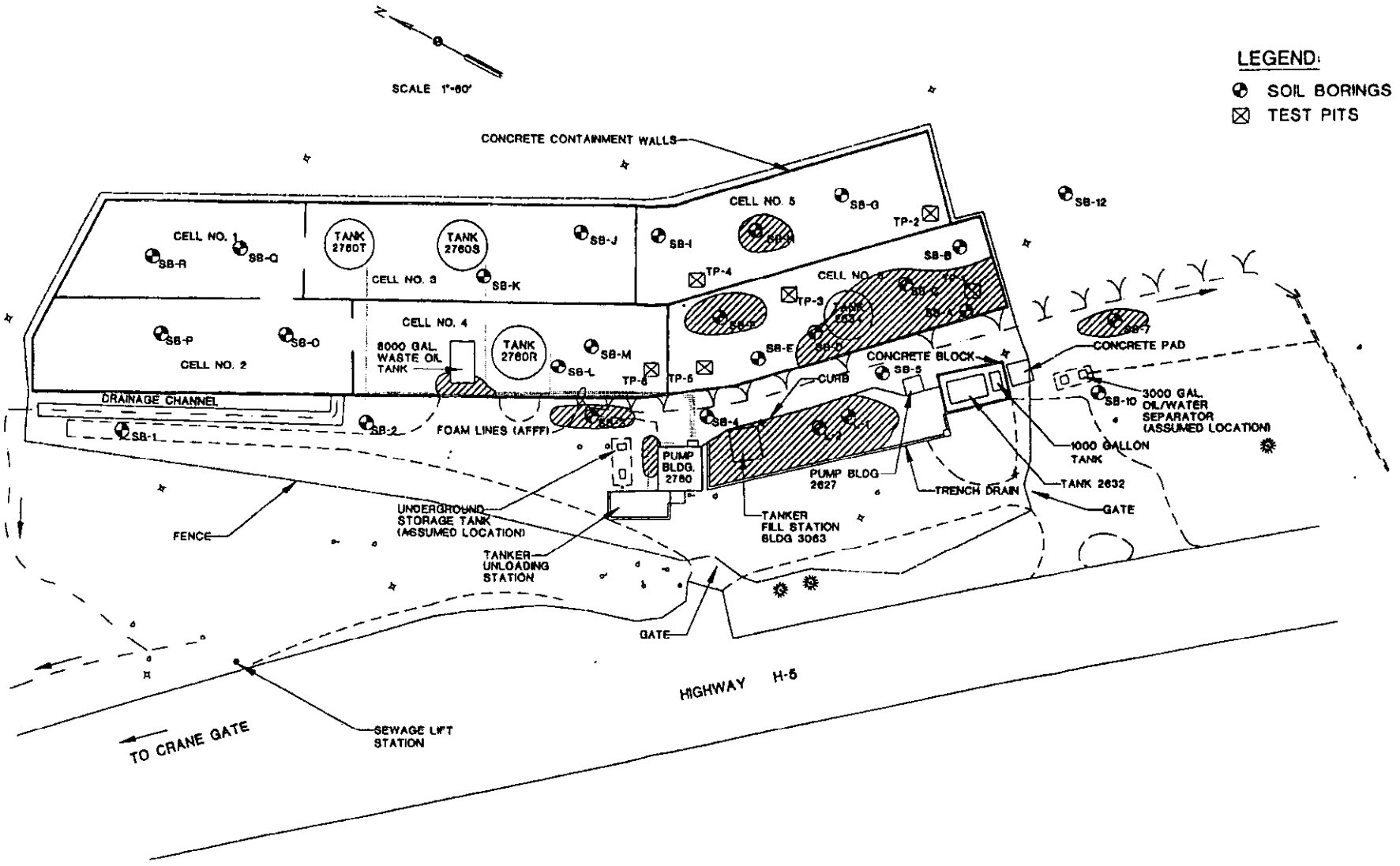
Based on previous test results by ATEC and the extensive testing conducted under this study, volume estimates and subsequent disposal costs have been greatly reduced. Previous disposal estimates discussed in Chapter 1 called for removal of 8,020 cubic yards of soil. HNTB now estimates that actual soil removal will be limited to a portion of Cell No. 6, the tanker loading area, and possibly soil adjacent to buried fuel lines. For these estimates, it has been assumed that IDEM's cleanup standard of 100 mg/kg applies and that over excavation of petroleum impacted soils (with TPH less than 100 mg/kg) will not occur. Soils left in place with low levels of hydrocarbons will not pose a threat to human health or the environment. Including these soils for disposal only raises cleanup costs while providing negligible benefits. Excavated soil estimates, based on the findings of this study, are as follows, shown in Table 3.8.

TABLE 3.8

ESTIMATED SOIL REMOVAL VOLUMES
TANK FARM
NAVAL SURFACE WARFARE CENTER
CRANE, INDIANA

LOCATION	AREA [ft²]	DEPTH [ft]	ESTIMATED VOLUME [cu. yds]
Cells No. 1, 2, 3	0	0	0
Cell No. 4 (near waste oil tank)	500	2.5	50
Cell No. 5 (near TP-2)	1,000	2.5	100
Cell No. 6	6,000	3-5	650-1,000
Tanker Loading Area	3,750	2	300
Misc. Areas Near Piping	-	-	200
ESTIMATED TOTAL VOLUME			1,300-1,650

Contaminated soil areas are shown in Figure 3.1. The parameter controlling disposal is limited to petroleum hydrocarbons above 100 mg/kg. All other waste parameters including heavy metals, PCBs, BTEX and hazardous waste criteria (TCLP, reactivity, ignitability and corrosivity) are below regulatory limits and pose no problem for disposal as a special waste as a sanitary landfill.



HNTB
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ARCHITECTS ENGINEERS PLANNERS
INDIANAPOLIS, INDIANA

FIGURE 3.1
CONTAMINATED SOIL AREAS
TANK FARM
NAVAL SURFACE WARFARE CENTER
CRANE, INDIANA
MARCH, 1993

CHAPTER 4

SITE REMEDIATION

4.1 SOIL REMEDIATION ALTERNATIVES

On the basis of considerations in Chapter 3, several contaminated soil disposal alternatives were developed. These alternatives represent HNTB's engineering judgement for the ability to meet disposal standards that are cost effective and easily implementable. These alternatives are summarized in the following sections.

4.1.1 Excavation/Off-Site Disposal

Off-site disposal of contaminated soil from the site will require the excavation of approximately 1,300-1,650 cubic yards of material and transport to a special waste landfill. A special waste landfill capable of accepting petroleum soils is located at Danville, Indiana. Based on our experience with contaminated soil at similar sites, we estimate that total disposal costs will amount to approximately $65.00 per cubic yard. This cost includes excavation, transport, and landfilling. Total estimated costs to landfill the soil off-site are $130,000, which includes a 20 percent contingency. Landfilling of the waste will require that a special waste permit be obtained from the Indiana Department of Environmental Management (IDEM). In addition, waste approval must be secured from the landfill by submitting waste analyses, quantity estimates, and a representative sample.

This alternative would only involve removal of petroleum contaminated soil above IDEM's standard of 100 mg/kg. Residual contamination below 100 mg/kg would remain in place. To provide a clean base for the new tanks, underlying soil would be excavated and used as fill for Cell No. 6 where the majority of petroleum soils are to be removed. To prevent false detection of future leaks, the area beneath the new tanks should be lined with a synthetic liner and equipped with leak detectors.

4.1.2 Soil Vapor Extraction

Soil vacuum, or vapor extraction is an in-site cleanup technique which can be used by itself or in conjunction with other remediation techniques for remediating Volatile Organic Compounds (VOCs) from the unsaturated zone (i.e., the layer nearest the soil surface and above the water table). In general, air inlet or injection wells are placed around the perimeter of a contaminated area, and soil gas extraction wells are placed near the center of the area. The lower sections of the well casings are slotted or screened to maximize fluid flow in and out of the wells. The injection wells can be connected to air blowers which force air into soil surrounding the contaminated zone. Alternatively, the injection wells may be left open to the atmosphere while the use of suction, or vacuum, pumps pulls air through the contaminated region of the soil. As air is pulled through the soil, the equilibrium which exists between liquid or sorbed organic in the soil pores and the VOCs present in the soil gas is disturbed. As clean air is forced through the zone of contamination, old air is

replaced with new air which causes more VOCs to evaporate and ultimately to be removed via the extraction wells. Gas/liquid separators are often used to remove entrained water from the extracted air. The collected gas, which contains VOCs, can be discharged to the atmosphere or treated depending on the degree of contamination and regulatory discharge requirements.

The major advantages of soil vapor extraction are its low capital and operating costs and its ease of application in areas where access is limited (e.g., contamination under a building).

One major disadvantage of soil vapor extraction is that it is applicable only at sites where volatile compounds are the primary constituents in the soil. In the case of the NSWC Tank Farm, the primary contaminants are heavier fuel oils (e.g., number 2 and number 6 fuel oils) each of which are comprised of over 100 different hydrocarbon types. A majority of these hydrocarbons have a low volatility and are not as easily extracted as gasoline or jet fuels, which are highly volatile. The greatest disadvantage of soil vapor extraction process is that it requires highly permeable soils which have uniform particle size distribution. Hydraulic conductivities of greater than 10^{-3} cm/sec are preferred. Sands and gravels tend to be better candidates than silts or clays. Based on the soil sampling investigation carried out at the Tank Farm, it appears that it was constructed on highly impermeable poorly draining clay which obstructs transport of both groundwater and air. Given the site characteristics, the limited contamination present, and the type of contaminants at this location, soil vapor extraction does not appear to be an effective remediation alternative.

4.1.3 Landfarming

Landfarming or land treatment is a waste treatment and disposal process whereby the contaminated soil is mixed with or incorporated into the surface soil where contaminants are degraded biologically, reduced through ultra violet light destruction, and released through volatilization into the air. Compared to other remediation options, landfarming carries lower long-term monitoring, maintenance, and potential cleanup liabilities. Landfarming guidelines, established by IDEM, require that a land treatment plan be developed and submitted to IDEM for approval prior to initiation of the land treatment project. Additionally IDEM would require initial sampling of the contaminated soil and the underlying soil at the land treatment pad. Landfarming guidelines are given in Appendix G.

In general, conditions favorable for plant growth are also favorable for waste degradation. A soil pH of 7 is optimum for bacterial growth. This may require liming if the soil is acidic. An optimum soil moisture content of 80-90% should be maintained. Soil temperature should be above 50°F and sufficient soil nutrients such as nitrogen, phosphorus, potassium, and sulphur should be applied. An impermeable pad is required to prevent the potential for groundwater contamination. This can be accomplished with the use of visqueen, a paved lot, or a clay pad. Based on a cleanup volume of 2000 cubic yards, landfarming would require a 1.3 acre pad. Additionally storm water runoff control is required at the site.

The primary advantage of land farming is the reduced long-term liability associated with landfilling off-site. In general, landfarming is considered to be more cost effective than landfilling or incineration, with initial estimated costs of $20.00 to $40.00 per cubic yard. However, experience on other projects indicates that since this is a rather new remediation process, actual cleanup costs tend to run much higher. Landfarming, like traditional crop farming, is subject to conditions that the engineer or contractor has no control over, especially the weather. Constant monitoring of waste conditions is required and runoff control can be costly.

4.1.4 No Action

Currently, neither state or federal cleanup programs deal specifically with contaminated soil cleanup from aboveground storage tanks. However, Indiana regulation 327 IAC 2-6 is sufficiently broad to address cleanups of oil spills and other materials from aboveground tanks. Specifically, under 327 IAC 2-6-2, owners/operators of aboveground storage tanks must clean up spills. This section could be interpreted to include cleanup of contaminated soils. However, the state encourages voluntary cleanup in cases such as this. While in the short term, the No Action alternative would appear to be the most cost-effective option, the potential for migration of contaminants to the underlying aquifer will always be present. Additionally, the EPA and IDEM may require that cleanup actions be taken at sites such as this is the future. New regulations aimed at aboveground storage tank sites are being promulgated by the EPA and are due within the next year. Due to the long-term liability associated with leaving the contaminated soil in place, this alternative is not recommended. Cleanup should achieve removal of soils with TPH concentrations above 100 mg/kg.

4.2 GROUNDWATER REMEDIATION ALTERNATIVES

On the basis of the considerations in Chapter 3, our evaluation of groundwater remediation requirements at the site is as follows. The elevation of the groundwater table appears to be below the apparent zone of contamination. The underlying clay soils have apparently served to contain the contamination. Therefore, it appears that groundwater remediation of the underlying aquifer will not be necessary. However, the original tank farm was designed with a gravel base foundation which runs throughout Cell No. 6 in the tank farm area. It is evident from the test pit excavations that remediation of contaminated water from this gravel base system will be required. HNTB has evaluated several groundwater remediation alternatives. These alternatives represent HNTB's engineering judgement for the ability to meet the treatment needs, to be cost-effective, and to be on-line in the near future. These alternatives are summarized in the following sections:

4.2.1 Pump/Haul Off-Site for Disposal

On the basis of considerations in Chapter 3, we estimate that as much as 50,000 gallons of contaminated groundwater may be present under Cell No. 6 (and Cells No. 4 and 5) which may require treatment. Capture of contaminated groundwater would involve the excavation of a sump pit to drain the gravel base layer and pumping of contaminated groundwater to a tanker truck for hauling to an off-site treatment and disposal facility. The off-site disposal

option would minimize scheduling conflicts since no construction or discharge permits would be required and would maximize capital cost savings by elimination of the need for capital expenditures on equipment, engineering design, and construction. Disposal costs provided by Heritage Environmental Services in Indianapolis for disposal of fuel oil/water mixtures are estimated at $0.50 per gallon. Assuming a total contaminated groundwater volume of 50,000 gallons, the estimated fee for transport and disposal is $25,000.

4.2.2 Pump and Treat/NPDES Discharge

The pump and treat/NPDES discharge option involves the collection and treatment of approximately 50,000 gallons of petroleum hydrocarbon contaminated groundwater with discharge to a nearby stream. Possible treatment methods include oil/water separation and either carbon treatment, biological treatment, or air stripping. An existing oil/water separator exist at the site could be used to separate free product from the contaminated groundwater prior to final treatment.

The carbon treatment alternative involves the leasing of carbon absorption units which are used to remove dissolved hydrocarbons from the groundwater. Given the low volume of contaminated water, carbon absorption may prove to be a cost-effective means of treatment. This option requires that carbon units be sized, NPDES discharge limits be established, and that an NPDES permit be obtained. Assuming a total hydrocarbon removal of 300-500 lbs., it is anticipated that rental of carbon units and activated carbon costs may approach $25,000, with total treatment costs for 50,000 gallons of contaminated water estimated at $0.75 to $1.00 per gallon for a total cost of $50,000. In addition, monitoring costs for testing the treated effluent would be required.

The air stripping alternative involves the purchase or leasing of an air stripper unit for removal of hydrocarbons through volatilization to the air. The air stripper would be preceded by a skimming tank and may require effluent treatment by activated carbon. While air stripping is generally considered to be a cost-effective means of groundwater remediation, it has not proven to be effective at removing heavier hydrocarbons such as fuel oils. Given the low volume of contaminated groundwater to be treated, air stripping would not be a cost-effective solution.

Scheduling for all the above alternatives requires that time be allotted for permitting. Normal permit turnaround times at IDEM are difficult to estimate. IDEM personnel, in recent telephone conversations, indicate that permits can be processed in approximately two months or less. However, HNTB's experience with this agency does not substantiate these quick turnaround times. IDEM backlogs for NPDES submittals number several hundred permits. IDEM is working to clear their backlog and has indicated that they are trying to act on new applications quickly. We have estimated the NPDES permitting time to be 180-240 days. All permitting time frames assume that there are no objections to the selected alternative filed under the Administrative Adjudicatory Act (AAA) which allows for public hearings and legal procedures to challenge IDEM's decision to issue permits for the project. Public opposition to the selected option could significantly delay the project. Given the long turnaround times for permitting and the high cost of treating such a small volume of

wastewater, it appears that hauling for off-site disposal is the most cost-effective and timely option.

4.2.3 Pump and Treat/WWTP Discharge

The pump and treat/WWTP discharge option involves the collection and treatment of approximately 50,000 gallons of petroleum hydrocarbon contaminated groundwater with discharge to a nearby lift station which ultimately discharges to the base's wastewater treatment plant (WWTP). Possible treatment methods are those described in Section 4.2.2 with the exception that the treated wastestream would be discharged to the wastewater treatment plant rather than to a local stream. This option requires that pretreatment requirements be established prior to discharge, but permitting through IDEM would not be required. Estimated costs for this option are equal to those discussed in 4.2.2 above at $0.75 to $1.00 per gallon for a total estimated cost of $50,000.

While discharge to the base WWTP relieves Crane of the scheduling problems which plague the NPDES discharge option, of the pump and treat options, only the carbon treatment/WWTP discharge option is cost competitive with the pump/haul off-site for disposal option.

4.2.4 Two Phase Vapor Extraction

Two interpretations for the term "two phase vacuum extraction" are generally accepted. The first involves soil vapor and groundwater extraction from the same well. A slight to moderate vacuum is used for vacuum extraction while a submersible pump is used to deepen the vadose zone and increase the area available for vacuum extraction. The second interpretation involves the use of a high vacuum rate which causes water to be extracted along with the vapor. A vapor/water separator is required prior to vapor treatment. In either case, the basic premise is to extract vapor from above the water table and evaporate volatile hydrocarbons. For the sake of evaluating groundwater alternatives, we will use the first interpretation.

A description of the soil vapor extraction process is provided in Section 4.1.2 of this report. The groundwater extraction of this dual phase process involves what is typically called a pump and treat system which consists of a groundwater extraction well(s) complete with a pumping system which is used to gain hydraulic control over the plume of contamination. The extraction or recovery well is generally located at or near the center of the plume of contamination. Monitoring wells are located at the periphery of the plume and are used to measure changes in contaminant concentration over time. Once contaminated groundwater is pumped from the recovery well, it must be treated prior to discharge. Several treatment options are available for the contaminated groundwater. These options are described in greater detail in Sections 4.2.1-4.2.3 and include: hauling off-site for disposal, carbon treatment and NPDES or WWTP discharge and air stripping and NPDES or WWTP discharge.

The soil vapor extraction phase of this process, as described in Section 4.1.2, cannot be recommended in this application due to the nature of the hydrocarbon product, the site characteristics, and the presence of impermeable clay. The local soils do not lend themselves to effective vapor phase extraction.

CHAPTER 5

SUMMARY AND RECOMMENDATIONS

This site remediation study has presented the findings from soil testing at the tank farm located at the Naval Surface Warfare Center, Crane, Indiana. The study was performed by Howard Needles Tammen & Bergendoff (HNTB) with environmental soil borings conducted by Engineering & Testing Services, Inc., (ETS) and laboratory testing by Louis B. Astbury Company, Inc.

The purpose of the study was to determine the nature and extent of petroleum contaminated soil at the tank farm in order to determine remediation options and costs for cleanup. Cleanup is necessary to comply with environmental regulations and to clear the area of contaminated soil prior to construction of replacement tank farm facilities. Cleanup standards required by the Indiana Department of Environmental Management (IDEM) do not exist. However, for petroleum facilities that do not impact water supplies or water bodies, cleanup is considered complete when the total petroleum hydrocarbon (TPH) concentration is below 100 mg/kg. This is the cleanup limit that should be targeted.

Previous studies of tank farm contamination in 1989 found contamination limited primarily to Cell No. 6 of the tank farm. No soil samples were taken outside the containment cells or deeper than five feet. In spite of the low concentration of petroleum hydrocarbons detected, the previous consultants recommended excavating soil from every containment cell for landfilling in the base sanitary landfill at a cost of $266,000. Disposal of 10,000 cubic yards at an off-base landfill as a special waste was estimated by HNTB to cost $650,000.

Due to the high cost to landfill petroleum contaminated soil, HNTB recommends that only soils contaminated with TPH concentration above 100 mg/kg (typical IDEM standard) be landfilled and that soils with TPH concentration below this level be left in place. Removing the more contaminated soils will eliminate the bulk of the contamination source (more than 90 percent) and minimize future site liability. Due to the remoteness of the tank farm, the lack of downstream receptors such as water intakes, wells, populated areas, etc., and the tight clay soils on site, the threat to human health and the environment is minimal.

Cost savings from selective soil removal of only those areas shown to be contaminated above 100 mg/kg TPH are significant. Based on the soil sampling done under this study and a review of data from previous studies, it is estimated that less than 2,000 cubic yards of soil needs to be landfilled. This volume is based upon volumes for the impacted cells only plus a 20 percent contingency. This volume is significantly lower than previously estimated and reflects how little contamination has spread. The tight clays found on-site have effectively contained the petroleum. A gravel layer in Cell No. 6 due to its high permeability has acted as a horizontal conduit for the spread of petroleum. The estimated soil remediation cost at $65.00 per cubic yard is $130,000. Contaminated water from the gravel layer in Cell No. 6 (previously used for tank foundations) also needs to be disposed at an estimated cost for 50,000 gallons of $25,000. Disposal assumes hauling off-site. In order to achieve these cost

savings, cleanup will require careful excavation that is done in layers with soil testing used to confirm that cleanup standards are achieved. Excavation done in this manner will take longer than normal due to turnaround times on lab samples. However, the large cost savings justify this approach.

Contamination is mainly confined to Cell No. 6 which was the scene of the July 14, 1987, fuel oil spill. This study confirmed the earlier ATEC study that showed high concentrations of fuel oil in the southwestern corner of Cell No. 6. Other areas where contamination was detected was at the tanker fill station 3063, near the waste oil tank and the southwest corner of Cell No. 5. Contamination may also be present at the underground storage tank (outside this scope of work) and surrounding underground fuel oil piping. It is recommended that all tanks and piping abandoned under the replacement tank project be removed and the soil tested to confirm that cleanup is complete. Apparent contamination was detected in Cells No. 1 and 2 but are not substantiated by either the previous studies or by smell or visual observations. It is recommended that further testing be completed in these two cells.

Construction plans and specifications to be prepared by HNTB will include special provisions that direct the contractor to target those areas determined to be contaminated by this study. The contractor will be required to test samples to both show that the contaminated soil has been removed and that "clean" soil has not also been landfilled.

Proposed construction detailed in HNTB's Facility Plan calls for construction of new concrete containment for replacement tanks. To maintain service at the tank farm, it is recommended that the new containment be constructed in Cells No. 5 and 6. To prevent detection of false leaks from the replacement system, it will be necessary to install a barrier between soils left in place (with TPH concentration below 100 mg/kg) and the containment. Monitors placed between these two barriers will then monitor only clean fill and not background petroleum levels. In addition to keeping residual petroleum out, the installed will serve as tertiary containment to contain leaks (the primary containment is the tank itself and the secondary containment is the concrete containment).

Total petroleum hydrocarbons were the main parameter of concern. To save analytical costs, TPH samples were screened with the least expensive laboratory test (TPH by Infrared). This test detects interfering substances such as vegetation, coal, etc., and therefore tends to register higher values than the more costly TPH test (TPH by GC/FID). TPH by GC/FID costs nearly twice as much but is a more refined test. All testing done during cleanup should be by the TPH by GC/FID test in order to satisfy IDEM requirements.

Other testing completed included metal analysis for total lead, total chromium, and TCLP lead. Concentrations of lead and chromium detected were above typical background levels but passed the TCLP test (i.e., they are non-hazardous). Likewise, all testing done to characterize the soils in order to determine whether they are hazardous, show the soil to be conclusively non-hazardous. Polychlorinated byphenyls (PCBs) were also non detected.

Contaminated groundwater is believed to be limited to an estimated 50,000 gallons. The groundwater found in the gravel base layer is contaminated with fuel oil. Due to the limited volume, it is recommended that disposal be by hauling to an off-site treatment plant. Other methods are available for treatment such as air stripping, carbon treatment, two phase vapor extraction, and pretreatment for discharge to the base wastewater plant. Capital costs are higher than for off-site disposal. Therefore, off-site disposal is recommended.

In summary, the contamination present is more limited than previously believed, the soils are non-hazardous, acceptable for sanitary landfilling, and confined principally to surficial clay soils (primarily in Cell No. 6). A methodical and systematic approach to excavate, test, and confirm cleanup will minimize disposal volumes and costs to the Navy.

APPENDIX A

SPILL REPORTS

JULY 14, 1987

BLOOMINGTON HERALD-TELEPHONE
7-17-87 PAGE A7

AD
09
0924

Crane diesel fuel spill cleaned up before reaching nearby White River

H-T Report

CRANE — Several more checks for diesel fuel pollution in a Martin-/Greene county creek will be made, but a Crane spokesman said Thursday that a Tuesday night spill has been pretty much cleaned up.

Tim Callahan of the Crane Naval Weapons Support Center, about 30 miles southwest of Bloomington, said an estimated 3,700 gallons of diesel fuel leaked Tuesday evening from a pipe valve between two tanks on the base.

He said most of the fuel was contained by a dike around the fuel tank area, but that some overflowed and ran about 250 yards down a ditch to Furst Creek, which empties into the West Fork of the White River about 11½ miles west.

He said a passing security patrol guard smelled the fuel and discovered the leak about 7 p.m. Tuesday, probably not more than an hour or two after it started. Local and state officials were notified and, using special cleaning equipment, Crane public works department staff worked all night Tuesday until creek water appeared clean.

Workers from Petrochem, an Indianapolis spill recovery company recommended by state environmental officials, were on the scene Wednesday to help with the cleanup.

Callahan said workers probably will dig up ground where the fuel soaked in. "They're monitoring the stream, but they are pretty sure they caught everything before it got to the river," he said.

He said the valve was in a system of pipes that ran between active tanks and an inactive tank near Crane Village, in the northwest corner of Martin County just south of Greene. The pipes to the inactive tank should have been disconnected when use was discontinued, he said, but were not.

FIRE DIVISION INCIDENT
NWSC. 11320/16 (8-84)

FIRE INCIDENT REPORT NO.	POLICE INCIDENT REPORT NO. (If assigned)	DATE
1041-87-210		7-15-87
FROM: Code 104	TO: Code A	VIA: Code 10
LOCATION OF INCIDENT: TANK FARM	RESPONSIBLE DEPARTMENT/ACTIVITY: 09	☒ ON CENTER ☐ OFF-CENTER

INCIDENT OCCURRED TIME 1854 DATE 7-14-87

METHOD OF REPORTING ☐ VERBAL ☒ TELEPHONE ☐ ALARM SYSTEM ☐ RADIO

REPORT RECEIVED BY

TYPE OF INCIDENT

	FIRE TYPE		ACCIDENT RESPONSE		OTHER ALARMS
	BUILDING		VEHICLE		ACCIDENTAL
	BRUSH		EXPLOSION		MECHANICAL
	VEHICLE		INDUSTRIAL		SMOKE DETECTOR
	OTHER		TRAIN DERAILMENT		SPRINKLER
			RESCUE		FALSE (MALICIOUS)
		X	OTHER HAZ. MAT. RESPONSE		INVESTIGATION
					OTHER

DETAILS OF INCIDENT (What, Where, How, Why, Action)

SECURITY COMMUNICATIONS REPORTED SMELL OF FUEL OIL ON MULE BARN HILL. FIRE DIVISION CHECKED AND FOUND FUEL OIL RUNNING FROM TANK FARM INTO DRAINAGE DITCH. REQUEST SAND IN PICKUP TO DYKE DITCH. CALLED ENVIRONMENTALISTS AND ADVISED OF SPILL. ASSISTED IN PLACING BOOMS IN FURST CREEK TO CONTAIN OIL. FIREFIGHTERS SHOVELED SAND AROUND LEAKS IN CONTAINMENT WALL AT TANK FARM. ASSISTED IN OPERATING TANK TRUCK TO SUCK UP OIL INSIDE TANK FARM AREA. CDO, 09, 09A, ON SCENE. NO INJURIES.

FIRE REPORT ☐ TO FOLLOW ☒ NONE REQUIRED

INVESTIGATION BY (Name and Title)	TELPHONE EXTENSION
CURTIS S. WOLFE, ACTING ASST. FIRE CHIEF	1235
FIRE CHIEF (Signature)	DATE 7-15-87

DISTRIBUTION: Code A (Original), Department/Activity (Yellow), Code 1034 (Pink), Code 104 File (Gold)

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
NANCY A. MALOLEY, Commissioner

105 South Meridian Street
P.O. Box 6015
Indianapolis 46206-6015
Telephone 317-232-8603

July 21, 1987

Crane Naval Weapons Support Center
Crane, Indiana 47522

Attention: Mr. Jim Hunsicker

Re: Fuel Oil Release
Navel Weapons Support Center, Crane

Dear Mr. Hunsicker:

On July 14, 1987, this office received notification stating that approximately 4,000 gallons of No. 2 fuel oil was released to the ground with approximately 400 gallons getting into First Creek near Crane. The release was caused by employee error. Petro Chem, Inc., was contracted for the cleanup.

Pursuant to 330 IAC 1-6-2(e), a narrative spill report which includes the following information concerning the incident must be submitted to this office within 10 days of the receipt of this letter.

- -date and time of spill
- -cause of spill inadvertently
- -spill location T5N, R4W, NE¼ Sec. 8; Scotland Quadrangle
- -description of area affected, mention square feet or cubic feet
- -amount spilled
- -amount recovered
- -containment & cleanup activities (with dates)
- -disposal of recovered material - by PetroChem
- -who was at the scene; name, organization, position
- -do you have a contingency plan; if so, was it implemented
- -list preventive measures to eliminate recurrence

Your response and any questions concerning the above matter should be directed to Mr. R. L. Moran (317/243-5158).

Very truly yours,

Skip Powers, Chief
Emergency Response Branch

APPENDIX B

PRELIMINARY FUEL OIL CONTAMINATION STUDY

ATEC ENVIRONMENTAL CONSULTANTS

JUNE 30, 1989

PRELIMINARY FUEL OIL CONTAMINATION STUDY
FUEL OIL TANK FARM NEAR BUILDING 2760
CRANE NAVAL WEAPONS SUPPLY CENTER
CRANE, INDIANA
ATEC PROJECT NUMBER 21-97124

MR. PAUL BUTT
PEDCO E&A SERVICES
114 CHESTER ROAD
CINCINNATI, OH 45246

ATEC Environmental Consultants
Division of ATEC Associates, Inc.
5150 East 65th Street
Indianapolis, Indiana 46220-4871
(317) 849-4990, FAX # (317) 849-4278

Solid & Hazardous Waste Site Assess
Remedial Design & Construction
Underground Tank Management
Asbestos Surveys & Analysis
Hydrogeologic Investigations & Monitoring
Analytical Testing / Chemistry
Industrial Hygiene / Hazard Communication
Environmental Audits & Permitting
Exploratory Drilling & Monitoring Wells

June 30, 1989

Mr. Paul Butt
PEDCO E&A Services
114 Chester Road
Cincinnati, OH 45246

Re: Preliminary Fuel Oil Contamination Study
Fuel Oil Tank Farm near Building 2760
Crane Naval Weapons Supply Center
Crane, Indiana
ATEC Project Number 21-97124

Dear Mr. Butt:

ATEC Environmental Consultants is pleased to provide PEDCO E&A Services with this report of the preliminary fuel oil contamination study conducted at the Crane Naval Weapons Supply Center outside Crane, Indiana.

This report documents the field investigation and laboratory analysis and provides conclusions and recommendations based upon the findings.

We trust this submittal is responsive to your needs. If you have any questions or comments regarding this report, or if we can be of any further service to you in the future, please do not hesitate to contact us.

Very truly yours,

ATEC Associates, Inc.

Pablo A. McLoud
Environmental Geologist

Daniel Pratter
Project Manager

TABLE OF CONTENTS

		PAGE
1.0	INTRODUCTION	1
2.0	FIELD INVESTIGATION	3
3.0	FINDINGS	7
	3.1 Soils	7
	3.2 Laboratory Analysis	9
4.0	CONCLUSIONS AND RECOMMENDATIONS	10

APPENDICES

PRELIMINARY FUEL OIL CONTAMINATION STUDY

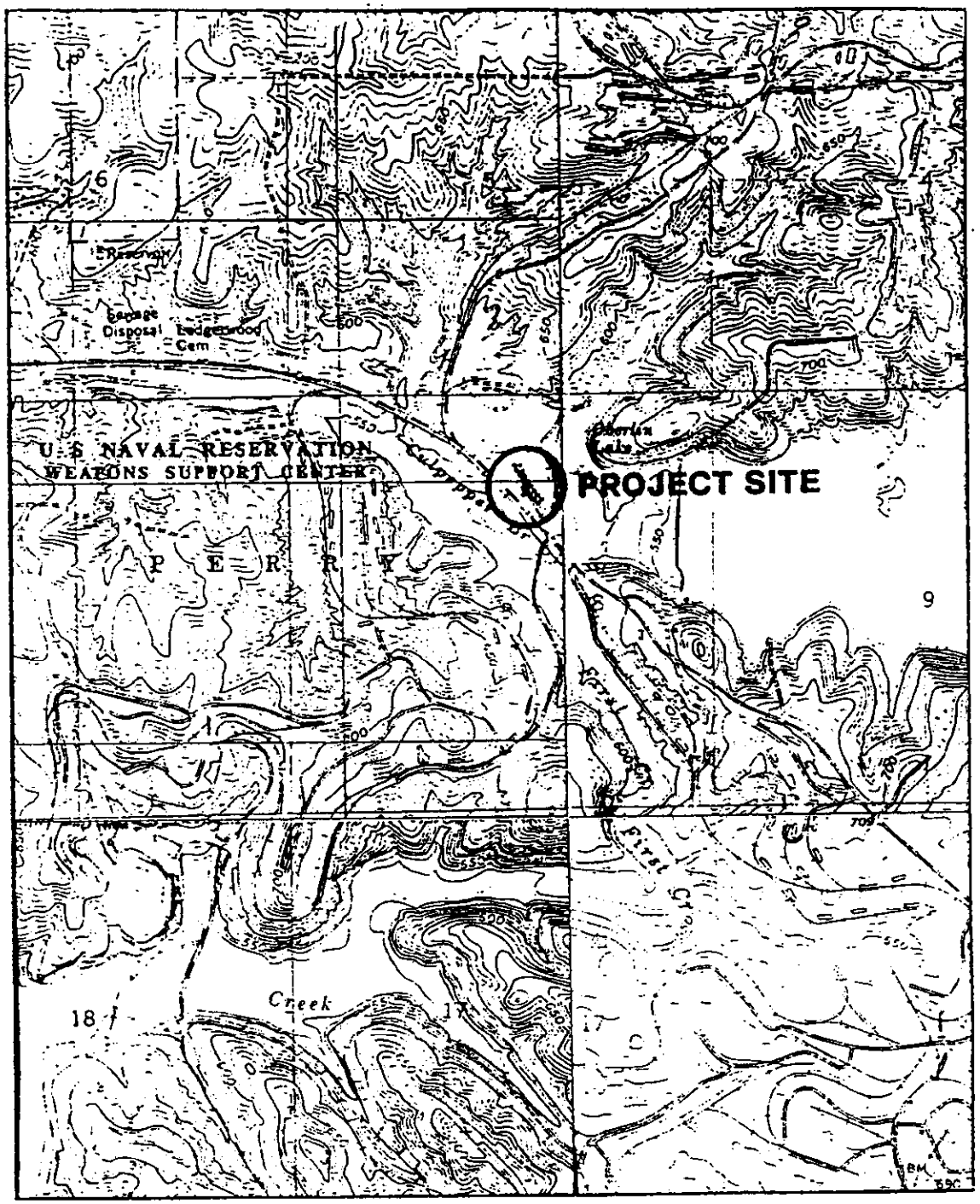
Fuel Oil Tank Farm near Building 2760
Crane Naval Weapons Supply Center
Crane, Indiana
ATEC Project Number 21-97124

1.0 INTRODUCTION

ATEC Environmental Consultants (ATEC) was retained by PEDCO E&A Services (PEDCO) to conduct a soils-gas survey, and soil sampling analysis at the Crane Naval Weapons Supply Center outside Crane, Indiana. A map illustrating the project location is provided in Figure 1.

The purpose of this investigation was to make a preliminary assessment of possible soil contamination within six adjacent diked concrete cells. These cells contain or once contained fuel oil aboveground storage tanks (ASTs). To accomplish the project objective, a soils-gas survey and a subsequent soil sampling and analysis program was conducted.

This report details the field activities conducted by ATEC during the subsurface investigation, documents all laboratory results, and provides conclusions and recommendations based on the field observations and laboratory analysis.



VICINITY MAP
FUEL OIL TANK FARM
CRANE NAVAL WEAPONS SUPPLY CNTR.
CRANE, IN

PROJECT NO.	21-97124
SCALE	1" = 2000'
FIGURE NO	1

ATEC

VICINITY MAP
FUEL OIL TANK FARM
CRANE NAVAL WEAPONS SUPPLY CNTR.
CRANE, IN

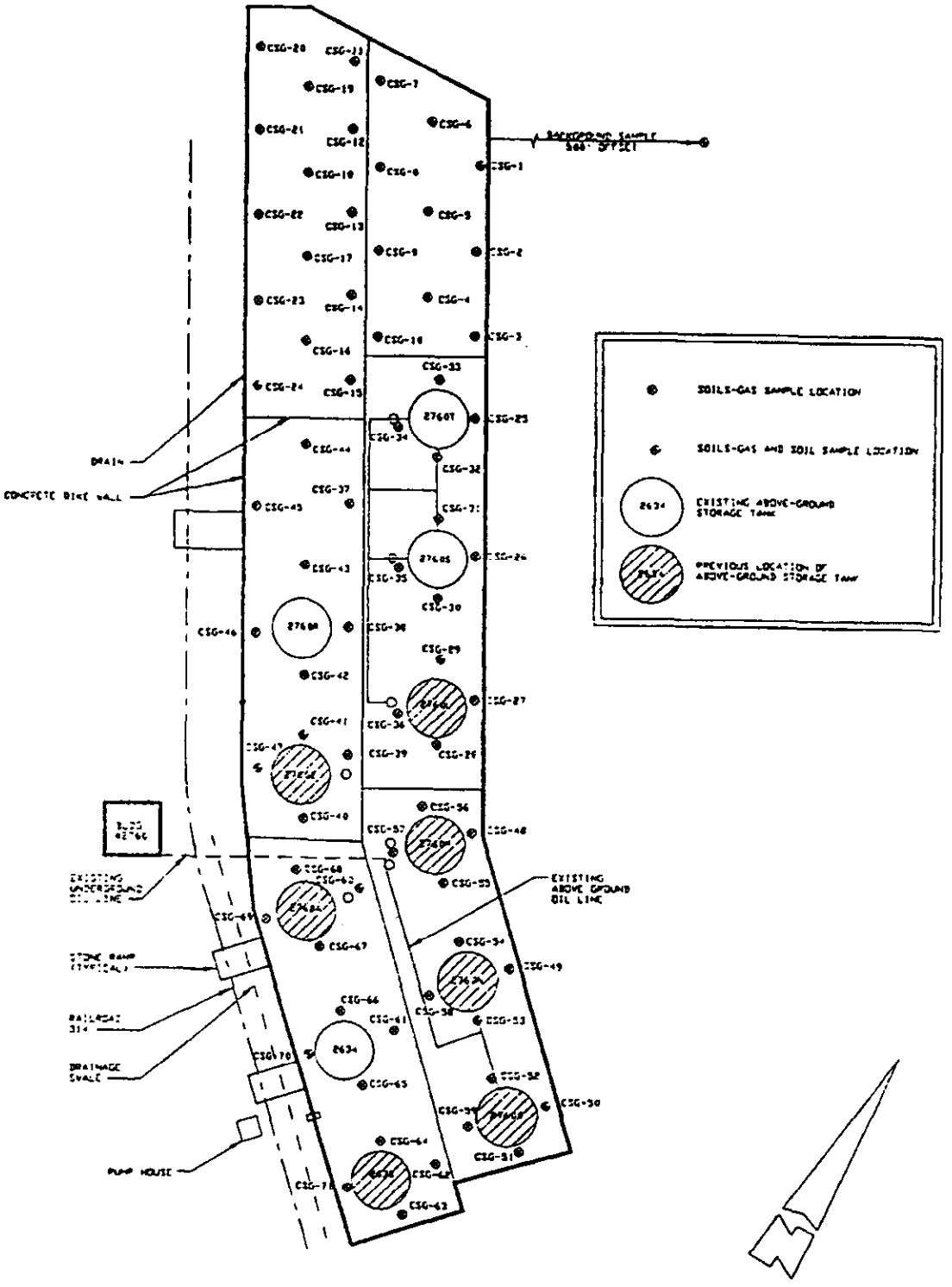
PROJECT NO.	21-97124
SCALE	1' = 2000'
FIGURE NO.	1

ATEC

2.0 FIELD INVESTIGATION

The field investigation consisted of a soils-gas survey followed by hand auger borings and a sampling of soils. A site plan of the project area illustrating soils-gas and hand auger locations is shown in Figure 2.

The first phase, the soils-gas survey, consisted of a total of seventy-one sampling points. The survey was conducted by installing temporary monitoring ports for the collection of soil vapor samples. The vapors were analyzed in the field by measuring the amount of total combustible vapors (TCVs). Boreholes for temporary monitoring ports were drilled to a 3.0 ft depth using a power auger equipped with 2 1/4 in. O.D. augers. The auger was then removed and 3.0 ft long temporary soils-gas monitoring ports constructed of 2.0 in. I.D. Schedule 40 polyvinyl chloride (PVC) pipe was then inserted into annulus of the borehole. The bottom 1.5 ft of the monitoring port was field slotted to allow entrance of vapors. The top of the pipe was equipped with a compression fitting which allowed an air-tight connection to the silicon tubing sampling line. The air within the sampling port was purged with a small portable field pump prior to sampling to eliminate any stagnant vapors and provide a representative sample. Photographic documentation of the above-mentioned procedure can be found in Appendix A.



SITE PLAN
FUEL OIL TANK FARM
CRANE NAVAL WEAPONS SUPPLY CNTR.
CRANE, IN

PROJECT NO.	21-97124
SCALE	1" = 50'
FIGURE NO.	2

ATEC

It should be emphasized that the soils-gas survey technique is a screening tool only. The survey serves to identify the existence of subsurface contamination by monitoring the emission of TCVs and to illustrate the relative distribution of petroleum vapors in the subsurface. This technique is based on emerging technology and field and laboratory modifications are often necessary to yield useful results. There are presently no standardized methods for performing these surveys and there are no guidelines (enforceable or otherwise) established by regulatory agencies regarding TCV limits in the subsurface. However, ATEC has had very good success in identifying contaminated soils and delineating the lateral extent of contaminant plumes. In general, background levels of TCVs at an undeveloped site would be 25 ppm or less while background values at an industrial site would be 50 to 200 ppm. For the purposes of identifying background levels at this location, a vapor port was installed 500 ft from the ASTs. The TCV from this location was reported to be 350 ppm.

Representative vapor samples were drawn through sampling ports and analyzed for TCVs in parts per million (ppm) with a Gastechtor Hydrocarbon Survey Model 1314 Gas Indicator. The Gastechtor is equipped with a small built-in pump which continuously draws air samples into a reaction chamber which is equipped with a heated catalytic platinum element. The indications of the catalytic element are reported on a dial

display on the instrument in ppm. Following purging of the sampling port, the silicon tubing was connected to the pump inlet of the Gastechtor for measurement. The highest value recorded for each sample during this procedure was noted. For screening purposes, ATEC calibrates the instrument to 400 ppm hexane, and the reported values represent ppm as hexane. There are no established Indiana Department of Environmental Management (IDEM) or U.S. EPA standards for TCV levels. The highest TCV readings from each sampling location can be found in Appendix B.

Based on the findings of the soils-gas survey, the areas with the highest readings within each cell were selected for further investigation. This second phase of the project consisted of making two hand auger borings to a depth of up to 5.0 ft in each cell. These hand auger locations were selected based on information from the vapor screening and visual observations. Samples were obtained at 6 in. intervals and each sample was classified and inspected visually for any indication of petroleum contamination such as staining, odors, etc. Vapors emitted from the samples were analyzed for TCVs using the Gastechtor. An ATEC field geologist inspected for contamination and logged the lithology of each sample. Boring logs depicting the soil subsurface conditions of each boring location are provided in Appendix C.

Also recorded on the boring logs are the results of the TCV survey. Based on the field inspection, one soil sample which had the greatest TCV measurement from the field screen was submitted to the laboratory for analysis of Total Petroleum Hydrocarbons (TPH).

The sampling hand auger was cleaned with an organic solvent (i.e, hexane) followed by a distilled water rinse between each sampling location. All collected samples selected for analysis were placed in a 4 oz. glass jar with Teflon-lined caps, labeled, and put on ice immediately following collection. Chain-of-custody documentation was used to track the samples from collection to final disposition.

3.0 FINDINGS

3.1 Soils

Soils within each cell were predominantly fill material consisting of gray and brown fine to medium sands, brown silty clays, and fine to medium gravels. Borings CSG-1, 6, 24, 29, and 36 consisted of silty sands and clays which registered TCVs from non-detectable to 105 ppm.

Boring CSG-11 consisted of fine to medium sand to a depth of 3.0 ft. From 3.0 to 3.5 ft a thick black tar layer was encountered with a strong diesel fuel odor and heavy black

staining. The boring was completed to a depth of only 3.5 ft due to auger refusal. TCV values registered greater than 500 ppm from 1.0 ft to the bottom of the boring.

Borings CSG-41 and CSG-47 were made up of silty clay and silty sand fill with TCV readings ranging from 50 to greater than 500 ppm. Moderate diesel fuel odors were noticeable in both borings with green and black staining of the soils.

Borings CSG-50 and CSG-53 consisted of silty clay fill material that exhibited strong diesel fuel odors and moderate black staining. TCV readings ranged from 100 to greater than 500 ppm.

The borings CSG-60, 70, and 71 consisted of fine to medium sand fill material with very strong diesel odors. Soils exhibited a green staining along with a moderate sheen. Boring CSG-71 was terminated at 2.0 ft due to cave in of the walls between sample intervals.

A background soil boring was augered approximately 500 ft northwest of the project site at an elevation 50 ft above that of the tank farm. This boring consisted of dark brown silty clay topsoil to a depth of 4.0 ft. TCV readings registered non-detectable to the bottom of the boring.

3.2 Laboratory Analysis

The collected soil samples were submitted to the ATEC laboratory for TPH analysis. All soil samples were collected and handled using protocols from U.S. EPA guidelines established in "Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods" SW-846. Total petroleum hydrocarbon analyses was performed on a Varian 3700 Gas Chromatograph using Flame Ionization Detection via SW-846 Method 8015 Revised.

Analytical results for all soil samples are summarized in Table 1 and a copy of the laboratory analysis is provided in Appendix D.

Table 1
Soil Laboratory Results

Sample Identification	Total Hydrocarbon (ppm)	Quantitation Limit (ppm)
CSG-1	<1.0	1.0
CSG-6	<1.0	1.0
CSG-11	12*	2.0
CSG-24	<1.0	1.0
CSG-29	<1.0	1.0
CSG-36	<1.0	1.0
CSG-41	5.3**	1.0
CSG-47	<1.0	1.0
CSG-50	1.4**	5.0
CSG-53	<1.0	1.0
CSG-60	<1.0	1.0
CSG-70	120*	4.0
CSG-71	1,800***	10
Background	<1.0	1.0

* Hydrocarbon identified as Weathered Diesel Fuel
** Hydrocarbon most closely resembles Weathered Diesel Fuel
*** Hydrocarbon pattern is a mixture of Gasoline and Diesel Fuel

4.0 CONCLUSIONS AND RECOMMENDATIONS

The soils-gas survey and field observations at the Crane Naval Weapons Supply Center has revealed the presence of petroleum hydrocarbon contaminated soils associated with the fuel oil ASTs located on the property at locations CSG-11, 41, 47, 50, 53, 60, 70 and 71. However, analytical confirmation from the samples obtained at these locations indicated the presence of hydrocarbons in only CSG-11, 41, 50, 70 and 72. Only two of these samples had elevated levels of TPH (CSG-70 and 71). Based on the data presented here the extent of contamination appears to be very limited. The Indiana Department of Environmental Management (IDEM) has clean-up criteria of 100 ppm TPH in soils contaminated with petroleum hydrocarbons.

The soils collected from CSG-70 and CSG-71 revealed the elevated presence of residual petroleum contamination in excess of the IDEM requirement. The IDEM suggests that all soils exceeding the evaluation criteria be removed and properly disposed. Although the contamination documented in this report does not constitute a great threat to human health or the environment, ATEC suggests that the soils near CSG-70 and 72 be excavated and disposed of properly.

ATEC identified other areas within the concrete dike which revealed the noticeable presence of petroleum hydrocarbons.

However these areas did not contain TPH concentrations above the 100 ppm criteria. In order to eliminate all future liabilities associated with soils containing any concentrations of hydrocarbons, ATEC suggests that when the soils are removed from near CSG-70 and 71, that the soils near CSG-11, 41, 47, 50, 53, and 60 also be removed.

Our professional services have been performed, our findings obtained and our recommendations prepared in accordance with generally accepted and customary principles and practices in the fields of environmental science and engineering. This warranty is in lieu of all other warranties either express or implied. This company is not responsible for the independent conclusions, opinions or recommendations made by others based on the data presented in this report.

APPENDIX A

Photographic Documentation
Crane Naval Weapons Center
Crane, Indiana
ATEC Project Number 21-97124

A-1 Evacuating monitoring port

A-2 Southeastern view of tank farm

A-3 Hand auger Boring CSG-24

A-4 Western view of CSG-60 through CSG-71 area

B-1 Screening soil samples from Boring CSG-6

B-2 Northern view of tank farm

B-3 Hand auger Boring CSG-6

B-4 Surface contamination near Boring CSG-35

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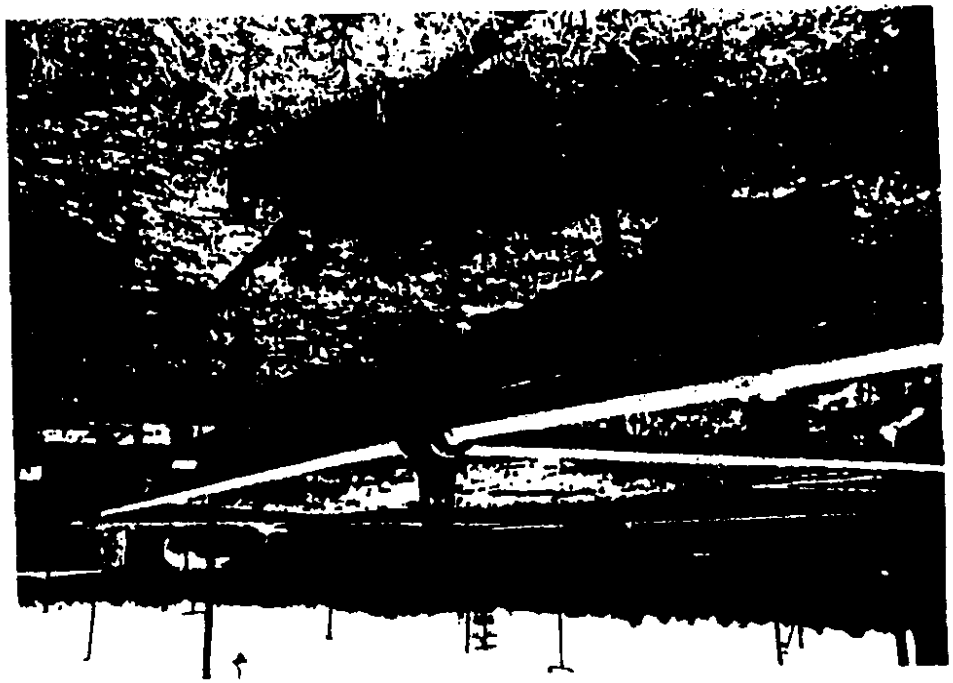

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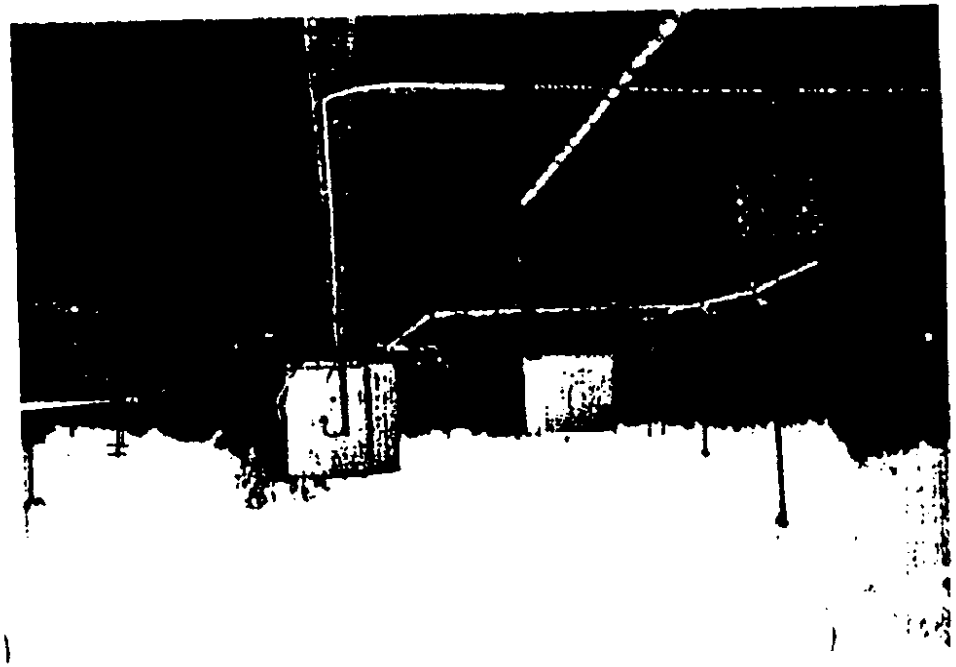

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APPENDIX B (cont'd)

SOILS-GAS SURVEY

Sample Location	Total Combustible Vapors (ppm)
CSG-45	80
CSG-46	250
CSG-47*	>500
CSG-48	260
CSG-49	280
CSG-50*	400
CSG-51	280
CSG-52	215
CSG-53*	480
CSG-54	250
CSG-55	350
CSG-56	250
CSG-57	175
CSG-58	250
CSG-59	280
CSG-60*	>500
CSG-61	325
CSG-62	75
CSG-63	425
CSG-64	>500
CSG-65	>500
CSG-66	120
CSG-67	320
CSG-68	425
CSG-69	265
CSG-70*	>500
CSG-71*	>500
Background*	325

* Soil boring and Soil Sampling Location

APPENDIX C

BORING LOGS

ATEC Associates, Inc.

Consulting Environmental, Geotechnical and Materials Engineers

LOG OF BORING NO. CSG-1

CLIENT PEDCO
PROJECT NAME Soil Investigation
PROJECT LOCATION Crane Naval Weapons Support Center
BORING LOCATION Aboveground Tank Farm
FOREMAN Pablo McLoud
INSPECTOR B. Ullery

JOB NO. 21-97124
START DATE 5/18/89
BORING METHOD HA
ROCK CORE DIA. ____ IN.
SHELBY TUBE DIA ____ IN.

SOIL/ROCK DESCRIPTION	STRATUM DEPTH ft.	DEPTH ft.	SAMPLE NO.	SPT (*)	REC %	TCV ppm (**)	REMARKS
Surface Elevation							
Brown and red tint slightly moist Silt fine to medium Sand (SP)	.5		1			ND	
			2			ND	
Brown slightly moist Clayey Silt fine to medium Sand (SM-SC)			3			ND	
			4			ND	
			5			ND	
		2.5	6			ND	
			7			ND	
			8			ND	
			9			ND	
			10			ND	
		5					
Bottom of test boring @ 5.0'							
							Composited sample for laboratory analysis of Total Petroleum Hydrocarbon

WATER LEVEL OBSERVATIONS
NOTED ON RODS None FT
AT COMPLETION Dry FT
AFTER ____ HRS. ____ FT

BORING METHODS
HSA-HOLLOW STEM AUGERS
CFA-CONT.FLIGHT AUGERS
HA-HAND AUGER

NOTES: (*) BLOWS/6 in., In Three 6 in. Increments
REC %: Sample Recovery, %
(**) TCV-Total Combustible Vapors ppm (parts per million)

ATEC Associates, Inc.

Consulting Environmental, Geotechnical and Materials Engineers

LOG OF BORING NO. CSG-6

CLIENT: PEDCO
PROJECT NAME: Soil Investigation
PROJECT LOCATION: Crane Naval Weapons Support Center
BORING LOCATION: Aboveground Tank Farm
FOREMAN: Pablo McLoud
INSPECTOR: B. Ullery

JOB NO. 21-97124
START DATE 5/18/89
BORING METHOD HA
ROCK CORE DIA. ____ IN.
SHELBY TUBE DIA ____ IN.

SOIL/ROCK DESCRIPTION Surface Elevation	STRATUM DEPTH ft.	DEPTH ft.	SAMPLE NO.	SPT (*)	REC %	TCV ppm (**)	REMARKS
Dark brown slightly moist Silt fine to medium Sand (SP)	.5		1			ND	
			2			ND	
Brown slightly moist Silt fine to medium SANDY CLAY (CL)			3			ND	
	2.0		4			ND	
Brown slightly moist coarse Silt fine to medium Sand (SM-SC)		2.5	5			ND	
			6			ND	
			7			ND	
			8			ND	
			9			ND	
		5	10			ND	
Bottom of test boring @ 5.0'							Composited sample for laboratory analysis of Total Petroleum Hydrocarbon

WATER LEVEL OBSERVATIONS
NOTED ON RODS None FT
AT COMPLETION Dry FT
AFTER ____ HRS. ____ FT

BORING METHODS
HSA-HOLLOW STEM AUGERS
CFA-CONT.FLIGHT AUGERS
HA-HAND AUGER

NOTES: (*)BLOWS/6 in., In Thre 6 in. Increments
REC %: Sample Recovery, %
(**)TCV-Total Combustible Vapors ppm (parts per million)

ATEC Associates, Inc.

Consulting Environmental, Geotechnical and Materials Engineers

LOG OF BORING NO. SG-11

CLIENT: PEDCO
PROJECT NAME: Soil Investigation
PROJECT LOCATION: Crane Naval Weapons Support Center
BORING LOCATION: Aboveground Tank Farm
FOREMAN: Pablo McLoud
INSPECTOR: B. Ullery

JOB NO. 21-97124
START DATE 5/18/89
BORING METHOD HA
ROCK CORE DIA. ____ IN.
SHELBY TUBE DIA ____ IN.

SOIL/ROCK DESCRIPTION	STRATUM DEPTH ft.	DEPTH ft.	SAMPLE NO.	SPT (*)	REC %	TCV ppm (**)	REMARKS
Surface Elevation							
Dark brown slightly moist Silt fine to medium Sand (SP)			1			25	
			2			30	
			3			>500	Strong diesel odor
			4			>500	with black staining
			5			>500	Black staining ob-
		2.5	6*			>500	served
	3.0		7			>500	Auger refusal at 3.5'
Black thick tar layer							
Bottom of test boring @ 3.5'							
							*Obtained sample for laboratory analysis of Total Petroleum Hydrocarbon

WATER LEVEL OBSERVATIONS
NOTED ON RODS None FT
AT COMPLETION Dry FT
AFTER ____ HRS. ____ FT

BORING METHODS
HSA-HOLLOW STEM AUGERS
CFA-CONT.FLIGHT AUGERS
HA-HAND AUGER

NOTES: (*)BLOWS/6 in., In Three 6 in. Increments
REC %: Sample Recovery, %
(**)TCV-Total Combustible Vapors ppm (parts per million)

ATEC Associates, Inc.

Consulting Environmental, Geotechnical and Materials Engineers

LOG OF BORING NO. CSG-24

CLIENT PEDCO
PROJECT NAME Soil Investigation
PROJECT LOCATION Crane Naval Weapons Support Center
BORING LOCATION Aboveground Tank Farm
FOREMAN Pablo McLoud
INSPECTOR B. Ullery

JOB NO. 21-97124
START DATE 5/18/89
BORING METHOD HA
ROCK CORE DIA. ___ IN.
SHELBY TUBE DIA ___ IN.

SOIL/ROCK DESCRIPTION Surface Elevation	STRATUM DEPTH ft.	DEPTH ft.	SAMPLE NO.	SPT (*)	REC %	TCV ppm (**)	REMARKS
Dark brown slightly moist fine SANDY SILTY CLAY (FILL)			1			40	
			2			50	
Red and light green slightly moist fine SANDY SILTY CLAY (FILL)	2.0		3			50	
			4			75	
		2.5	5			75	
Green, gray and brown fine SANDY SILTY CLAY (CL)	3.5		6			80	
			7*			110	
Brown and red slightly moist coarse Silt fine Sand (SP)			8			65	
			9			60	
		5	10			50	
Bottom of test boring @ 5.0'							*Obtained sample for laboratory analysis of Total Petroleum Hydrocarbon

WATER LEVEL OBSERVATIONS
NOTED ON RODS None FT
AT COMPLETION Dry FT
AFTER ___ HRS. ___ FT

BORING METHODS
HSA-HOLLOW STEM AUGERS
CFA-CONT.FLIGHT AUGERS
HA-HAND AUGER

NOTES: (*)BLOWS/6 in., In Three 6 in. Increments
REC %: Sample Recovery, %
(**)TCV-Total Combustible Vapors ppm (parts per million)

ATEC Associates, Inc.

Consulting Environmental, Geotechnical and Materials Engineers

LOG OF BORING NO. CSG-29

CLIENT PEDCO
PROJECT NAME Soil Investigation
PROJECT LOCATION Crane Naval Weapons Support Center
BORING LOCATION Aboveground Tank Farm
FOREMAN Pablo McLoud
INSPECTOR B. Ullery

JOB NO. 21-97124
START DATE 5/18/89
BORING METHOD HA
ROCK CORE DIA. ____ IN.
SHELBY TUBE DIA ____ IN.

SOIL/ROCK DESCRIPTION Surface Elevation	STRATUM DEPTH ft.	DEPTH ft.	SAMPLE NO.	SPT (*)	REC %	TCV ppm (**)	REMARKS
Brown and black slightly moist Silt fine			1			30	
SANDY SLAY (CL)			2			20	
Occasional red	1.5		3			25	
Light green and brown slightly moist			4			40	
SILTY CLAY (CL) with trace fine Sand		2.5	5			50	
			6			50	
			7			60	
			8*			75	
			9			50	
		5	10			60	
Bottom of test boring @ 5.0'							
							*Obtained sample for laboratory analysis of Total Petroleum Hydrocarbon

WATER LEVEL OBSERVATIONS
NOTED ON RODS None FT
AT COMPLETION Dry FT
AFTER ____ HRS. ____ FT

BORING METHODS
HSA-HOLLOW STEM AUGERS
CFA-CONT.FLIGHT AUGERS
HA-HAND AUGER

NOTES: (*)BLOWS/6 in., In Three 6 in. Increments
REC %: Sample Recovery, %
(**)TCV-Total Combustible Vapors ppm (parts per million)

ATEC Associates, Inc.

Consulting Environmental, Geotechnical and Materials Engineers

LOG OF BORING NO. CSG-36

CLIENT PEDCO
PROJECT NAME Soil Investigation
PROJECT LOCATION Crane Naval Weapons Support Center
BORING LOCATION Aboveground Tank Farm
FOREMAN Pablo McLoud
INSPECTOR B. Ullery

JOB NO. 21-97124
START DATE 5/18/89
BORING METHOD HA
ROCK CORE DIA. ____ IN.
SHELBY TUBE DIA ____ IN.

SOIL/ROCK DESCRIPTION Surface Elevation	STRATUM DEPTH ft.	DEPTH ft.	SAMPLE NO.	SPT (*)	REC %	TCV ppm (**)	REMARKS
Brown slightly moist Silt fine SANDY CLAY (FILL)			1			50	
			2			50	
			3			75	
	2.0		4			100	
Light gray slightly moist Silt trace SANDY CLAY (CL) with trace Gravel		2.5	5			90	
			6*			105	
			7			90	
Brown and gray below 4.0'			8			50	
			9			50	
		5	10			60	
Bottom of test boring @ 5.0'							
							*Obtained sample for laboratory analysis of Total Petroleum Hydrocarbon

WATER LEVEL OBSERVATIONS
NOTED ON RODS None FT
AT COMPLETION Dry FT
AFTER ____ HRS. ____ FT

BORING METHODS
HSA-HOLLOW STEM AUGERS
CFA-CONT.FLIGHT AUGERS
HA-HAND AUGER

NOTES: (*)BLOWS/6 in., In Three 6 in. Increments
REC %: Sample Recovery, %
(**)TCV-Total Combustible Vapors ppm (parts per million)

ATEC Associates, Inc.

Consulting Environmental, Geotechnical and Materials Engineers

LOG OF BORING NO. CSG-41

CLIENT	PEDCO	JOB NO.	21-97124
PROJECT NAME	Soil Investigation	START DATE	5/18/89
PROJECT LOCATION	Crane Naval Weapons Support Center	BORING METHOD	HA
BORING LOCATION	Aboveground Tank Farm	ROCK CORE DIA.	IN.
FOREMAN	Pablo McLoud	SHELBY TUBE DIA	IN.
INSPECTOR	B. Ullery		

SOIL/ROCK DESCRIPTION Surface Elevation	STRATUM DEPTH ft.	DEPTH ft.	SAMPLE NO.	SPT (*)	REC %	TCV ppm (**)	REMARKS
Dark brown to brown slightly moist SILTY	.5		1			75	Slight diesel odor
SANDY CLAY (SP)			2			50	and green staining
Brown slightly moist Silt fine SANDY			3			50	
CLAY (CL) (FILL)			4			125	Moderate diesel odor
		2.5	5			200	and green staining
Green and gray below 2.5'			6			125	
			7			125	
			8*			310	
			9			180	
		5	10			120	
Bottom of test boring @ 5.0'							
							*Obtained sample for laboratory analysis of Total Petroleum Hydrocarbon

WATER LEVEL OBSERVATIONS
NOTED ON RODS None FT
AT COMPLETION Dry FT
AFTER ____ HRS. ____ FT

BORING METHODS
HSA-HOLLOW STEM AUGERS
CFA-CONT.FLIGHT AUGERS
HA-HAND AUGER

NOTES: (*)BLOWS/6 in., In Three 6 in. Increments
REC %: Sample Recovery, %
(**)TCV-Total Combustible Vapors ppm (parts per million)

ATEC Associates, Inc.

Consulting Environmental, Geotechnical and Materials Engineers

LOG OF BORING NO. CSG-47

CLIENT PEDCO
PROJECT NAME Soil Investigation
PROJECT LOCATION Crane Naval Weapons Support Center
BORING LOCATION Aboveground Tank Farm
FOREMAN Pablo McLoud
INSPECTOR B. Ullery

JOB NO. 21-97124
START DATE 5/18/89
BORING METHOD HA
ROCK CORE DIA. ____ IN.
SHELBY TUBE DIA ____ IN.

SOIL/ROCK DESCRIPTION Surface Elevation	STRATUM DEPTH ft.	DEPTH ft.	SAMPLE NO.	SPT (*)	REC %	TCV ppm (**)	REMARKS
Dark brown slightly moist Silty Clay fine			1			75	
to coarse Sand (FILL) with trace Gravel	1.0		2			150	
Brown slight moist Silt fine to medium			3			60	
Sandy Clay (FILL)			4			325	Moderate diesel odor
Brown slightly moist Silty Clay fine to		2.5	5*			>500	and occasional black
Coarse Sand with trace fine Gravel	3.0		6			>500	staining
Bottom of test boring @ 3.0'							Auger refusal @ 3.0'
							*Obtained sample for laboratory analysi of Total Petroleum Hydrocarbon

WATER LEVEL OBSERVATIONS
NOTED ON RODS None FT
AT COMPLETION Dry FT
AFTER ____ HRS. ____ FT

BORING METHODS
HSA-HOLLOW STEM AUGERS
CFA-CONT.FLIGHT AUGERS
HA-HAND AUGER

NOTES: (*)BLOWS/6 in., In Three 6 in. Increments
REC %: Sample Recovery, %
(**)TCV-Total Combustible Vapors ppm (parts per million)

ATEC Associates, Inc.

Consulting Environmental, Geotechnical and Materials Engineers

LOG OF BORING NO. CSG-50

CLIENT: PEDCO
PROJECT NAME: Soil Investigation
PROJECT LOCATION: Crane Naval Weapons Support Center
BORING LOCATION: Aboveground Tank Farm
FOREMAN: Pablo McLoud
INSPECTOR: B. Ullery

JOB NO. 21-97124
START DATE 5/18/89
BORING METHOD HA
ROCK CORE DIA. ____ IN.
SHELBY TUBE DIA ____ IN.

SOIL/ROCK DESCRIPTION	STRATUM DEPTH ft.	DEPTH ft.	SAMPLE NO.	SPT (*)	REC %	TCV ppm (**)	REMARKS
Surface Elevation							
Brown moist Silt fine to medium Sand (FILL)			1			160	Strong diesel odor throughout boring
			2			250	
Brown slightly moist Silt fine SANDY CLAY			3			150	
			4			175	
			5*			>500	
		2.5	6			>500	
			7			>500	
			8			>500	
			9			>500	
			10			300	
		5					
Bottom of test boring @ 5.0'							
							*Obtained sample for laboratory analysis of Total Petroleum Hydrocarbon

WATER LEVEL OBSERVATIONS
NOTED ON RODS None FT
AT COMPLETION Dry FT
AFTER ____ HRS. ____ FT

BORING METHODS
HSA-HOLLOW STEM AUGERS
CFA-CONT.FLIGHT AUGERS
HA-HAND AUGER

NOTES: (*)BLOWS/6 in., In Thru 6 in. Increments
REC %: Sample Recovery, %
(**)TCV-Total Combustible Vapors ppm (parts per million)

ATEC Associates, Inc.

Consulting Environmental, Geotechnical and Materials Engineers

LOG OF BORING NO. CSG-53

CLIENT PEDCO
PROJECT NAME Soil Investigation
PROJECT LOCATION Crane Naval Weapons Support Center
BORING LOCATION Aboveground Tank Farm
FOREMAN Pablo McLoud
INSPECTOR B. Ullery

JOB NO. 21-97124
START DATE 5/18/89
BORING METHOD HA
ROCK CORE DIA. ____ IN.
SHELBY TUBE DIA ____ IN.

SOIL/ROCK DESCRIPTION	STRATUM DEPTH ft.	DEPTH ft.	SAMPLE NO.	SPT (*)	REC %	TCV ppm (**)	REMARKS
Surface Elevation							
Dark brown slightly moist Silty Clay fine Sand (FILL)			1			100	
			2			100	
Brown and gray slightly moist Silt fine SANDY CLAY (FILL)			3			110	
			4			250	Slightly black
		2.5	5*			500	stained and strong
			6			275	diesel odor
Trace Gravel below 3.5'			7			310	
			8			260	
			9			190	
		5	10			130	
Bottom of test boring @ 5.0'							
							*Obtained sample for laboratory analysis of Total Petroleum Hydrocarbon

WATER LEVEL OBSERVATIONS
NOTED ON RODS None FT
AT COMPLETION Dry FT
AFTER ____ HRS. ____ FT

BORING METHODS
HSA-HOLLOW STEM AUGERS
CFA-CONT.FLIGHT AUGERS
HA-HAND AUGER

NOTES: (*)BLOWS/6 in., In Thre 6 in. Increments
REC %: Sample Recovery, %
(**)TCV-Total Combustible Vapors ppm (parts per million)

ATEC Associates, Inc.

Consulting Environmental, Geotechnical and Materials Engineers

LOG OF BORING NO. CSG-60

CLIENT PEDCO
PROJECT NAME Soil Investigation
PROJECT LOCATION Crane Naval Weapons Support Center
BORING LOCATION Aboveground Tank Farm
FOREMAN Pablo McLoud
INSPECTOR B. Ullery

JOB NO. 21-97124
START DATE 5/18/89
BORING METHOD HA
ROCK CORE DIA. ____ IN.
SHELBY TUBE DIA ____ IN.

SOIL/ROCK DESCRIPTION Surface Elevation	STRATUM DEPTH ft.	DEPTH ft.	SAMPLE NO.	SPT (*)	REC %	TCV ppm (**)	REMARKS
Brown slightly moist fine SANDY SILTY CLAY (FILL)			1			50	
			2			125	Slight diesel odor
Brown and gray below 1.5'			3			135	Slight diesel odor
			4			450	Strong diesel odor
		2.5	5			210	Strong diesel odor
Light gray and trace moist Sand below 3.0'			6			150	
			7			325	
			8			450	
			9			>500	Slight sheen
		5	10*			>500	
Bottom of test boring @ 5.0'							
							*Obtained sample for laboratory analysis of Total Petroleum Hydrocarbon

WATER LEVEL OBSERVATIONS
NOTED ON RODS None FT
AT COMPLETION Dry FT
AFTER ____ HRS. ____ FT

BORING METHODS
HSA-HOLLOW STEM AUGERS
CFA-CONT.FLIGHT AUGERS
HA-HAND AUGER

NOTES: (*) BLOWS/6 in., In Three 6 in. Increments
REC %: Sample Recovery, %
(**) TCV-Total Combustible Vapors ppm (parts per million)

ATEC Associates, Inc.

Consulting Environmental, Geotechnical and Materials Engineers

LOG OF BORING NO. CSG-70

CLIENT PEDCO
PROJECT NAME Soil Investigation
PROJECT LOCATION Crane Naval Weapons Support Center
BORING LOCATION Aboveground Tank Farm
FOREMAN Pablo McLoud
INSPECTOR B. Ullery

JOB NO. 21-97124
START DATE 5/18/89
BORING METHOD HA
ROCK CORE DIA. ____ IN.
SHELBY TUBE DIA ____ IN.

SOIL/ROCK DESCRIPTION Surface Elevation	STRATUM DEPTH ft.	DEPTH ft.	SAMPLE NO.	SPT (*)	REC %	TCV ppm (**)	REMARKS
Brown and black moist Silty Clay fine to medium Sand (FILL)			1			350	Strong diesel odor and green and black staining throughout boring
			2			325	
Brown and black moist Silt fine to medium Sandy Clay (FILL)			3			>500	
			4			>500	
		2.5	5			>500	
			6			>500	
			7			>500	
Wet and fine to medium Sand with trace Clay below 4.0' (FILL)			8*			>500	Sheen observed on sample at 4.0'
			9			>500	
Wet Silt fine to medium Sandy Clay (FILL)		5	10			>500	
Bottom of test boring @ 5.0'							*Obtained sample for laboratory analysis of Total Petroleum Hydrocarbon

WATER LEVEL OBSERVATIONS
NOTED ON RODS None FT
AT COMPLETION Dry FT
AFTER ____ HRS. ____ FT

BORING METHODS
HSA-HOLLOW STEM AUGERS
CFA-CONT.FLIGHT AUGERS
HA-HAND AUGER

NOTES: (*)BLOWS/6 in., In Thre 6 in. Increments
REC %: Sample Recovery, %
(**)TCV-Total Combustible Vapors ppm (parts per million)

ATEC Associates, Inc.

Consulting Environmental, Geotechnical and Materials Engineers

LOG OF BORING NO. CSG-71

CLIENT	PEDCO	JOB NO.	21-97124
PROJECT NAME	Soil Investigation	START DATE	5/18/89
PROJECT LOCATION	Crane Naval Weapons Support Center	BORING METHOD	HA
BORING LOCATION	Aboveground Tank Farm	ROCK CORE DIA.	IN.
FOREMAN	Pablo McLoud	SHELBY TUBE DIA	IN.
INSPECTOR	B. Ullery		

SOIL/ROCK DESCRIPTION Surface Elevation	STRATUM DEPTH ft.	DEPTH ft.	SAMPLE NO.	SPT (*)	REC %	TCV ppm (**)	REMARKS
Brown wet Sand fine to medium Gravel			1			350	
(FILL)			2*			>500	Strong diesel odor
Gray wet Silt fine to coarse Silty Clay	1.5		3			>500	and green staining
(FILL) below 1.5			4			>500	throughout boring
Bottom of test boring @ 2.0'		2.5					Boring cave in @ 2.0'
							*Obtained sample for laboratory analysis of Total Petroleum Hydrocarbon

WATER LEVEL OBSERVATIONS
NOTED ON RODS None FT
AT COMPLETION Dry FT
AFTER ____ HRS. ____ FT

BORING METHODS
HSA-HOLLOW STEM AUGERS
CFA-CONT.FLIGHT AUGERS
HA-HAND AUGER

NOTES: (*)BLOWS/6 in., In Three 6 in. Increments
REC %: Sample Recovery, %
(**)TCV-Total Combustible Vapors ppm (parts per million)

ATEC Associates, Inc.

Consulting Environmental, Geotechnical and Materials Engineers

LOG OF BORING NO. Background

CLIENT PEDCO
PROJECT NAME Soil Investigation
PROJECT LOCATION Crane Naval Weapons Support Center
BORING LOCATION Aboveground Tank Farm
FOREMAN Pablo McLoud
INSPECTOR B. Ullery

JOB NO. 21-97124
START DATE 5/18/89
BORING METHOD HA
ROCK CORE DIA. ____ IN.
SHELBY TUBE DIA ____ IN.

SOIL/ROCK DESCRIPTION Surface Elevation	STRATUM DEPTH ft.	DEPTH ft.	SAMPLE NO.	SPT (*)	REC %	TCV ppm (**)	REMARKS
Dark brown slightly moist topsoil			1			ND	
Dark brown and red slightly moist Silt			2			ND	
Fine to medium Sandy Clay (CL) topsoil			3			ND	
			4			ND	
		2.5	5*			ND	
			6				
			7				
			8				Coarse Gravel @ 4.0'
Bottom of test boring @ 4.0'							Auger refusal @ 4.0'
		5					
							*Obtained sample for laboratory analysis of Total Petroleum Hydrocarbon

WATER LEVEL OBSERVATIONS
NOTED ON RODS None FT
AT COMPLETION Dry FT
AFTER ____ HRS. ____ FT

BORING METHODS
HSA-HOLLOW STEM AUGERS
CFA-CONT.FLIGHT AUGERS
HA-HAND AUGER

NOTES: (*)BLOWS/6 in., In Three 6 in. Increments
REC %: Sample Recovery, %
(**)TCV-Total Combustible Vapors ppm (parts per million)

FIELD CLASSIFICATION SYSTEM FOR SOIL EXPLORATION

NON COHESIVE SOILS
(Silt, Sand, Gravel and Combinations)

Density

Very Loose	- 5 blows/ft. or less
Loose	- 6 to 10 blows/ft.
Medium Dense	-11 to 30 blows/ft.
Dense	-31 to 50 blows/ft.
Very Dense	-51 blows/ft. or more

Relative Proportions

Descriptive Term	Percent
Trace	1 -10
Little	11-20
Some	21-35
And	36-50

Particle Size Identification

Boulders	-8 inch diameter or more	
Cobbles	-3 to 8 inch diameter	
Gravel	-Coarse	-1 to 3 inch
	Medium	-½ to 1 inch
	Fine	-¼ to ½ inch
Sand	-Coarse	2.00mm to ¼ inch (dia. of pencil lead)
	Medium	0.42 to 2.00mm (dia. of broom straw)
	Fine	0.074 to 0.42mm (Dia. of human hair)
Silt		0.074 to 0.002mm (Cannot see particles)

COHESIVE SOILS
(Clay, Silt and Combinations)

Consistency

Very Soft	- 3 blows/ft. or less
Soft	- 4 to 5 blows/ft.
Medium Stiff	- 6 to 10 blows/ft.
Stiff	-11 to 15 blows/ft.
Very Stiff	-16 top 30 blows/ft.
Hard	-31 blows/ft. or more

Plasticity

Degree of Plasticity	Plasticity Index
None to slight	0- 4
Slight	5- 7
Medium	8-22
High to Very High	over 22

Classification on logs are made by visual inspection of samples.

Standard Penetration Test — Driving a 2.0" O.D., 1-3/8" I.D., sampler a distance of 1.0 foot into undisturbed soil with a 140 pound hammer free falling a distance of 30.0 inches. It is customary for ATEC to drive the spoon 6.0 inches to seat into undisturbed soil, then perform the test. The number of hammer blows for seating the spoon and making the test are recorded for each 6.0 inches of penetration on the drill log (Example — 6/8/9). The standard penetration test result can be obtained by adding the last two figures (i.e. 8+ 9 = 17 blows/ft.). (ASTM D-1586-67)

Strata Changes — In the column "Soil Descriptions" on the drill log the horizontal lines represent strata changes. A solid line (_____) represents an actually observed change, a dashed line (_ _ _ _) represents an estimated change.

Ground Water observations were made at the times indicated. Porosity of soil strata, weather conditions, site topography, etc., may cause changes in the water levels indicated on the logs.

APPENDIX D

LABORATORY ANALYSIS

June 8, 1989

Mr. Daniel Pratter
ATEC Environmental Services
5150 E. 65th Street
Indianapolis, IN 46220

Re: Fourteen Soil Total Hydrocarbon
SW 846 Method 8015 Revised
Pedco E & A Services
ATEC Project Number 21-97124

Dear Mr. Pratter:

Enclosed are the results of the Organic Analyses for the fourteen soil samples which were submitted to the ATEC Environmental/ Analytical Testing Division on May 19, 1989, on behalf of Pedco E & A Services. Total Hydrocarbon analyses were performed on a Varian 3700 Gas Chromatograph using Flame Ionization Detection via SW 846 Method 8015 Revised.

All associated Quality Control information will be maintained in the Testing Division files, a copy of which can be forwarded to you upon request. After a thirty-day period, a fee will be assessed for this additional information.

It has been a pleasure serving you and, as always, if there are any questions concerning these results or the ATEC Policies, please feel free to contact me.

Respectfully submitted,

ATEC Associates, Inc.

Keith S. Kline

Keith S. Kline
Environmental/Analytical
Testing Division

REPORT OF TEST RESULTS

ATEC Project Number 21-97124

Date: June 8, 1989

Client: Pedco E & A Services
11499 Chester Road
Cincinnati, OH 45246

Analysis Information: Total Hydrocarbon Analysis
SW 846 Method 8015 Revised

Sample Taken By: ATEC (BU)
Sample Matrix: Soil
Date Sampled: May 18, 1989
Date Received: May 19, 1989
Date Analyzed: May 25 to 31, 1989
Analyst: RAR, PHR
Verified By: KSK
Processed By: FEB
ATEC Lab Number: 890753

* Hydrocarbon identified as Weathered Diesel Fuel
** Hydrocarbon most closely resembles Weathered Diesel Fuel
*** Hydrocarbon pattern is a mixture of Gasoline and Diesel Fuel

Sample Identification	Total Hydrocarbon	Quantitation Limit
CSG-1	<1.0 ppm	1.0 ppm
CSG-6	<1.0 ppm	1.0 ppm
CSG-11	12 ppm*	2.0 ppm
CSG-24	<1.0 ppm	1.0 ppm
CSG-29	<1.0 ppm	1.0 ppm
CSG-36	<1.0 ppm	1.0 ppm
CSG-41	5.3 ppm**	1.0 ppm
CSG-47	<1.0 ppm	1.0 ppm
CSG-50	1.4 ppm**	5.0 ppm
CSG-53	<1.0 ppm	1.0 ppm
CSG-60	<1.0 ppm	1.0 ppm
CSG-70	120 ppm*	4.0 ppm
CSG-71	1,800 ppm***	10 ppm
Background	<1.0 ppm	1.0 ppm

Respectfully submitted,
ATEC Associates, Inc.

Keith S. Kline

Environmental/Analytical Testing Division

APPENDIX C

TANK FARM STUDY

PEDCo E & A SERVICES, INC.

JULY 31, 1989

TANK FARM STUDY
FOR
CRANE NAVAL WEAPONS SUPPORT CENTER
CRANE, INDIANA

JULY 31, 1989

PREPARED BY:

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PEAS PN-0492-06

TABLE OF CONTENTS

Section			Page
Section I		Introduction	1
Section II		Civil and Site Improvements	2
	IIA	Removal of Contaminated Soil	2
	IIB	Repair or Replacement of Existing Containment	3
	IIC	Drainage Improvements North of the Tank Farm	5
	IID	New Fencing	6
	IIE	Exterior Lighting Upgrade	6
	IIF	Relocation of Tank B-30	6
	IIG	Miscellaneous Items	7
Section III		Operational Improvements	7
	IIIA	Pumping System for Existing Tanks	7
	IIIB	Pumping Systems for New Tanks	9
	IIIC	Replacement of Existing 42,000-Gallon Storage Tank	9
	IIID	Waste Oil Storage Tank	10
	IIIE	Jet Fuel Tank	11
Section IV		Cost Summary	12

I. Introduction

PEAS has prepared a study and developed an overall plan for improvements at the existing Tank Farm. The study includes civil and site improvements such as removal of contaminated soil within the containment cells, repair or replacement of the existing containment, drainage improvements north of the Tank Farm, new fencing, upgraded exterior lighting, and relocation of Tank 8-30. The operational improvements include a redesigned piping system for the three existing storage tanks, pumping systems for the new gasoline tank and JP-5 fuel tank as well as piping for the new waste oil tank, a cost comparison of replacing the existing 42,000-gallon storage tank with either a new 40,000-or 50,000-gallon tank, a cost comparison of moving an existing 30,000-gallon waste oil storage into the Tank Farm or purchasing a new 20,000-gallon tank, and a cost comparison of moving an existing 30,000-gallon jet fuel storage tank into the Tank Farm or purchasing a new 10,000-gallon tank. The operational improvements also include the additional power and wiring required for the pumps in the new and redesigned piping systems, the equipment necessary to monitor and control the operations, replacement of existing electrical hardware not conforming to current standards and installation of a new grounding system.

PEAS has included in the appendix to this report individual cost estimate sheets for all the items above. Also included with this report are the following drawings:

1. Site Plan - showing the reconfigured dike walls, alternate wall details, drainage, new fencing and lights.

2. Piping Plan - showing the layout of piping and equipment for the new and existing tanks and the modifications required inside the existing pump house.

3. Flow Diagram - showing how the new piping systems would operate.

PEAS' findings, recommendations, and estimated costs are included in the following descriptions for the various items and alternatives. The final sheet is a cost summary for each alternative. Where a cost comparison of new versus reused tanks was made, the cost summary includes the cost of the alternative which PEAS has recommended.

II. Civil and Site Improvements

A. Removal of Contaminated Soil

Based on the findings of the fuel oil contamination study performed by ATEC Environmental Consultants, the extent of the contamination appears to be very limited. A copy of the report has been included with this study. Based on ATEC's findings only Cell 6 had contamination in excess of Indiana Department of Environmental Management Standards and will require immediate clean-up. The soil borings extended to a depth of 5 feet and showed significant contamination throughout. It appears that the majority of the soil within Cell 6 must be removed and disposed of properly. ATEC also recommends that other isolated areas in Cells 2, 4 and 5 be excavated. These areas do not exceed IDEM's present standards but should be cleaned up now to avoid non-compliance should the standards become more restrictive in the future. PEAS concurs with this recommendation but suggests that it be carried one step further. PEAS recommends that a minimum of 2 feet of soil be removed from all cells. This would remove all the surface material most likely to be contaminated as well as exposing the entire subgrade which could be examined for other possible undetected isolated areas of contamination. Also, removing the top 2 feet of soil eliminates most of the existing sandy silty clay which drains poorly, is difficult to compact and greatly contributes to the existing "quicksand" conditions within the cells. PEAS recommends that qualified environmental personnel be retained full-time on site during all cell excavation. These technicians would examine the subgrade, take samples, make tests and direct the level of excavation work in order that all contaminated soil be removed from

the site. Care would have to be exercised when excavating near the existing tank foundations and foam system pipe supports in order to prevent undermining. Some hand digging might be required in small areas. The existing pipe supports for pipe which is being replaced plus any abandoned underground piping would be removed as a part of the cell excavation.

For the cost estimate, PEAS made the following assumptions regarding the amount of material to be excavated from each cell. The assumptions were based on the boring logs in the ATEC report.

1) Removal of 2 feet of soil in Cells 1, 2 and 4.

2) Removal of 3 feet of soil in Cell 3.

3) Removal of 5 feet of soil in Cells 5 and 6.

PEAS estimates the cost to remove the contaminated soil and dispose of it on station property to be $266,000. PEAS cautions that this cost is based on estimates and could vary significantly plus or minus depending on the actual field conditions encountered after the initial excavation begins. A 20% contingency was added to compensate for this unknown.

B. Repair or Replacement of the Existing Containment

Except for a portion of Cell 6, the existing concrete dike walls are individual precast concrete panels bolted together and embedded 4 feet into the ground. The panels do not have a footing base but are supported by the soil on each side of the panel. Some of the panels are misaligned due to ground movement and the joints between many of the adjacent panels are not tight. A few of the interior panels between cells have been deliberately broken out for access or to improve drainage. Each panel joint offers the potential for leakage during a spill. This type of construction does not fully satisfy the "impervious" requirement for dike walls as stated in the Code of

Federal Regulations. It would be possible to seal the panel joints in place by pressure grouting. However, the panels would still be soil supported and subject to ground movements which could break the grout seals at the joints. Also, leaving the panels in place greater complicates the cell excavation work. Since the panels are soil supported, excavation on either side tends to cause instability. Temporary bracing of the panels would be required to keep them from overturning once the soil was removed. This extra work would add costs to the project and be a hinderance to efficient excavation operations. Where cell excavation of contaminated soil exceeded 4 feet below grade, the panels would have no means of vertical support and would have to be removed and reset after clean backfill is placed. For these reasons, PEAS is convinced that repairing the existing dike walls is not a practical solution from a construction standpoint, is not economical and will not fully satisfy the Code of Federal Regulations.

Two alternate designs have been prepared for replacing the existing containment walls. Each alternate is shown on the site drawing with a typical section indicating details of construction. The first alternate shows reinforced concrete cantilever retaining walls similar to those used elsewhere on the station. The second alternate employs earth beams of compacted backfill material to impound any possible spills.

The site drawing indicates abandonment of Cells 1, 2 and 5. Based on our conversations with Crane personnel, these cells are not required by the proposed plans for the Tank Farm. Cells 3 and 4 already contain existing tanks and Cell 6 is the most logical choice for the future tanks. The renovation of Cells 3, 4 and 6 will provide more than ample impoundment capacity for all foreseeable needs.

The reinforced concrete wall alternate will require the complete removal of the existing precast walls and probably more excavation than the earth berm alternative. Depending on soil contamination

conditions, the earth berm alternate will allow most of the existing dike walls to be left in place. Both alternatives show the containment bottom to be a compacted backfill material such as a typical highway subbase course conforming to Indiana State Standards. This material can be compacted to a dense impervious condition and sloped for positive drainage to the new catch basins shown in all cells. New underground piping would connect the catch basins and allow rainwater or spills to be drained from the cells in a controlled manner. The outlet of the drain pipe would be fitted with a valve normally locked in the closed position similar to the present situation. PEAS estimates the cost of the reinforced concrete wall alternative to be $375,000 and the earth berm alternative to be $278,000. Based on cost, the earth berms appear to be significantly more economical and still meet the requirements in the Code of Federal Regulations. PEAS recommends the earth berm alternative.

A further improvement to the containments would be the addition of a liner. This could be either a Bentonite layer placed in the backfill material and installed as a part of the earthwork operations or a surface-applied Geotextile membrane similar to that used to line ponds. Neither liner is mandated by the Code of Federal Regulations and would be prohibitively expensive. PEAS believes that the liner is an unnecessary expense and recommends against its use.

C. Drainage Improvements North of the Tank Farm

Drainage of the area north of the Tank Farm needs to be greatly improved because groundwater and runoff from this area are partly responsible for the constant sogginess in and around the Tank Farm. By regrading the area this water will be directed away from the Cells and into the drainage creeks east and west of the site. See the new drainage ditch shown on the site plan. The excavated material from this area will be used to fill in abandoned Cells 1, 2 and 5. The estimated cost for the improvement is $61,000. This

cost is somewhat misleading since backfill for abandoned Cells 1, 2 and 5 would otherwise have to be hauled in from off-site. This would be much more expensive than moving earth from one part of the site to another and would do nothing to improve the drainage north of the Tank Farm. The drainage improvement pays for itself in reduced backfill costs for Cells 1, 2, and 5.

D. New Fencing

New fencing will be required on three sides of the Tank Farm. Earthwork operations will disrupt most of the fence on the north and east sides and the western fence line needs to move approximately 200 feet closer to the Pump House because of the reduced size of the Tank Farm. The fence will be chain-like type similar to the existing. The estimated cost is $19,000.

E. Exterior Lighting Upgrade

The Tank Farm improvements will include funds to improve, expand or repair the existing outside lights which appear to be inadequate and are reported to not function properly. Most of the original fixtures are incandescent type supported from the existing dike walls. The demolition of the dike walls will also require replacement of these lights. Lighting levels will be brought up to current standards and fixtures selected for the proper NEMA Classification. The location of new lights is not shown on the site plan because of the preliminary nature of the study and will depend on the final location of the new tanks. The estimated cost is $10,000.

F. Relocation of Tank B-30

Existing Tank B-30 will be moved from its present location near the Pump House Building 2627 into Cell 6. This was done because its present containment is constructed of unreinforced concrete block which has been found to be unsatisfactory in previous studies. The

removal of the tank may also help the traffic flow and ease congestion in the area. The existing trench drains in the area will have to be extended. PEAS estimates the cost for relocating Tank B-30, including new piping and foundation to be $17,000.

G. Miscellaneous Items

Funds for supports for the new piping to the existing tanks are included with the operational costs. Similarly funds for supports for new tanks and their associated piping is included with the operational costs for the tank. The pipe supports will be similar to those for the existing foam system with a drilled concrete pier and a galvanized steel support member. The location of the new pipe supports is not shown on the plans because of the preliminary nature of the pipe routing. PEAS has included $10,000 allowance for stairs and crossover stiles to improve accessibility into the Tank Farm.

III. Operational Improvements

All design criterion used in this study were derived from Department of the Navy, Naval Facilities Engineering Command Design Manual 22 "Petroleum Fuel Facilities", 1982 edition and associated referenced standards and codes.

This study does not include provisions for extension of existing aqueous film forming foam (AFFF) system to new tanks or areas. Design Manual 22 (DM-22) requires tanks in excess of 100,000-gallon fuel storage capacity to be protected by a foam system. All new tanks in this study are less than 100,000 gallons.

A. Pumping System for Existing Tanks

The present system for on and off loading No. 2 fuel oil from tank trucks to existing Tank Farm fuel oil storage consists of two Viking gear pumps and a simple arrangement of valving located in Building 2760. Simultaneous loading and transfer operations are not possible

with the existing system. Both pumps are identical and have a nameplate rating of 350 gallons per minute.

Possible arrangements that would maximize flexibility and utility of the Tank Farm No. 2 fuel oil system were investigated. In conjunction with operators recommendations and requirements, a system which will offer dual simultaneous operations with system backup and expansion capabilities is desired.

Referring to the Flow Diagram and Piping Plan Drawings, system pumping and valving logic permits any two product movement functions simultaneously through any combination of two active pumps. This arrangement allows a much greater flexibility of operations, enhanced safety and increased reliability. Utilizing all new equipment and piping should effectively reduce the possibility of an unidentified system spill to a minimum. Additionally, should farm tankage increase or become more product diversified, this system could accommodate either situation with few modifications. Any single pump could become dedicated to another service and not detract from the initial No. 2 fuel oil service operations.

The estimated cost for the proposed improvements, including controls and electrical support would be $407,700.

Alternatively, a simpler system modification scheme could be implemented utilizing existing pumps and a modified tankage piping system. This scheme would involve individual tank fill piping, as shown on the piping plan drawing, and a simple pump suction/ distribution manifold. Only single pumping operations would be possible, however. The disadvantage of this approach over the proposed system would be the inability to transfer product between storage tanks without intermediate temporary tankage (a tank truck). The inability to pump from a tanker truck to another tanker truck without transferring product to a storage tank would also be lost.

The estimated cost for this system, including meters, controls and minor electrical modifications, would be $78,200.

B. Pumping Systems for New Tanks

The additional pumping systems required to accommodate new tankage in Cell 6 include pumps and piping to load and unload to a new 40,000- or 50,000-gallon gasoline tank and a new or relocated JP-5 fuel tank. In each instance a dedicated pump is capable of loading and unloading tank trucks to the respective storage tanks. The No. 1 fuel oil system will continue to use the existing Building 2627 pump system with minor modifications due to a proposed relocation of No. 1 fuel oil tank
B-30 into Cell 6. An additional piping system connecting a new or relocated waste oil tank to a load unload station is proposed. This particular system utilizes truck pumps for loading and unloading.

The estimated costs for added tankage pumping and piping systems would be $176,700.

C. Replacement of Existing 42,000-Gallon Storage Tank

An existing leaking and obsolete 42,000-gallon storage tank is to be replaced by either a 40,000-gallon or 50,000-gallon gasoline vertical tank at the same location. The solid roof vertical tank would be field erected and provided with an access manway and appropriate nozzles for pumping and water removal.

The estimated cost for the 50,000-gallon system is $85,000.

The estimated cost for the 40,000-gallon system is $72,000.

Each cost includes demolition of the existing 42,000-gallon vertical tank and all foundation, gauges and instrumentation costs and pump pad.

D. Waste Oil Storage Tank

Two possibilities exist for installing a waste oil storage tank at the Tank Farm. Option One includes the relocation of a selected existing 30,000-gallon horizontal tank (10'-6" diameter x 46'-0" long) to Cell 4. The existing tank would be one of several presently located at one of the Stations following boiler houses, Buildings 115, 150 or 199. This option would require the government to clean and inspect all candidate tanks to determine suitability. The cleaning and inspection operations are not included in the estimated cost of installing the used tank.

Option Two involves installing a new 20,000-gallon horizontal waste oil tank (10'-0" diameter x 34'-6" long) in Cell 4. The new factory assembled tank would be provided with necessary openings and nozzles for pumping and inspection access.

Each option above has merit, however it should be recognized that each of the existing 30,000-gallon tanks are approximately 30 years or older and one or more are presently unusable. There are a total of six of these tanks whose remaining life is undetermined at this time. Upon government clearing and inspection, it could be determined that none of the tanks are suitable. If this occurs, there would be no alternative to placing a new tank on order. This would involve delay and added cost.

Option One estimated cost (30,000-gallon tank relocation), including moving, foundations, gauges, and instrumentation, but excluding cleaning and inspection is $28,000.

Option Two estimated cost (new 20,000-gallon tank), including foundations, gauges and instrumentation is $34,000.

Considering the small cost differential and the uncertain availability of a suitable existing tank, PEAS recommends that a new 20,000-gallon waste oil tank be installed.

E. Jet Fuel Storage Tank

Again two options are available for a JP-5 jet fuel storage tank. The same conditions exist for the selection of one of these options as described in the previous section.

Option One involves relocation of an existing 30,000-gallon storage tank from one of the Stations' Boiler Houses to Cell 6.

Option Two involves installing a new 10,000-gallon horizontal JP-5 fuel tank (10'-0" diameter x 17'-4" long) in Cell 6.

Option One estimated cost (30,000-gallon tank relocation) is $28,000.

Option Two estimated cost (new 10,000-gallon tank) is $26,000.

Considering the similarity of situation to the waste oil tank application and a favorable cost differential, PEAS recommends that a new 10,000-gallon JP-5 tank be installed.

Cost Summary

Section	Item	Estimated Base Cost	Alternate Cost
IIA	Removal of Contamianted Soil	$266,000	
IIB	Repair/Replacement of Existing Containment	$375,000 (Concrete)	$278,000 (Earth)
IIC	Drainage Improvements	$ 61,000	
IID	New Fencing	$ 19,000	
IIE	Exterior Lighting Upgrade	$ 10,000	
IIF	Relocation of Tank B-30	$ 17,000	
IIG	Miscellaneous Civil Items	$ 10,000	
IIIA	Pumping Systems for Existing Tanks	$407,700 (maximum)	$ 78,200 (minimum)
IIIB	Pumping Systems for New Tanks	$176,700	
IIIC	Replacement of Existing 42,000-Gallon Tank	$ 85,000	
IIID	Waste Oil Storage Tank	$ 34,000	
IIIE	Jet Fuel Storage Tank	$ 26,000	
	Total Cost	$1,487,400	$1,060,900

APPENDIX D

SOIL BORING LOGS

JANUARY 26 & 27, 1993
FEBRUARY 11, 1993

Fu 274

March 5, 1993

Geotechnical, Environmental & Materials Consultants

Mr. Glendon Williams
HNTB
111 Monument Circle
Indianapolis, Indiana 46222

Re: Soil Boring Logs
Tank Farm Containment Project
Crane NSWC, Indiana
ETS Project No. I4778

Dear Mr. Williams:

We are submitting logs of the test borings which were completed on the referenced project site on January 26 & 27 and February 11, 1993. General descriptions of the subsurface soils and observations of groundwater are illustrated on the boring logs. Please note the soil descriptions are based upon field observations identified on the field logs and do not reflect an engineer's evaluation of the samples in a controlled environment.

The soil boring logs are based solely upon observations made during drilling activities. The drilling logs are intended to present a general description of the soils encountered at the boring location, and are not to be construed as relating to health and safety issues directly. In addition, the soil boring logs should not be construed as verification of compliance by the present owners or operators of the site with federal, state or local laws and regulations.

Please contact us should you have any questions or desire additional information.

Respectfully,

ENGINEERING & TESTING SERVICES, INC.

Gregory A. Nethery

Gregory A. Nethery, CPG, CHMM
Environmental Services Manager

Encl: Soil boring logs; Nomenclature

DATE RECEIVED
HNTB INDIANAPOLIS
JOB NO.
FILE
MAR 8 - 1993
ROUTE TO:

Engineering & Testing Services, Inc.
Indianapolis • Chicago • Detroit • Memphis
7920 Georgetown Road, Suite 900
Indianapolis, Indiana 46268.1668
317 879.3380
Fax 879.3391

Client: HNTB	ETS Project #: 14778	Boring Log Number: SB1
	Sheet: 1 of 1	

Project: Tank Farm Containment	Location: Crane NSWC, Crane, Indiana

Engineering & Servic

Sample No./Type	Sample Distance	Recovery	Depth (feet)	PCF Indicates Sample Dry Unit Weight In Pounds Per Cubic Foot Description Of Material Surface Elevation: 563.3	⊗ "N" Blows Per Foot ● Natural Moisture Content P.L.% 0 20 40 60 LL.% Scale:	PID Scale:
1/SS				SANDY CLAY–light brown–very moist (CL)		ND
			5			
2/SS			10	FINE SAND OR SILT–light gray to brown–wet (SM)		ND
3/SS			15			ND
				END OF BORING		
			20			
			25			
			30	Note: Borehole backfilled with natural soils and grout plug at surface.		
			35			

Note: The stratification lines indicated herein are approximate; in-situ the transition between soil types may be gradual

Water Level Observation			
9' WS or WD	Boring Started: 1–26–93	Drawn By: FS	Approved: R.
– AB	Boring Completed: 1–26–93	Office: Indianapolis	CAD File: 477
– @ – Hrs. AB	Rig: D–50 (TRUCK)	Foreman: D. Stephens	
	Note: Boring backfilled with soil unless otherwise noted.		

Client: HNTB	ETS Project #: 14778	Boring Log Number: SB2	Engineering & Testing Services, Inc.
	Sheet: 1 of 1		
Project: Tank Farm Containment	Location: Crane NSWC, Crane, Indiana		

Sample No./Type	Sample Distance	Recovery	Depth (feet)	PCF Indicates Sample Dry Unit Weight In Pounds Per Cubic Foot / Description Of Material	⊗ "N" Blows Per Foot / ● Natural Moisture Content (P.L% △ ····· ● ····· □ LL%)	PID
				Surface Elevation: 563.6	Scale: 0 20 40 60	Scale:
1/SS			5	SANDY CLAY–grayish brown–mottled–moist (CL)		ND
2/SS			10	SAND–light gray to brown–mottled–moist (SP)		ND
3/SS			15	FINE SAND–red–wet (SP)		ND
				END OF BORING		
			20			
			25			
			30	Note: Borehole backfilled with natural soils and grout plug at surface.		
			35			

Note: The stratification lines indicated herein are approximate; in-situ the transition between soil types may be gradual

Water Level Observation			
13.5' WS or WD	Boring Started: 1-26-93	Drawn By: FS	Approved: RMK
– AB	Boring Completed: 1-26-93	Office: Indianapolis	CAD File: 47782
– @ – Hrs. AB	Rig: D-50 (TRUCK)	Foreman: D. Stephens	
	Note: Boring backfilled with soil unless otherwise noted.		

Client: HNTB	CTS Project #: 14778	Boring Log Number: SB5
	Sheet: 1 of 1	

Project: Tank Farm Containment	Location: Crane NSWC, Crane, Indiana

Engineering & Servic ing

Sample No./Type	Sample Distance	Recovery	Depth (feet)	PCF Indicates Sample Dry Unit Weight In Pounds Per Cubic Foot Description Of Material Surface Elevation: 561.9	⊗ "N" Blows Per Foot ● Natural Moisture Content P.L.% 0 20 40 60 LL.%	PID
1/SS			5	CLAY–brown–stiff–moist (CL)		ND
2/SS			10	SANDY CLAY–gray to brown–moist–with 2" red gravel layer at 9.5'–gravel through out (CL)		ND
3/SS			15	CLAY–brown to gray–mottled–very stiff–slightly moist (CL)		ND
				END OF BORING		
			20			
			25			
			30	Note: Borehole backfilled with natural soils and grout plug at surface.		
			35			

Note: The stratification lines indicated herein are approximate; in-situ the transition between soil types may be gradual.

Water Level Observation			
Dry	WS or WD	Boring Started: 1–27–93	Drawn By: FS
–	AB	Boring Completed: 1–27–93	Office: Indianapolis
–	@ – Hrs. AB	Rig: D–50 (TRUCK)	Foreman: J. Janschek
		Note: Boring backfilled with soil unless otherwise noted.	

Approved: [illegible]

CAD File: 47[illegible]

Client: HNTB	ETS Project #: 14778	Boring Log Number: SB7	Engineering & Testing Services, Inc.
	Sheet: 1 of 1		
Project: Tank Farm Containment	Location: Crane NSWC, Crane, Indiana		

PCF Indicates Sample Dry Unit Weight In Pounds Per Cubic Foot

⊗ "N" Blows Per Foot

● Natural Moisture Content

Surface Elevation: 558.6

Sample No./Type	Sample Distance	Recovery	Depth (feet)	Description Of Material	PID
1/SS			5	CLAYEY SAND–gray to brown–mottled–moist (CL)	ND
2/SS			10	CLAY–brown–stiff–plastic–fine wet sand layer at 9' and 9.5' (CL)	ND
3/SS			15	FINE SAND OR SILT (14'–15')–brown–wet (SM)	ND
				END OF BORING	
			20		
			25		
			30		
			35		

Note:
Borehole backfilled with natural soils and grout plug at surface.

Note: The stratification lines indicated herein are approximate; in-situ the transition between soil types may be gradual

Water Level Observation			
14'	WS or WD	Boring Started: 1–27–93	Drawn By: FS / Approved: RMH
–	AB	Boring Completed: 1–27–93	Office: Indianapolis / CAD File: 47787
–	@ – Hrs. AB	Rig: D–50 (TRUCK)	Foreman: J. Janschek
		Note: Boring backfilled with soil unless otherwise noted.	

Client: HNTB	ETS Project #: 14778	Boring Log Number: SB10
	Sheet: 1 of 1	
Project: Tank Farm Containment	Location: Crane NSWC, Crane, Indiana	Engineering & Services

Sample No./Type	Sample Distance	Recovery	Depth (feet)	PCF Indicates Sample Dry Unit Weight In Pounds Per Cubic Foot / Description Of Material	⊗ "N" Blows Per Foot ● Natural Moisture Content △ P.L.% ● □ LL.% (0 20 40 60)	PID
				Surface Elevation: 559.5	Scale:	Scale:
1/SS			5	CLAYEY SAND–gray to brown–mottled–moist–with some small cobbles (CL)		ND
2/SS			10	CLAYEY SAND–gray to brown–mottled–moist–with 1" fine sand layer at 9.5'–with some large cobbles (CL)		ND
3/SS			15	CLAY–gray to brown–mottled–stiff–moist (CL)		ND
				END OF BORING		
			20			
			25			
			30			
			35	Note: Borehole backfilled with natural soils and grout plug at surface.		

Note: The stratification lines indicated herein are approximate; in-situ the transition between soil types may be gradual

Water Level Observation			
Dry	WS or WD	Boring Started: 1–27–93	Drawn By: FS	Approved: R.
–	AB	Boring Completed: 1–27–93	Office: Indianapolis	CAD File: 477810
–	@ – Hrs. AB	Rig: D–50 (TRUCK)	Foreman: J. Janschek	
		Note: Boring backfilled with soil unless otherwise noted.		

Client: HNTB	ETS Project #: 14778	Boring Log Number: L1	Engineering & Testing Services, Inc.
	Sheet: 1 of 1		
Project: Tank Farm Containment	Location: Crane NSWC, Crane, Indiana		

Sample No./Type	Sample Distance	Recovery	Depth (feet)	PCF Indicates Sample Dry Unit Weight In Pounds Per Cubic Foot Description Of Material Surface Elevation: —	⊗ "N" Blows Per Foot ● Natural Moisture Content P.L.% LL.% 0 20 40 60 Scale:	PID Scale:
				CLAY–gray–moist * (CL)		8
1/SS			5	CLAYEY SAND–gray to brown–mottled–moist (CL)	⊗	LT5
				END OF BORING		
			10			
				* Description based on visual from soil cuttings		
			15			
			20			
			25			
			30	Note: Borehole backfilled with natural soils and grout plug at surface.		
			35			

Note: The stratification lines indicated herein are approximate; in-situ the transition between soil types may be gradual

Water Level Observation				
Dry	WS or WD	Boring Started: 1-27-93	Drawn By: FS	Approved: RM
–	AB	Boring Completed: 1-27-93	Office: Indianapolis	CAD File: 4778L1
–	⊖ — Hrs. AB	Rig: D-50 (TRUCK)	Foreman: J. Janschek	
		Note: Boring backfilled with soil unless otherwise noted.		

Client: HNTB	ETS Project #: 14778	Boring Log Number: L2	Engineering & Testing Services
	Sheet: 1 of 1		
Project: Tank Farm Containment	Location: Crane NSWC, Crane, Indiana		

Sample No./Type	Sample Distance	Recovery	Depth (feet)	PCF Indicates Sample Dry Unit Weight in Pounds Per Cubic Foot Description Of Material Surface Elevation: —	⊗ "N" Blows Per Foot ● Natural Moisture Content △ P.L.% ● □ L.L.% 0 20 40 60 Scale:	PID Scale:
				* CLAYEY SAND–gray to brown–mottled–moist (CL)		LT5
1/SS			5	CLAYEY SAND–gray to brown–mottled–moist (CL)	⊗	ND
				END OF BORING		
			10			
				* Descriptions based on visual from soil cutting		
			15			
			20			
			25			
			30	Note: Borehole backfilled with natural souls and grout plug at surface.		
			35			

Note: The stratification lines indicated herein are approximate; in-situ the transition between soil types may be gr[illegible]al

Water Level Observation			
Dry	WS or WD	Boring Started: 1-27-93	Drawn By: FS
–	AB	Boring Completed: 1-27-93	Office: Indianapolis
–	@ – Hrs. AB	Rig: D-50 (TRUCK)	Foreman: J. Janschek
		Note: Boring backfilled with soil unless otherwise noted.	

Approved: [illegible]

CAD File: 4778L2

Client: HNTB	ETS Project #: 14778	Boring Log Number: SB-A
Project: Tank Farm Closure	Location: Crane NSWC	Sheet: 1 of 1

Engineering & Testing Services, Inc.

PCF Indicates Sample Dry Unit Weight In Pounds Per Cubic Foot

⊗ "N" Blows Per Foot

● Natural Moisture Content

△ P.L.% ····· ● ····· □ LL.%

0 20 40 60

Surface Elevation: 565.0

Sample No./Type	Sample Distance	Recovery	Depth (feet)	Description Of Material	PID
				CLAY–gray (soil cuttings) (CL)	45
1/SS			5	SILTY CLAY–gray–wet from 7' to 8'–with gravel layer from 4.5'–5' (CL)	25
2/SS			10	SILTY CLAY–gray–moist–with wet clay seam from 9.5' to 10' and slight petroleum odor (ML)	5
3/SS			15	SILTY SAND–gray–moist (SM)	5
				END OF BORING	
			20		
			25		
			30	Note: Borehole backfilled with natural soils and grout plug at surface.	
			35		

Note: The stratification lines indicated herein are approximate; in-situ the transition between soil types may be gradual

Water Level Observation			
7' WS or WD	Boring Started: 2-11-93	Drawn By: FS	Approved: RM
– AB	Boring Completed: 2-11-93	Office: Indianapolis	CAD File: 4778SBA
– @ – Hrs. AB	Rig: CME-45B (ATV)	Foreman: E. Phillippe	
	Note: Boring backfilled with soil unless otherwise noted.		

Client: HNTB	ETS Project #: 14778	Boring Log Number: SB-B
	Sheet: 1 of 1	
Project: Tank Farm Closure	Location: Crane NSWC	Engineering & Services,

Sample No./Type	Sample Distance	Recovery	Depth (feet)	PCF Indicates Sample Dry Unit Weight In Pounds Per Cubic Foot — Description Of Material	⊗ "N" Blows Per Foot ● Natural Moisture Content △ P.L.% ● LL.% □ (0 20 40 60)	PID
				Surface Elevation: 564.8	Scale:	Scale:
				CLAY–gray–moist (soil cuttings) (CL)		LT5
1/SS			5	SANDY CLAY–gray–moist (CL)		7
2/SS			10	CLAYEY SILT–brown–moist (ML)		7
3/SS			15	SILTY SAND–gray–moist to 14.5'–clay from 14.5' to 15'–brown–moist (SM)		LT5
				END OF BORING		
			20			
			25			
			30			
			35			

Note: The stratification lines indicated herein are approximate; in-situ the transition between soil types may be gr[illegible]

Water Level Observation			
Dry	WS or WD	Boring Started: 2-11-93	Drawn By: FS	Approved: [illegible]
–	AB	Boring Completed: 2-11-93	Office: Indianapolis	CAD File: 4778SoB
–	@ __ Hrs. AB	Rig: CME-45B (ATV)	Foreman: E. Phillippe	
		Note: Boring backfilled with soil unless otherwise noted.		

Client: HNTB	ETS Project #: 14778	Boring Log Number: SB-C	Engineering & Testing Services, Inc.
	Sheet: 1 of 1		
Project: Tank Farm Closure	Location: Crane NSWC		

Sample No./Type	Sample Distance	Recovery	Depth (feet)	PCF Indicates Sample Dry Unit Weight In Pounds Per Cubic Foot Description Of Material Surface Elevation: 564.7	⊗ "N" Blows Per Foot ● Natural Moisture Content △ P.L% ····· ● ····· □ LL% 0 20 40 60 Scale:	PID Scale:
				CLAY–dark gray–moist (soil cuttings) (CL)		LT5
1/SS			5	CLAY–gray–moist (CL)		LT5
2/SS			10	SILTY CLAY–light brown–moist–wet clay at 7' (ML)		LT5
				END OF BORING		
			15			
			20			
			25			
			30			
			35			

Note: The stratification lines indicated herein are approximate; in-situ the transition between soil types may be gradual

Water Level Observation			
7' WS or WD	Boring Started: 2-11-93	Drawn By: FS	Approved: RMH
– AB	Boring Completed: 2-11-93	Office: Indianapolis	CAD File: 4778S...
– ⊖ – Hrs. AB	Rig: CME-45B (ATV)	Foreman: E. Phillippe	
	Note: Boring backfilled with soil unless otherwise noted.		

Client: HNTB	ETS Project #: 14778	Boring Log Number: SB-D
	Sheet: 1 of 1	
Project: Tank Farm Closure	Location: Crane NSWC	

Engineering & Testing Services

PCF Indicates Sample Dry Unit Weight In Pounds Per Cubic Foot

⊗ "N" Blows Per Foot

● Natural Moisture Content

△ P.L.% ····· ● ····· □ L.L.%

0 20 40 60

Surface Elevation: 564.9

Scale:

Scale:

Sample No./Type	Sample Distance	Recovery	Depth (feet)	Description Of Material	PID
				CLAY–moist (soil cuttings) (CL)	LT5
1/SS			5	SILTY CLAY–gray to brown–moist–mottled (CL)	ND
2/SS			10	CLAY–with red gravel–moist (CL)	ND
				END OF BORING	
			15		
			20		
			25		
			30		
			35		

Note: The stratification lines indicated herein are approximate; in-situ the transition between soil types may be gradual

Water Level Observation			
Dry	WS or WD	Boring Started: 2-11-93	Drawn By: FS	Approved: [illegible]
–	AB	Boring Completed: 2-11-93	Office: Indianapolis	CAD File: 4778SOD
–	@ — Hrs. AB	Rig: CME-45B (ATV)	Foreman: E. Phillippe
		Note: Boring backfilled with soil unless otherwise noted.	

Client: HNTB	ETS Project #: 14778	Boring Log Number: SB-E	Engineering & Testing Services, Inc.
	Sheet: 1 of 1		
Project: Tank Farm Closure	Location: Crane NSWC		

PCF Indicates Sample Dry Unit Weight In Pounds Per Cubic Foot

⊗ "N" Blows Per Foot

● Natural Moisture Content

△ P.L.% ····· ● ····· □ L.L.%

0 20 40 60

Surface Elevation: 565.2

Scale:

Scale:

Sample No./Type	Sample Distance	Recovery	Depth (feet)	Description Of Material	PID
				CLAY-gray- 6" gravel seam (GM) at 3' (CL) (soil cuttings)	LT5
1/SS			5	SILTY CLAY-brown-moist (CL)	ND
2/SS			10	SILTY CLAY-brown-moist-with some gravel (CL)	ND
				END OF BORING	
			15		
			20		
			25		
			30		
			35		

Note: The stratification lines indicated herein are approximate; in-situ the transition between soil types may be gradual

Water Level Observation			
Dry	WS or WD	Boring Started: 2-11-93	Drawn By: FS
–	AB	Boring Completed: 2-11-93	Office: Indianapolis
–	@ – Hrs. AB	Rig: CME-458 (ATV)	Foreman: E. Phillippe
		Note: Boring backfilled with soil unless otherwise noted.	

Approved: RMB

CAD File: 4778SB

Client: HNTB	ETS Project #: 14778	Boring Log Number: SB-F
	Sheet: 1 of 1	
Project: Tank Farm Closure	Location: Crane NSWC	Engineering & Service

Sample No./Type	Sample Distance	Recovery	Depth (feet)	PCF Indicates Sample Dry Unit Weight In Pounds Per Cubic Foot — Description Of Material	⊗ "N" Blows Per Foot ● Natural Moisture Content △ P.L.% ● □ L.L.% (0 20 40 60)	PID
				Surface Elevation: 565.0	Scale:	Scale:
				CLAY–gray–moist (soil cuttings) (CL)		LT5
1/SS			5	SILTY CLAY–light gray–moist (CL)		ND
2/SS			10	SILTY CLAY–light gray with some brown–moist (CL)		ND
				END OF BORING		
			15			
			20			
			25			
			30			
			35			

Note: The stratification lines indicated herein are approximate; in-situ the transition between soil types may be gradual

Water Level Observation			
Dry	WS or WD	Boring Started: 2-11-93	Drawn By: FS
–	AB	Boring Completed: 2-11-93	Office: Indianapolis
–	@ – Hrs. AB	Rig: CME-45B (ATV)	Foreman: E. Phillippe
		Note: Boring backfilled with soil unless otherwise noted.	

Approved: R.

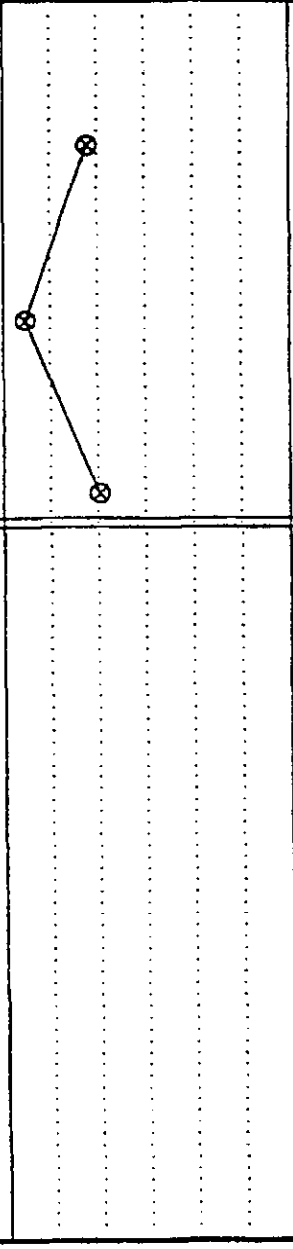
CAD File: 4778SaF

Client: HNTB	ETS Project #: 14778	Boring Log Number: SB-G	Engineering & Testing Services, Inc.
	Sheet: 1 of 1		
Project: Tank Farm Closure	Location: Crane NSWC		

Sample No./Type	Sample Distance	Recovery	Depth (feet)	Description Of Material (PCF Indicates Sample Dry Unit Weight In Pounds Per Cubic Foot)	PID
1/SS			5	CLAY–gray to brown–moist–mottled (CL)	LTS
2/SS			10	CLAY–light gray–moist (CL)	ND
3/SS			15	SILTY CLAY–some gravel–moist (CL)–with sand layer 14.5'–15' (SP)	ND
			20	END OF BORING	
			25		
			30	Note: Borehole backfilled with natural soils and grout plug at surface.	
			35		

Surface Elevation: 564.8

⊗ "N" Blows Per Foot
● Natural Moisture Content
△ P.L.% ····· ● ····· □ L.L.%



Scale:

Note: The stratification lines indicated herein are approximate; in-situ the transition between soil types may be gradual

Water Level Observation			
Dry	WS or WD	Boring Started: 2-11-93	Drawn By: FS
–	AB	Boring Completed: 2-11-93	Office: Indianapolis
–	@ — Hrs. AB	Rig: CME-45B (ATV)	Foreman: E. Phillippe
		Note: Boring backfilled with soil unless otherwise noted.	

Approved: RM

CAD File: 4778S...

Client: HNTB	ETS Project #: 14778	Boring Log Number: SB-H
	Sheet: 1 of 1	
Project: Tank Farm Closure	Location: Crane NSWC	Engineering & Service

Sample No./Type	Sample Distance	Recovery	Depth (feet)	PCF Indicates Sample Dry Unit Weight in Pounds Per Cubic Foot Description Of Material Surface Elevation: 565.1	⊗ "N" Blows Per Foot ● Natural Moisture Content P.L.% △ ● □ L.L.% 0 20 40 60 Scale:	PID Scale:
1/SS			5	CLAY–gray–moist–with some gravel–sand lense (SP) at 4'–4.3'–light gray silt 4.5' to 5'–moist (CL)	⊗	ND
2/SS			10	CLAY–light brown–moist–sand (SP) at 10' (CL)	⊗	ND
				END OF BORING		
			15			
			20			
			25			
			30	Note: Borehole backfilled with natural soils and grout plug at surface.		
			35			

Note: The stratification lines indicated herein are approximate; in-situ the transition between soil types may be gradual

Water Level Observation			
– WS or WD	Boring Started: 2-11-93	Drawn By: FS	Approved:
– AB	Boring Completed: 2-11-93	Office: Indianapolis	CAD File: 4778Sarl
– @ – Hrs. AB	Rig: CME-45B (ATV)	Foreman: E. Phillippe	
	Note: Boring backfilled with soil unless otherwise noted.		

Client: HNTB	ETS Project #: 14778	Boring Log Number: SB-1	Engineering & Testing Services, Inc.
Project: Tank Farm Closure	Sheet: 1 of 1		
	Location: Crane NSWC		

Sample No./Type	Sample Distance	Recovery	Depth (feet)	PCF Indicates Sample Dry Unit Weight In Pounds Per Cubic Foot Description Of Material Surface Elevation: 565.1	⊗ "N" Blows Per Foot ● Natural Moisture Content P.L.% △ ····· ● ····· □ L.L.% 0 20 40 60 Scale:	PID Scale:
1/SS			5	SILTY CLAY–light gray to brown–moist–mottled (CL)	⊗	ND
2/SS			10	CLAY–brown–slightly moist–with some silt & gravel (CL)	⊗	ND
				END OF BORING		
			15			
			20			
			25			
			30	Note: Borehole backfilled with natural soils and grout plug at surface.		
			35			

Note: The stratification lines indicated herein are approximate; in-situ the transition between soil types may be gradual

Water Level Observation				
Dry	WS or WD	Boring Started: 2-11-93	Drawn By: FS	Approved: RMH
–	AB	Boring Completed: 2-11-93	Office: Indianapolis	CAD File: 4778SB1
–	@ — Hrs. AB	Rig: CME-45B (ATV)	Foreman: E. Phillippe	
		Note: Boring backfilled with soil unless otherwise noted.		

Client: HNTB	ETS Project #: 14778	Boring Log Number: SB-J
	Sheet: 1 of 1	
Project: Tank Farm Closure	Location: Crane NSWC	Engineering & Testing Service

PCF Indicates Sample Dry Unit Weight In Pounds Per Cubic Foot

⊗ "N" Blows Per Foot

● Natural Moisture Content

△ P.L% ····· ● ····· □ LL%

Surface Elevation: 565.0

Sample No./Type	Sample Distance	Recovery	Depth (feet)	Description Of Material	Scale: 0 20 40 60	PID Scale:
1/SS			5	CLAYEY SILT–light brown–moist (ML)	⊗	ND
2/SS			10	CLAYEY SILT–light brown–moist–with some sand (ML)	⊗	ND
				END OF BORING		
			15			
			20			
			25			
			30			
			35			

Note: The stratification lines indicated herein are approximate; in-situ the transition between soil types may be gradual

Water Level Observation			
Dry	WS or WD	Boring Started: 2-11-93	Drawn By: FS
–	AB	Boring Completed: 2-11-93	Office: Indianapolis
–	@ – Hrs. AB	Rig: CME-45B (ATV)	Foreman: E. Phillippe
		Note: Boring backfilled with soil unless otherwise noted.	

Approved: [illegible]

CAD File: 4778SoJ

Client: HNTB	ETS Project # 14778	Boring Log Number: SB-K
	Sheet: 1 of 1	

Project: Tank Farm Closure	Location: Crane NSWC

Engineering & Testing Services, Inc.

PCF Indicates Sample Dry Unit Weight In Pounds Per Cubic Foot

⊗ "N" Blows Per Foot

● Natural Moisture Content

P.L.% △ ····· ● ····· □ L.L.%

0 20 40 60

Surface Elevation: 565.0

Sample No./Type	Sample Distance	Recovery	Depth (feet)	Description Of Material	PID
1/SS			5	SILTY CLAY–light brown–moist (CL)	ND
2/SS			10	SILTY CLAY–light brown–moist (CL)	ND
				END OF BORING	
			15		
			20		
			25		
			30		
			35		

Note: The stratification lines indicated herein are approximate; in-situ the transition between soil types may be gradual

Water Level Observation				
Dry	WS or WD	Boring Started: 2-11-93	Drawn By: FS	Approved: RMH
–	AB	Boring Completed: 2-11-93	Office: Indianapolis	CAD File: 4778S...
–	@ – Hrs. AB	Rig: CME-458 (ATV)	Foreman: E. Phillippe	
		Note: Boring backfilled with soil unless otherwise noted.		

Client: HNTB	ETS Project #: 14778	Boring Log Number: SB-L	Engineering & Testing Services
	Sheet: 1 of 1		
Project: Tank Farm Closure	Location: Crane NSWC		

Sample No./Type	Sample Distance	Recovery	Depth (feet)	PCF Indicates Sample Dry Unit Weight In Pounds Per Cubic Foot / Description Of Material	⊗ "N" Blows Per Foot ● Natural Moisture Content △ P.L% ····· ● ····· □ LL% (0 20 40 60)	PID
				Surface Elevation: 565.2	Scale:	Scale:
1/SS			5	CLAYEY SILT-brown-moist (CL)		ND
2/SS			10	CLAYEY SILT-brown-moist-with some sand (CL)		ND
				END OF BORING		
			15			
			20			
			25			
			30			
			35			

Note: The stratification lines indicated herein are approximate; in-situ the transition between soil types may be gradual

Water Level Observation			
Dry	WS or WD	Boring Started: 2-11-93	Drawn By: FS
–	AB	Boring Completed: 2-11-93	Office: Indianapolis
–	@ – Hrs. AB	Rig: CME-45B (ATV)	Foreman: E. Phillippe
		Note: Boring backfilled with soil unless otherwise noted.	

Approved: [illegible]

CAD File: 477b[illegible]

Client: HNTB	ETS Project #: 14778	Boring Log Number: SB-M
	Sheet: 1 of 1	
Project: Tank Farm Closure	Location: Crane NSWC	Engineering & Testing Services, Inc.

PCF indicates Sample Dry Unit Weight in Pounds Per Cubic Foot

⊗ "N" Blows Per Foot

● Natural Moisture Content

△ P.L.% ····· ● ····· □ L.L.%

0 20 40 60

Surface Elevation: 565.2

Sample No./Type	Sample Distance	Recovery	Depth (feet)	Description Of Material	PID
1/SS			5	CLAYEY SILT–light brown–moist–mottled (CL)	ND
2/SS			10	CLAYEY SILT–light brown–moist–mottled (CL)	ND
				END OF BORING	
			15		
			20		
			25		
			30		
			35		

Note: The stratification lines indicated herein are approximate; in-situ the transition between soil types may be gradual

Water Level Observation			
Dry	WS or WD	Boring Started: 2–11–93	Drawn By: FS
–	AB	Boring Completed: 2–11–93	Office: Indianapolis
–	@ – Hrs. AB	Rig: CME–45B (ATV)	Foreman: E. Phillippe
		Note: Boring backfilled with soil unless otherwise noted.	

Approved: RM

CAD File: 477b_SBM

Client: HNTB	ETS Project #: 14778	Boring Log Number: SB12
	Sheet: 1 of 1	
Project: Tank Farm Closure	Location: Crane NSWC	

Engineering & Service

Sample No./Type	Sample Distance	Recovery	Depth (feet)	PCF Indicates Sample Dry Unit Weight In Pounds Per Cubic Foot Description Of Material Surface Elevation: 564.9	⊗ "N" Blows Per Foot ● Natural Moisture Content △ P.L.% ● ● □ LL.% 0 20 40 60 Scale:	PID Scale:
1/SS			5	CLAY–brown–moist (CL)		ND
2/SS			10	CLAY–light gray–moist (CL)		ND
3/SS			15	CLAY–dark gray–slightly moist (CL)		ND
				END OF BORING		
			20			
			25			
			30	Note: Borehole backfilled with natural soils and grout plug at surface.		
			35			

Note: The stratification lines indicated herein are approximate; in-situ the transition between soil types may be gradual

Water Level Observation			
Dry	WS or WD	Boring Started: 2-11-93	Drawn By: FS
–	AB	Boring Completed: 2-11-93	Office: Indianapolis
–	@ __ Hrs. AB	Rig: CME-45B (ATV)	Foreman: E. Phillippe
		Note: Boring backfilled with soil unless otherwise noted.	

Approved: K

CAD File: 477a12

APPENDIX E

ANALYTICAL TEST RESULTS

LOUIS B. ASTBURY COMPANY, INC.
ENVIRONMENTAL SERVICES

JANUARY 26 & 27, 1993
FEBRUARY 11, 1993

Louis B. Astbury Co., Inc.
ENVIRONMENTAL SERVICES
5933 WEST 71ST STREET INDIANAPOLIS, INDIANA 46278
(317) 290-1471
FAX (317) 290-1670

HNTB
111 Monument Circle
Indianapolis, Indiana 46204

Attn: James T. Parks
Invoice Number:

Order #: 93-01-536
Date: 02/10/93 13:58
Work ID: 14624 Crane NWSC Tank Farm
Date Received: 01/28/93
Date Completed: 02/10/93
Client Code: HNTB

SAMPLE IDENTIFICATION

Sample Number	Sample Description
01	TP-1 Ground Water
02	TP-1 Soil @ 5'-6'
03	TP-1 Soil @ 9'-10'
04	TP-2 Soil @ 2'-3'
05	TP-2 Soil @ 6'-7'
06	TP-3 Soil @ 2'-3'
07	TP-3 Soil @ 5'-6'
08	TP-3 Soil @ 8'-9'
09	TP-4 Soil @ 3'
10	TP-4 Soil @ 6'
11	TP-5 Soil @ 2.5'
12	TP-5 Soil @ 7'
13	TP-5 Soil @ 11'
14	TP-6 Soil @ 2.5'
15	TP-6 Soil @ 7'

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Certified By

TEST RESULTS BY SAMPLE

Sample: 02AS TP-1 Soil @ 5'-6' **Collected: 01/26/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Flashpoint.	>160	73	degrees F	02/08/93	CAS

Sample: 03AS TP-1 Soil @ 9'-10' **Collected: 01/26/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Flashpoint.	>160	73	degrees F	02/08/93	CAS

Sample: 04AS TP-2 Soil @ 2'-3' **Collected: 01/26/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Total Pet. Hydrocarbon, IR	86.7	5.0	mg/kg	02/05/93	KA

Sample: 05AS TP-2 Soil @ 6'-7' **Collected: 01/26/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Total Pet. Hydrocarbon, IR	141.0	5.0	mg/kg	02/05/93	KA

Sample: 06AS TP-3 Soil @ 2'-3' **Collected: 01/26/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Total Pet. Hydrocarbon, IR	22.1	5.0	mg/kg	02/05/93	K

Sample: 07AS TP-3 Soil @ 5'-6' **Collected: 01/26/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Flashpoint.	>160	73	degrees F	02/08/93	CAS

Sample: 08AS TP-3 Soil @ 8'-9' **Collected: 01/26/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Total Pet. Hydrocarbon, IR	11.4	5.0	mg/kg	02/05/93	KA

Sample: 09AS TP-4 Soil @ 3' **Collected: 01/26/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Total Pet. Hydrocarbon, IR	28.7	5.0	mg/kg	02/05/93	KA

Sample: 10AS TP-4 Soil @ 6' **Collected: 01/26/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Total Pet. Hydrocarbon, IR	13.8	5.0	mg/kg	02/05/93	KA

Sample: 11AS TP-5 Soil @ 2.5' **Collected: 01/26/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Total Pet. Hydrocarbon, IR	12.0	5.0	mg/kg	02/05/93	K

TEST RESULTS BY SAMPLE

Sample: 12AS TP-5 Soil @ 7' **Collected: 01/26/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Total Pet. Hydrocarbon, IR	32.2	5.0	mg/kg	02/05/93	KA

Sample: 13AS TP-5 Soil @ 11' **Collected: 01/26/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Total Pet. Hydrocarbon, IR	36.9	5.0	mg/kg	02/05/93	KA

Sample: 14AS TP-6 Soil @ 2.5' **Collected: 01/26/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Total Pet. Hydrocarbon, IR	96.8	5.0	mg/kg	02/05/93	KA

Sample: 15AS TP-6 Soil @ 7' **Collected: 01/26/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Total Pet. Hydrocarbon, IR	54.3	5.0	mg/kg	02/05/93	KA

TEST RESULTS BY SAMPLE

Sample Description: TP-1 Ground Water Lab No: 01A
Test Description: Tot. Pet. Hydrocarbon, FID Method: SW846_8015MD Test Code: TPH_FD
Collected: 01/26/93 Category: WATER

PARAMETER	RESULT	LIMIT	BLANK	BLANK LIMIT
Diesel	2930	100	ND	10

Analytical Run Information:

EXTRACTED	02/09/93
DATE RUN	02/09/93
ANALYST	KA
INSTRUMENT	HPII-1
CONC FACTOR	10
UNITS	mg/L

TEST RESULTS BY SAMPLE

.ple Description: TP-1 Soil @ 5'-6' Lab No: 02A
Test Description: BTEX via PATGC/MS. Method: SW846_8260 Test Code: BTX_MS
Collected: 01/26/93 Category: SOIL

PARAMETER	CAS NUMBER	RESULT	LIMIT	BLANK	BLANK LIMIT
Benzene	71-43-2	58	22	ND	5.0
Toluene	108-88-3	54	22	ND	5.0
Ethylbenzene	100-41-4	63	22	ND	5.0
Total Xylenes	1330-20-7	790	22	ND	5.0

SURROGATE	%RECOVERY	LIMITS
4-Bromofluorobenzene	108	71 - 114
Toluene-d8	104	75 - 126

Analytical Run Information:

DATE RUN	02/04/93
ANALYST	JH
INSTRUMENT	5971MS
FILE ID	0301003.D
CONC FACTOR	4.399
UNITS	ug/kg

Sample Description: TP-1 Soil @ 5'-6' Lab No: 02A
Test Description: Tot. Pet. Hydrocarbon, FID Method: SW846_8015MD Test Code: TPH_FD
Collected: 01/26/93 Category: SOIL

PARAMETER	RESULT	LIMIT	BLANK	BLANK LIMIT
Diesel	2370	500	ND	10

Analytical Run Information:

EXTRACTED	02/09/93
DATE RUN	02/09/93

TEST RESULTS BY SAMPLE

Sample Description: TP-1 Soil @ 5'-6' Lab No: 02A
Test Description: Tot. Pet. Hydrocarbon, FID Method: SW846_8015MD Test Code: TPH_FD
Collected: 01/26/93 Category: SOIL

ANALYST	KA
INSTRUMENT	HPII-1
CONC FACTOR	50
UNITS	mg/kg

Sample Description: TP-1 Soil @ 9'-10' Lab No: 03A
Test Description: Tot. Pet. Hydrocarbon, FID Method: SW846_8015MD Test Code: TPH_FD
Collected: 01/26/93 Category: SOIL

PARAMETER	RESULT	LIMIT	BLANK	BLANK LIMIT
Diesel	10	10	ND	10

Analytical Run Information:

EXTRACTED	02/09/93
DATE RUN	02/09/93
ANALYST	KA
INSTRUMENT	HPII-1
CONC FACTOR	1
UNITS	mg/kg

TEST RESULTS BY SAMPLE

ple Description: TP-3 Soil @ 5'-6' Lab No: 07A
Test Description: BTEX via PATGC/MS. Method: SW846_8260 Test Code: BTX_MS
Collected: 01/26/93 Category: SOIL

PARAMETER	CAS NUMBER	RESULT	LIMIT	BLANK	BLANK LIMIT
Benzene	71-43-2	BQL	5.0	ND	5.0
Toluene	108-88-3	6.4	5.0	ND	5.0
Ethylbenzene	100-41-4	BQL	5.0	ND	5.0
Total Xylenes	1330-20-7	7.7	5.0	ND	5.0

SURROGATE	%RECOVERY	LIMITS
4-Bromofluorobenzene	96	71 - 114
Toluene-d8	101	75 - 126

Analytical Run Information:

DATE RUN	02/03/93
ANALYST	JM
INSTRUMENT	5970MS
FILE ID	0203G09A.D
CONC FACTOR	0.940
UNITS	ug/kg

Sample Description: TP-3 Soil @ 5'-6' Lab No: 07A
Test Description: Tot. Pet. Hydrocarbon, FID Method: SW846_8015MD Test Code: TPH_FD
Collected: 01/26/93 Category: SOIL

PARAMETER	RESULT	LIMIT	BLANK	BLANK LIMIT
TOTAL PETROLEUM HYDROCARBONS	<10	10	ND	10

Analytical Run Information:

EXTRACTED	02/09/93
DATE RUN	02/09/93

TEST RESULTS BY SAMPLE

Sample Description: TP-3 Soil @ 5'-6' Lab No: 07A
Test Description: Tot. Pet. Hydrocarbon, FID Method: SW846_8015MD Test Code: TPH_FD
Collected: 01/26/93 Category: SOIL

ANALYST	KA
INSTRUMENT	HPII-1
CONC FACTOR	1
UNITS	mg/kg

CLIENT: HNTB

DATE OF SAMPLE: ~~1~~ 1/26, 1/27

DATE RECEIVED: 1/28/93

DATE OF ANALYSIS: 2/9

ANALYST: KA

MATRIX: soil, water

LAB NUMBERS: 9301536-01A, — 02A, 03A, 07A, 9301537-01A, 03A

ESG ENVIRONMENTAL SERVICE GROUP
A DIVISION OF ASTORY CORPORATION

ANALYTICAL QUALITY CONTROL REQUIREMENTS

TPH BY GC/FID (SW846 METHOD MODIFIED 8015)

PETROLEUM IDENTIFIED: Diesel

CALIBRATION CURVE DATE: ~~5/5/9~~ 9/26/92 % RSD: 5.0

METHOD BLANK

<10 mg/kg

DAILY STANDARDS

DS1: 102%

DS2: 99%

CONTROL SAMPLE

104%

MATRIX DUPLICATE

SAMPLE # 9301536-07A

RUN 1 <10 mg/kg

RUN 2 <10 mg/kg

AVERAGE <10 mg/kg

MATRIX SPIKE

SAMPLE # 9301536-07A

RESULT <10 mg/kg

SPIKE LEVEL 215 mg/kg

% RECOVERY 94%

Louis B. Astbury Co., Inc.
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(317) 290-1471
FAX (317) 290-1670

HNTB
111 Monument Circle
Indianapolis, Indiana 46204

Attn: James T. Parks
Invoice Number:

Order #: 93-01-537
Date: 02/12/93 14:19
Work ID: 14624 Crane NWSC Tank Farm
Date Received: 01/28/93
Date Completed: 02/12/93
Client Code: HNTB

SAMPLE IDENTIFICATION

Sample Number	Sample Description
01	L-1 Soil @ 0'-2'
02	L-1 Soil @ 3.5'-5'
03	L-2 Soil @ 0'-2'
04	L-2 Soil @ 3.5'-5'
05	TP-3 Soil Comp @ 0'-9'
06	SB-A Soil Surface
07	SB-D Soil Surface
08	SB-K Soil Surface
09	SB-L Soil Surface
10	SB-Q Soil Surface

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TEST RESULTS BY SAMPLE

Sample: 01AS L-1 Soil @ 0'-2' **Collected: 01/27/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Flashpoint.	>160	73	degrees F	02/08/93	CAS

Sample: 02AS L-1 Soil @ 3.5'-5' **Collected: 01/27/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Total Pet. Hydrocarbon, IR	50.4	5.0	mg/kg	02/05/93	KA

Sample: 03AS L-2 Soil @ 0'-2' **Collected: 01/27/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Flashpoint.	>160	73	degrees F	02/08/93	CAS

Sample: 04AS L-2 Soil @ 3.5'-5' **Collected: 01/27/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Total Pet. Hydrocarbon, IR	100.0	5.0	mg/kg	02/05/93	KA

Sample: 05AS TP-3 Soil Comp @ 0'-9' **Collected: 01/26/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
lashpoint.	>160	73	degrees F	02/08/93	CAS
Reactive Cyanide	<0.05	0.05	mg/kg	02/05/93	TLO
Reactive Sulfide	<2.0	2.0	mg/kg	02/05/93	TLO
Standard 10% pH value test	7.11	1.00	pH units	02/05/93	TLO
Total Solids at 103-105C	82.0	1.0	%	02/12/93	TLO

Sample: 06AS SB-A Soil Surface **Collected: 01/27/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Lead, FAAS.	12.00	5.00	mg/kg	01/29/93	CPV
TCLP Lead, FAAS	<0.50	0.50	mg/L	02/03/93	CPV

Sample: 07AS SB-D Soil Surface **Collected: 01/27/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Chromium, FAAS.	9.07	5.00	mg/kg	02/01/93	CPV
Lead, FAAS.	<5.0	5.0	mg/kg	01/29/93	CPV
TCLP Lead, FAAS	<0.50	0.50	mg/L	02/03/93	CPV

Sample: 08AS SB-K Soil Surface **Collected: 01/27/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Chromium, FAAS.	11.70	5.0	mg/kg	02/01/93	CPV
Lead, FAAS.	75.00	10.0	mg/kg	01/29/93	CPV
TCLP Lead, FAAS	<0.50	0.50	mg/L	02/03/93	CPV

TEST RESULTS BY SAMPLE

Sample: 09AS SB-L Soil Surface **Collected: 01/27/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Chromium, FAAS.	10.80	5.0	mg/kg	02/01/93	CPV
Lead, FAAS.	85.00	10.0	mg/kg	01/29/93	CPV
TCLP Lead, FAAS	<0.50	0.50	mg/L	02/03/93	CPV

Sample: 10AS SB-Q Soil Surface **Collected: 01/27/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Lead, FAAS.	<5.0	5.0	mg/kg	01/29/93	CPV
TCLP Lead, FAAS	<0.50	0.50	mg/L	02/03/93	CPV

TEST RESULTS BY SAMPLE

ple Description: L-1 Soil @ 0'-2' Lab No: 01A
Test Description: Tot. Pet. Hydrocarbon, FID Method: SW846_8015MD Test Code: TPH_FD
Collected: 01/27/93 Category: SOIL

PARAMETER	RESULT	LIMIT	BLANK	BLANK LIMIT
Diesel	242	10	ND	10

Analytical Run Information:

EXTRACTED	02/09/93
DATE RUN	02/09/93
ANALYST	KA
INSTRUMENT	HPII-1
CONC FACTOR	1
UNITS	mg/kg

Sample Description: L-2 Soil @ 0'-2' Lab No: 03A
Test Description: Tot. Pet. Hydrocarbon, FID Method: SW846_8015MD Test Code: TPH_FD
Collected: 01/27/93 Category: SOIL

PARAMETER	RESULT	LIMIT	BLANK	BLANK LIMIT
TOTAL PETROLEUM HYDROCARBONS	<10	10	ND	10

Analytical Run Information:

EXTRACTED	02/09/93
DATE RUN	02/09/93
ANALYST	KA
INSTRUMENT	HPII-1
CONC FACTOR	1
UNITS	mg/kg

TEST RESULTS BY SAMPLE

Sample Description: TP-3 Soil Comp @ 0'-9' Lab No: 05A
Test Description: Metals TCLP analysis. Method: SW846_1311 Test Code: M_TCLP
Collected: 01/26/93 Category: SOIL

PARAMETER	RESULT	LIMIT	40CFR LIMIT	CONC FACTOR	DATE	ANALYST
Lead	<0.50	0.50	5.0	1	02/03/93	CPV
Barium	1.01	1.0	100	1	02/09/93	MM
Chromium	<0.50	0.50	5.0	1	02/03/93	CPV
Mercury	<0.010	0.010	0.2	5	02/10/93	KAK
Silver	<0.10	0.10	5.0	1	02/03/93	CPV
Cadmium	<0.05	0.050	1.0	1	02/03/93	CPV
Arsenic	<0.010	0.010	5.0	1	02/04/93	KAK
Selenium	<0.010	0.010	1.0	1	02/04/93	KAK

Analytical Run Information:

EXTRACTED 02/01/93
UNITS mg/L

Results are matrix spike-corrected in accordance with SW846 Method 1311.

TEST RESULTS BY SAMPLE

Sample Description: TP-3 Soil Comp @ 0'-9' Lab No: 05A
Test Description: Polychlorinated Biphenyls Method: SW846_8081 Test Code: PCB
Collected: 01/26/93 Category: SOIL

PARAMETER	CAS NUMBER	RESULT	LIMIT	BLANK	BLANK LIMIT
Arochlor-1016	12674-11-2	ND	0.082	ND	0.08
Arochlor-1221	11104-28-2	ND	0.082	ND	0.08
Arochlor-1232	11141-16-5	ND	0.082	ND	0.08
Arochlor-1242	53469-21-9	ND	0.082	ND	0.08
Arochlor-1248	12672-29-6	ND	0.082	ND	0.08
Arochlor-1254	11097-69-1	ND	0.082	ND	0.08
Arochlor-1260	11096-82-5	ND	0.082	ND	0.08
Arochlor-1262	----------	ND	0.082	ND	0.08
Arochlor-1268	----------	ND	0.082	ND	0.08

SURROGATE	%RECOVERY	LIMITS
Decachlorobiphenyl	105.7	24 - 150
Tetrachloro-m-xylene	104.5	24 - 150

Analytical Run Information:

EXTRACTED	02/03/93
DATE RUN	02/04/93
ANALYST	JLH
INSTRUMENT	COL B
CONC FACTOR	1
UNITS	mg/kg

Louis B. Astbury Co., Inc.
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HNTB
111 Monument Circle
Indianapolis, Indiana 46204

Attn: James T. Parks
Invoice Number:

Order #: 93-02-294
Date: 02/18/93 13:31
Work ID: 14624-DS-025-002 Crane NWSC
Date Received: 02/12/93
Date Completed: 02/17/93
Client Code: HNTB

SAMPLE IDENTIFICATION

Sample Number	Sample Description
01	SB-1 Soil @ 3.5'-5'
02	SB-1 Soil @ 8.5'-10'
03	SB-2 Soil @ 3.5'-5'
04	SB-2 Soil @ 8.5'-10'
05	SB-3 Soil @ 3.5'-5'
06	SB-3 Soil @ 8.5'-10'
07	SB-4 Soil @ 3.5'-5'
08	SB-4 Soil @ 8.5'-10'
09	SB-5 Soil @ 3.5'-5'
10	SB-5 Soil @ 8.5'-10'
11	SB-7 Soil @ 3.5'-5.0'
12	SB-7 Soil @ 8.5'-10'
13	SB-10 Soil @ 3.5'-5'
14	SB-10 Soil @ 8.5'-10'

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TEST RESULTS BY SAMPLE

Sample: 01AS SB-1 Soil @ 3.5'-5' **Collected: 01/26/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Total Pet. Hydrocarbon, IR	9.2	5.0	mg/kg	02/17/93	KA

Sample: 02AS SB-1 Soil @ 8.5'-10' **Collected: 01/26/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Total Pet. Hydrocarbon, IR	11.8	5.0	mg/kg	02/17/93	KA

Sample: 03AS SB-2 Soil @ 3.5'-5' **Collected: 01/26/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Total Pet. Hydrocarbon, IR	17.5	5.0	mg/kg	02/17/93	KA

Sample: 04AS SB-2 Soil @ 8.5'-10' **Collected: 01/26/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Total Pet. Hydrocarbon, IR	<5	5.0	mg/kg	02/17/93	KA

Sample: 05AS SB-3 Soil @ 3.5'-5' **Collected: 01/26/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Total Pet. Hydrocarbon, IR	491.0	5.0	mg/kg	02/17/93	KA

Sample: 06AS SB-3 Soil @ 8.5'-10' **Collected: 01/26/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Total Pet. Hydrocarbon, IR	6.7	5.0	mg/kg	02/17/93	KA

Sample: 07AS SB-4 Soil @ 3.5'-5' **Collected: 01/26/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Total Pet. Hydrocarbon, IR	9.7	5.0	mg/kg	02/17/93	KA

Sample: 08AS SB-4 Soil @ 8.5'-10' **Collected: 01/26/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Total Pet. Hydrocarbon, IR	13.3	5.0	mg/kg	02/17/93	KA

Sample: 09AS SB-5 Soil @ 3.5'-5' **Collected: 01/26/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Total Pet. Hydrocarbon, IR	40.2	5.0	mg/kg	02/17/93	KA

Sample: 10AS SB-5 Soil @ 8.5'-10' **Collected: 01/26/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Total Pet. Hydrocarbon, IR	18.8	5.0	mg/kg	02/17/93	KA

TEST RESULTS BY SAMPLE

Sample: 11AS SB-7 Soil @ 3.5'-5.0' **Collected: 01/26/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed
Total Pet. Hydrocarbon, IR	445.0	5.0	mg/kg	02/17/93

Sample: 12AS SB-7 Soil @ 8.5'-10' **Collected: 01/26/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed
Total Pet. Hydrocarbon, IR	1000.0	5.0	mg/kg	02/17/93

Sample: 13AS SB-10 Soil @ 3.5'-5' **Collected: 01/26/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed
Total Pet. Hydrocarbon, IR	15.4	5.0	mg/kg	02/17/93

Sample: 14AS SB-10 Soil @ 8.5'-10' **Collected: 01/26/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed
Total Pet. Hydrocarbon, IR	8.7	5.0	mg/kg	02/17/93

Louis B. Astbury Co., Inc.
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HNTB
111 Monument Circle
Indianapolis, Indiana 46204

Attn: James T. Parks
Invoice Number:

Order #: 93-02-437
Date: 02/23/93 13:04
Work ID: 14624-DS-025-002 Crane NWSC
Date Received: 02/23/93
Date Completed: 02/23/93
Client Code: HNTB

SAMPLE IDENTIFICATION

Sample Number	Sample Description
01	SB-3 Soil @ 3.5'-5'
02	SB-7 Soil @ 3.5'-5'
03	SB-7 Soil @ 8.5'-10'

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TEST RESULTS BY SAMPLE

Sample Description: SB-3 Soil @ 3.5'-5' Lab No: 01A
Test Description: Tot. Pet. Hydrocarbon, FID Method: SW846_8015MD Test Code: TPH_FD
Collected: 01/26/93 Category: SOIL

PARAMETER	RESULT	LIMIT	BLANK	BLANK LIMIT
Diesel	111	10	ND	10

Analytical Run Information:

EXTRACTED	02/22/93
DATE RUN	02/22/93
ANALYST	KA
INSTRUMENT	HPII-1
CONC FACTOR	1
UNITS	mg/kg

Sample Description: SB-7 Soil @ 3.5'-5' Lab No: 02A
Test Description: Tot. Pet. Hydrocarbon, FID Method: SW846_8015MD Test Code: TPH_FD
Collected: 01/26/93 Category: SOIL

PARAMETER	RESULT	LIMIT	BLANK	BLANK LIMIT
Diesel	116	10	ND	10

Analytical Run Information:

EXTRACTED	02/22/93
DATE RUN	02/22/93
ANALYST	KA
INSTRUMENT	HPII-1
CONC FACTOR	1
UNITS	mg/kg

TEST RESULTS BY SAMPLE

mple Description: SB-7 Soil @ 8.5'-10' Lab No: 03A
Test Description: Tot. Pet. Hydrocarbon, FID Method: SW846_8015MD Test Code: TPH_FD
Collected: 01/26/93 Category: SOIL

PARAMETER	RESULT	LIMIT	BLANK	BLANK LIMIT
Diesel	252	10	ND	10

Analytical Run Information:

EXTRACTED	02/22/93
DATE RUN	02/22/93
ANALYST	KA
INSTRUMENT	HPII-1
CONC FACTOR	1
UNITS	mg/kg

Louis B. Astbury Co., Inc.
ENVIRONMENTAL SERVICES (317) 290-1471
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HNTB
111 Monument Circle
Indianapolis, Indiana 46204

Attn: James T. Parks
Invoice Number:

Order #: 93-02-295
Date: 02/20/93 16:14
Work ID: 14624-DS-025-002 Crane NWSC
Date Received: 02/12/93
Date Completed: 02/19/93
Client Code: HNTB

SAMPLE IDENTIFICATION

Sample Number	Sample Description
01	SB-A Soil @ 0'-2'
02	SB-A Soil @ 3.5'-5'
03	SB-A Soil @ 8.5'-10'
04	SB-A Soil @ 13.5'-15'
05	SB-A Soil @ 0'-10'
06	SB-B Soil @ 0'-2'
07	SB-B Soil @ 3.5'-5'
08	SB-B Soil @ 8.5'-10'
09	SB-B Soil @ 13.5'-15'
10	SB-C Soil @ 0'-2'
11	SB-C Soil @ 3.5'-5'
12	SB-C Soil @ 8.5'-10'
13	SB-D Soil @ 0'-2'
14	SB-D Soil @ 3.5'-5'
15	SB-D Soil @ 8.5'-10'
16	SB-E Soil @ 0'-2'
17	SB-E Soil @ 3.5'-5'
18	SB-E Soil @ 8.5'-10'
19	SB-F Soil @ 0'-2'
20	SB-F Soil @ 3.5'-5'
21	SB-F Soil @ 8.5'-10'
22	SB-G Soil @ 3.5-5'
23	SB-G Soil @ 8.5'-10'
24	SB-G Soil @ 13.5'-15'
25	SB-H Soil @ 3.5'-5'
26	SB-H Soil @ 8.5'-10'
27	SB-I Soil @ 3.5'-5'
28	SB-I Soil @ 8.5'-10'
29	SB-J Soil @ 3.5'-5'
30	SB-J Soil @ 8.5'-10'
31	SB-K Soil @ 3.5'-5'
32	SB-K Soil @ 8.5'-10'
33	SB-L Soil @ 3.5'-5'
34	SB-L Soil @ 8.5'-10'
35	SB-M Soil @ 3.5'-5'
36	SB-M Soil @ 8.5'-10'
37	SB-O Soil @ 0'-1'
38	SB-P Soil @ 0'-1'
39	SB-Q Soil @ 0'-1'
40	SB-R Soil @ 0'-1'
41	SB-12 Soil @ 3.5'-5'
42	SB-12 Soil @ 8.5'-10'

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TEST RESULTS BY SAMPLE

Sample: 01AS SB-A Soil @ 0'-2' **Collected: 02/11/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Total Pet. Hydrocarbon, IR	2170.0	5.0	mg/kg	02/17/93	KA

Sample: 02A SB-A Soil @ 3.5'-5' **Collected: 02/11/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Flashpoint.	>160	73	degrees F	02/15/93	RD

Sample: 03AS SB-A Soil @ 8.5'-10' **Collected: 02/11/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Total Pet. Hydrocarbon, IR	40.0	5.0	mg/kg	02/17/93	KA

Sample: 04AS SB-A Soil @ 13.5'-15' **Collected: 02/11/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Flashpoint.	>160	73	degrees F	02/15/93	RD
Reactive Cyanide	<0.05	0.05	mg/kg	02/17/93	TLO
Reactive Sulfide	<2.0	2.0	mg/kg	02/17/93	TLO
Standard 10% pH value test	8.13	1.00	pH units	02/16/93	TLO
Total Pet. Hydrocarbon, IR	23.0	5.0	mg/kg	02/17/93	KA
Total Solids at 103-105C	86.0	1.0	%	02/18/93	CMK

Sample: 05AS SB-A Soil @ 0'-10' **Collected: 02/11/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Total Pet. Hydrocarbon, IR	187.0	5.0	mg/kg	02/17/93	KA

Sample: 06AS SB-B Soil @ 0'-2' **Collected: 02/11/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Lead, FAAS.	<12.5	12.5	mg/kg	02/17/93	CPV
Total Pet. Hydrocarbon, IR	40.0	5.0	mg/kg	02/17/93	KA

Sample: 07AS SB-B Soil @ 3.5'-5' **Collected: 02/11/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Flashpoint.	>160	73	degrees F	02/15/93	RD

Sample: 08AS SB-B Soil @ 8.5'-10' **Collected: 02/11/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Total Pet. Hydrocarbon, IR	64.3	5.0	mg/kg	02/17/93	KA

Sample: 09AS SB-B Soil @ 13.5'-15' **Collected: 02/11/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Total Pet. Hydrocarbon, IR	13.6	5.0	mg/kg	02/17/93	KA

TEST RESULTS BY SAMPLE

Sample: 10AS SB-C Soil @ 0'-2' **Collected: 02/11/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Lead, FAAS.	<12.5	12.5	mg/kg	02/17/93	CPV
Total Pet. Hydrocarbon, IR	1070.0	5.0	mg/kg	02/17/93	KA

Sample: 11AS SB-C Soil @ 3.5'-5' **Collected: 02/11/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Flashpoint.	>160	73	degrees F	02/15/93	RD

Sample: 12AS SB-C Soil @ 8.5'-10' **Collected: 02/11/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Total Pet. Hydrocarbon, IR	14.3	5.0	mg/kg	02/17/93	KA

Sample: 13AS SB-D Soil @ 0'-2' **Collected: 02/11/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Total Pet. Hydrocarbon, IR	368.0	5.0	mg/kg	02/17/93	KA

Sample: 14AS SB-D Soil @ 3.5'-5' **Collected: 02/11/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Flashpoint.	>160	73	degrees F	02/15/93	R

Sample: 15AS SB-D Soil @ 8.5'-10' **Collected: 02/11/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Total Pet. Hydrocarbon, IR	22.3	5.0	mg/kg	02/17/93	KA

Sample: 16AS SB-E Soil @ 0'-2' **Collected: 02/11/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Lead, FAAS.	<12.5	12.5	mg/kg	02/17/93	CPV
Total Pet. Hydrocarbon, IR	82.3	5.0	mg/kg	02/19/93	KA

Sample: 17AS SB-E Soil @ 3.5'-5' **Collected: 02/11/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Flashpoint.	>160	73	degrees F	02/15/93	RD

Sample: 18AS SB-E Soil @ 8.5'-10' **Collected: 02/11/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Total Pet. Hydrocarbon, IR	5.3	5.0	mg/kg	02/19/93	KA

Sample: 19AS SB-F Soil @ 0'-2' **Collected: 02/11/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Lead, FAAS.	<12.5	12.5	mg/kg	02/17/93	CP

TEST RESULTS BY SAMPLE

Test Description	Result	Limit	Units	Analyzed	By
Total Pet. Hydrocarbon, IR	251.0	5.0	mg/kg	02/19/93	

Sample: 20AS SB-F Soil @ 3.5'-5' Collected: 02/11/93 Category: SOIL

Test Description	Result	Limit	Units	Analyzed	By
Flashpoint.	>160	73	degrees F	02/15/93	RD

Sample: 21AS SB-F Soil @ 8.5'-10' Collected: 02/11/93 Category: SOIL

Test Description	Result	Limit	Units	Analyzed	By
Total Pet. Hydrocarbon, IR	7.8	5.0	mg/kg	02/19/93	KA

Sample: 23AS SB-G Soil @ 8.5'-10' Collected: 02/11/93 Category: SOIL

Test Description	Result	Limit	Units	Analyzed	By
Total Pet. Hydrocarbon, IR	33.5	5.0	mg/kg	02/19/93	KA

Sample: 24AS SB-G Soil @ 13.5'-15' Collected: 02/11/93 Category: SOIL

Test Description	Result	Limit	Units	Analyzed	By
Total Pet. Hydrocarbon, IR	6.7	5.0	mg/kg	02/19/93	KA

Sample: 25AS SB-H Soil @ 3.5'-5' Collected: 02/11/93 Category: SOIL

Test Description	Result	Limit	Units	Analyzed	By
Total Pet. Hydrocarbon, IR	107.0	5.0	mg/kg	02/19/93	KA

Sample: 26AS SB-H Soil @ 8.5'-10' Collected: 02/11/93 Category: SOIL

Test Description	Result	Limit	Units	Analyzed	By
Total Pet. Hydrocarbon, IR	<5	5.0	mg/kg	02/19/93	KA

Sample: 27AS SB-I Soil @ 3.5'-5' Collected: 02/11/93 Category: SOIL

Test Description	Result	Limit	Units	Analyzed	By
Total Pet. Hydrocarbon, IR	8.7	5.0	mg/kg	02/19/93	KA

Sample: 28AS SB-I Soil @ 8.5'-10' Collected: 02/11/93 Category: SOIL

Test Description	Result	Limit	Units	Analyzed	By
Total Pet. Hydrocarbon, IR	22.1	5.0	mg/kg	02/19/93	KA

Sample: 30AS SB-J Soil @ 8.5'-10' Collected: 02/11/93 Category: SOIL

Test Description	Result	Limit	Units	Analyzed	By
Total Pet. Hydrocarbon, IR	6.4	5.0	mg/kg	02/19/93	KA

TEST RESULTS BY SAMPLE

Sample: 31AS SB-K Soil @ 3.5'-5' **Collected: 02/11/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Total Pet. Hydrocarbon, IR	6.0	5.0	mg/kg	02/19/93	KA

Sample: 32AS SB-K Soil @ 8.5'-10' **Collected: 02/11/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Total Pet. Hydrocarbon, IR	5.0	5.0	mg/kg	02/19/93	KA

Sample: 34AS SB-L Soil @ 8.5'-10' **Collected: 02/11/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Total Pet. Hydrocarbon, IR	5.4	5.0	mg/kg	02/19/93	KA

Sample: 35AS SB-M Soil @ 3.5'-5' **Collected: 02/11/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Total Pet. Hydrocarbon, IR	8.7	5.0	mg/kg	02/19/93	KA

Sample: 36AS SB-M Soil @ 8.5'-10' **Collected: 02/11/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Total Pet. Hydrocarbon, IR	23.1	5.0	mg/kg	02/19/93	K

Sample: 37AS SB-O Soil @ 0'-1' **Collected: 02/11/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Lead, FAAS.	<12.5	12.5	mg/kg	02/17/93	CPV
Total Pet. Hydrocarbon, IR	1260.0	5.0	mg/kg	02/19/93	KA

Sample: 38AS SB-P Soil @ 0'-1' **Collected: 02/11/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Lead, FAAS.	18.60	12.5	mg/kg	02/17/93	CPV
Total Pet. Hydrocarbon, IR	543.0	5.0	mg/kg	02/19/93	KA

Sample: 39AS SB-Q Soil @ 0'-1' **Collected: 02/11/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Total Pet. Hydrocarbon, IR	140.0	5.0	mg/kg	02/19/93	KA

Sample: 40AS SB-R Soil @ 0'-1' **Collected: 02/11/93** **Category: SOIL**

Test Description	Result	Limit	Units	Analyzed	By
Lead, FAAS.	<12.5	12.5	mg/kg	02/17/93	CPV
Total Pet. Hydrocarbon, IR	173.0	5.0	mg/kg	02/19/93	KA

TEST RESULTS BY SAMPLE

Sample: 41AS SB-12 Soil @ 3.5'-5' Collected: 02/11/93 Category: SOIL

Test Description	Result	Limit	Units	Analyzed	By
Total Pet. Hydrocarbon, IR	23.2	5.0	mg/kg	02/19/93	KA

Sample: 42AS SB-12 Soil @ 8.5'-10' Collected: 02/11/93 Category: SOIL

Test Description	Result	Limit	Units	Analyzed	By
Total Pet. Hydrocarbon, IR	5.8	5.0	mg/kg	02/19/93	KA

TEST RESULTS BY SAMPLE

Sample Description: SB-A Soil @ 3.5'-5' Lab No: 02A
Test Description: Tot. Pet. Hydrocarbon, FID Method: SW846_8015MD Test Code: TPH_FD
Collected: 02/11/93 Category: SOIL

PARAMETER	RESULT	LIMIT	BLANK	BLANK LIMIT
Diesel	1090	50	ND	10

Analytical Run Information:

EXTRACTED	02/18/93
DATE RUN	02/19/93
ANALYST	KA
INSTRUMENT	HPII-1
CONC FACTOR	5
UNITS	mg/kg

TEST RESULTS BY SAMPLE

Sample Description: SB-A Soil @ 13.5'-15' Lab No: 04A
Test Description: Metals TCLP analysis. Method: SW846_1311 Test Code: M_TCLP
Collected: 02/11/93 Category: SOIL

PARAMETER	RESULT	LIMIT	40CFR LIMIT	CONC FACTOR	DATE	ANALYST
Lead	<0.50	0.50	5.0	1	02/18/93	CPV
Barium	2.17	1.0	100	1	02/18/93	MM
Chromium	<0.50	0.50	5.0	1	02/18/93	CPV
Mercury	<0.010	0.010	0.2	5	02/18/93	KAK
Silver	<0.10	0.10	5.0	1	02/18/93	CPV
Cadmium	<0.05	0.050	1.0	1	02/19/93	CPV
Arsenic	<0.020	0.020	5.0	2	02/18/93	KAK
Selenium	<0.020	0.020	1.0	2	02/18/93	KAK

Analytical Run Information:

EXTRACTED 02/16/93
UNITS mg/L

Results are matrix spike-corrected in accordance with SW846 Method 1311.

TEST RESULTS BY SAMPLE

Sample Description: SB-A Soil @ 13.5'-15' Lab No: 04A
Test Description: Polychlorinated Biphenyls Method: SW846_8081 Test Code: PCB
Collected: 02/11/93 Category: SOIL

PARAMETER	CAS NUMBER	RESULT	LIMIT	BLANK	BLANK LIMIT
Arochlor-1016	12674-11-2	ND	0.082	ND	0.08
Arochlor-1221	11104-28-2	ND	0.082	ND	0.08
Arochlor-1232	11141-16-5	ND	0.082	ND	0.08
Arochlor-1242	53469-21-9	ND	0.082	ND	0.08
Arochlor-1248	12672-29-6	ND	0.082	ND	0.08
Arochlor-1254	11097-69-1	ND	0.082	ND	0.08
Arochlor-1260	11096-82-5	ND	0.082	ND	0.08
Arochlor-1262	----------	ND	0.082	ND	0.08
Arochlor-1268	----------	ND	0.082	ND	0.08

SURROGATE	%RECOVERY	LIMITS
Decachlorobiphenyl	114.0	24 - 150
Tetrachloro-m-xylene	108.9	24 - 150

Analytical Run Information:

EXTRACTED	02/16/93
DATE RUN	02/17/93
ANALYST	JLH
INSTRUMENT	COL 8
CONC FACTOR	1
UNITS	mg/kg

TEST RESULTS BY SAMPLE

ample Description: S8-A Soil @ 13.5'-15' Lab No: 04A
Test Description: Semivolatiles TCLP GC/MS Method: SW846_8270 Test Code: S_TCLP
Collected: 02/11/93 Category: SOIL

PARAMETER	CAS NUMBER	RESULT	LIMIT	BLANK	BLANK LIMIT
Pyridine	110-86-1	ND	50	ND	50
1,4-Dichlorobenzene	106-46-7	ND	50	ND	50
Total Cresols	--------	ND	50	ND	50
Hexachloroethane	67-72-1	ND	50	ND	50
Nitrobenzene	98-95-3	ND	50	ND	50
Hexachlorobutadiene	87-68-3	ND	50	ND	50
2,4,6-Trichlorophenol	88-06-2	ND	50	ND	50
2,4,5-Trichlorophenol	95-95-4	ND	50	ND	50
2,4-Dinitrotoluene	121-14-2	ND	50	ND	50
Hexachlorobenzene	118-74-1	ND	50	ND	50
Pentachlorophenol	87-76-5	ND	100	ND	100

SURROGATE	%RECOVERY	LIMITS
2-Fluorophenol	69	21 - 100
Phenol-d6	63	10 - 94
Nitrobenzene-d5	93	35 - 114
2-Fluorobiphenyl	93	43 - 116
2,4,6-Tribromophenol	75	10 - 123
Terphenyl-d14	57	33 - 141

Analytical Run Information:

EXTRACTED	02/17/93
DATE RUN	02/18/93
ANALYST	JLH
INSTRUMENT	5971 A
FILE ID	0218930
CONC FACTOR	5
UNITS	ug/L

Results are matrix spike-corrected in accordance with SW846 Method 1311.

TEST RESULTS BY SAMPLE

Sample Description: SB-A Soil @ 13.5'-15' Lab No: 04A
Test Description: Volatiles TCLP PATGC/MS Method: SW846_8260 Test Code: V_TCLP
Collected: 02/11/93 Category: SOIL

PARAMETER	CAS NUMBER	RESULT	LIMIT	BLANK	BLANK LIMIT
Vinyl chloride	75-01-4	ND	50	ND	50
1,1-Dichloroethene	75-35-4	ND	25	ND	25
2-Butanone	78-93-3	ND	50	ND	50
Chloroform	67-66-3	ND	25	ND	25
1,2-Dichloroethane	107-06-2	ND	25	ND	25
Benzene	71-43-2	ND	25	ND	25
Tetrachloromethane	56-23-5	ND	25	ND	25
Trichloroethene	79-01-6	ND	25	ND	25
Tetrachloroethene	127-18-4	ND	25	ND	25
Chlorobenzene	108-90-7	ND	25	ND	25

SURROGATE	%RECOVERY	LIMITS
1,2-Dichloroethane-d4	93	79 - 114
Toluene-d8	124	75 - 126
p-Bromofluorobenzene	111	71 - 114

Analytical Run Information:

EXTRACTED	02/17/93
DATE RUN	02/18/93
ANALYST	JM
INSTRUMENT	5970MS
FILE ID	02188.D
CONC FACTOR	1.000
UNITS	ug/L

Results are matrix spike-corrected in accordance with SW846 Method 1311.

TEST RESULTS BY SAMPLE

Sample Description: SB-B Soil @ 3.5'-5' Lab No: 07A
Test Description: Tot. Pet. Hydrocarbon, FID Method: SW846_8015MD Test Code: TPH_FD
Collected: 02/11/93 Category: SOIL

PARAMETER	RESULT	LIMIT	BLANK	BLANK LIMIT
TOTAL PETROLEUM HYDROCARBONS	<10	10	ND	10

Analytical Run Information:

EXTRACTED	02/18/93
DATE RUN	02/18/93
ANALYST	KA
INSTRUMENT	HPII-1
CONC FACTOR	1
UNITS	mg/kg

Sample Description: SB-C Soil @ 3.5'-5' Lab No: 11A
Test Description: Tot. Pet. Hydrocarbon, FID Method: SW846_8015MD Test Code: TPH_FD
Collected: 02/11/93 Category: SOIL

PARAMETER	RESULT	LIMIT	BLANK	BLANK LIMIT
Diesel	19	10	ND	10

Analytical Run Information:

EXTRACTED	02/18/93
DATE RUN	02/18/93
ANALYST	KA
INSTRUMENT	HPII-1
CONC FACTOR	1
UNITS	mg/kg

Sample Description: SB-D Soil @ 3.5'-5' Lab No: 14A
Test Description: Tot. Pet. Hydrocarbon, FID Method: SW846_8015MD Test Code: TPH_FD
Collected: 02/11/93 Category: SOIL

TEST RESULTS BY SAMPLE

Sample Description: SB-D Soil @ 3.5'-5' Lab No: 14A
Test Description: Tot. Pet. Hydrocarbon, FID Method: SW846_8015MD Test Code: TPH_FD
Collected: 02/11/93 Category: SOIL

PARAMETER	RESULT	LIMIT	BLANK	BLANK LIMIT
TOTAL PETROLEUM HYDROCARBONS	<10	10	ND	10

Analytical Run Information:

EXTRACTED	02/18/93
DATE RUN	02/18/93
ANALYST	KA
INSTRUMENT	HPII-1
CONC FACTOR	1
UNITS	mg/kg

Sample Description: SB-E Soil @ 3.5'-5' Lab No: 17A
Test Description: Tot. Pet. Hydrocarbon, FID Method: SW846_8015MD Test Code: TPH_FD
Collected: 02/11/93 Category: SOIL

PARAMETER	RESULT	LIMIT	BLANK	BLANK LIMIT
TOTAL PETROLEUM HYDROCARBONS	<10	10	ND	10

Analytical Run Information:

EXTRACTED	02/18/93
DATE RUN	02/18/93
ANALYST	KA
INSTRUMENT	HPII-1
CONC FACTOR	1
UNITS	mg/kg

Sample Description: SB-F Soil @ 3.5'-5' Lab No: 20A
Test Description: Tot. Pet. Hydrocarbon, FID Method: SW846_8015MD Test Code: TPH_FD
Collected: 02/11/93 Category: SOIL

PARAMETER	RESULT	LIMIT	BLANK	BLANK LIMIT

TEST RESULTS BY SAMPLE

Sample Description: SB-F Soil @ 3.5'-5' Lab No: 20A
Test Description: Tot. Pet. Hydrocarbon, FID Method: SW846_8015MD Test Code: TPH_FD
Collected: 02/11/93 Category: SOIL

Diesel	49	10	ND	10

Analytical Run Information:

EXTRACTED	02/18/93
DATE RUN	02/18/93
ANALYST	KA
INSTRUMENT	HPII-1
CONC FACTOR	1
UNITS	mg/kg

Sample Description: SB-G Soil @ 3.5-5' Lab No: 22A
Test Description: Tot. Pet. Hydrocarbon, FID Method: SW846_8015MD Test Code: TPH_FD
Collected: 02/11/93 Category: SOIL

PARAMETER	RESULT	LIMIT	BLANK	BLANK LIMIT
TOTAL PETROLEUM HYDROCARBONS	<10	10	ND	10

Analytical Run Information:

EXTRACTED	02/18/93
DATE RUN	02/19/93
ANALYST	KA
INSTRUMENT	HPII-1
CONC FACTOR	1
UNITS	mg/kg

Sample Description: SB-J Soil @ 3.5'-5' Lab No: 29A
Test Description: Tot. Pet. Hydrocarbon, FID Method: SW846_8015MD Test Code: TPH_FD
Collected: 02/11/93 Category: SOIL

PARAMETER	RESULT	LIMIT	BLANK	BLANK LIMIT
TOTAL PETROLEUM HYDROCARBONS	<10	10	ND	10

TEST RESULTS BY SAMPLE

Sample Description: SB-J Soil @ 3.5'-5' Lab No: 29A
Test Description: Tot. Pet. Hydrocarbon, FID Method: SW846_8015MD Test Code: TPH_FD
Collected: 02/11/93 Category: SOIL

Analytical Run Information:

EXTRACTED	02/18/93
DATE RUN	02/19/93
ANALYST	KA
INSTRUMENT	HPII-1
CONC FACTOR	1
UNITS	mg/kg

Sample Description: SB-L Soil @ 3.5'-5' Lab No: 33A
Test Description: Tot. Pet. Hydrocarbon, FID Method: SW846_8015MD Test Code: TPH_FD
Collected: 02/11/93 Category: SOIL

PARAMETER	RESULT	LIMIT	BLANK	BLANK LIMIT
TOTAL PETROLEUM HYDROCARBONS	<10	10	ND	10

Analytical Run Information:

EXTRACTED	02/18/93
DATE RUN	02/19/93
ANALYST	KA
INSTRUMENT	HPII-1
CONC FACTOR	1
UNITS	mg/kg

CLIENT: HNTB

DATE OF SAMPLE: ~~12/1~~ 2/17/93

DATE RECEIVED: 2/12/93

DATE OF ANALYSIS: 2/18, 2/19

ANALYST: KA

MATRIX: Soil

LAB NUMBERS: 9302295-02A, 07A, 11A, 14A, 17A, 20A, 22A, 29A, 33A

ANALYTICAL QUALITY CONTROL REQUIREMENTS

TPH BY GC/FID (SW846 METHOD MODIFIED 8015)

PETROLEUM IDENTIFIED: Diesel

CALIBRATION CURVE DATE: 9/26/93 % RSD: 5.0

METHOD BLANK

<10 mg/kg

DAILY STANDARDS

DS1: 107%

DS2: 104%

CONTROL SAMPLE

106%

MATRIX DUPLICATE

SAMPLE # 9302295-29A

RUN 1 <10 mg/kg

RUN 2 <10 mg/kg

AVERAGE <10 mg/kg

MATRIX SPIKE

SAMPLE # 9302295-29A

RESULT <10 mg/kg

SPIKE LEVEL 231 mg/kg

% RECOVERY 102%

Louis B. Astbury Co., Inc.
ENVIRONMENTAL SERVICES
5933 WEST 71ST STREET INDIANAPOLIS, INDIANA 46278
(317) 290-1471
FAX (317) 290-1670

DATE RECEIVED
HNTB INDIANAPOLIS
JOB NO.
FILE
FEB 24 1993
ROUTE TO:

INORGANIC QA/QC REPORT

CLIENT NAME: HNTB
PROJECT ID: Crane NWSC Tank Farm
ESG LAB No: 93-01-536

ANALYSIS	DATE	BLANK	CHECK FOUND	CHECK TRUE	CHECK %REC	SPIKE FOUND	SPIKE %REC	SPK/DUP FOUND	SPK/DUP %RPD
Flashpoint	02-08-93	NA	82	81	NA	NA		NA	
TPH - IR	02-05-93	<5.	858	916	94.00%	90.	92.	Dup.31	4.0

Advisory Control Limits:

Prep Blank - Less than (<) the Reporting Limit

Check Standard - Within 90-110% Recovery

Mercury - 80-120% Rec.

Matrix Spike - Within 80-120% Recovery (waters), 75-125% Recovery (solids)

Matrix Spike/Dup - Less than 20% RPD (waters), Less than 25% RPD (solids) or Matrix Duplicate

ND = Not Detected

NC = Non-Calculable

Units - mg/L (ppm)

Louis B. Astbury Co., Inc.
ENVIRONMENTAL SERVICES (317) 290-1471
5933 WEST 71ST STREET INDIANAPOLIS, INDIANA 46278 FAX (317) 290-1670

INORGANIC QA/QC REPORT

CLIENT NAME: HNTB
PROJECT ID: Crane NWSC Tank Farm
ESG LAB No: 93-01-537

ANALYSIS	DATE	BLANK	CHECK			SPIKE		SPK/DUP	
			FOUND	TRUE	%REC	FOUND	%REC	FOUND	%RPD
Flashpoint	02-08-93	NA	82	81	NA	NA		NA	
TPH - IR	02-05-93	<5.	858	916	94.00%	90.	92.	31.Dup	4.0
Total Chromium	02-01-93	<0.500	0.959	1	96.00%	0.959	96.	0.815	16.2
Total Lead	01-29-93	<0.500	1.03	1	103.00%	21.8	109.	23.6	5.9
TCLP Lead	02-03-93	<0.500	1.06	1	106.00%	0.99	99.	<0.5Dup	NC
TCLP Chromium	02-03-93	<0.500	1.02	1	102.00%	0.76	76.	<0.5Dup	NC
TCLP Silver	02-03-93	<0.100	0.225	0.25	90.00%	0.89	89.	<0.1Dup	NC
TCLP Cadmium	02-03-93	<0.050	0.217	0.2	109.00%	0.199	99.	<.05Dup	NC
TCLP Arsenic	02-04-93	<0.010	0.021	0.02	105.00%	0.046	115.	<.01Dup	NC
TCLP Selenium	02-04-93	<0.010	0.019	0.02	95.00%	0.021	52.	<.01Dup	NC
TCLP Barium	02-10-93	<1.00	1.1	1	110.00%	21.	105.	1.1Dup	0.52
TCLP Mercury	02-10-93	<0.0020	0.0046	0.005	93.00%	0.0064	128.	<.01Dup	NC
Reactive CN	02-05-93	<0.005	NA			NA		<.05Dup	NC
Reactive Sulfide	02-05-93	<0.10	NA			NA		<0.1Dup	NC

Advisory Control Limits:

Prep Blank - Less than (<) the Reporting Limit

Check Standard - Within 90-110% Recovery Mercury - 80-120% Rec. ND = Not Detected

Matrix Spike - Within 80-120% Recovery (waters), 75-125% Recovery (solids) NC = Non-Calculable

Matrix Spike/Dup - Less than 20% RPD (waters), Less than 25% RPD (solids) Units - mg/L (ppm)

or Matrix Duplicate

TCLP Spike - Within 50-150% Recovery

Environmental Service Group, Inc.

Total Characteristic Leaching Procedure for
Volatile Organics via PATGC/MS

Data File: (Spike) DATA:0203A04A.D
Operator: Mack Overton
Date Acquired: 3-Feb-93
Method File: LONG_VOC.M
Sample Name: 9301511-01A Crystal Flash, dil=5.000
Miscellaneous Information: TCLP soil, spiked @ 25ppb
Bottle Number: 4
Total Number of Compounds Screened: 16 Spike: 25 ug/L
Dilution: 5.000
Results:

chck:	Num	Compound Name	Spike Amt	D1	D2	Average	RPD	Matrix Spike	% Rec
	1	Vinyl Chloride	125	0.00	0.00	0.00	0%	82.95	66%
	2	1,1-Dichloroethene	125	0.00	0.00	0.00	0%	90.26	72%
	3	2-Butanone (MEK)	125	17.78	17.78	17.78	0%	103.38	68%
	5	Chloroform	125	0.00	0.00	0.00	0%	112.42	90%
	7	1,2-Dichlorethane	125	0.00	0.00	0.00	0%	109.43	88%
	8	Benzene	125	0.00	0.00	0.00	0%	125.24	100%
	9	Carbon Tetrachloride	125	0.00	0.00	0.00	0%	115.87	93%
	11	Trichlorothene	125	0.00	0.00	0.00	0%	122.41	98%
	13	Tetrachloroethene	125	0.00	0.00	0.00	0%	121.95	98%
	15	Chlorobenzene	125	0.00	0.00	0.00	0%	125.19	100%

These spike recoveries are in effect for the following samples:

9301511-01A
9301537-05A

Environmental Service Group, Inc.

Total Characteristic Leaching Procedure for
Volatile Organics via PATGC/MS

Data File: D:\011493\ 0501005.D
Operator: Mack Overton
Date Acquired: 14-Jan-93
Method File: TCLP.M
Sample Name: 9301147-01A Citizens' Ga
Miscellaneous Information: TCLP soil, method dup, dil=5.000
Bottle Number: 5
Total Number of Compounds Screened: 16

Results:

Num	Compound Name	R.T.	Area	Amount	Units	Type:	chck:	SPIKE CORRECTED
1	Vinyl chloride	2.241	619	0.05	ug/L		*	
2	1,1-Dichloroethene	3.831	2166	0.04	ug/L		*	
3	2-Butanone	6.122	264456	10.74	ug/L			25.6
4	Bromochloromethane	6.912	4518090	40.00	ug/L	ISTD		
5	Chloroform	6.963	161520	1.76	ug/L		*	
6	1,2-Dichloroethane-d4	8.040	10470031	46.27	ug/L	SURR		
7	1,2-Dichloroethane	8.199	167439	2.75	ug/L			
8	Benzene	8.766	3028917	20.53	ug/L			25.3
9	Carbon Tetrachloride	8.803	70733	1.29	ug/L			
10	1,4-Difluorobenzene	9.501	21856472	40.00	ug/L	ISTD		
11	Trichloroethene	10.328	2924	0.06	ug/L		*	
12	Toluene-d8	13.017	26659873	49.57	ug/L	SURR		
13	Tetrachloroethene	14.902	6545	0.13	ug/L			
14	Chlorobenzene-d5	16.225	20845238	40.00	ug/L	ISTD		
15	Chlorobenzene	16.298	177984	1.60	ug/L			
16	4-Bromofluorobenzene	19.099	13018131	47.36	ug/L	SURR		

SURR SUMMARY REPORT: 50 ug/L

FILE: D:\011493\ 0501005.D

	Compound Name:	Area:	Avg Calib Area	Calculated Result	% Rec	% Area				
6	1,2-Dichloroethane-d4	10470031	11441869	46.27	93%	92%	ok	74%	-	121%
12	Toluene-d8	26659873	27242182	49.57	99%	98%	ok	81%	-	117%
16	4-Bromofluorobenzene	13018131	14158264	47.36	95%	92%	ok	74%	-	121%

ISTD SUMMARY REPORT: 40 ug/L

FILE: D:\011493\ 0501005.D

	Compound Name:	R.T.:	Area:	Avg Calib Area	Calculated Result	% Rec	% Area
4	Bromochloromethane	6.91	4518090	4598860	40.00	100%	98%
10	1,4-Difluorobenzene	9.50	21856472	22125385	40.00	100%	99%
14	Chlorobenzene-d5	16.23	20845238	21501485	40.00	100%	97%

APPENDIX F

SAMPLE CHAIN OF CUSTODY

CHAIN OF CUSTODY RECORD

ENVIRONMENTAL SERVICE GROUP
5933 WEST 71 ST. STREET
INDIANAPOLIS, IN. 46278
PHONE # (317) 290-1471 FAX # (317) 290-1670

CLIENT: HNTB 636-4082

930153 6

PROJECT NO.: 14624

PROJECT NAME: CRANE NWSC TANK FARM

SAMPLERS (SIGNATURE): JAMES T. PARKS James T. Parks

STA. NO.	DATE	TIME	COMP	GRAB	STATION LOCATION	NO. OF CONTAINERS	TPH BY GC/FID	TPH BY IR	BTEX BY GC/MS	FLASHPOINT			REMARKS
TP-1	1-26			X	TEST PIT NO 1 - GROUND WATER	1	X						WATER SAMPLE
~~[illegible]~~	~~[illegible]~~			~~X~~	~~" " " " - 2'-3' DEPTH~~	~~[illegible]~~	~~[illegible]~~			~~X~~			~~CLAY~~
"	1-26			X	" " " " - 5'-6' "	1	X		X	X			GRAVEL LAYER
"	1-26			X	" " " " - 9'-10 "	1	X			X			CLAY
TP-2	1-26			X	TEST PIT NO 2 - 2-3' DEPTH	1	X	X					
TP 2	1-26			X	TEST PIT NO 2 - 6'-7' DEPTH	1		X					
TP-3	1-26			X	TEST PIT NO. 3 - 2'-3' DEPTH	1		X					
"	1-26			X	" " " " - 5'-6' DEPTH	1	X		X	X			GRAVEL LAYER
"	1-26			X	" " " " - 8'-9' DEPTH	1		X					
TP-4	1-26			X	TEST PIT NO 4 - 3' DEPTH	1		X					
TP-4	1-26			X	" " " " - 6' DEPTH	1		X					
TP-5	1-26			X	TEST PIT NO 5 - 2 1/2' DEPTH	1		X					
TP-5	1-26			X	" " " " - 7' "	1		X					
TP-5	1-26			X	" " " " - 11' "	1		X					
TP-6	1-26			X	TEST PIT NO 6 - 2 1/2' DEPTH	1		X					
TP-6	1-26			X	TEST PIT NO 6 - 7' DEPTH	1		X					

RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY (SIGNATURE)
James T. Parks	1/20/93	9:15 a	
RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY (SIGNATURE)
RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED FOR LABORATORY BY (SIGNATURE)

REMARKS

CHAIN OF CUSTODY RECORD

ENVIRONMENTAL SERVICE GROUP
5933 WEST 71 ST. STREET
INDIANAPOLIS, IN. 46278
PHONE # (317) 290-1471 FAX # (317) 290-1670

CLIENT: HNTB 636-4682

930153 7

PROJECT NO.: 14624

PROJECT NAME: CRANE NWSC TANK FARM

SAMPLERS: (SIGNATURE) JAMES T. PARKS James T. Parks

STA. NO.	DATE	TIME	COMP	GRAB	STATION LOCATION	NO. OF CONTAINERS	TPH BY GC:FID	TPH BY IR	TCLP LEAD	TOTAL LEAD	TOT. CURRENT	FLASHPOINT	SPECIAL WASTE	REMARKS	PCBs
L1	1-27			X	LOADING AREA 0-2' DEPTH	1	X					X		SURFACE ODOR	
L1	1-27			X	" " 3 1/2-5' DEPTH	1		X						CLAY	
L2	1-27			X	LOADING AREA 0-2' DEPTH	1	X					X		SURFACE ODOR	
L2	1-27			X	" " 3 1/2-5' DEPTH	1		X						CLAY	
TP-3	1-26		X		TEST PIT No 3 0'-9' COMPOSITE	1							(*)		
SB-A	1-27			X	SOIL BORING SITE A - SURFACE	2			X	(*)				SURFACE SAMPLE	
SB-D	1-27			X	SOIL BORING SITE D - SURFACE	2			X	(*)	X			SURFACE SAMPLE	X
SB-K	1-27			X	SOIL BORING SITE K - SURFACE	2			X	(*)	X			SURFACE SAMPLE	X
SB-L	1-27			X	SOIL BORING SITE L - SURFACE	2			X	(*)	X			SURFACE SAMPLE	X
SB-Q	1-27			X	SOIL BORING SITE Q - SURFACE	2			X	(*)				SURFACE SAMPLE	

RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)
James T. Parks	1-28-93	9:15 am	
RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)
RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY LABORATORY: (SIGNATURE)

REMARKS

(*) SPECIAL WASTE DETERMINATIONS
- TCLP - EXCLUDE PEST./HERB. SW846 1310
- IGNITABILITY SW846 1010
- CORROSIVITY SW846 9040
- REACTIVITY
- PCBs SW846 8080
- TOTAL SOLIDS APHA 2540B

CHAIN OF CUSTODY RECORD

ENVIRONMENTAL SERVICE GROUP
5933 WEST 71 ST. STREET
INDIANAPOLIS, IN. 46278
PHONE # (317) 290-1471 FAX # (317) 290-1670

CLIENT: HNTB JIM PARKS 636-4682

9302294

PROJECT NO.: 14624-DS-025-002

PROJECT NAME: CRANE NWSC TANK FARM

SAMPLERS (SIGNATURE): JAMES T. PARKS James T. Parks

STA. NO.	DATE	TIME	COMP	GRAB	STATION LOCATION	NO. OF CONTAINERS	TPH BY IR						REMARKS
SB-1	1-26-93			X	SOIL BORING SB-1 3½'-5' DEPTH	1	X						
"	"			X	" " " 8½'-10' "	1	X						
SB-2	1-26-93			X	SOIL BORING SB-2 3½'-5' DEPTH	1	X						
"	"			X	" " " 8½'-10' "	1	X						
SB-3	1-26-93			X	SOIL BORING SB-3 3½'-5' DEPTH	1	X						
"	"			X	" " " 8½'-10' "	1	X						
SB-4	1-26-93			X	SOIL BORING SB-4 3½'-5' DEPTH	1	X						
"	"			X	" " " 8½'-10' "	1	X						
SB-5	1-26-93			X	SOIL BORING SB-5 3½'-5' DEPTH	1	X						
"	"			X	" " " 8½'-10' "	1	X						
SB-7	1-26-93			X	SOIL BORING SB-7 3½'-5' DEPTH	1	X						
"	"			X	" " " 8½'-10' DEPTH	1	X						
SB-10	1-26-93			X	SOIL BORING SB-10 3½'-5' DEPTH	1	X						
"	"			X	" " " 8½'-10' "	1	X						

RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)
James T. Parks	2/12/93	3:05pm	
RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)
RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY LABORATORY: (SIGNATURE)

REMARKS: HOLD 13½'-15' DEPTH FOR SB-1, SB-2, SB-3, SB-4, SB-5 SB-7 and SB-10

ESG

CHAIN OF CUSTODY RECORD

ENVIRONMENTAL SERVICE GROUP
6033 WEST 71 ST. STREET
INDIANAPOLIS, IN. 46278
PHONE # (317) 290-1471 FAX # (317) 290-1670

CLIENT: HNTB Jim Parks 636-4602

130235

PROJECT NO.: 14624-DS-025

PROJECT NAME: CRANE NWSC TANK FARM

SAMPLERS (SIGNATURE): JAMES T. PARKS James T. Parks

SITE HOLE	DATE	TIME	COMP	GRAB	STATION LOCATION	NO. OF CONTAINERS	TPH BY 8015/FID	TPH BY IR	FLASHPOINT	TOTAL LEAD	BTEX	SPECIAL WASTE *	REMARKS
SB-A	2-11-93			X	SOIL BORING A 0-2' DEPTH	1		X					
"	"			X	SOIL BORING A 3.5'-5' DEPTH	1	X		X				
"	"			X	SOIL BORING A 8½'-10' "	1		X					
"	"			X	SOIL BORING A 13½'-15' "	1		X			X	X	
"	"		X		SOIL BORING A 0'-10' DEPTH	1		X					
SB-B	2-11			X	SOIL BORING B 0-2' DEPTH	1		X		X			
"	"			X	" " " 3½-5' "	1	X		X				
"	"			X	" " " 8½'-10' "	1		X					
~~SB-B~~	~~2-11~~			~~X~~	~~SOIL BORING B 13½'-15' DEPTH~~	~~1~~		~~X~~					
SB-B	2-11			X	SOIL BORING B 13½'-15' DEPTH	1		X					
SB-C	2-11			X	SOIL BORING C 0-2' DEPTH	1		X		X			
"	"			X	" " " 3½'-5' "	1	X		X				
"	"			X	" " " 8½'-10' "	1		X					
~~SB-C~~	~~2-11~~			~~X~~	~~SOIL BORING C 13½'-15'~~	~~1~~		~~X~~					
SB-D	2-11			X	SOIL BORING D 0-2' DEPTH	1		X					
"	"			X	" " " 3½'-5' "	1	X		X				
"	"			X	" " " 8½-10' "	1		X					
~~SB-D~~	~~2-11~~			~~X~~	~~SOIL BORING D 13½'-15'~~	~~1~~		~~X~~					

RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)
James T. Parks	2/12/93	3:00	
RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)
RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED FOR LABORATORY BY: (SIGNATURE)

REMARKS

* SPECIAL WASTE DETERMINATION TO INCLUDE:
- TCLP - EXCLUDE PEST./HERB. SW846-131
- IGNITABILITY SW 846 1010
- CORROSIVITY SW846 9040
- REACTIVITY
- PCBS SW846 8080
- TOTAL SOLIDS APHA 25

CHAIN OF CUSTODY RECORD

ENVIRONMENTAL SERVICE GROUP
6033 WEST 71 ST. STREET
INDIANAPOLIS, IN. 46278
PHONE # (317) 290-1476 FAX # (317) 290-1670

CLIENT: HNTB Jim Parks 636-4682

93022195

PROJECT NO.: 1424-DS-025200

PROJECT NAME: CRANE NWSC TANK FARM

SAMPLERS (SIGNATURE):

SAMPLE NO.	DATE	TIME	COMP	GRAB	SAMPLE LOCATION	NO. OF CONTAINERS	TPH BY GC/FID	TPH BY IR	FLASHPOINT	TOTAL LEAD			REMARKS
SB-E	2-11-93			X	SOIL BORING E 0'-2' DEPTH	1		X		X			
"	"			X	" " " 3½'-5' "	1	X		X				
"	"			X	" " " 8½'-10' "	1		X					
SB-F	2-11-93			X	SOIL BORING F 0'-2' DEPTH	1		X		X			
"	"			X	" " " 3½'-5' "	1	X		X				
"	"			X	" " " 8½'-10' "	1		X					
SB-G	2-11-93			X	SOIL BORING G 3½'-5' DEPTH	1	X						
"	"			X	" " " 8½'-10' "	1		X					
"	"			X	" " " 13½'-15' "	1		X					
SB-H	2-11-93			X	SOIL BORING H 3½'-5' DEPTH	1		X					
"	"			X	" " " 8½'-10' "	1		X					
SB-I	2-11-93			X	SOIL BORING I 3½'-5' DEPTH	1		X					
"	"			X	" " " 8½'-10' "	1		X					
SB-J	2-11-93			X	SOIL BORING J 3½'-5' DEPTH	1	X						
"	"			X	" " " 8½'-10' "	1		X					

RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)
James S. Parks	2/12/93	3:45	
RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)
RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY LABORATORY: (SIGNATURE)

REMARKS

CHAIN OF CUSTODY RECORD

ENVIRONMENTAL SERVICE GROUP
6933 WEST 71 ST. STREET
INDIANAPOLIS, IN. 46270
PHONE # (317) 290-1471 FAX # (317) 290-1670

CLIENT: HNTB Jim Parks 636-4682

9302295

PROJECT NO.: 1424-DS-025200

PROJECT NAME: CRANE NWSC TANK FARM

SAMPLERS (SIGNATURE):

SAMPLE NO.	DATE	TIME	COMP	GRAB	SAMPLE LOCATION	NO. OF CONTAINERS	TPH BY G.C./FID	TPH BY IR	FLASHPOINT	TOTAL LEAD			REMARKS
SB-E	2-11	13		X	SOIL BORING E 0'-2' DEPTH	1		X		X			
"	"			X	" " " 3½'-5' "	1	X		X				
"	"			X	" " " 8½'-10' "	1		X					
SB-F	2-11	13		X	SOIL BORING F 0'-2' DEPTH	1		X		X			
"	"			X	" " " 3½'-5' "	1	X		X				
"	"			X	" " " 8½'-10' "	1		X					
SB-G	2-11	13		X	SOIL BORING G 3½'-5' DEPTH	1	X						
"	"			X	" " " 8½'-10' "	1		X					
"	"			X	" " " 13½'-15' "	1		X					
SB-H	2-11	13		X	SOIL BORING H 3½'-5' DEPTH	1		X					
"	"			X	" " " 8½'-10' "	1		X					
SB-I	2-11	13		X	SOIL BORING I 3½'-5' DEPTH	1		X					
"	"			X	" " " 8½'-10' "	1		X					
SB-J	2-11	13		X	SOIL BORING J 3½'-5' DEPTH	1	X						
"	"			X	" " " 8½'-10' "	1		X					

RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)
James J. Parks	2/12/93	3:15	
RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)
RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY LABORATORY: (SIGNATURE)

REMARKS

APPENDIX G

LANDFARMING GUIDELINES

INDIANA DEPARTMENT
OF
ENVIRONMENTAL MANAGEMENT

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
OFFICE OF ENVIRONMENTAL RESPONSE
LEAKING UNDERGROUND STORAGE TANK SECTION

"Guidelines For Landtreatment"

DRAFT
FOR DISCUSSION PURPOSES ONLY

December 1990

This document is provided for guidance purposes only to the regulated community. Unusual circumstances and special conditions may require taking additional measures or providing other information than what is requested in this document.

Before any landtreatment project is initiated, prior approval must be obtained from the Indiana Department of Environmental Management after submitting a landtreatment plan containing the following information:

1. Soil type (USDA soil textures) and estimated quantity of contaminated materials (i.e. 60 cubic yards - gasoline contaminated silty clay loam, 800 cubic yards -diesel contaminated sandy loam and etc.);

2. Topographical and soil survey maps of the area to be landtreated with location of landtreatment plot indicated as well as:

   a. land use of area (urban areas are not considered suitable),
   b. location of surface waters and drainage ditches,
   c. depth to ground water (includes perched or seasonal high water tables),
   d. location of nearby sewers or other utilities that could be impacted,

3. Indication of liner or other impervious surface for storage and placement of contaminated soils such as compacted clay, visqueen, paved lot and etc. Visqueen is preferred and should be at least 20 mils in thickness;

4. Type of run-on and run-off control for landtreatment plot (berms, dikes, sheltered storage and etc.). Berms or dikes must be constructed of an impervious material or overlapped with the liner. They must also be built up 6 inches higher than the soils being landtreated. Measures that will be taken to treat and/or dispose of any waters accumulated in the landtreatment plot should also be included;

5. Use of any bacterial agents, fertilizers or aerators to accelerated the biodegradation of contaminates (if so, in what treatment ratios or concentrations will they be applied or maintained);

6. Maximum depth/average depth of contaminated soils in landtreatment plot (18 inches maximum depth is recommended to promote aerobic conditions);

7. Frequency of tilling or aeration of contaminated soils (daily, weekly and etc.);

8. Representative sampling (one grab sample per 50 cubic yards for the first 500 cubic yards and one sample per 100 cubic yards for greater quantities; for example 1,000 cubic yards would require 15 grab samples total - first 500/50 = 10 plus the next 500/100 = 5) to verify adequate treatment of contaminated soils as well as sampling of underlying soils to verify the contaminates have not migrated or leached to other soils. This may include griding for sampling of the landtreatment plot. All samples shall be collected from the lower 6 inches of the contaminated soils. To help reduce the cost of repeated sampling to verify adequate treatment of soils the use of instruments such as an OVA or HNU for field screening of soils is acceptable when capable of measuring the contaminates. However, the final samples for treatment confirmation must be submitted for laboratory analysis;

9. Indication of final deposition of contaminated soils once they have been properly treated (i.e. redeposited in the tank pit, left in landtreatment plot and etc.). It should be noted that before any contaminated soils can be deposited off-site on another property (owned by a different party); they must be treated to one (1) part per million of total petroleum hydrocarbons and given clearance from the Office of Solid and Hazardous Waste Management, Special Projects Section (317/232-4473);

10. Updates should be submitted to the site manager assigned to your case at the address listed below at least every 3 months; reporting the status of the project, analysis or field screening results and any other pertinent information.

Once this information is available, please send your Landtreatment Plan, all pertinent supporting information and the incident number with all correspondence to the:

Attention: Site Manager
Indiana Department of Environmental Management
Office of Environmental Response
Leaking Underground Storage Tank Section
2321 Executive Drive
Indianapolis, IN 46241

AC 317/243-5022

ATTACHMENT B

Date: 13 May 1996

From; LCDR Gregory L. Utley, NREEULANT
To: Mr. Jim Hunsicker, Environmental Program Manager, Crane Division, Naval Surface Weapons Center

Subj: *EVALUATION OF ENVIRONMENTAL ISSUES ASSOCIATED WITH THE BULK FUEL STORAGE FACILITIES, CRANE DIVISION, NAVAL SURFACE WEAPONS CENTER*

Ref: (a) Site Remediation Study, Tank Farm, by Howard, Needles, Tammen & Bergendoff dtd 30 March 1993
(b) NAVFACINST 11300.37A

Encl: (1) Evaluation of Bulk Fuel Storage Facilities and Bulk Fuel Storage Capacity
(2) CONVAULT Brochure

1. During the period of 27 February through 1 March 1996, while on board Crane Division, Naval Surface Weapons Center (NSWC Crane), I was tasked with a study of the fuel oil storage and handling facilities. As part of the study, references (a) and (b) were reviewed. Enclosure (1) is a discussion of: (1) fuel oil storage capacity and consumption, (2) tank farm site conditions and (3)discussions of options for improvement.

2. Reference (b) requires Navy facilities to maintain a 90 day supply of fuel, or a 30 day supply of emergency fuel on site. The primary fuel source for NSWC Crane is natural gas. The natural service is only curtailed in extremely cold weather, when the gas is needed elsewhere.

3. The primary purpose of the tank farm is bulk storage of fuel oil, for use in heating buildings. The importance of fuel oil as a heating source has greatly diminished since NSWC Crane switched to natural gas. In recent years, fuel has only been used for heating an average of 3 days per year. The largest production facilities have 7 to 8 days of on-site storage capacity, which is more than adequate capacity to provide heat during the 2 to 3 days per year when gas is unavailable. Since bulk fuel is readily available commercially, the need for a large tank farm can be questioned.

4. The discussion of the options is based on environmental concerns, which may not necessarily coincide with the operational concerns or contingency plans of NSWC Crane. However, from an environmental standpoint, option (2), dismantling of the tank farm and cleanup of the site, appears to be best.

5. Portable, self contained, above ground bulk fuel storage tanks are available from commercial sources. Such tanks could be installed at NSWC Crane's mission critical facilities. The General

Subj: EVALUATION OF ENVIRONMENTAL ISSUES ASSOCIATED WITH THE BULK FUEL STORAGE FACILITIES, CRANE DIVISION, NAVAL SURFACE WEAPONS CENTER

Services Administration has a contract with one manufacturer, CONVAULT. Enclosure (a) is CONVAULT's brochure.

6. If I can be of further service, I can be reached at (502) 821-3506.

G. L. Utley
LCDR(SCW), CEC, USNR-R

EVALUATION OF BULK FUEL STORAGE FACILITIES AND BULK FUEL STORAGE CAPACITY

Fuel Storage Capacity and Consumption.

The NSWC Crane tank farm lies just east of Crane Gate No. 4 on Highway H-5. Fuel is brought to the tank farm by truck and then hauled from the tank farm to the various buildings and production facilities. The tank farm was constructed during the mid 1940's and was expanded in 1952. The tank farm has held as many as 17 storage tanks; the majority of the tanks have been retired from service and removed. At present only three of the tanks (2760 R, 2760 S, and 2760 T, all erected during the 1970's) are still in service. A fourth tank (2634) is still in place, but is empty and out of service.

Until recently, NSWC Crane used No.2 fuel oil for heating. The primary fuel source is now natural gas, which is provided by the public utilities. The public utility can curtail natural gas service to NSWC Crane if, during extremely cold weather, the demand is greater in other areas. Thus, No. 2 fuel oil is now an emergency fuel source, used only when the natural gas supply is curtailed.

According to Mr. Bob Herman (Public Works Utilities), the base has only used fuel oil twice during the last three years; the most recent occurrence was 2-4 February 1996 (a maximum of three days). During the three day period, the three largest buildings (115, 128, and 150) used a total of 20,000 gallons.

Buildings 115, 128, and 150 have fuel storage tanks with capacities of 60,000, 60,000 and 84,000 gallons respectively. At the rates of consumption listed above, the 204,000 gallons of storage give the three buildings a 8.5 day supply of fuel. Fuel oil is available by contract and can be delivered within 7 days.

Tank Farm Site. Reference (a) discusses both HNTB's January/ February 1993 site investigation , as well as a 1989 investigation by PEDCo E & A Services, Inc. Reference (a) documents the extent of soil contamination at the tank farm site and makes several recommendations for site remediation. Soil removal/ groundwater remediation costs are estimated to be $130,000/$25,000 respectively. Site visits on 27/28 February 1996 revealed the following.

A. The concrete dike surrounding the tank farm appears to be structurally sound. However, the coating on the interior of the dike (apparently a bituminous substance) is severely deteriorated and provides little protection to the concrete. Also, seals in the expansion joints in the concrete are deteriorated and would allow

for spilled oil to flow out of the dike.

B. Several of uncapped fuel lines (which ran from tanks that have been removed) protrude from the ground.

C. Small amounts of oil had been spilled in the vicinity of existing tanks 2760S and 2760T.

Options.

1. **Upgrade the tank farm.** In order to bring the tank farm up to current environmental protection and spill prevention standards, improvements would include:

A. Construction of primary containment structures (berms), capable of holding the contents of the tank, plus fire flow and precipitation from the 24 hour, 25 year storm event. The berms would have to prevent infiltration of fuel into the groundwater; the maximum permeability of the soil would be 1 x 10-7 cm/sec (either a clay or geosynthetic liner).

B. Corrosion protection.

C. Leak detection on underground piping (such as double walled pipes).

D. Removal of contaminated soil from the old tank sites.

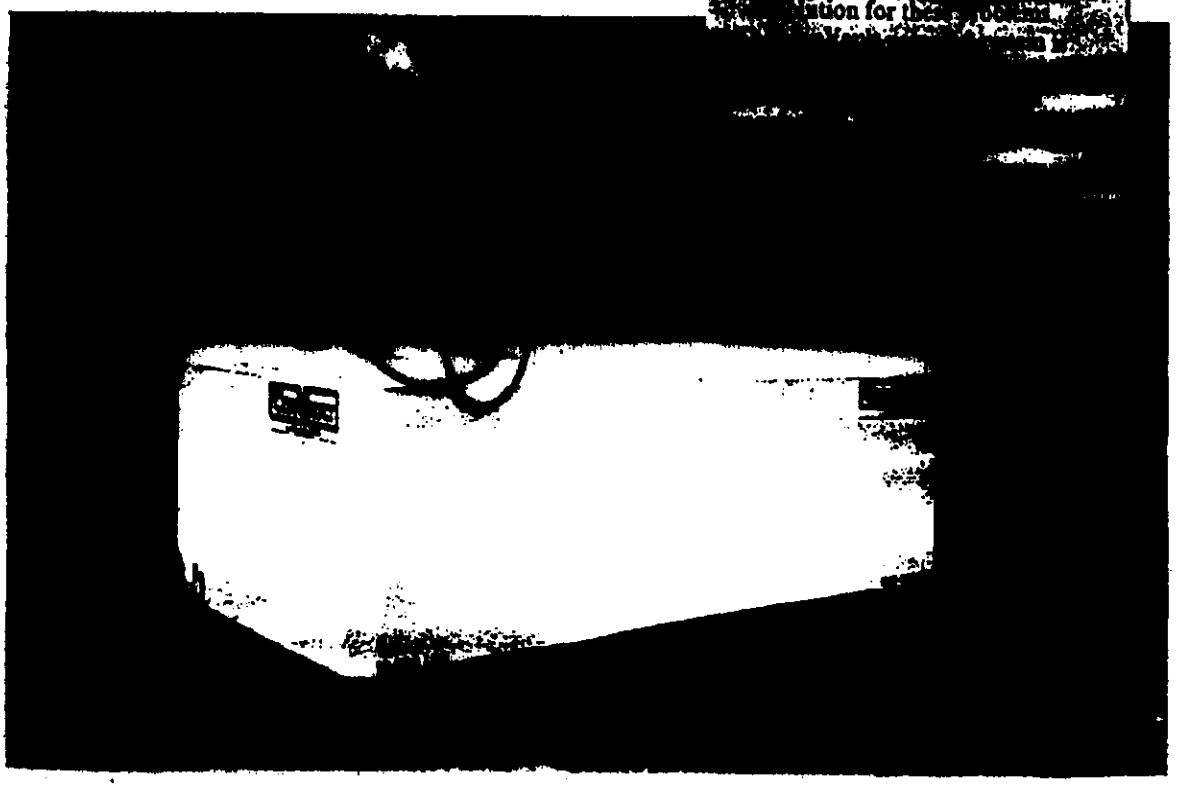
A berm constructed to contain the contents of tanks 2760 R, 2760 S, and 2760 T would have to contain 450,000 of fuel, plus the fire flow and the 24 hour, 25 year storm. Costs of a compacted clay liner are in the $5-6 per cubic yard range, if suitable clay is available at NSWC Crane. Geosynthetic liner installation costs are in the $0.50 per square foot range for a single layer of material. The 1993 HNTB report estimated costs of soil and groundwater remediation at $155,000.

2. **Dismantle the tanks and cleanup the tank farm site.** As noted above, the costs of the soil and groundwater remediation was estimated to be $155,000. The soil cleanup needs to be performed regardless of whether the tank farm is upgraded or dismantled. The costs of dismantling the tanks is unknown: however, the costs should be substantially less than the costs of berm construction, installation of leak detection systems, etc.

[redacted]

[redacted] may be [redacted] and [redacted] event of a leak, the actual costs for soil and groundwater clean-up can be catastrophic.

[redacted] storage tank [redacted] tion for the [redacted]



The Leader in Aboveground Containment.

U.S. Patent #'s 4826644, 4931235, 4934122, 4986346
(Other U.S. & Foreign Patents Pending)

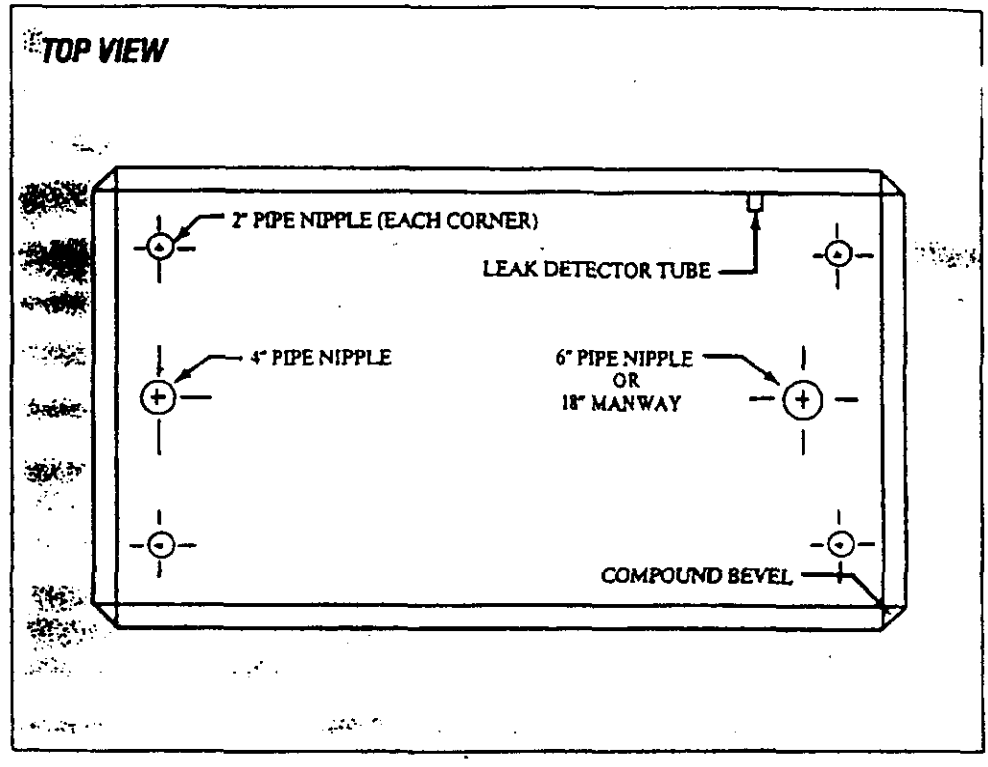
ConVault

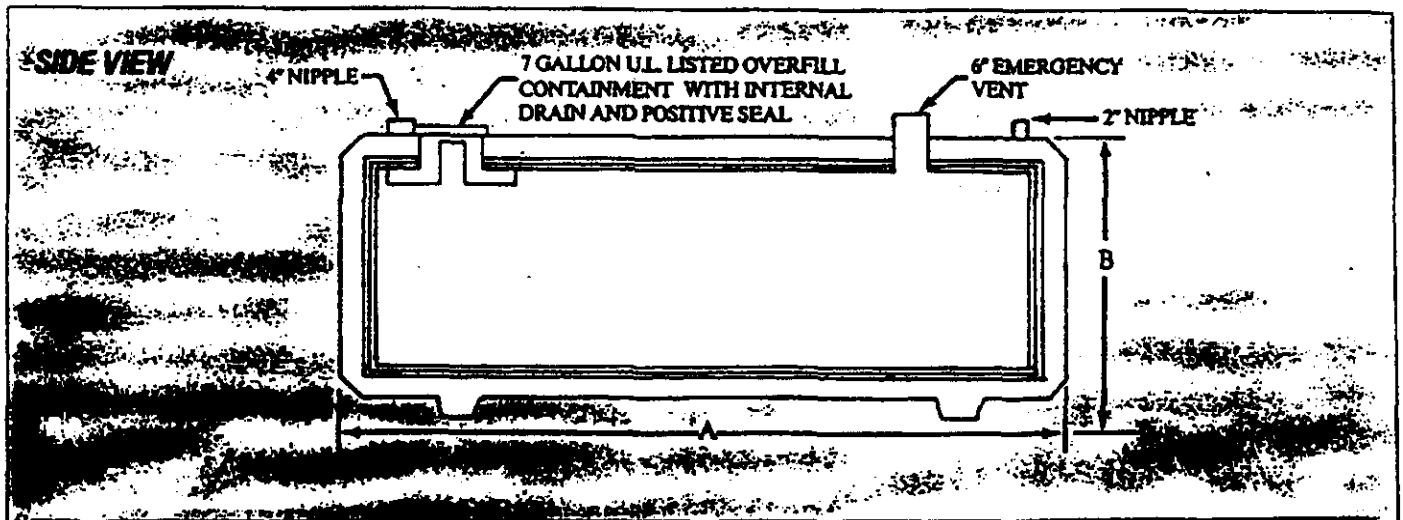
APPLICATIONS

- Standby Fuel System
- Waste Oil Disposal
- Fleet Fuel Servicing
- Aviation and Marina Fueling Systems
- Generator Fuel Supply

USERS

- Auto Dealers
- Contractors
- School Districts/Universities
- Fire Departments
- Retailers
- Utilities
- Golf Courses
- Railroads
- Equipment Rental Companies
- Municipalities
- Convenience Stores
- Hospitals and Nursing Homes
- Airports
- Marinas/Resorts
- Military Installations
- State and National Parks





SIZE	WEIGHT	A	B	WIDTH
250 GALLON	8,000 lbs	7'8"	3'3"	3'9"
500 GALLON	12,000 lbs	11'0"	3'4"	4'6"
DOUBLE 500 GALLON	18,000 lbs	11'0"	4'4"	5'8"
1000 GALLON	18,000 lbs	11'0"	4'4"	5'8"
DOUBLE 1000 GALLON	30,000 lbs	11'3"	5'6"	8'0"
2000 GALLON	30,000 lbs	11'3"	5'6"	8'0"

SIZE	WEIGHT	A	B	WIDTH
4000 GALLON	44,000 lbs	17'7"	6'5¼"	8'0"
5200 GALLON	53,000 lbs	13'0"	7'0"	11'11"
6000 GALLON	60,000 lbs	17'7"	8'9¼"	8'0"
8000 GALLON	66,000 lbs	23'1"	8'9¼"	8'0"
10000 GALLON	80,000 lbs	28'7"	8'9¼"	8'0"
12000 GALLON	96,000 lbs	34'1"	8'9¼"	8'0"

ATTACHMENT C

DRAFT

REPRODUCED AT GOVERNMENT EXPENSE

11160
Ser 112R/6027

MEMORANDUM

From: 11A
To: 09A

Subj: **TANK FARM**

Encl: (1) Discontinue Use of Tank Farm Bulk Storage Facility Implementation Plan
(2) Procedures For Ordering and Processing Receipt Documents for Burner Oil Number 2

1. The tank farm bulk storage facility located at Building 2760 has been identified in previous environmental inspections as an environment liability due to inadequate spill containment. The cost estimate to bring the facility up to acceptable standards is well over one million dollars. Usage of burner oil number 2 from the tank farm has reduced during recent years due to a change over to natural gas. During this next heating season, only eleven tanks will be filled from burner oil that would be stored at the tank farm. Additional conversion during the next fiscal year will reduce or eliminate the number of buildings that would be using fuel from the tank farm. Buildings not supplied from the tank farm facility have been supplied under the contract as multiple drop.

2. A meeting was held 22 August 1996 between the Supply Directorate and the Public Works Directorate (Codes 112, 115, 095, 096 and 097) to discuss what action should be taken to eliminate the tank farm problem. Supply Directorate presented a recommendation to convert all delivery of burner oil to multiple drop and eliminate the need for the tank farm facility. Concern was expressed over reserve quantities for emergencies if natural gas supply or delivery of fuel were interrupted due to extreme weather conditions. Code 115 reviewed regulations to determine if there were any requirements to maintain an emergency reserve of fuel. Since NAVSURFWARCENDIV Crane does not produce their own electrical power, the answerer is no. All desired burner oil reserve can be stored in various tanks that Code 097 now manages using the multiple drop contract. Code 097 is using this method for buildings already using natural gas, and during the past three years, this method has worked. The clause for multiple drop will be modified to require the addition of a meter, 150 foot hose and capability to deliver 24 hours a day/7 days a week during emergencies. Changing the clause will cover emergency needs and require the contractor to be able to reach smaller tanks and record multidrop delivery quantities.

3. Recommend that we discontinue use of tank farm bulk storage facility and purchase all burner oil using multiple drop. Enclosures (1) and (2) contain the implementation plan for this change and procedures for processing orders of burner oil. Acceptance and implementation of this recommendation will give full management of the burner oil to Public Works Directorate (Code 097).

Subj: **TANK FARM**

4. Supply Directorate point of contact is Mr. Ron Crew, Code 112R, extension 4999.

DONALD P. SCHULTE

REPRODUCED AT GOVERNMENT EXPENSE

DISCONTINUE USE OF TANK FARM BULK STORAGE FACILITY
IMPLEMENTATION PLAN

A. Fax request to Defense Fuel Supply Center (DFSC) to modify requirement as follows:
   1. Delete line item 527-461
   2. Modify line item 527-462 to:
      TT/TW W/PUMP, METER AND 150 FT HOSE
      INTO 1/50,000, 8/30,000, 2/25,000, 3/20,000, 1/15,000
      1/12,000, 6/10,000, 1/8,000, 1/6,000, 1/2,000, 3/1,500,
      3/1,000 and 4/270 GAL TANKS
      MULTIPLE DROP
      NORMAL DELIVERY 0700 TO 1500 HOURS
      SHOULD CONDITIONS DICTATE, DELIVERY
      MAY BE REQUIRED 24 HRS A DAY, 7 DAYS
      A WEEK AS DETERMINED BY GOV'T PERSONNEL
      DELIVERY TICKET REQUIRED FOR EACH DROP

   ACTION: Code 115, 116
   COMPLETE BY: 27 SEP 96

B. *Develop an Emergency Fuel Delivery Plan*

   ACTION: Code 097
   COMPLETE BY: 11 OCT 96

C. Issue/transfer all usable fuel to other sites. Issue Burner Oil #2 to Code 097 for building tanks. Transfer Diesel Fuel to either building 3280 or 3 as appropriate. Code 097 will provide issue card to Code 115 for burner oil #2. Code 1122 will record transfer on fuel report and notify Code 115 of residue at tank farm that was unable to be transferred or issued.

   ACTION: Codes 096, 097, 115, 1122
   COMPLETE BY: 11 OCT 96

D. Survey fuel remaining on Supply records located at the tank farm that was not recoverable.

   ACTION: Code 115
   COMPLETE BY: 18 OCT 96

E. Implement new procedures for providing burner oil #2 to all buildings including reserve fuel transfer. Code 115 will work with Code 097 to teach them the ordering process.

   ACTION: Code 097, 115
   COMPLETION: 18 OCT 96

REPRODUCED AT GOVERNMENT EXPENSE

F. Transfer control of the tank farm to Code 095, Environment Protection Department.

ACTION: Codes 111, 092, 095
COMPLETION: 25 OCT 95

G. Clean/purge all tanks, pipelines, valve and pumps of any remaining fuels.

ACTION: Code 095, 097
COMPLETION: 1 JAN 97

H. Implement action to disassemble and clean tank farm area to EPA requirements.

ACTION: Code 095
COMPLETION: 1 JAN 1997

REPRODUCED AT GOVERNMENT EXPENSE

PROCEDURES FOR ORDERING AND PROCESSING RECEIPT DOCUMENTS FOR BURNER OIL NUMBER 2

1. Defense Fuel Supply Center sends survey for two year requirement for burner oil #2 to Code 097.

2. Code 097 receive request for two year requirement of burner oil #2. Code 097 sends requirements to DFSC for multiple drop of burner oil #2.

3. DFSC contracts for the fuel requirements. Notification is sent to NSWC Crane Division that contract line item has been awarded and who received the award.

4. Code 097 determines amount of fuel required for the up coming month.

5. Code 097 submits requisition to Code 116 to place a delivery order for the designated month.

6. Code 116 calls the company and places a delivery order for the designated month. Send notification to Code 097.

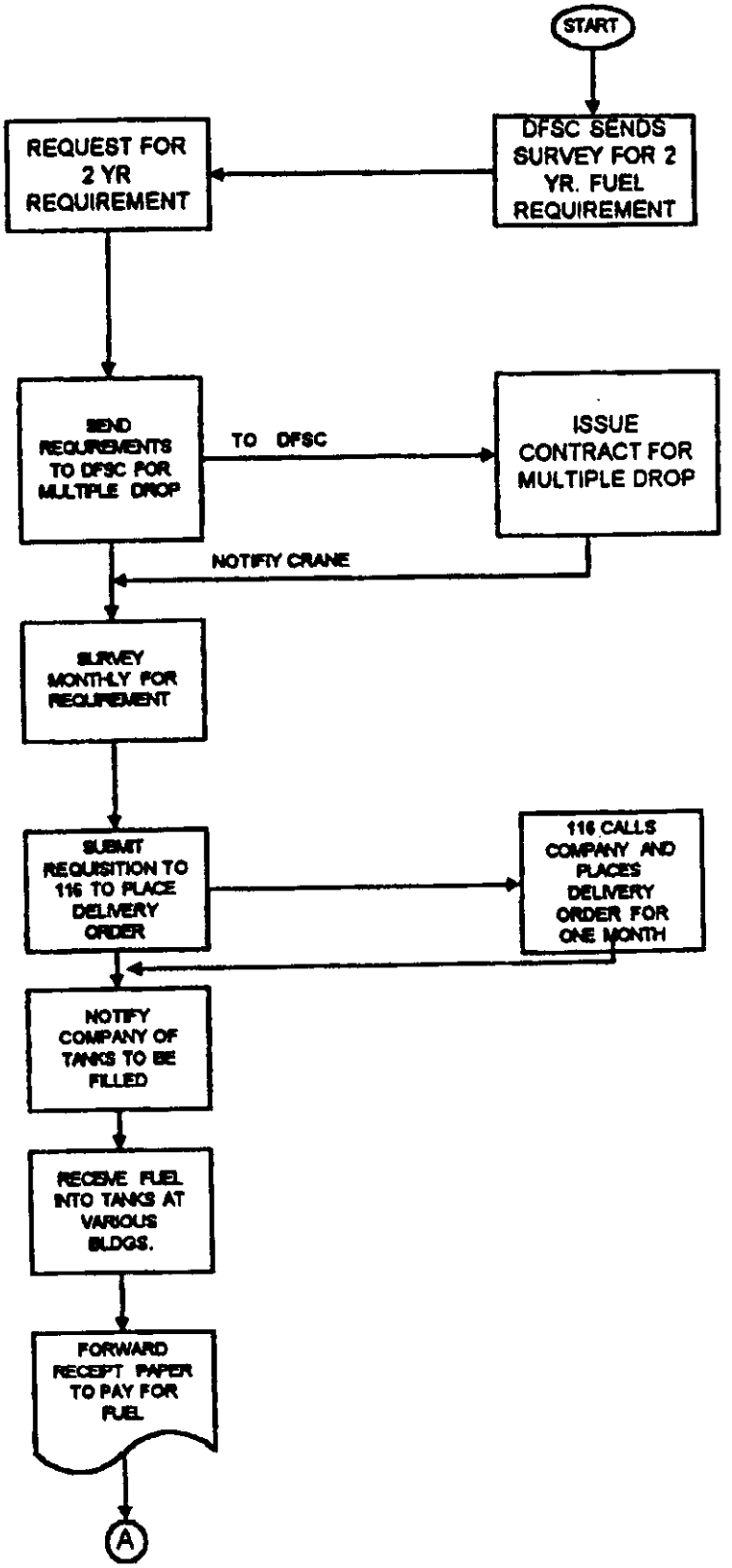
7. Code 097 will schedule fuel deliveries with the company providing tank locations and dates to be filled.

8. Code 097 receives the fuel into tanks at various buildings.

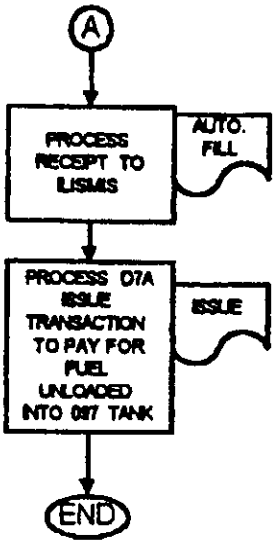
9. Forward receipt paper(s) to Code 1121, building 41 SE the same day fuel is received.

10. Code 1121 processes the receipt to ILSMIS and forward DD250 to DFSC within two days after receipt of fuel. Code 1121 will close out end of month (ZRT) for all receipts.

REPRODUCED AT GOVERNMENT EXPENSE



REPRODUCED AT GOVERNMENT EXPENSE



REPRODUCED AT GOVERNMENT

ATTACHMENT D

July 1, 1997

Mr. Lee Benson
U. S. Army Corps of Engineers
9799 Billings Road
Fort Harrison
Indianapolis, Indiana 46216

Re: Underground Storage and Above-Ground Tank Closure Report
Tank Farm Decontamination - Crane Surface Warfare Center - Crane Division
Storage Tank Removal and Installation Program
Statewide Indiana
DACA27-94-D-0013 D.O. # 55 Case DC

Mr. Robert E. Lee
Crane Environmental Protection Department
(812) 854-6158

Dear Mr. Benson:

The following report describes activities performed by Sverdrup Environmental, Inc. (SvE) during the removals of both above and below-ground storage tanks from the Tank Farm at Crane Naval Surface Warfare Center (CNSWC).

SITE ACTIVITIES

Field Activities Summary

On April 24 through June 16, 1997 a total of seven (7) AST's and one (1) UST were removed, cleaned, cut up into salvageable sized pieces, and stacked on-site for later disposal by others. A site location map showing the tank locations is presented in Figure 1. Tank information showing tank number, size, and contents is shown in Table 1.

During the AST and UST contents removals, a total of 22,950 gallons of product, sludge, water, and oily residue were removed and transported off-site to either E.S.I. recycling facility in Indianapolis or Warrior Oil Services facility in Franklin, Indiana. Disposal documentation of the tank contents is presented in Appendix I.

Table 1 - Tank Summary

Tank Number	Tank Size (Gallons)	Tank Contents
2632	15,000	# 1 Fuel Oil
2634	43,000	Empty
2760R	200,000	# 2 Fuel Oil
2760S	125,000	# 2 Fuel Oil
2760T	125,000	# 2 Fuel Oil
WASTE OIL - Horizontal	8,000	Waste Oil
GASOLINE - Horizontal	2,000	Gasoline
UST	10,000	# 6 Fuel Oil

Chronology of Events

April 24, 1997: Warrior Oil Service (Warrior) removed and transported approximately 3,000 gallons of waste oil from the 8,000-gallon, waste oil, above ground tank (AST).

April 25, 1997: One (1) sample was obtained to characterize the tank contents. The sample was submitted to Specialized Assays, Inc. in Nashville, Tennessee to be analyzed for TCLP RCRA metals, TCLP volatile organic compounds (VOC's), TCLP semi-volatile organic compounds (SVOC's), and PCB's.

April 28 and 29, 1997: SvE subcontractor Environmental Monitoring Systems Corporation (EMSC) mobilized equipment to the jobsite.

April 30, 1997: Warrior removed and transported 400 gallons of fuel oil/sludge from the 15,000-gallon AST and 2,600 gallons from the 200,000-gallon AST, to their Franklin, Indiana facility.

May 1, 1997: Warrior removed and transported 1,800 gallons of product from the 200,00-gallon AST. EMSC removed the above-ground piping and fill lines contents.

May 2, 1997: EMSC completed flushing all above-ground piping and began demolition of fill piping and opening of AST hatches.

May 6, 1997: Warrior removed and transported 5,500 gallons of product from the 15,000 and 200,000-gallon AST's.

May 7, 1997: Began cleaning the western most 125,000-gallon AST (2760T). Warrior removed and transported 4,100 gallons of product from this tank. An additional 1,000 gallons of product was transferred from the 125,000-gallon AST to the 10,000-gallon underground storage tank (UST) located near building #2760. This transfer was performed to decrease the sludge thickness in the 10,000-gallon UST so tank contents could be removed. Approximately 400 feet of piping

has been demolished to date.

May 8, 1997: EMSC completed cleaning the western most 125,000-gallon AST. Approximately 400 gallons of product/sludge was transferred into 55-gallon drums because the vacuum truck not on-site this day. The 55-gallon drums were later emptied by E.S.I. and transported to their facility.

May 12, 1997: Warrior removed and transported approximately 1,200 gallons of product/sludge from the 10,000-gallon UST at building 2760. SvE collected five (5) soil samples from the AST area. These samples were submitted to Specialized Assays, Inc. of Nashville, Tennessee. Two of the five soil samples were analyzed for total petroleum hydrocarbons (TPH) using Method 8015. All five of the samples were analyzed for flashpoint/ignitability using Method 1010M. Soil sample locations are shown in Figure 1. A summary of analytical results for soil samples is presented in Table 2.

May 15, 1997: Specialty Services Hazardous Waste (SSHW) of Indianapolis, Indiana removed and transported approximately 2,400 gallons of product/sludge to E.S.I. in Indianapolis, Indiana. Warrior removed and transported approximately 900 gallons of water/product. Both removals were from the 10,000-gallon UST.

May 16, 1997: SSHW removed and transported 1,000 gallons of gasoline/water from the 2,000-gallon AST.

May 21, 1997: SSHW removed and transported approximately 800 gallons from the 10,000-gallon UST. A total of 3,900 gallons of product/sludge was removed from the 10,000-gallon UST to date. SSHW also removed and transported approximately 200 gallons of product from the 8,000 and 2,000-gallon AST's. The cleaning of both the 8,000 and 2,000-gallon AST's were completed.

May 22, 1997: SSHW removed and transported approximately 50 gallons of oil residue that remained in the pipelines at buildings #2760 and #2627 (pump houses). EMSC completed the cleaning and contents removals of all the AST's and UST. All AST's are ready for demolition.

June 4, 1997: An excavator/shear (Kamatsu PC300LC) was mobilized to the job site.

June 5, 1997: Tank Environmental Technologies (TET) began to shear the tanks. The 43,000-gallon AST was the first to be cut apart.

June 6, 1997: TET completed shearing the eastern 125,000-gallon AST. Began shearing the 200,000-gallon AST.

June 9, 1997: TET completed shearing the western most 125,000-gallon and the waste oil 8,000-gallon ASTs.

June 10, 1997: completed the shearing the 15,000 and 2,000-gallon AST's. The shearing of all AST's is complete. Began torch cutting some of the larger sections of metal into smaller sections.

June 11, 1997: TET removed the 10,000-gallon UST from the ground. SvE collected seven (7) confirmatory soil samples from the UST excavation. Soil samples were submitted to Specialized Assays, Inc. for TPH analysis using Method 8015. The excavation was observed to be clean. The piping associated with the UST was removed from the excavation and placed with the stockpiled metal debris.

June 16, 1997: TET completed cutting and stockpiling the remaining steel.

Table 2 - Analytical Results Summary for AST Contents Characterization

SAMPLE ID	NSWC	NSWC	SS1	SS2	SS3	SS4	SS5
SAMPLING DATE	4/25/97	4/25/97	5/12/97	5/12/97	5/12/97	5/12/97	5/12/97
MATRIX	SLUDGE	OIL	SOIL	SOIL	SOIL	SOIL	SOIL
UNITS	mg/L	mg/L	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
TPH - 8015			22.8		ND		
Ignitability			>200	>200	>200	>200	>200
Arsenic	ND						
Barium	ND						
Cadmium	ND						
Chromium	ND						
Lead	ND						
Mercury	ND						
Selenium	0.23						
Silver	ND						
Benzene	ND						
Carbon Tetrachloride	ND						
Chlorobenzene	ND						
Chloroform	ND						
1,2-Dichloroethane	ND						
1,1-Dichloroethene	ND						
Methylethylketone	ND						
Tetrachloroethene	ND						
Trichloroethene	ND						
Vinyl Chloride	ND						
Pyridine	ND						
1,4-Dichlorobenzene	ND						
2-Methylphenol	ND						
Hexachloroethane	ND						
4-Methylphenol	ND						
Nitrobenzene	ND						
Hexacholorobutadiene	ND						
2,4,5-Trichlorophenol	ND						
2,4,6-Trichlorophenol	ND						
2,4-Dinitrotoluene							
Hexachlorobenzene	ND						
Pentachlorophenol	ND						
UNITS	mg/kg	mg/kg					
PCB 1232	ND	ND					
PCB 1242	ND	ND					
PCB 1248	ND	ND					
PCB 1254	ND	ND					
PCB 1260	ND	ND					
PCB 1262	ND	ND					

ND - Not Detected above the method detection limit
mg/L - Milligrams per Liter - ppm
mg/kg - milligrams per kilogram - ppm

UST REMOVAL ACTIVITIES

Responsible Party

The UST was owned and operated by CNSWC. The UST which was removed from the site, contained #6 fuel oil.

UST Contractor

The UST removal was performed by SvE under the Storage Tank Removal and Installation Program - Statewide Indiana contract (DACA27-94-D-0013, DO #55) with the US Army Corps of Engineers (USACE) - Louisville District. The SvE world headquarters is located at 13723 Riverport Drive, Maryland Heights, Missouri 63043.

UST Site Description

The site is located adjacent to a AST Tank Farm containment area near pump building 2760, CNSWC, Crane, Indiana. A site location map is presented in Figure 1.

One 10,000-gallon steel UST existed at the CNSWC facility. The UST was used to store # 6 fuel oil. A site map showing the UST location is presented in Figure 2. The UST was permanently removed from the ground on June 11, 1997. The UST did not have a leak detection system. During removal activities, evidence of previous spills were not observed. Tank tightness results or reported UST closures near the site were not identified.

The site soil characteristics encountered during removal activities include a brown silty clay with some thin sand layers and subrounded sand and gravel sized fill.

Excavation

On May 15, 1997, was partially uncovered to gain access for contents removal. Approximately 3,100 gallons of product/sludge was removed from the UST by SSHW and Warrior. The UST contents and cleaning fluids were transported to E.S.I. facility in Indianapolis and to Warrior's facility in Franklin, Indiana.

On June 11, 1997, The UST was completely uncovered in preparation for permanent removal. Approximately 800 gallons of product/sludge was removed from the UST using a vacuum truck. The UST's interior was cleaned in-place prior to being removed from the excavation. During the UST excavation, indications of soil contamination were not observed. Air monitoring was performed during field activities using a organic vapor monitor (OVM). No significant measurements were detected near the UST or excavation.

Approximately eighty (80) cubic yards of soil were removed during the UST removal activities.

Following UST removal, the steel UST was moved to a central area where it was mechanically sheared into eight (8) foot sections and stacked. Disposal of the remaining scrape steel will be by others.

Field screening and laboratory analytical results indicated TPH concentrations were not detected in any of the soil samples analyzed. Following laboratory analysis, the soil was placed back into the excavation.

Sampling and sampling results

A total of seven (7) confirmatory soil samples were collected from the UST excavation and submitted for laboratory analysis. Sample location and identifications are presented in Figure 3. The samples were obtained using sampling methods outlined in the *IDEM UST Guidance Manual*. The samples were labeled, packaged using standard chain-of-custody (COC) procedures, and then sent via Federal Express for overnight delivery to Specialized Assays, Nashville, Tennessee. Four (4) wall samples (NOWALL, EASTWALL, SOWALL, and WESTWALL), two (2) floor excavation samples (EAST BOTTOM, WEST BOTTOM), and one (1) stockpile sample (STOCKPILE), were collected during the UST removal activities.

Between sampling events, all sampling equipment was decontaminated by a initial wash using Alconox® and potable water solution, rinsed with potable water, rinsed with deionized water, and allowed to air dry.:

All samples were analyzed for Total Petroleum Hydrocarbons (TPH) using EPA Method 8015. A summary of analytical results is presented in Table 2. The analytical laboratory reports and COC log is included in Appendix II. The analytical results indicate TPH concentration were not detected in any of the soil samples analyzed.

Table 2 - Analytical Results Summary for UST Removal

SAMPLE ID	Sample Date	TPH (PPM)
No Wall	June 11, 1997	ND
East Wall	June 11, 1997	ND
So Wall	June 11, 1997	ND
West Wall	June 11, 1997	ND
East Bottom	June 11, 1997	ND
West Bottom	June 11, 1997	ND
Stockpile	June 11, 1997	ND

TPH - Total Petroleum Hydrocarbon analysis, EPA Method 8015
ND - Not Detected above the method detection limit

Backfilling

Approximately eighty (80) cubic yards of soil were excavated during the UST removal activities. The remaining excavation was backfilled with approximately 15 cubic yards of select granular backfill.

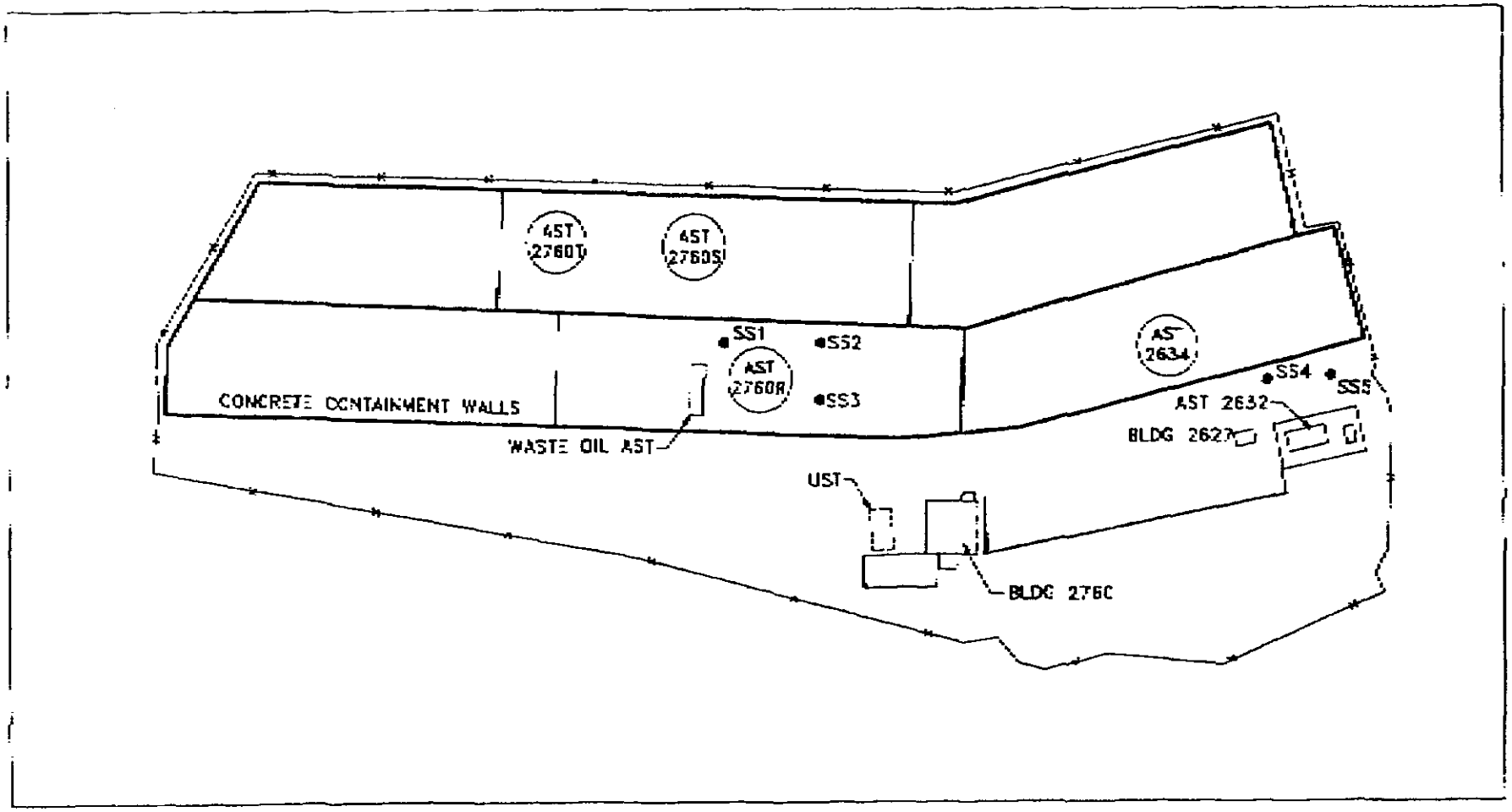
CONCLUSION

Sverdrup Environmental, Inc. hereby concludes that the 10,000-gallon UST has been removed in accordance with construction industry standards and regulatory statutes governing removal of underground fuel storage tanks.

Based on laboratory analytical results, SvE concludes that target concentrations of suspected contaminants in soil samples collected from within the excavation are below IDEM clean-up levels that are indicative of environmental soil contamination, therefore, no additional soil removal is required. A UST system closure report form is presented in Appendix III.

Sverdrup Environmental, Inc. appreciates the continued opportunity to provide environmental and engineering services to the United States Army Corps of Engineers. Please do not hesitate to call if you should have any questions regarding this report.

Mr. Kevin Dulle
Certification # 97-3749
SVERDRUP ENVIRONMENTAL, INC.
(314) 770-4078



LEGEND

SS' SOIL SAMPLING LOCATION AND IDENTIFICATION

0 40 80
FEET

Sverdrup ENVIRONMENTAL	SITE LOCATION MAP CLOSURE REPORT TANK FARM DECONTAMINATION CRANE SURFACE WARFARE CENTER - CRANE, INDIANA	DWN: PTS CHKD: DATE: 7/1/97	DES: APPD: REV: A	PROJECT NO.: 000119 FIGURE NO.: 1

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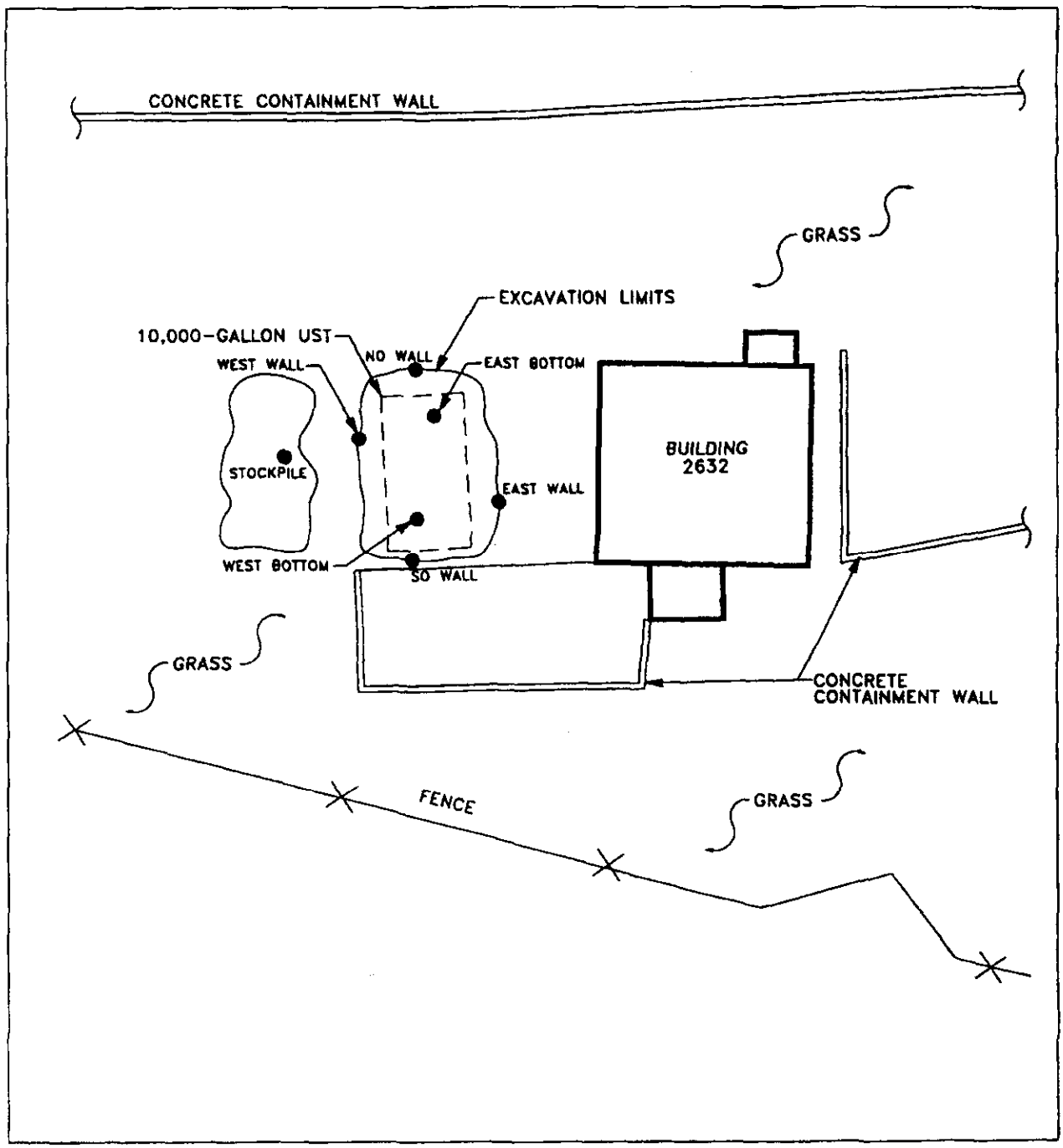

LEGEND

●EAST WALL SOIL SAMPLE LOCATION AND IDENTIFICATION

0 10 20
FEET

Sverdrup ENVIRONMENTAL	SITE MAP CLOSURE REPORT TANK FARM DECONTAMINATION CRANE, INDIANA	DWN: PTS	DES.:	PROJECT NO.: 000119
		CHKD:	APPD:	FIGURE NO.: 2
		DATE: 7/1/97	REV.: A	

n:\000119\gis\crane\ustfig2.dwg

Appendix I

Certificate of DESTRUCTION

IT IS HEREBY CERTIFIED that Warrior Oil Service, Inc. has received and processed 17100 gallons of waste #2 oil at our Franklin, IN facility. It is further certified that said oil will be used (burned) exclusively as an industrial boiler fuel.

Generator: N.S.W.C.

Receiving Date(s) 5/11/97 B/L No.(s): 19676

Joe Snedegar, President, WOS. Inc.

Date: 5-30-97

Certificate of DESTRUCTION

IT IS HEREBY CERTIFIED that Warrior Oil Service, Inc. has received and processed 1400 gallons of non-hazardous waste water at our Franklin, IN facility. It is further certified that said waste water has been disposed of properly & according to EPA Regulations and the city of Franklin.

Generator: N.S.W.C.

Receiving Date(s) 5/15/97 Invoice/Shipment No.(s): 19674

Joe Snedegar

Joe Snedegar, President, WOS, Inc.

Date: 5-30-97

Permit #IWP9000112

CERTIFICATE OF

QUALITY ASSURANCE

On this date, May 22, 1997, 50 gallons of sludge, Lot #M97141-2 and Manifest # XXXX were received, de-watered, stabilized, and disposed by ECOLOGICAL SYSTEMS, INC. in accordance with the United States Environmental Protection Agency, the Indiana Department of Environmental Management, and the City of Indianapolis regulations.

James C. Shoustal
Operator of Responsible Charge

Joseph C. Snodgrass
Vice-President of Operations

Re: NSWC TANKFARM
Invoice #: 8292

State of Indiana
Indiana Department of Environmental Management
327 IAC Article 3 Generic Construction and
Operator's Mobile Waste Water Pre-Treatment
Facility
Permit No. 2076

City of Indianapolis Industrial Discharge Permit No. 495303

State of Indiana
Indiana Department of Environmental Management
Special Waste Disposal Permit No. 60358

CERTIFICATE OF

QUALITY ASSURANCE

On this date, May 22, 1997, 1000 gallons of contaminated water, Lot #M97141-3 and Manifest # XXXX were received, treated, and discharged by ECOLOGICAL SYSTEMS, INC. in accordance with the United States Environmental Protection Agency, the Indiana Department of Environmental Management, and the City of Indianapolis regulations.

James C. Shoustal
Operator of Responsible Charge

Joseph C. Snodgrass
Vice President of Operations

Re: NSWC TANKFARM
Invoice #: 8293

State of Indiana
Indiana Department of Environmental Management
327 IAC Article 3 Generic Construction and
Operator's Mobile Waste Water Pre-Treatment
Facility
Permit No. 2076

City of Indianapolis Industrial Discharge Permit No. 495303

State of Indiana
Indiana Department of Environmental Management
Special Waste Disposal Permit No. 60358

EnviroSolve
Environmental, Inc.

Certificate of Quality Assurance

On this date, May 16, 1997, the following quantity of Material was received by EnviroSolve Environmental Management, Inc. for treatment, reclamation, and/or disposal in strict accordance with all local, state and federal regulations.

Generating Location: Specialty Systems
Quantity: 1,000 Gallons
Material: Gasoline and #6 Fuel Oil

Invoice #: 9108
Profile #: 16140

Troy D. Flowers, Executive Vice President

City of Indianapolis Industrial Discharge Permit No. 495306

CERTIFICATE OF

QUALITY ASSURANCE

On this date, May 15, 1997, 2400 gallons of contaminated water, Lot #B97135-14 and Manifest # XXXX were received, treated, and discharged by ECOLOGICAL SYSTEMS, INC. in accordance with the United States Environmental Protection Agency, the Indiana Department of Environmental Management, and the City of Indianapolis regulations.

James C. Shoustal
Operator of Responsible Charge

Joseph C. Snodgrass
Vice President of Operations

Re: CRANE NAVAL BASE
Invoice #: 8188

State of Indiana
Indiana Department of Environmental Management
327 IAC Article 3 Generic Construction and
Operator's Mobile Waste Water Pre-Treatment
Facility
Permit No. 2076

City of Indianapolis Industrial Discharge Permit No. 495303

State of Indiana
Indiana Department of Environmental Management
Special Waste Disposal Permit No. 60358

Shipper's No.

[Carrier] SCAC: Carrier's No.

at date from

(Mail or street address of consignee for purposes of notification only)

TO:
Consignee
Street
Destination Zip

FROM:
Shipper
Street
Origin Zip

Route:

Delivering Carrier

1	Y	T/T Gasoline UN1203 mix pw/ EC Fuel only	3			1000				

Remit C.O.D. to:
Address:
City: State: Zip:

COD AMT: $

Charges Advanced $

C. O. D. FEE:
Prepaid ☐
Collect ☐ $

FREIGHT CHARGES
☐ Prepaid ☐ Collect

☐ Yes ☐ No - Prepayment or Carrier Instructions

SHIPPER: E M S C
PER: Quinn Wilson DATE: 5/16/97

CARRIER: SSHW
PER: Scott Rogers DATE: 5/16/97

EMERGENCY RESPONSE TELEPHONE NUMBER: 801 1261 2630

29-BLS-44 (Rev. 1/96)

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STRAIGHT BILL OF LADING – SHORT FORM – Original – Not Negotiable

Shipper's No.

Carrier SSHW SCAC. Carrier's No. 560242

at date from

(Mail or street address of consignee for purposes of notification only.)

TO: Consignee ESF. Street Mass. Ave Destination Indpls. Zip

FROM: Shipper USWC Tankfarm Street Crane Indiana Origin Zip

Route:

Delivering Carrier

1	WO	Water + waste oil				1000 gal		

Driver cleaned out own truck.

Bart Bidwell #197144-3

Permit C.O.D. to: Address: City: State: Zip:

COD AMT: $

Charges Advanced $

C.O.D. FEE: Prepaid ☐ Collect ☐ $

FREIGHT CHARGES ☐ Prepaid ☐ Collect

SHIPPER: E.M.S.C. PER: DATE: 5/21/97

CARRIER: SSHW PER: DATE: 5/21/97

EMERGENCY RESPONSE TELEPHONE NUMBER: (317) 269-2126

29-BL8-A4 (Rev. 7/95)

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STRAIGHT BILL OF LADING – SHORT FORM – Original – Not Negotiable

Shipper's No.

(Carrier) SSHW SCAC. Carrier's No. USDOT 560212

at date from

TO: Consignee E.S.I
Street
Destination MASS AVE Indpls In Zip

FROM: Shipper NSWC Tankfarm
Street crane Ind. inc
Origin Zip

Route:

Delivering Carrier

1	W	Gal Residue							
		Clean-out 30 min							
		Bert Bidwell M97144-2							

Recall C.O.D. to:
Address:
City: State: Zip:

COD AMT: $

Charges Advanced $

C. O. D. FEE: Prepaid ☐ Collect ☐ $

FREIGHT CHARGES ☐ Prepaid ☐ Collect

SHIPPER: GMSC
PER: DATE: 5-22-97

CARRIER: SSHW
PER: DATE: 5-22-97
EMERGENCY RESPONSE TELEPHONE NUMBER: (317) 249 2101

29-BLS-A4 (Rev. 7/96)

WARRIOR OIL SERVICE, INC.
P.O. Box 382
FRANKLIN, INDIANA 46131
(317) 738-9777

CUSTOMER'S ORDER NO. | PHONE | DATE 5-12-77

NAME NSWC
ADDRESS Navy
Crane In

SOLD BY | CASH | C.O.D. | CHARGE | ON ACCT. | MONEY RECD. | PAID OUT

QTY.	DESCRIPTION	PRICE	AMOUNT
700	gal waste oil		

IN ACCORDANCE TO CFR 40 PART 279 GENERATOR AS NAMED ABOVE CERTIFIES THAT THIS USED OIL HAS NOT BEEN MIXED WITH HAZARDOUS WASTE.

TAX

RECEIVED BY [signature]

TOTAL 95.00

All claims and returned goods MUST be accompanied by this bill.

19673

WARRIOR OIL SERVICE, INC.
P.O. Box 382
FRANKLIN, INDIANA 46131
(317) 738-9777

CUSTOMER'S ORDER NO. | PHONE | DATE 5-12-77

NAME NSWC
ADDRESS Navy
Crane In

SOLD BY | CASH | C.O.D. | CHARGE | ON ACCT. | MONEY RECD. | PAID OUT

QTY.	DESCRIPTION	PRICE	AMOUNT
1200	gal waste Oil		

IN ACCORDANCE TO CFR 40 PART 279 GENERATOR AS NAMED ABOVE CERTIFIES THAT THIS USED OIL HAS NOT BEEN MIXED WITH HAZARDOUS WASTE.

TAX

RECEIVED BY [signature]

TOTAL

All claims and returned goods MUST be accompanied by this bill

19678

JUN 06 '97 09:10AM DW FRIT INF COD OSC P.2

WARRIOR OIL SERVICE, INC.

P.O. Box 382
FRANKLIN, INDIANA 46131
(317) 738-9777

CUSTOMER'S ORDER NO.	PHONE	DATE 4/24/97
NAME		
ADDRESS		

SOLD BY	CASH	C.O.D.	CHARGE	ON ACCT.	MDSE RETD.	PAID OUT

QTY.	DESCRIPTION	PRICE	AMOUNT
3,000	gal waste Oil		
	IN ACCORDANCE TO CFR 40 PART 279 GENERATOR AS NAMED ABOVE CERTIFIES THAT THIS USED OIL HAS NOT BEEN MIXED WITH HAZARDOUS WASTE.	TAX	
RECEIVED BY		TOTAL	

19638

All claims and returned goods MUST be accompanied by this bill.

Thank You

Shipper's No. _____

(Carrier) SSHG

Received, subject to the classifications and tariffs in effect on the date of this Bill of Lading:

SCAC. _____ Carrier's No. _____

at _____ date _____ from _____

the property described below, in apparent good order, except as noted (contents and condition of contents of packages unknown), marked, consigned, and destined as indicated below, which said carrier (the word carrier being understood throughout this contract as meaning any person or corporation in possession of the property under the contract) agrees to carry to the usual place of delivery at said destination, if on its own route, otherwise to deliver to another carrier on the route to said destination. It is mutually agreed, as to each carrier of all or any portion of said property over all or any portion of said route to destination, and as to each party at any time interested in all or any of said property, that every service to be performed hereunder shall be subject to all the conditions not prohibited by law, whether printed or written, herein contained including those on the back hereof, which are hereby agreed to by the shipper and accepted for himself and his assigns.

TO: (Mail or street address of consignee for purposes of notification only.)
Consignee E.S.L.
Street
Destination _____ Zip

FROM: Camp Dawson Base
Shipper
Street
Origin _____ Zip

Route:

Delivering Carrier

1	NO	#6 Oil Burner				DAMAGED			

Remit C.O.D. to:
Address:
City: State: Zip:

COD AMT: $

Charges Advanced $

Subject to Section 7 of conditions, if this shipment is to be delivered to the consignee without recourse on the consignor, the consignor shall sign the following statement:
The carrier shall not make delivery of this shipment without payment of freight and all other lawful charges.

(Signature of consignor)

C. O. D. FEE:
Prepaid ☐
Collect ☐ $

FREIGHT CHARGES
☐ Prepaid ☐ Collect

☐ YES ☐ NO - FURNISHED BY CARRIER
DRIVER'S SIGNATURE:

NO

SHIPPER: _____
PER: _____ DATE: _____

CARRIER: SSHG
PER: [illegible] Carter DATE: 3/13/97

EMERGENCY RESPONSE TELEPHONE NUMBER: 800-261-2126

Marked at all times the Hazardous Material is in transportation including storage incidental to transportation (§172.604)

Permanent post office address of shipper

29-BLS-A4 (Rev. 7/95)

WARRIOR OIL SERVICE, INC.
P.O. Box 302
FRANKLIN, INDIANA 46131
(317) 738-9777

CUSTOMER'S ORDER NO. | PHONE | DATE

NAME

ADDRESS

SOLD BY | CASH | C.O.D. | CHARGE | ON ACCT. | MDSE. RET'D. | PAID OUT

QTY.	DESCRIPTION	PRICE	AMOUNT
4,000	Used waste Oil		

IN ACCORDANCE TO CFR 40 PART 279 GENERATOR AS NAMED ABOVE CERTIFIES THAT THIS USED OIL HAS NOT BEEN MIXED WITH HAZARDOUS WASTE.

TAX

RECEIVED BY

TOTAL

All claims and returned goods MUST be accompanied by this bill.

19728

WARRIOR OIL SERVICE, INC.
P.O. Box 302
FRANKLIN, INDIANA 46131
(317) 738-9777

CUSTOMER'S ORDER NO. | PHONE | DATE 7-5-97

NAME

ADDRESS

SOLD BY | CASH | C.O.D. | CHARGE | ON ACCT. | MDSE. RET'D. | PAID OUT

QTY.	DESCRIPTION	PRICE	AMOUNT
5000	Used waste Oil		
500	Used waste water		

IN ACCORDANCE TO CFR 40 PART 279 GENERATOR AS NAMED ABOVE CERTIFIES THAT THIS USED OIL HAS NOT BEEN MIXED WITH HAZARDOUS WASTE

TAX

RECEIVED BY

TOTAL

All claims and returned goods MUST be accompanied by this bill.

19730

WARRIOR OIL SERVICE, INC.
P.O. Box 382
FRANKLIN, INDIANA 46131
(317) 738-9777

CUSTOMER'S ORDER NO. | PHONE | DATE 4-30-97

NAME NS WC

ADDRESS Tank Farm

SOLD BY	CASH	C.O.D.	CHARGE	ON ACCT.	MDSE. RETD.	PAID OUT

QTY.	DESCRIPTION	PRICE	AMOUNT
3,000	gal	N/C	

IN ACCORDANCE TO CFR 40 PART 279 GENERATOR AS NAMED ABOVE CERTIFIES THAT THIS USED OIL HAS NOT BEEN MIXED WITH HAZARDOUS WASTE.

TAX

TOTAL

RECEIVED BY

All claims and returned goods MUST be accompanied by this bill.

184

WARRIOR OIL SERVICE, INC.
P.O. Box 382
FRANKLIN, INDIANA 46131
(317) 738-9777

CUSTOMER'S ORDER NO. | PHONE | DATE 5-1-97

NAME NS WC

ADDRESS Tank Farm

SOLD BY	CASH	C.O.D.	CHARGE	ON ACCT.	MDSE. RETD.	PAID OUT

QTY.	DESCRIPTION	PRICE	AMOUNT
1,800	gal	N/C	

IN ACCORDANCE TO CFR 40 PART 279 GENERATOR AS NAMED ABOVE CERTIFIES THAT THIS USED OIL HAS NOT BEEN MIXED WITH HAZARDOUS WASTE.

TAX

TOTAL

RECEIVED BY

All claims and returned goods MUST be accompanied by this bill.

19883

Appendix II

THE LAB™

Laboratory Analysis Bureau, Inc.

RESULTS OF ANALYSIS

CLIENT:

Environmental Monitor Systems Corporation
6464 Rucker Road
Indianapolis, Indiana 46220
(317) 255-6134 / FAX (317) 255-6070
Attention: Larry Schuck

PROJECT DATA:

Date of Report: May 06, 1997
Date of Sample: April 25, 1997
Date Received: April 28, 1997
Project Name: NBWC
Sample Description: 6T / 10,000 Gal UST NBWC

REQUESTED TESTING:

TCLP RCRA METALS (8)

Lab Number: 11447

Elements	Results	Method Det. Limit
Arsenic	BDL	0.005
Barium	BDL	10.0
Cadmium	BDL	0.1
Chromium	BDL	0.1
Lead	BDL	0.2
Mercury	BDL	0.005
Selenium	0.33	0.05
Silver	BDL	0.1

Note: BDL = Below Detection Limit
Units expressed in mg/L unless otherwise noted.

RUN INFORMATION:

Matrix:	TCLP Extraction (1311)	Analyst:	SR
Date of Extraction:	April 28, 1997	Lab No.:	442443
Date of Analysis:	May 01 & 02, 1997	Units of Measure:	mg/L
Test Method:	US EPA SW846-7000 Series	Instrument:	PE 3100 / AA [illegible]

PROJECT COMMENTS:

Check: _____
Test Code/12ST

REVIEWED BY: _____
Laboratory Manager

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5335 West Minnesota Street, Indianapolis, Indiana 46241 (317) 241-1008 / FAX (317) 241-1009

THE LAB

Laboratory Analysis Bureau, Inc.

RESULTS OF ANALYSIS

CLIENT:

Environmental Monitor Systems Corporation
6404 Rustler Road
Indianapolis, Indiana 46220
(317) 255-6134 / FAX (317) 256-4070
Attention: Larry Sobuck

PROJECT DATA:

Date of Report: May 06, 1997
Date of Sample: April 28, 1997
Date Received: April 28, 1997
Project Name: [illegible]
Sample Description: 91 / 10,000 Gal UST NBWC

REQUESTED TESTING:

TCLP VOLATILE ORGANIC COMPOUNDS

Lab Number: 11447

Compounds	Results	Method Det. Limit
Benzene	BDL	0.050
Carbon Tetrachloride	BDL	0.10
Chlorobenzene	BDL	0.10
Chloroform	BDL	0.10
1,2-Dichloroethane	BDL	0.050
1,1-Dichloroethylene	BDL	0.050
Methyl Ethyl Ketone	BDL	0.50
Tetrachloroethylene	BDL	0.050
Trichloroethylene	BDL	0.050
Vinyl Chloride	BDL	0.050

Note: BDL = Below Detection Limit
Units expressed in mg/L unless otherwise noted

RUN INFORMATION:

Matrix: TCLP Extraction (1311)
Date of Extraction: April 30, 1997
Date of Analysis: May 06, 1997
Test Method: [illegible]
Analyst: DN
Units of Measure: mg/L

PROJECT COMMENTS:

Check: [illegible]
Test Code: 1057

REVIEWED BY: [illegible]
Laboratory Manager

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THE LAB

Laboratory Analysis Bureau, Inc.

RESULTS OF ANALYSIS

CLIENT:

Environmental Monitor Systems Corporation
6464 Rucker Road
Indianapolis, Indiana 46220
(317) 255-9134 / FAX (317) 255-6070
Attention: Larry Sabuck

PROJECT DATA:

Date of Report: May 06, 1997
Date of Sample: April 25, 1997
Date Received: April 28, 1997
Project Name: NSWC
Sample Description: #1 / 10,000 Gal UST NSWC

REQUESTED TESTING:

TCLP SEMI-VOLATILE ORGANIC COMPOUNDS

Lab Number: 11447

Compound	Results	Method Det. Limit
Pyridine	BDL	0.04
1,4 - Dichlorobenzene	BDL	0.04
2 - Methylphenol	BDL	0.04
Hexachloroethane	BDL	0.04
4 - Methylphenol	BDL	0.04
Nitrobenzene	BDL	0.04
Hexachlorobutadiene	BDL	0.04
2,4,6 - Trichlorophenol	BDL	0.04
2,4,5 - Trichlorophenol	BDL	0.04
2,4 - Dinitrotoluene	BDL	0.04
Hexachlorobenzene	BDL	0.04
Pentachlorophenol	BDL	0.20

Note: BDL = Below Detection Limit
Units expressed in mg/L, unless otherwise noted.

RUN INFORMATION:

Matrix:	TCLP Extraction (1311)	Analyst:	BP
Date of Extraction:	April 29, 1997	Unit No.:	491080
Date of Analysis:	May 05, 1997	Units of Measure:	mg/L
Test Method:	[illegible]	Instrument:	HP [illegible]

PROJECT COMMENTS:

Check: [illegible]
Test Code: 1411

REVIEWED BY: [illegible]
Laboratory Manager

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Laboratory Analysis Bureau, Inc.

RESULTS OF ANALYSIS

CLIENT:

Environmental Monitor Systems Corporation
6464 Rucker Road
Indianapolis, Indiana 46220
(317) 255-6134 / FAX (317) 255-6070
Attention: Larry Schuck

PROJECT DATA:

Date of Report: May 08, 1997
Date of Sample: April 25, 1997
Date Received: April 29, 1997
Project Name: [illegible] NSWC
Sample Description: 62 / 8,000 Gal w/o AST NSWC

REQUESTED TESTING:

PCBs

Lab Number: 11448

Compounds	Results
1232	BDL
1242	BDL
1248	BDL
1254	BDL
1260	BDL
1262	BDL

Note: BDL = Below Detection Limit
Units expressed in ppm, unless otherwise noted.

RUN INFORMATION:

Matrix:	Sludge	Analyst:	SP / SP
Date of Extraction:	May 01, 1997	Unit No.:	[illegible]
Date of Analysis:	May 05, 1997	Method Det Limit:	0.0 mg/kg
Test Method:	[illegible]	Instrument:	[illegible]

PROJECT COMMENTS:

Check: [illegible]
Test Code: [illegible]

REVIEWED BY: [illegible]
Laboratory Manager

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Laboratory Analysis Bureau, Inc.

RESULTS OF ANALYSIS

CLIENT:

Environmental Monitor Systems Corporation
6404 Rucker Road
Indianapolis, Indiana 46220
(317) 255-6134 / FAX (317) 255-6070
Attention: Larry Sebock

PROJECT DATA:

Date of Report: May 06, 1997
Date of Sample: April 25, 1997
Date Received: April 26, 1997
Project Name: NSWC
Sample Description: #1 / 10,000 Gal UST NSWC

REQUESTED TESTING:

PCBs

Lab Number: 11447

Compounds	Results
1232	BDL
1242	BDL
1248	BDL
1254	BDL
1260	BDL
1262	BDL

Note: BDL = Below Detection Limit
Units expressed in mg/L unless otherwise noted.

RUN INFORMATION:

Matrix:	Oil	Analyst:	SP / SP
Date of Extraction:	May 01, 1997	Unit No.:	[illegible]
Date of Analysis:	May 05, 1997	Method Det Limit:	5.0 mg/kg
Test Method:	[illegible]	[illegible]:	[illegible]

PROJECT COMMENTS:

Check: [illegible]
Test Code: 1300

REVIEWED BY: [illegible]
Laboratory Manager

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SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
ATT: PETE SAZMA
13723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A036983

Sample ID: SS1

Date Collected: 5/12/97

Project: CRANE POL

Time Collected:

Project Name: COE LOUISVILLE CRANE

Date Received: 5/13/97

Sampler: T. YARBROUGH

Time Received: 8:30

State Certification:

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TRPH, GC	22.8	mg/kg	20.0	20.0	1	5/14/97	0:33	K.Walkup	8015	9460
GENERAL CHEMISTRY PARAMETERS										
Ignitability	NOT IGNITABLE TO 200F					5/13/97	16:02	B.Marlin	1010M	9342

ND = Not detected at the report limit.

Flash point/ignitability reported to the nearest 10 deg F.

Sample Extraction Data

DRO Extracted 5/13/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
DRO Surrogate,s	89.0	50. - 150.

COPY 1

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

ANALYTICAL REPORT

Laboratory Number: 97-A036983
Sample ID: SS1

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range

Report Approved By: Michael H. Dunn Report Date: 5/14/97

Theodore J. Duello, Ph.D.
Michael H. Dunn, M.S.
Danny B. Hale, M.S.

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
ATT: PETE SAZMA
13723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A036984

Sample ID: SS2

Date Collected: 5/12/97

Project: CRANE POL

Time Collected:

Project Name: COE LOUISVILLE CRANE

Date Received: 5/13/97

Sampler: T. YARBROUGH

Time Received: 8:30

State Certification:

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
GENERAL CHEMISTRY PARAMETERS										
Ignitability	NOT IGNITABLE TO 200F					5/13/97	16:02	B.Karlin	1010M	9342

ND = Not detected at the report limit.

Flash point/ignitability reported to the nearest 10 deg F.

Report Approved By: Michael H. Dunn Report Date: 5/14/97

Theodore J. Duello, Ph.D.
Michael H. Dunn, M.S.
Danny B. Hale, M.S.

COPY 1

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
ATT: PETE SAZMA
13723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A036985

Sample ID: SS3

Date Collected: 5/12/97

Project: CRANE POL

Time Collected:

Project Name: COE LOUISVILLE CRANE

Date Received: 5/13/97

Sampler: T. YARBROUGH

Time Received: 8:30

State Certification:

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TRPH, GC	ND	mg/kg	20.0	20.0	1	5/14/97	2:57	K.Walkup	8015	9460
GENERAL CHEMISTRY PARAMETERS										
Ignitability	NOT IGNITABLE TO 200F					5/13/97	16:02	B.Marlin	1010M	9342

ND = Not detected at the report limit.

Flash point/ignitability reported to the nearest 10 deg F.

Sample Extraction Data

DRO Extracted 5/13/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
DRO Surrogate,s	90.0	50. - 150.

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

ANALYTICAL REPORT

Laboratory Number: 97-A036985
Sample ID: SS3

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range

Report Approved By: Michael H. Dunn Report Date: 5/14/97

Theodore J. Duello, Ph.D.
Michael H. Dunn, M.S.
Danny B. Hale, M.S.

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
ATT: PETE SAZMA
13723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A036986

Sample ID: SS4

Date Collected: 5/12/97

Project: CRANE POL

Time Collected:

Project Name: COE LOUISVILLE CRANE

Date Received: 5/13/97

Sampler: T. YARBROUGH

Time Received: 8:30

State Certification:

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
GENERAL CHEMISTRY PARAMETERS										
Ignitability	NOT IGNITABLE TO 200F					5/13/97	16:02	B.Marlin	1010M	9342

ND = Not detected at the report limit.

Flash point/ignitability reported to the nearest 10 deg F.

Report Approved By: Michael H. Dunn

Report Date: 5/14/97

Theodore J. Duello, Ph.D.
Michael H. Dunn, M.S.
Danny B. Hale, M.S.

COPY 1

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
ATT: PETE SAZMA
13723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A036987

Sample ID: SS5

Date Collected: 5/12/97

Project: CRANE POL

Time Collected:

Project Name: COE LOUISVILLE CRANE

Date Received: 5/13/97

Sampler: T. YARBROUGH

Time Received: 8:30

State Certification:

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
GENERAL CHEMISTRY PARAMETERS										
Ignitability	NOT IGNITABLE TO 200F					5/13/97	16:02	B.Marlin	1010M	9342

ND = Not detected at the report limit.

Flash point/ignitability reported to the nearest 10 deg F.

Report Approved By: Michael H. Dunn Report Date: 5/14/97

Theodore J. Duello, Ph.D.
Michael H. Dunn, M.S.
Danny B. Hale, M.S.

COPY 1

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

PROJECT QUALITY CONTROL DATA

Matrix Spike Recovery

Analyte	units	Orig. Val.	MS Val	Spike Conc	Recovery	Target Range	Q.C. Batch
TRPH, GC	mg/kg	< 20.0	52.4	80.0	65.50	45. - 121.	9460

Matrix Spike Duplicate

Analyte	units	Orig. Val.	Duplicate	RPD	Limit	Q.C. Batch
TRPH, GC	mg/kg	52.4	49.2	6.30	26.	9460

Laboratory Control Data

Analyte	units	Known Val.	Analyzed Val	% Recovery	Target Range	Q.C. Batch
TRPH, GC	mg/kg	80.0	75.2	94.	45. - 121.	9460

Blank Data

Analyte	Blank Value	Units	Q.C. Batch
TRPH, GC	< 20.0	mg/kg	9460

SPECIALIZED ASSAYS
ENVIRONMENTAL

REFERRING CLIENT
Account: 6116
Sverdrup - Indiana

13723 Riverport Drive
Maryland Heights, MO 63043
Ph: 314-770-4012 Fax: 314-770-5108

2960 Foster Creighton Drive
Nashville, TN 37204
615-726-0177
FAX 615/726-3404

Specialized Assays: (800) 765-0980

NG CONTROL NUMBER (FOR LAB USE ONLY): 68353

PROJECT #: CRANE POL

P.O. #: 119-55

LERS (Signature-Please Print): J.G. YARBROUGH

PROJECT NAME: CoE Louisville - Crane

FOR LAB USE ONLY ACC#	SAMPLE DESCRIPTION	DATE	TIME	COMP	GRAB	# of cont	ANALYSIS REQUESTED
97-A036983	SS 1	5-12-97			X	1	FLASHPOINT, TPH 8015-I
97-A036984	SS 2				X	1	FLASHPOINT
97-A036985	SS 3				X	1	FLASHPOINT, TPH 8015-I
97-A036986	SS 4				X	1	FLASHPOINT
7-A036987	SS 5				X	1	FLASHPOINT

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Received for Laboratory by:	Date / Time
	5-12-97 1400		CBB	5/13/97 830
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Remarks	
Relinquished by: (Signature)	Date / Time	Received by: (Signature)		
Relinquished by: (Signature)	Date / Time	Received by: (Signature)		

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2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
ATT: PETE SAZMA
13723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A047078

Sample ID: NO WALL

Date Collected: 6/11/97

Project: UST 2760

Time Collected:

Project Name: CRANE POL

Date Received: 6/12/97

Sampler: T.G. YARBROUGH

Time Received: 8:30

State Certification:

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TRPH, GC	ND	mg/kg	20.0	20.0	1	6/12/97	20:46	K.Walkup	8015	7110

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 6/12/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
DRO/TPH Hi Surr., triacontane	89.0	50. - 150.

Report Approved By: Michael H. Dunn Report Date: 6/13/97

Theodore J. Duello, Ph.D.
Michael H. Dunn, M.S.
Danny B. Hale, M.S.

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ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
ATT: PETE SAZMA
13723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A047079

Sample ID: EAST WALL

Date Collected: 6/11/97

Project: UST 2760

Time Collected:

Project Name: CRANE POL

Date Received: 6/12/97

Sampler: T.G. YARBROUGH

Time Received: 8:30

State Certification:

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TRPH, GC	ND	mg/kg	20.0	20.0	1	6/12/97	21:32	K.Walkup	8015	7110

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 6/12/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
DRO/TPH Hi Surr., triacontane	92.0	50. - 150.

Report Approved By: Michael H. Dunn Report Date: 6/13/97

Theodore J. Duello, Ph.D.
Michael H. Dunn, M.S.
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ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
ATT: PETE SAZMA
13723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A047080

Sample ID: SO WALL

Date Collected: 6/11/97

Project: UST 2760

Time Collected:

Project Name: CRANE POL

Date Received: 6/12/97

Sampler: T.G. YARBROUGH

Time Received: 8:30

State Certification:

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TRPH, GC	ND	mg/kg	20.0	20.0	1	6/12/97	22:19	K.Walkup	8015	7110

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 6/12/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
DRO/TPH Hi Surr., triacontane	94.0	50. - 150.

Report Approved By: Michael H. Dunn Report Date: 6/13/97

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ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
ATT: PETE SAZMA
13723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A047081

Sample ID: WEST WALL

Date Collected: 6/11/97

Project: UST 2760

Time Collected:

Project Name: CRANE POL

Date Received: 6/12/97

Sampler: T.G. YARBROUGH

Time Received: 8:30

State Certification:

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TRPH, GC	ND	mg/kg	20.0	20.0	1	6/12/97	23:06	K.Walkup	8015	7110

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 6/12/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
DRO/TPH Hi Surr., triacontane	98.0	50. - 150.

Report Approved By: Michael H. Dunn Report Date: 6/13/97

Theodore J. Duello, Ph.D.
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ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
ATT: PETE SAZMA
13723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A047082

Sample ID: EAST BOTTOM

Date Collected: 6/11/97

Project: UST 2760

Time Collected:

Project Name: CRANE POL

Date Received: 6/12/97

Sampler: T.G. YARBROUGH

Time Received: 8:30

State Certification:

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TRPH, GC	ND	mg/kg	20.0	20.0	1	6/12/97	23:53	K.Walkup	8015	7110

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 6/12/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
DRO/TPH Hi Surr., triacontane	94.0	50. - 150.

Report Approved By: Michael H. Dunn Report Date: 6/13/97

Theodore J. Duello, Ph.D.
Michael H. Dunn, M.S.
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ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
ATT: PETE SAZMA
13723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A047083

Sample ID: WEST BOTTOM

Date Collected: 6/11/97

Project: UST 2760

Time Collected:

Project Name: CRANE POL

Date Received: 6/12/97

Sampler: T.G. YARBROUGH

Time Received: 8:30

State Certification:

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TRPH, GC	ND	mg/kg	20.0	20.0	1	6/13/97	0:40	K.Walkup	8015	7110

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 6/12/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
DRO/TPH Hi Surr., triacontane	94.0	50. - 150.

Report Approved By: Michael H. Dunn Report Date: 6/13/97

Theodore J. Duello, Ph.D.
Michael H. Dunn, M.S.
Danny B. Hale, M.S.

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ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
ATT: PETE SAZMA
13723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A047084

Sample ID: STOCKPILE

Date Collected: 6/11/97

Project: UST 2760

Time Collected:

Project Name: CRANE POL

Date Received: 6/12/97

Sampler: T.G. YARBROUGH

Time Received: 8:30

State Certification:

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TRPH, GC	ND	mg/kg	20.0	20.0	1	6/13/97	1:26	K.Walkup	8015	7110

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 6/12/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
DRO/TPH Hi Surr., triacontane	96.0	50. - 150.

Report Approved By: Michael H. Dunn Report Date: 6/13/97

Theodore J. Duello, Ph.D.
Michael H. Dunn, M.S.
Danny B. Hale, M.S.

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Phone 1-615-726-0177

PROJECT QUALITY CONTROL DATA

Matrix Spike Recovery

Analyte	units	Orig. Val.	MS Val	Spike Conc	Recovery	Target Range	Q.C. Batch
TRPH, GC	mg/kg	< 20.0	73.6	80.0	92.00	45. - 121.	7110

Matrix Spike Duplicate

Analyte	units	Orig. Val.	Duplicate	RPD	Limit	Q.C. Batch
TRPH, GC	mg/kg	73.6	65.2	12.10	26.	7110

Blank Data

Analyte	Blank Value	Units	Q.C. Batch
TRPH, GC	< 20.0	mg/kg	7110

SPECIALIZED ASSAYS
ENVIRONMENTAL

REFERRING CLIENT
Account: 6116
Sverdrup - Indiana

13723 Riverport Drive
Maryland Heights, MO 63043
Ph: 314-770-4012 Fax: 314-770-5108

2960 Foster Creighton Drive
Nashville, TN 37204
615-726-0177
FAX 615/726-3404

Specialized Assays: (800) 765-0980

BILLING CONTROL NUMBER (FOR LAB USE ONLY): 70745
PROJECT #: UST # 2760
P.O. #: 119-55
SAMPLERS (Signature-Please Print): T.G. Yarbrough
PROJECT NAME: Crane POL

FOR LAB USE ONLY ACC#	SAMPLE DESCRIPTION	DATE	TIME	COMP	GRAB	# OF CONT	ANALYSIS REQUESTED
97-A047078	No. Wall	6-11-97			X	1	TPH 8015 - IN
97-A047079	East Wall				X	1	
97-A047080	So. Wall				X	1	
97-A047081	West Wall				X	1	
97-A047082	East Bottom				X	1	
97-A047083	West Bottom				X	1	
97-A047084	Stockpile				X	1	

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Received for Laboratory by:	Date / Time
	6-11 1500		CBB	6/12/97 830
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Remarks	
Relinquished by: (Signature)	Date / Time	Received by: (Signature)		
Relinquished by: (Signature)	Date / Time	Received by: (Signature)		

For further assistance in completing the chain of custody form please refer to the instructions found on the opposite side

UST SYSTEM CLOSURE REPORT

N: NOT SUBMITTED S: SUBMITTED N/A: NOT APPLICABLE I: INADEQUATE A: ADEQUATE

	N	S	N/A	I	A	COMPLETE DATE	RESPONSIBLE PARTY
1		X					OWNER/OPERATOR NAME, OWNER I.D. #, ADDRESS, & PHONE NUMBER
2	X						CONTACT PERSON, OWNER/OPERATOR AFFILIATION, PHONE #
3	X		X				PAST OWNER/OPERATORS

	N	S	N/A	I	A		UST CONTRACTOR
4		X					UST CLOSURE CONTRACTOR NAME & ADDRESS
5		X					NAME AND OSFM CERTIFICATION NUMBER

	N	S	N/A	I	A		UST SITE
6		X					FACILITY NAME, I.D. NUMBER, ADDRESS, & PHONE NUMBER
7		X					TYPE OF FACILITY, PAST AND PRESENT OPERATIONS
8		X					COVERAGE (PAVED OR NONPAVED, ETC.)
9	X		X				HISTORY OF SPILL REPORTS (BY INCIDENT NUMBER)
10		X					SITE SURROUNDINGS
11		X					SITE SOIL TEXTURE

	N	S	N/A	I	A		SITE SPECIFIC MAP
12		X					APPROPRIATE SCALE AND LEGENDS
13		X					BUILDINGS/STRUCTURES AND SITE BOUNDARIES
14		X					LOCATIONS OF ALL USTs AT SITE
15		X					TANK EXCAVATION WITH DIMENSIONS
16	X		X				LOCATION OF ANY PREVIOUSLY CLOSED UST SYSTEMS
17	X		X				LOCATION OF PUMP ISLANDS
18	X		X				LOCATIONOF UST PIPING (REMOVED AND NON-REMOVED PIPING)
19	X		X				IDENTIFIED BURIED UTILITY LINES
20	X		X				SOIL BORING LOCATIONS (IN-PLACE CLOSURE)
21	X						DRAINAGE FEATURES (NATURAL AND CONSTRUCTED)
22		X					SAMPLING LOCATIONS (SOIL AND WATER)
23	X		X				GROUNDWATER MONITORING WELL LOCATIONS

	N	S	N/A	I	A		UNDERGROUND STORAGE TANK(S)
24		X					NUMBER AND VOLUME OF TANKS(S)
25		X					PAST AND PRESENT CONTENTS OF TANK(S)
26		X					CONSTRUCTION MATERIAL OF TANK(S)
27	X						AGE AND INSTALLATION DATES OF TANK(S)
28		X					LEAK DETECTION METHODS USED
29	X		X				RECORDS OF TANK TIGHTNESS TEST RESULTS
30	X		X				RECORDS OF ANY OTHER LEAK DETECTION METHOD RESULTS
31	X		X				INFORMATION ON ANY PREVIOUSLY CLOSED UST SYSTEMS

*=SEE SPECIFIC COMMENTS

FACILITY I.D.: OWNER I.D.: LUST I.D.: CRANE TANK FARM

	N	S	N/A	I	A		SAMPLE RESULTS
32		X					DATA FROM ANALYSIS OF SOIL SAMPLES (TPH, ETC.)
33	X		X				DATA FROM ANALYSIS OF WATER SAMPLES (BTEX, ETC.)
34		X					PROPER SAMPLE NUMBERS FOR CROSS REFERENCE TO UST SITE MAPS
35		X					ANALYTICAL METHOD USED
36		X					DETECTION LIMITS USED
37		X					SIGNED CERTIFICATE OF ANALYSIS
38		X					CHAIN OF CUSTODY DOCUMENTATION
39	X		X				TIER II WASTE OIL ANALYSIS
40		X					DECONTAMINATION PROCEDURES
41	X						SAMPLING PROCEDURES AND TECHNIQUES
42		X					EXCAVATION SAMPLES
43	X		X				PIPING RUN SAMPLES
44	X		X				PUMP ISLAND SAMPLES

	N	S	N/A	I	A		MISCELLANEOUS CLOSURE DOCUMENTATION
45		X					DATE OF CLOSURE
46	X		X				SOIL BORING LOGS GIVENG LITHOLOGY DESCRIPTIONS (IN-PLACE)
47	X		X				SOIL BORING LOGS ALL USING SAME VERTICAL SCALE (IN-PLACE)
48	X		X				DOCUMENTATION OF ANY OVEREXCAVATION ACTIVITIES
49		X					APPROXIMATE AMOUNT OF SOILS EXCAVATED
50		X					DOCUMENTATION FO DISPOSAL OR TREATMENT OF SOILS OR WATER
51		X					DOCUMENTATION FO DISPOSAL FOR REMAINING PRODUCT AND SLUDGE
#		X					DOCUMENTATION FO DISPOSAL FOR CLOSED UST SYSTEM

*=SEE SPECIFIC COMMENTS

SPECIFIC COMMENTS:

CC:

FACILITY I.D.: OWNER I.D.: LUST I.D.: CRANE TALK FARM

ATTACHMENT E

WORK PERFORMED
TANK FARM
CRANE SURFACE WARFARE CENTER
CRANE DIVISION CRANE, INDIANA

STORAGE TANK REMOVAL and
INSTALLATION PROGRAM
DACA27-94-D-0013 DO #59

Prepared for:

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, LOUISVILLE DISTRICT
LOUISVILLE, KENTUCKY

Prepared by:

Sverdrup

Sverdrup Environmental, Inc.
13723 Riverport Drive
Maryland Heights, Missouri 63043

October 29, 1997

October 29, 1997

Mr. Brian Lorence
Corps of Engineers
Louisville Project Office
810 North 27th Street
Louisville, KY 40202

Re: Tank Farm Remedial Action - Crane Naval Surface Warfare Center
Crane, Indiana
Storage Tank Removal and Installation Program
Statewide Indiana
DACA27-94-D-0013 D.O. #59 Case DL

Dear Mr. Lorence:

The following letter report describes activities performed by Sverdrup Environmental, Inc. (SvE) during the remedial action activities at the Tank Farm located at Crane Naval Surface Warfare Center (NSWC) near Crane, Indiana. The NSWC is owned and operated by the United States Navy.

UST CONTRACTOR

Remedial action activities at the Tank Farm were conducted by SvE under the Storage Tank Removal and Installation Program Statewide Indiana contract (DACA27-94-0013) with the U.S. Army Corps of Engineers - Louisville District. The SvE world headquarters are located at 13723 Riverport Drive, Maryland Heights, Missouri 63043.

SITE DESCRIPTION

The NSWC Tank Farm is located in the west central portion of the NSWC facility (See Figure 1 for the Tank Farm layout). Two previous phases of work have been completed to date. In April through June 1997, phase I, seven (7) aboveground storage tank (AST) and one (1) underground storage tank (UST) were removed. Phase II included the removal of the interior concrete structures which consisted of a interior wall and the AST concrete footings. The remedial action activities of D.O. #59, (phase III), includes soil analytical testing and contaminated soil removal. The Tank Farm consists of a perimeter concrete retaining wall approximately three (3) feet high by six (6) inches thick. This perimeter wall was not included in the original concrete demolition in order to contain any potential contamination that may exist within the Tank Farm.

WORK PERFORMED

Preliminary Sampling Activities - Prior to remedial action activities, a sampling grid (25 feet by 50 feet) was developed to collect 38 samples within the containment area of the Tank farm. Figure 2 presents a site map showing the 38 soil sampling locations. The 38 soil sample locations were collected to determine if the shallow subsurface soils (0 to 2 feet depth) could be utilized for excavation backfilling. Two samples were collected at each location, one at one (1) foot depth and the other at two (2) foot depth. The two samples collected at each location were then composited into one sample and submitted for laboratory analysis. The soil samples were analyzed for Total Petroleum Hydrocarbons (TPH) by USEPA Method 8015- Indiana. Following laboratory analysis, areas with TPH concentrations below 100 mg/kg will be used to backfill the excavations. The preliminary soil sampling analytical results are shown in Table 1.

Excavation Activities - A preliminary subsurface study of the Tank Farm area was previously performed by the United States Army Corps of Engineers (USACE). Based on information obtained during the preliminary study, areas that indicated a presence of contamination were included in the remedial action activities (Phase III). The areas of known contamination are shown in Figure 3.

The excavation activities included overexcavation of subsurface soils in the areas of known contamination. The excavated soils were stockpiled within the Tank Farm containment area. A series of field drawings showing daily progress including excavation dimensions and locations are included in Appendix I. The following table summarizes the daily excavation dimensions and estimated volumes of contaminated soil.

DATE	EXCAVATION DIMENSIONS	ESTIMATED VOLUME OF SOIL REMOVED
9-2-97	42' x 26' x 2' depth 25' x 33' x 1' depth 11' x 9' x 4' depth	127 cubic yards
9-3-97	45'- 40' x 108' x 2'-3' depth	459 cubic yards
9-4-97	51' x 30' x 3.5' depth	200 cubic yards
9-5-97	17'-22' x 91' x 4'-6' depth	296 cubic yards
9-8-97	5' x 100' x 3' depth 70' x 15' x 2' depth	134 cubic yards
9-9-97	55' x 22' x 6' depth 110' x 8' x 6' depth 7' x 25' x 6' depth	509 cubic yards
9-10-97	412' x 8' x 6' depth 55' x 45' x 6' depth	787 cubic yards
9-18-97	26' x 60' x 4' depth	231 cubic yards
9-19-97	78' x 2.5' x 3' depth 30' x 52' x 4' depth	130 cubic yards
9-22-97	32' x 21' x 3' depth	75 cubic yards

A total estimated volume of approximately 2,750 cubic yards of contaminated soil was excavated and stockpiled during the remedial action activities. Appendix II contains photographic documentation of the activities conducted at the site.

Excavation Sampling and Laboratory Analysis - A total of twenty-seven (27) confirmatory soil samples were collected from the Tank Farm excavations. One (1) soil sample was collected for every 250 square feet of excavation bottom. The samples were sent via Federal Express to Specialized Assays Environmental, Inc. of Nashville Tennessee for laboratory analysis. The soil samples were analyzed for TPH using USEPA Method 8015- Indiana. Sample (SW Corner-8) was also analyzed for TCLP lead using USEPA Method 6010. Sample LOC-35-3' was also analyzed for volatile organic compounds (VOC's) using USEPA Method 8260. The laboratory analytical results are summarized in Table 2. Figure 4 shows the excavation soil samples locations. Table 2 also lists the corresponding map identification numbers used in Figure 4. Appendix III contains the laboratory analytical report sheets.

Backfilling - Following removal of all visible contamination and soil sample collection from each excavation, the excavations were backfilled with clean soil. The clean soil was obtained from the northwest quadrant of the containment area. (See the preliminary sampling activities section.)

The on-site government's representative, Mr. Lee Benson, determined that the stockpiled contaminated soils (approximately 2,750 cubic yards) would be handled within the containment area at the Tank Farm. For future treatment and to facilitate natural attenuation of the contaminated soil, the stockpiled contaminated soils were spread evenly over the southeastern two-thirds of the containment area. The soil was spread out within the containment area at a 1.5 to 2 foot depth.

In the extreme southern corner of the containment area, a gravel layer containing petroleum contamination was encountered at a depth of 7 feet below ground surface. Mr. Lee Benson instructed SvE personnel not to excavate the 62 foot x 58 foot area. The volume of contaminated soil that would require excavation was determined to exceed the scope of work for this delivery order. Exploratory excavations outside of the containment area indicated that the gravel layer containing petroleum contamination extends beyond the containment area. Therefore, the 62 foot x 58 foot area was segregated from the rest of the containment area with a berm of clean soil and will be addressed under a subsequent phase of work at the Tank Farm.

CONCLUSIONS

Based on laboratory analytical results, SvE concludes that TPH concentrations of soil samples collected from within the excavations are below levels that are usually indicative of environmental soil contamination (i.e., TPH - 100 ppm).

Sverdrup Environmental, Inc. appreciates the continued opportunity to provide environmental and engineering services to the USCOE. Please do not hesitate to call if you should have any questions regarding this report.

Sincerely,

SVERDRUP ENVIRONMENTAL, INC.

Dan R. Ayres
Project Geologist

TABLE 1
ANALYTICAL RESULTS
PRELIMINARY SOIL SAMPLING

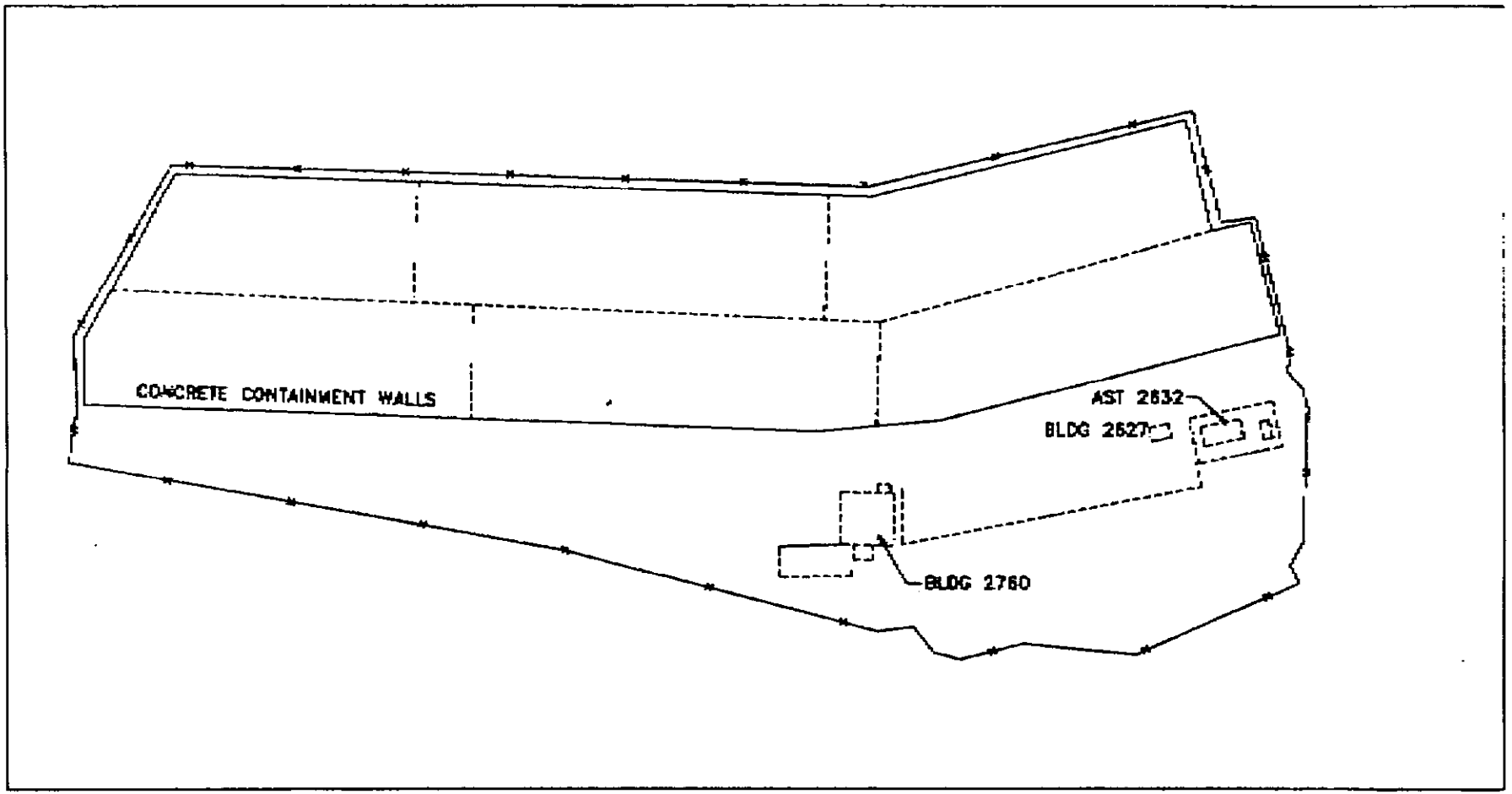
DATE COLLECTED	SAMPLE ID	TPH (METHOD 8015)
8-14-97	TF-1	ND
8-14-97	TF-2	ND
8-14-97	TF-3	ND
8-25-97	TF-4	19.2 ppm
8-25-97	TF-5	ND
8-18-97	TF-6	ND
8-18-97	TF-7	ND
8-18-97	TF-8	409 ppm
8-18-97	TF-9	323.8 ppm
8-18-97	TF-10	15.6 ppm
8-18-97	TF-11	128 ppm
8-14-97	TF-12	ND
8-14-97	TF-13	ND
8-18-97	TF-14	ND
8-25-97	TF-15	ND
8-18-97	TF-16	ND
8-26-97	TF-17	ND
8-26-97	TF-18	27.1 ppm
8-26-97	TF-19	960 ppm
8-18-97	TF-20	10.2 ppm
8-18-97	TF-21	ND
8-18-97	TF-22	ND
8-25-97	TF-23	ND
8-25-97	TF-24	ND
8-25-97	TF-25	ND
8-25-97	TF-26	ND
8-26-97	TF-27	ND
8-26-97	TF-28	ND
8-26-97	TF-29	ND
8-26-97	TF-30	42 ppm
8-25-97	TF-31	ND
8-25-97	TF-32	ND
8-25-97	TF-33	ND
8-25-97	TF-34	56 ppm
8-26-97	TF-35	23.8 ppm
8-26-97	TF-36	130 ppm
8-26-97	TF-37	49.2 ppm
8-26-97	TF-38	2466.9 ppm

ND = not detected at the report limit
All results in mg/kg (parts per million)

TABLE 2
SUMMARY OF ANALYTICAL RESULTS - EXCAVATION SOIL SAMPLING

DATE COLLECTED	CORRESPONDING MAP ID	SAMPLE ID	TPH (8015)	TCLP (6010)	VOC's (8260)
9-9-97	26	LOC11-4'	ND	—	—
9-9-97	9	LOC8-2'	ND	—	—
9-9-97	9A	LOC8-3.5'	ND	—	—
9-9-97	11	LOC7-2'	19.3 ppm	—	—
9-9-97	12	LOC7-5'	ND	—	—
9-9-97	7	LOC-35-3'	341 ppm	—	1,1 Dichloroethene 0.012 ppm cis-1,2, Dichloroethene 0.0030 ppm
9-10-97	19	SW CORNER 8	8326 ppm	ND	—
9-11-97	20	SOUTH TRENCH-1	ND	—	—
9-12-97	18	NORTH P.TRENCH-1	ND	—	—
9-12-97	17	NORTH P.TRENCH-2	ND	—	—
9-12-97	16	NORTH P.TRENCH-3	ND	—	—
9-12-97	15	NORTH P.TRENCH-4	ND	—	—
9-12-97	14	NORTH P.TRENCH-5	ND	—	—
9-12-97	13	NORTH P.TRENCH-6	ND	—	—
9-17-97	1	CELL6-1	188 ppm	—	—
9-17-97	2	CELL6-2	ND	—	—
9-17-97	3	CELL6-3	ND	—	—
9-17-97	4	CELL6-4	ND	—	—
9-17-97	5	CELL6-5	ND	—	—
9-17-97	6	CELL6-6	ND	—	—
9-17-97	10	NORTH P.TRENCH-7	10.7 ppm	—	—
9-17-97	8	NORTH P.TRENCH-8	ND	—	—
9-30-97	21	CELL6-SIDEWALL	14.6 ppm	—	—
9-30-97	23	LOC37-2-4'	75.5 ppm	—	—
9-30-97	22	LOC38-1-2.5'	87.8 ppm	—	—
9-30-97	25	LOC22-3'	68.1 ppm	—	—
9-30-97	24	LOC29-4'	96.9 ppm	—	—

ND = not detected at the report limit
All results in mg/kg (parts per million)
NA = sample collected but was not analyzed



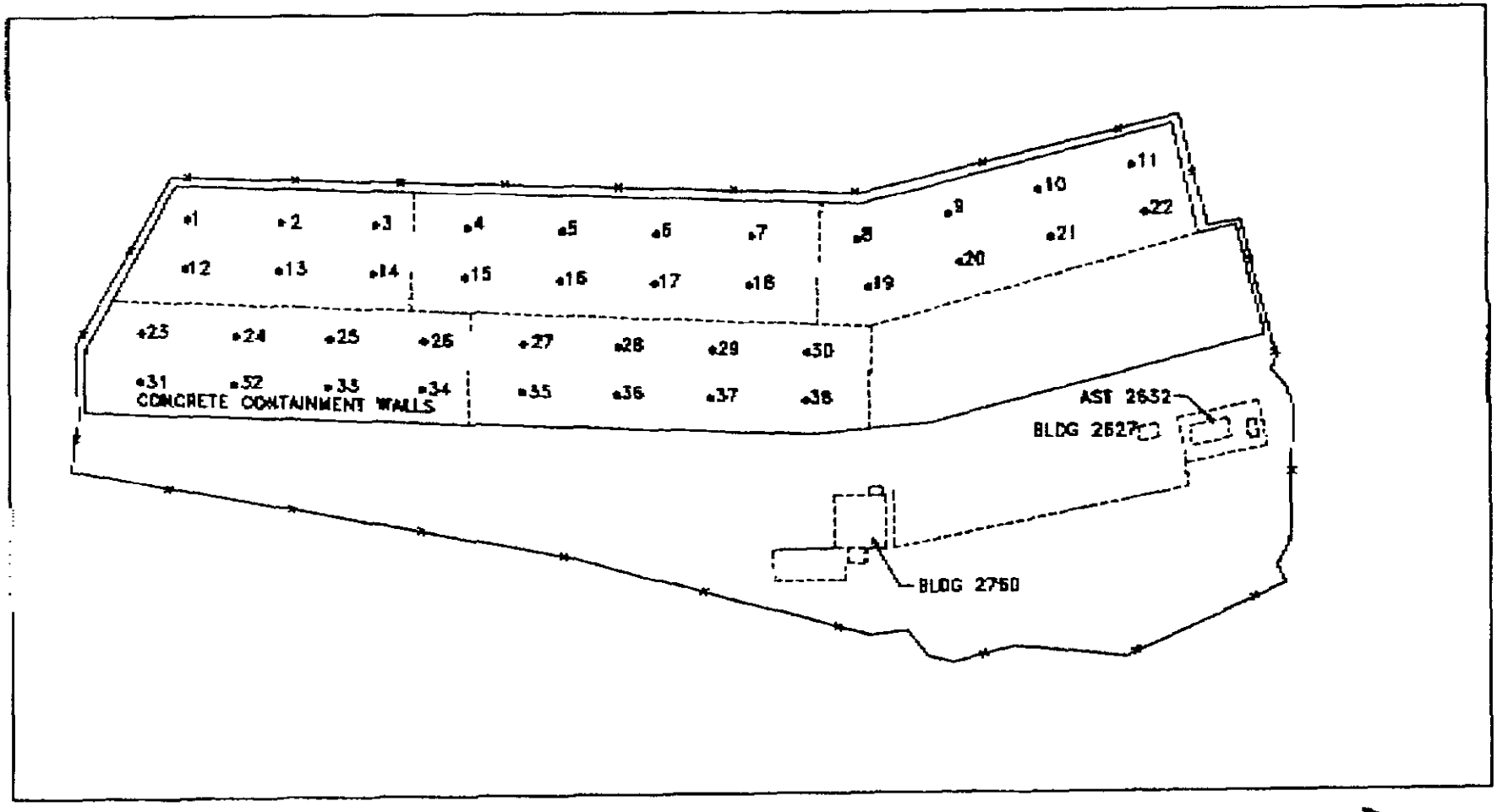
LEGEND

----- FORMER SITE FEATURES (REMOVED JULY, 1997)

0 40 80
FEET

Sverdrup ENVIRONMENTAL	SITE MAP REMEDIAL ACTION ACTIVITIES CRANE TANK FARM CRANE SURFACE WARFARE CENTER - CRANE, INDIANA	DRAW: PTS CHKD: DATE: 7/1/97	DES.: APPD: REV: A	PROJECT NO.: 000119 FIGURE NO.: 1

n:\000119\gis\crane\ dwg



LEGEND

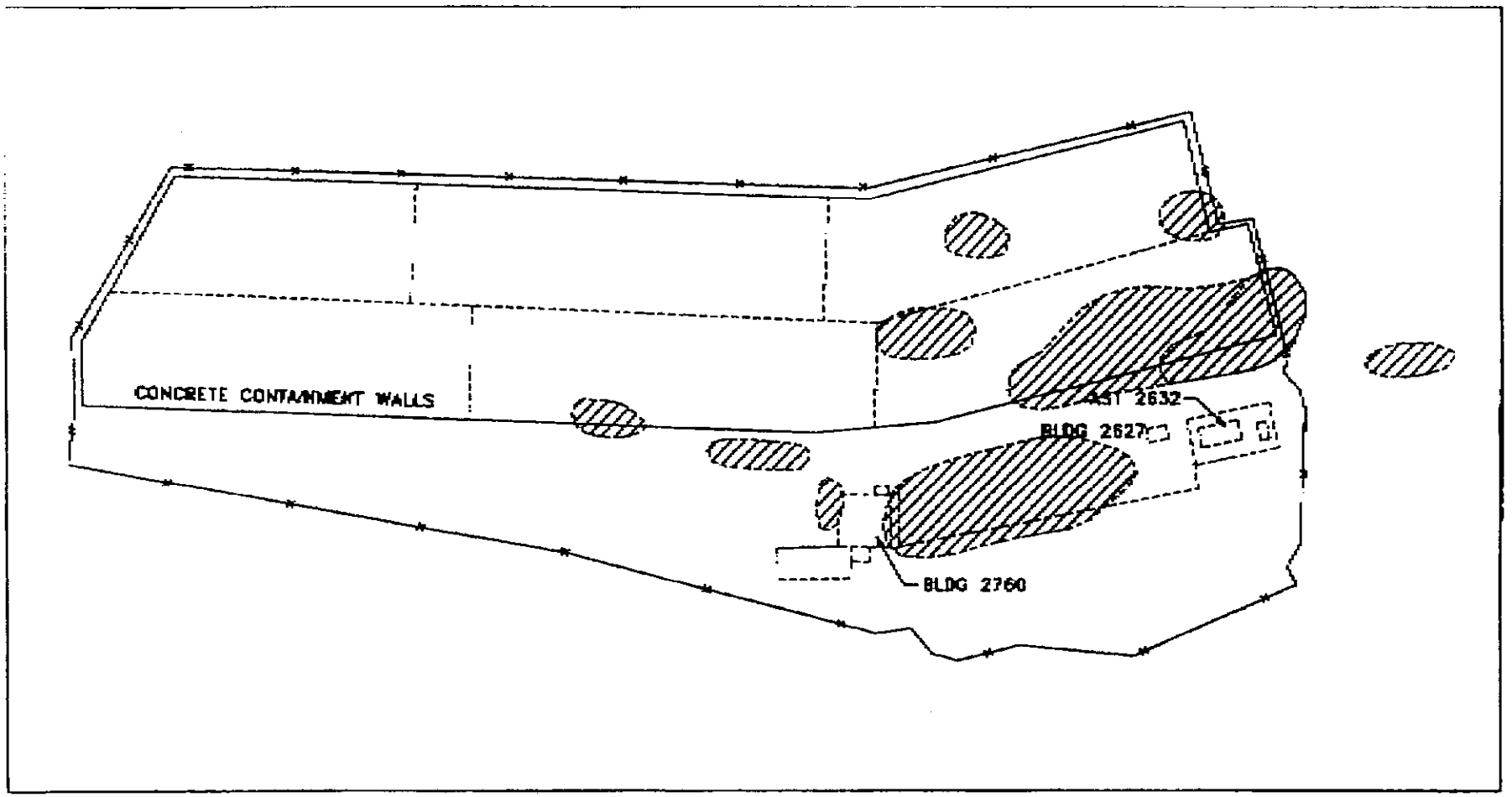
• 28 PRELIMINARY SOIL SAMPLING LOCATION AND NUMBER (25' BY 50' GRID)

----- FORMER SITE FEATURES (REMOVED JULY, 1997)

0 40 80
FEET

Sverdrup ENVIRONMENTAL	PRELIMINARY SOIL SAMPLE LOCATIONS REMEDIAL ACTION ACTIVITIES CRANE TANK FARM CRANE SURFACE WARFARE CENTER - CRANE, INDIANA	DWN: PTS CHKD: DATE: 7/1/97	DES.: APPD: REV.: A	PROJECT NO.: 000119 FIGURE NO.: 2

r:\000119\gis\crane\rpt\fig2.dwg



LEGEND

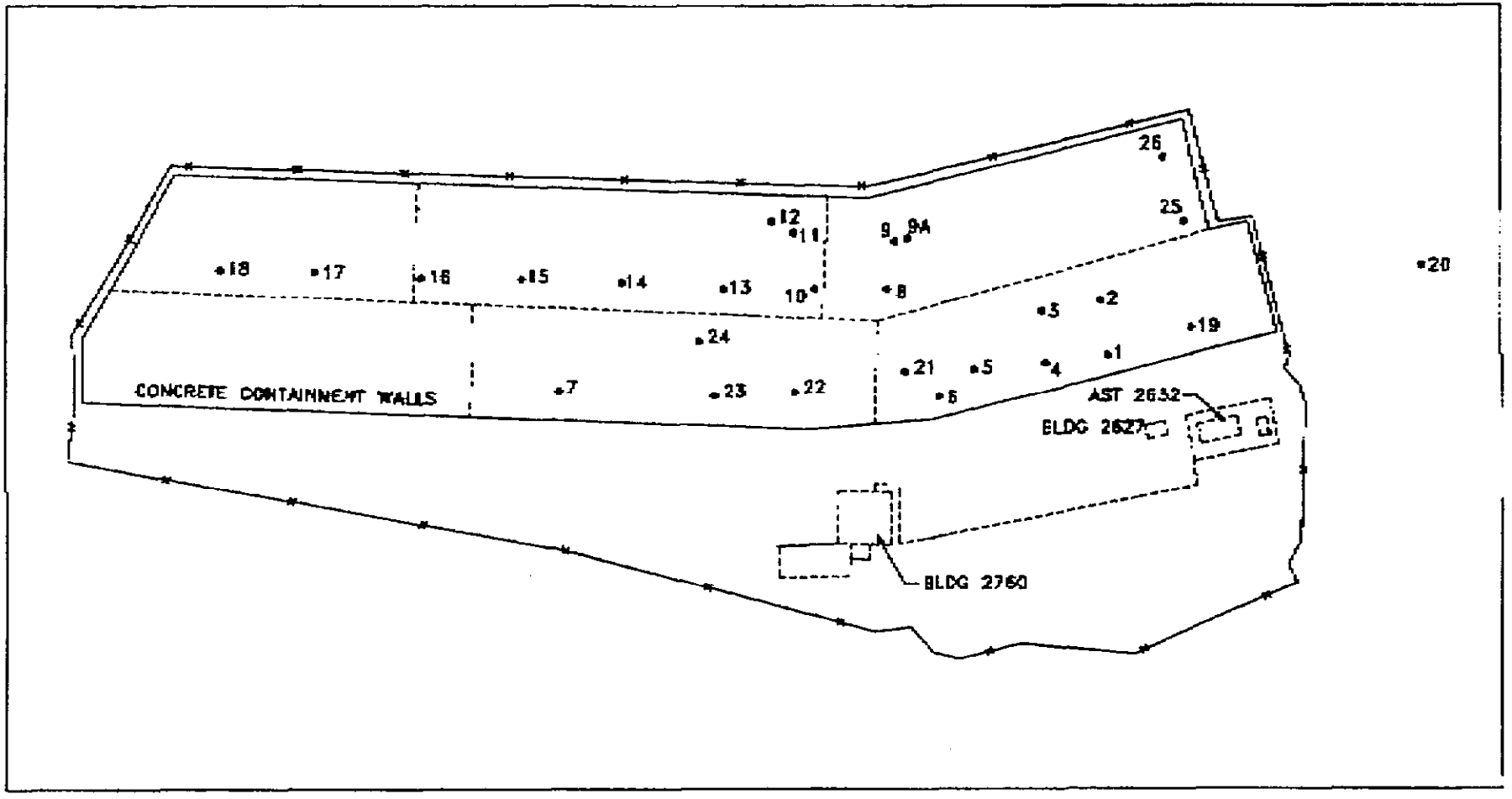
----- FORMER SITE FEATURES (REMOVED JULY, 1997)

AREAS OF SUSPECTED CONTAMINATION

0 40 80
FEET

Sverdrup ENVIRONMENTAL	AREAS OF KNOWN CONTAMINATION REMEDIAL ACTION ACTIVITIES CRANE TANK FARM CRANE SURFACE WARFARE CENTER - CRANE, INDIANA	DWN: PTS CHKD: DATE: 10/13/97	DES: APPD: REV.: A	PROJECT NO.: 000119 FIGURE NO.: 3

n:\000119\gis\yaron



LEGEND

• 8 EXCAVATION SOIL SAMPLING LOCATIONS AND NUMBER

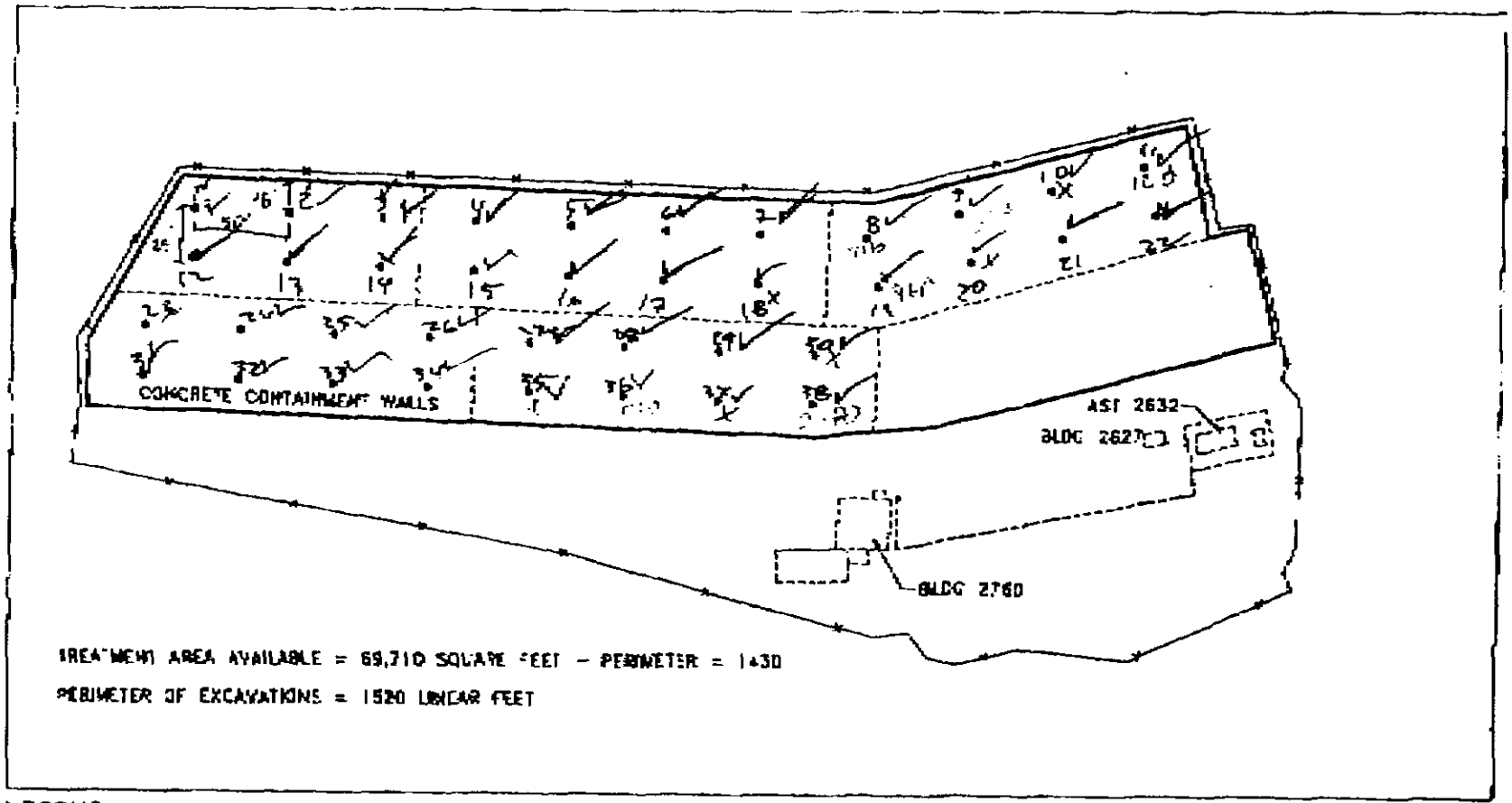
----- FORMER SITE FEATURES (REMOVED JULY, 1997)

0 40 80
FEET

Sverdrup ENVIRONMENTAL	EXCAVATION SOIL SAMPLE LOCATIONS REMEDIAL ACTION ACTIVITIES CRANE TANK FARM CRANE SURFACE WARFARE CENTER - CRANE, INDIANA	DWN: PTS CHKD: DATE: 10/13/97	DES: APPD: REV.: A	PROJECT NO.: 000119 FIGURE NO.: 4

n:\000119\gis\crane\pr1fg3.dwg

Appendix I

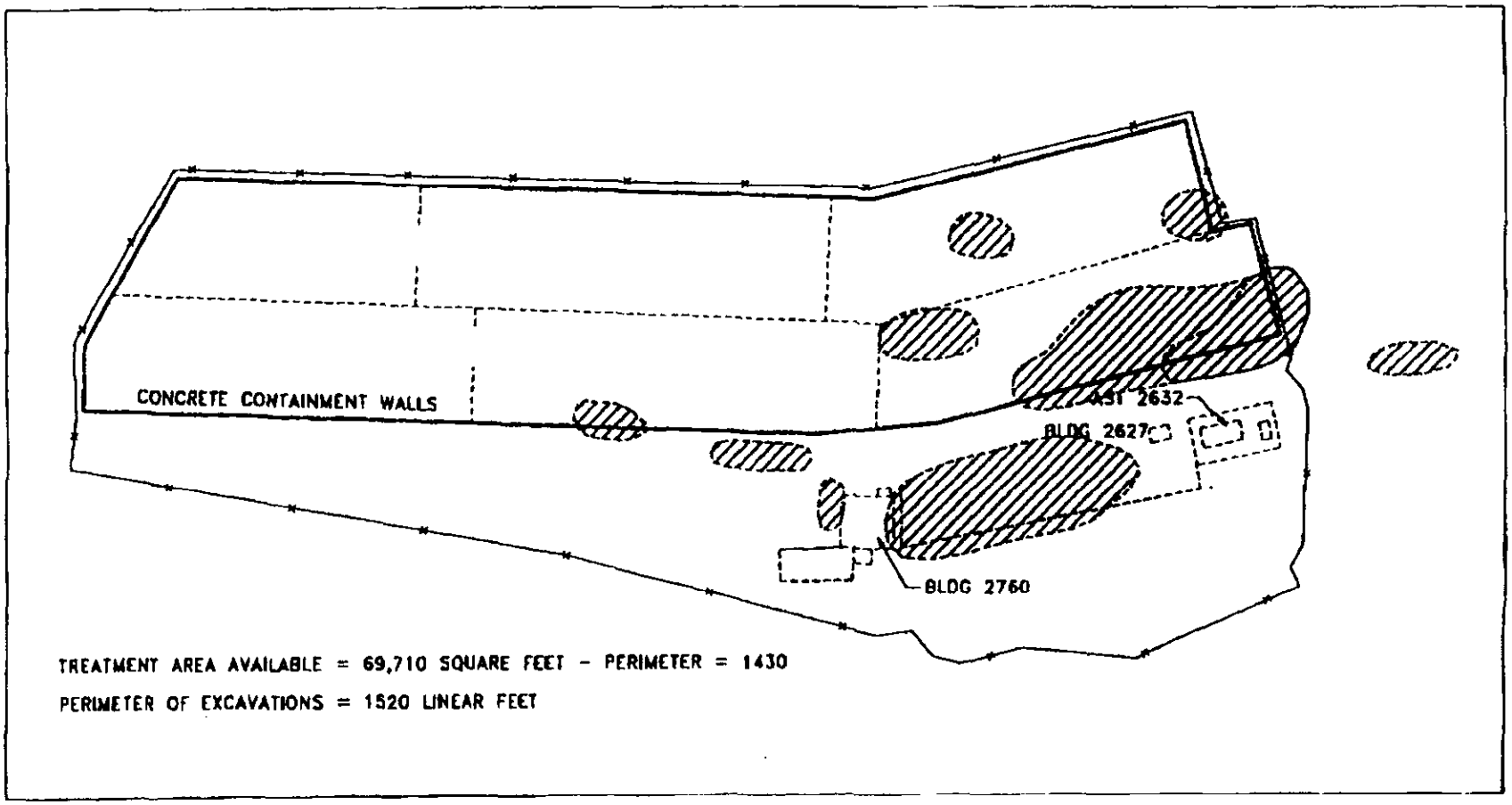


LEGEND

- • PRELIMINARY SOIL SAMPLING LOCATION (25' BY 50' GRID)
- ----- FORMER SITE FEATURES (REMOVED JULY, 1997)

0 40 80
FEET

Sverdrup ENVIRONMENTAL	SITE LOCATION MAP CRANE SURFACE WARFARE CENTER - CRANE, INDIANA	DWN: PTS	DES:	PROJECT NO.: 000119
		CHKD:	APPD:	FIGURE NO.: 1
		DATE: 7/1/97	REV.: A	



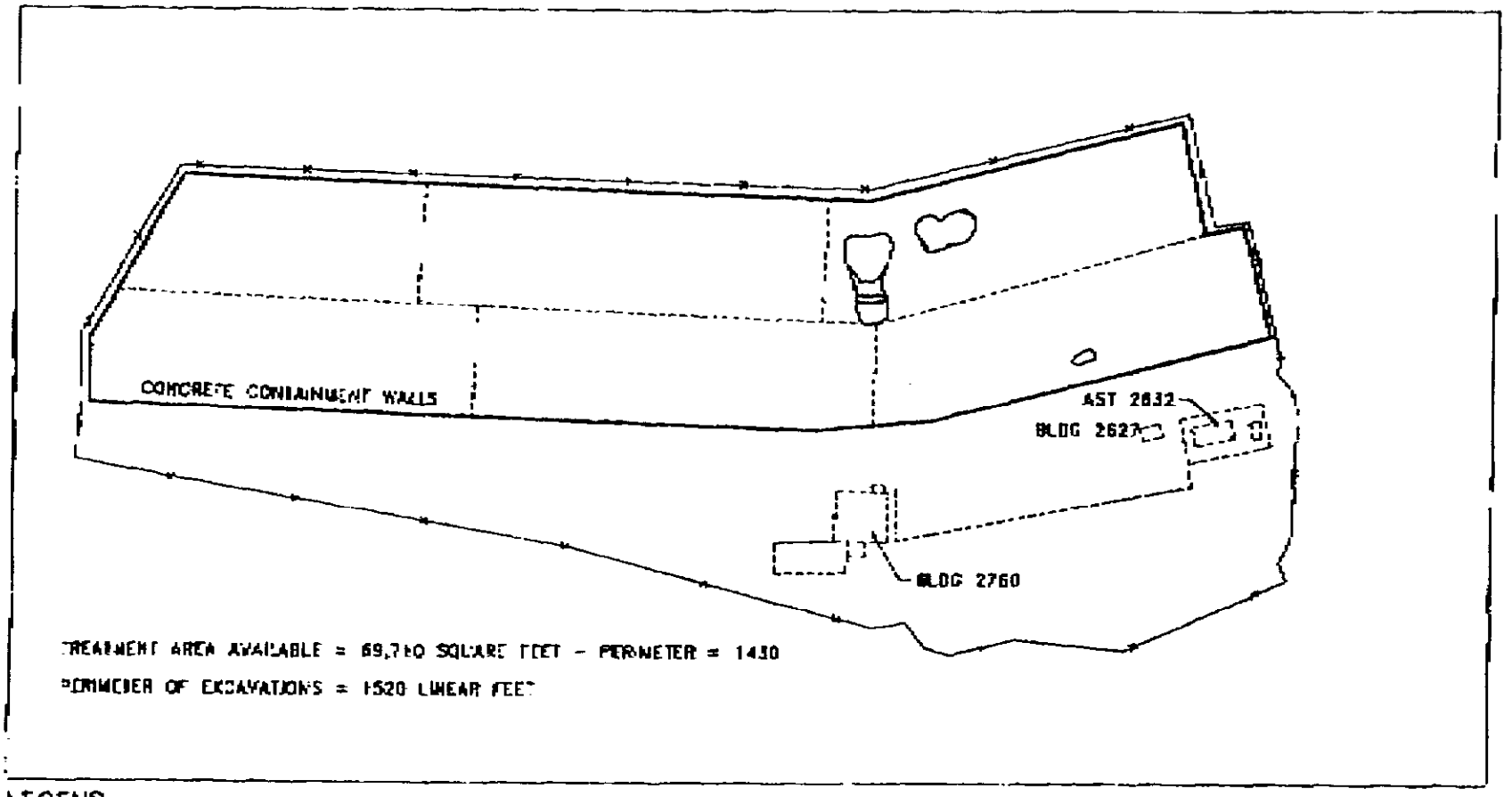
LEGEND

- ● SOIL SAMPLING LOCATION AND IDENTIFICATION
- ----- FORMER SITE FEATURES (REMOVED JULY, 1997)
- AREAS OF SUSPECTED CONTAMINATION

0 40 80
FEET

Sverdrup ENVIRONMENTAL	SITE LOCATION MAP CRANE SURFACE WARFARE CENTER - CRANE, INDIANA	DWN: PTS CHKD: DATE: 7/1/97	DES.: APPD: REV.: A	PROJECT NO.: 000119 FIGURE NO.: 1

n:\000119\gis\crane\PHASE3.dwg



LEGEND

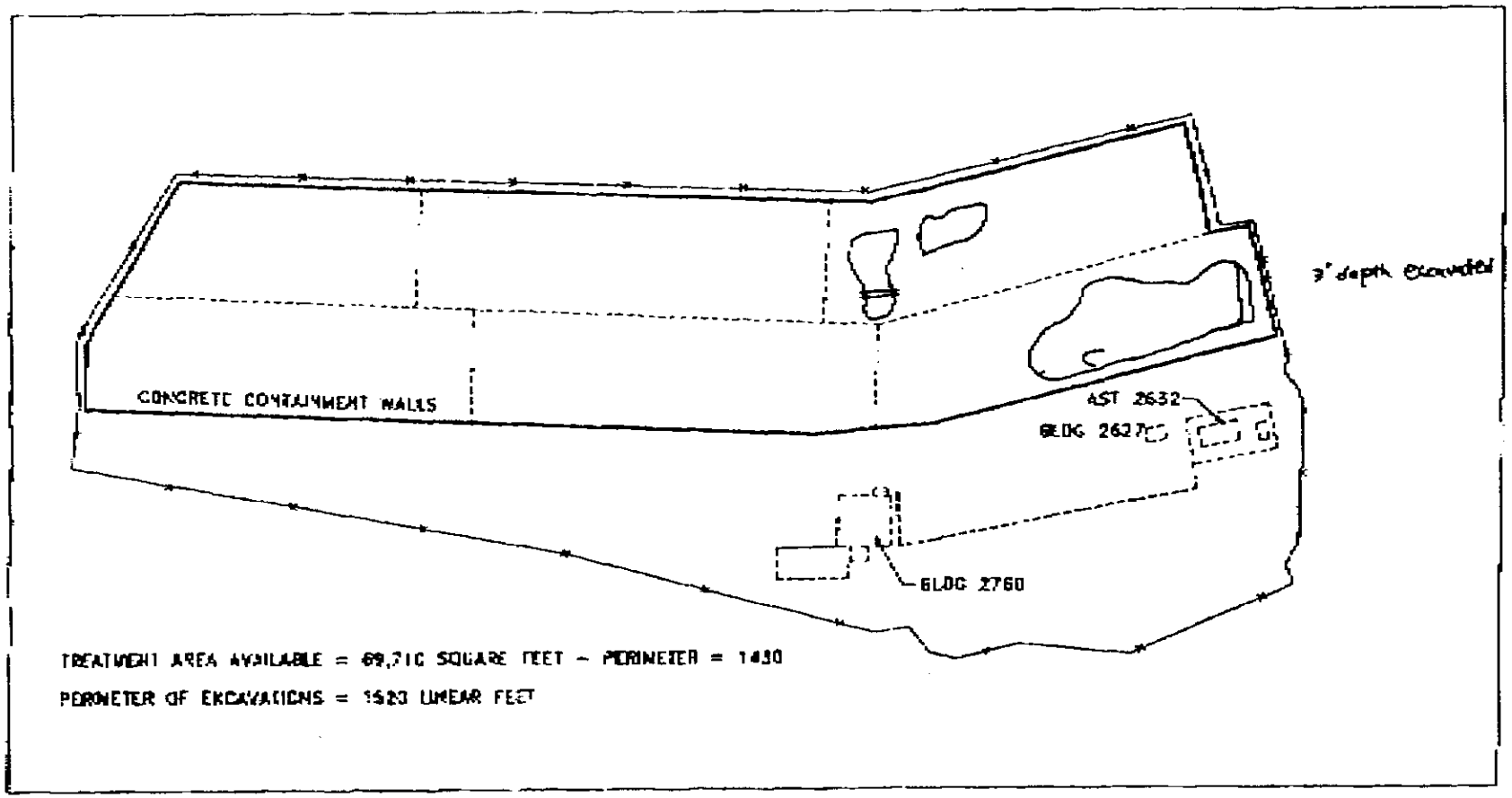
◄ SCP. SAMPLING LOCATION AND IDENTIFICATION

----- FORMER SITE FEATURES (REMOVED JULY, 1997)

0 40 80
FEET

Sverdrup ENVIRONMENTAL	SITE LOCATION MAP 9-2-97 CRANE SURFACE WARFARE CENTER - CRANE, INDIANA	DWN: PTS CHKD: DATE: 7/1/97	DES: APPD: REV: A	PROJECT NO: 000119 FIGURE NO: 1

N:\000119\gis\crane\PHASE3.dwg



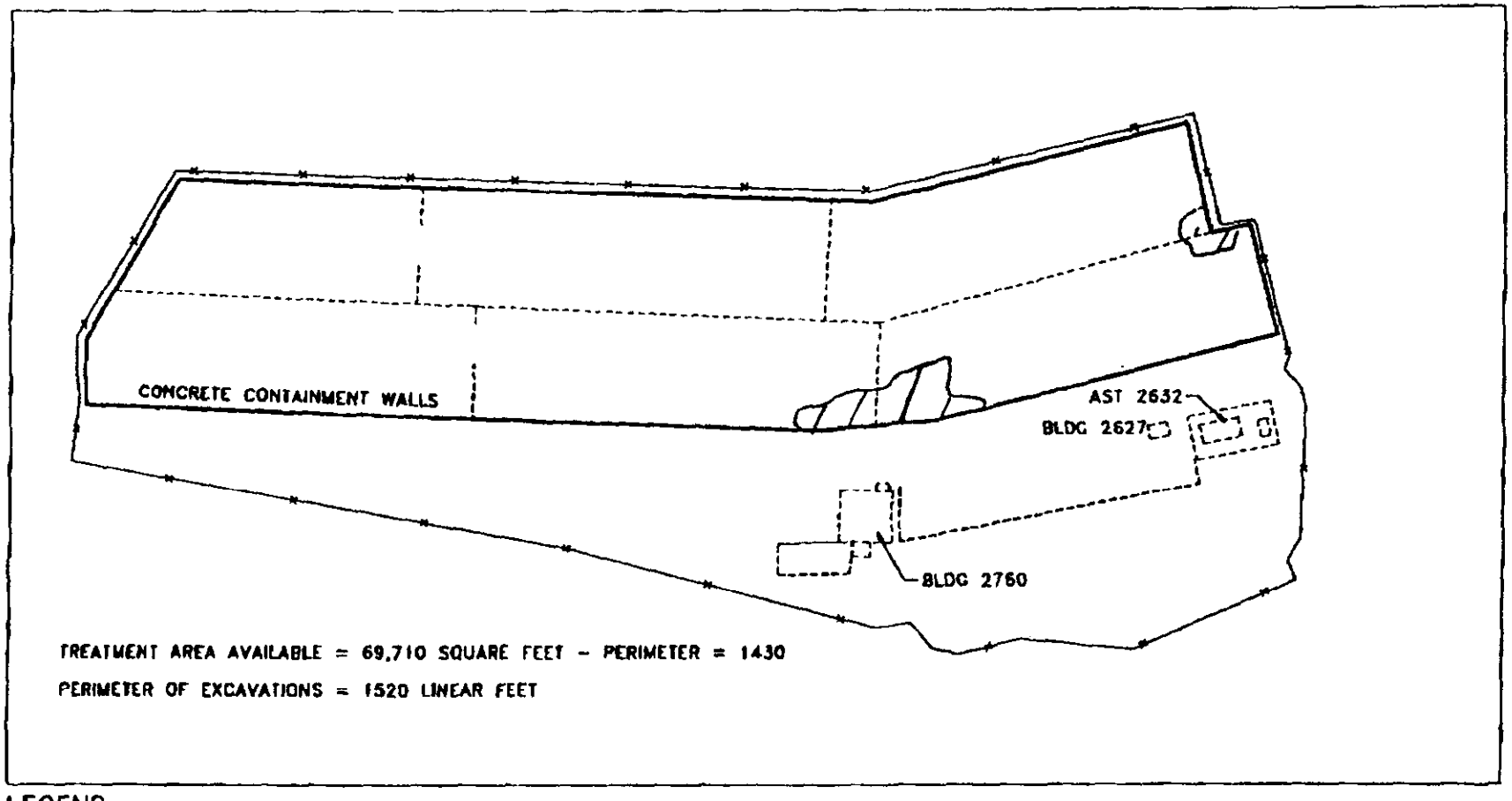
LEGEND

- ● SOIL SAMPLING LOCATION AND IDENTIFICATION
- ---- FORMER SITE FEATURES (REMOVED JULY, 1997)

0 40 80
FEET

Sverdrup ENVIRONMENTAL	SITE LOCATION MAP 9-3-97 CRANE SURFACE WARFARE CENTER - CRANE, INDIANA	DRN: PTS CHKD: DATE: 7/1/97	DES: APPD: REV: A	PROJECT NO.: 000119 FIGURE NO.: 1

e:\[illegible]\gis\crane\[illegible]



LEGEND

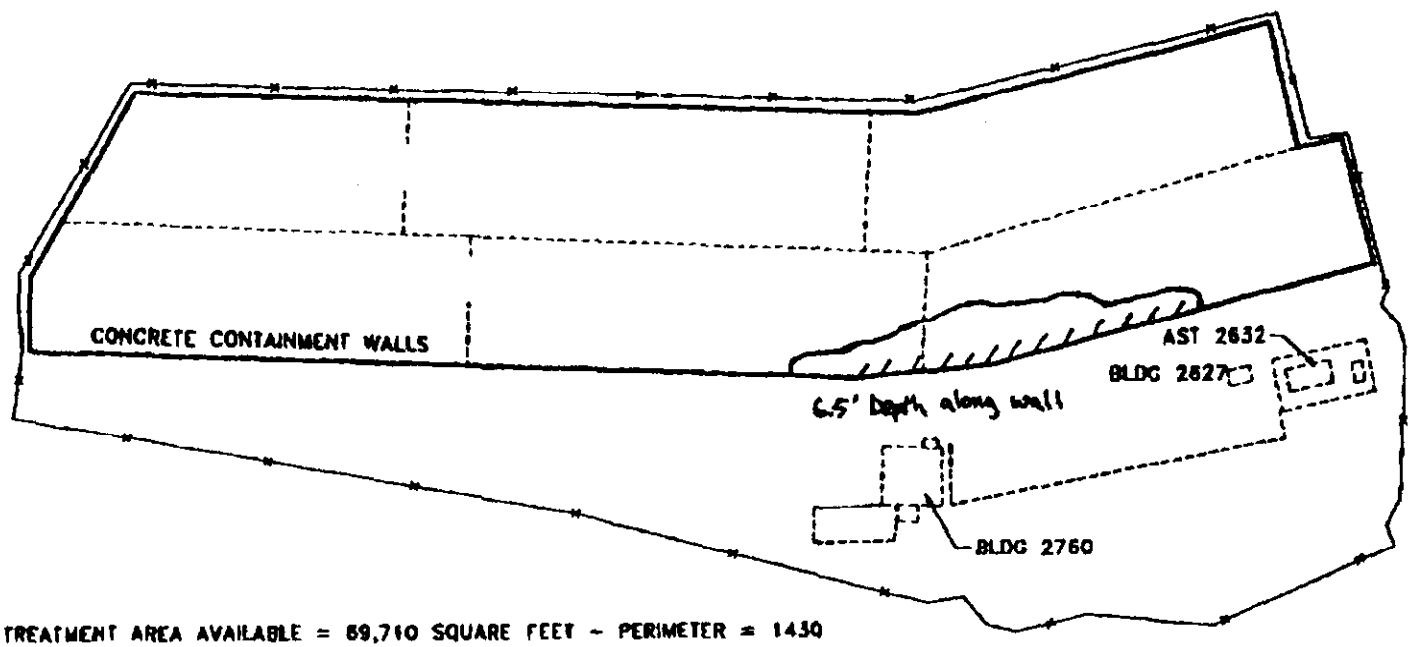
● SOIL SAMPLING LOCATION AND IDENTIFICATION

----- FORMER SITE FEATURES (REMOVED JULY, 1997)

0 40 80
FEET

Sverdrup ENVIRONMENTAL	SITE LOCATION MAP New Excavation on 9-4-97 CRANE SURFACE WARFARE CENTER - CRANE, INDIANA	DWN: PTS CHKD: DATE: 7/1/97	DES.: APPD: REV.: A	PROJECT NO.: 000119 FIGURE NO.: 1

n:\000119\gis\crane\PHASE1.dwg



TREATMENT AREA AVAILABLE = 69,710 SQUARE FEET - PERIMETER = 1430

PERIMETER OF EXCAVATIONS = 1520 LINEAR FEET

LEGEND

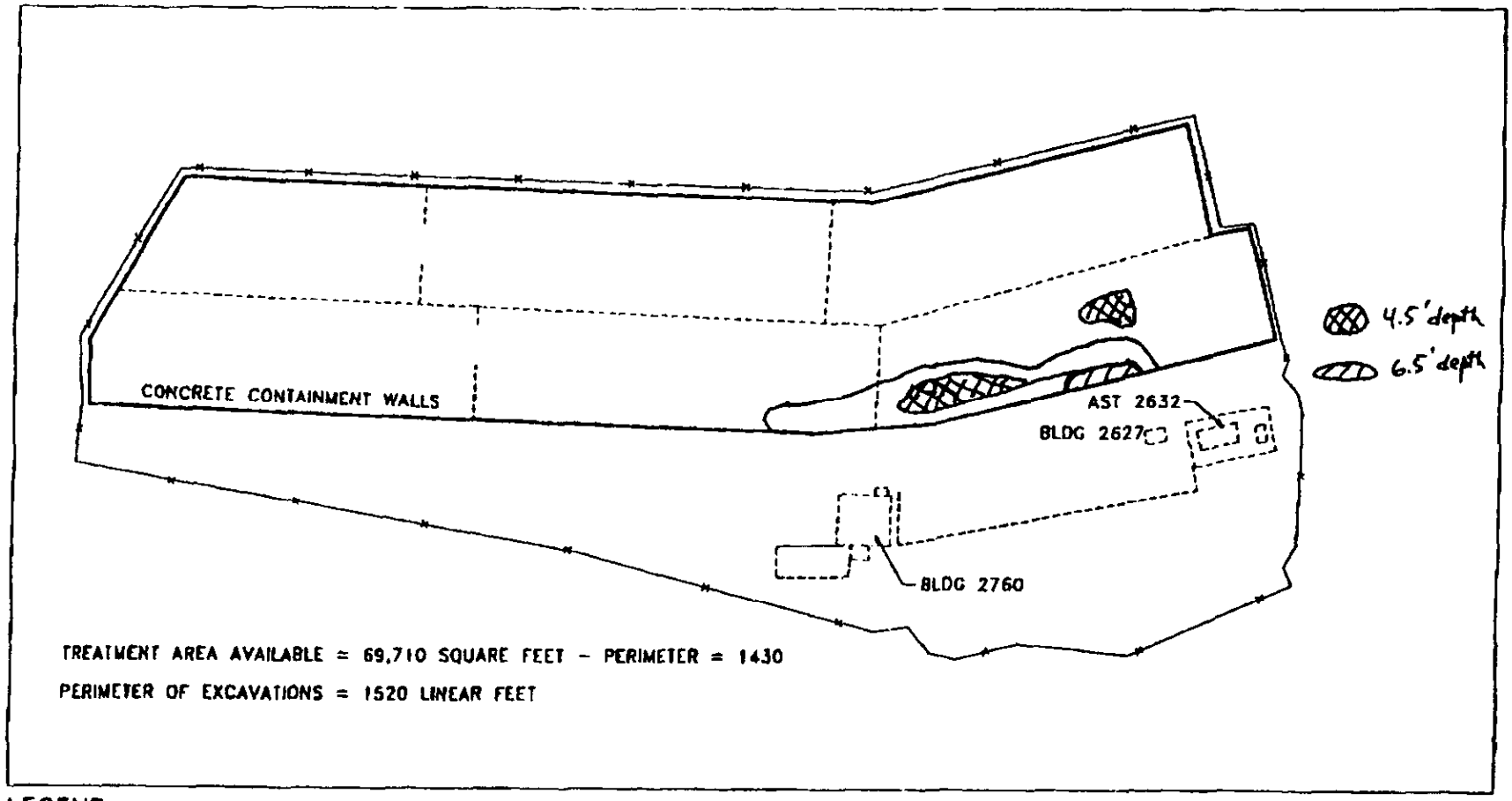
● SOIL SAMPLING LOCATION AND IDENTIFICATION

----- FORMER SITE FEATURES (REMOVED JULY, 1997)

0 40 80
FEET

Boardrup ENVIRONMENTAL	SITE LOCATION MAP 9-5-97 CRANE SURFACE WARFARE CENTER - CRANE, INDIANA	DRN: PTS CHKD: DATE: 7/1/97	DES.: APPD: REV.: A	PROJECT NO.: 000119 FIGURE NO.: 1

n:\000119\gis\crane\PHASE1.dwg



LEGEND

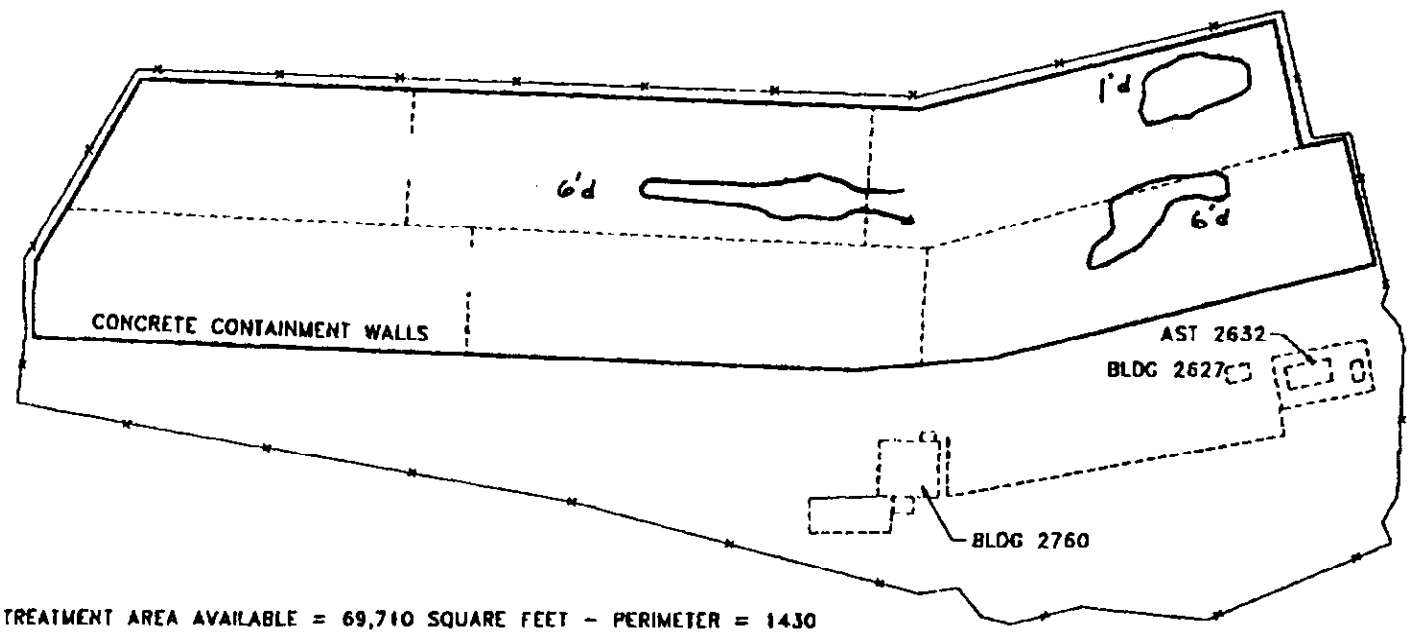
● SOIL SAMPLING LOCATION AND IDENTIFICATION

----- FORMER SITE FEATURES (REMOVED JULY, 1997)

0 40 80
FEET

Sverdrup ENVIRONMENTAL	SITE LOCATION MAP 9-8-97 CRANE SURFACE WARFARE CENTER - CRANE, INDIANA	DWN: PTS CHKD: DATE: 7/1/97	DES.: APPD: REV.: A	PROJECT NO.: 000119 FIGURE NO.: 1

n:\000119\gis\crane\PHASE3.dwg



TREATMENT AREA AVAILABLE = 69,710 SQUARE FEET - PERIMETER = 1430

PERIMETER OF EXCAVATIONS = 1520 LINEAR FEET

LEGEND

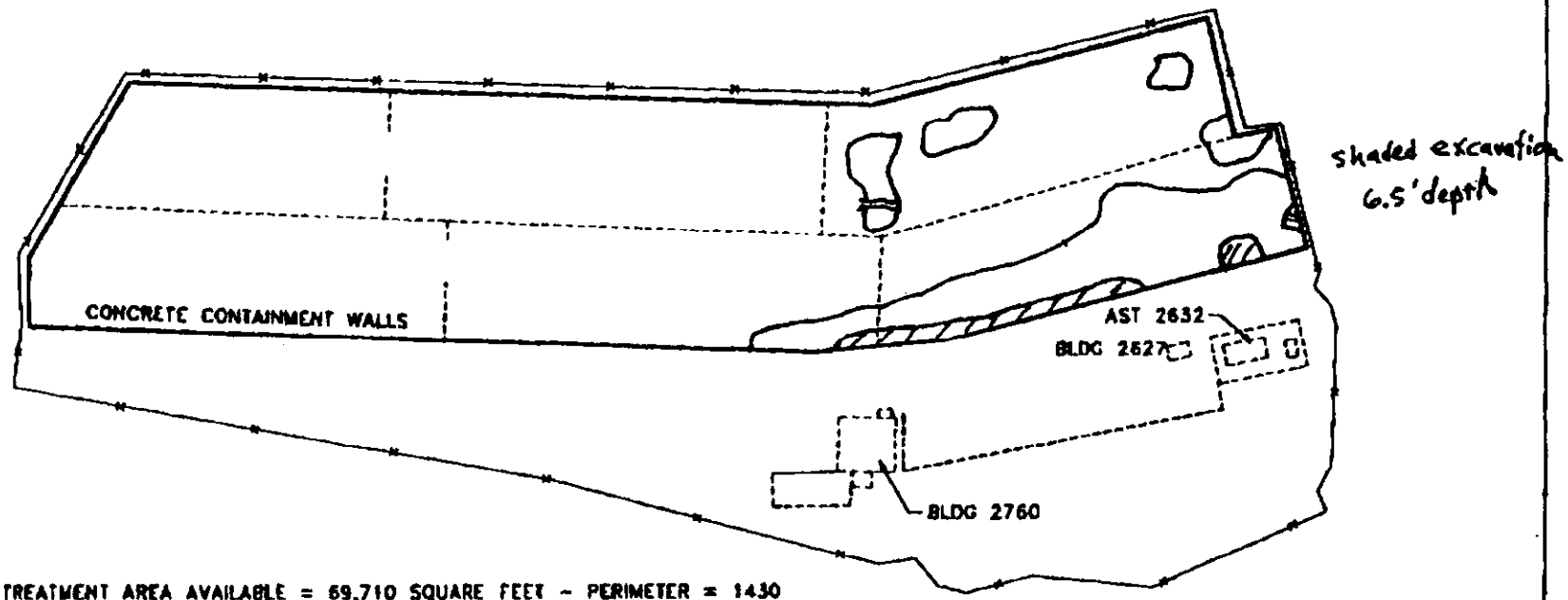
● SOIL SAMPLING LOCATION AND IDENTIFICATION

----- FORMER SITE FEATURES (REMOVED JULY, 1997)

0 40 80
FEET

Sverdrup ENVIRONMENTAL	SITE LOCATION MAP 9-9-97 CRANE SURFACE WARFARE CENTER - CRANE, INDIANA	DWN: PTS	DES.:	PROJECT NO.: 000119	
		CHKD:	APPD:	FIGURE NO.: 1	
		DATE: 7/1/97	REV.: A		

n:\000119\gis\crane\PHASE3.dwg



TREATMENT AREA AVAILABLE = 69,710 SQUARE FEET - PERIMETER = 1430

PERIMETER OF EXCAVATIONS = 1520 LINEAR FEET

LEGEND

- ● SOIL SAMPLING LOCATION AND IDENTIFICATION
- ----- FORMER SITE FEATURES (REMOVED JULY, 1997)

0 40 80
FEET

Sverdrup ENVIRONMENTAL	SITE LOCATION MAP Excavation completed up to 9-9-97 CRANE SURFACE WARFARE CENTER - CRANE, INDIANA	DRN: PTS CHKD: DATE: 7/1/97	DES.: APPD: REV.: A	PROJECT NO.: 000119 FIGURE NO.: 1

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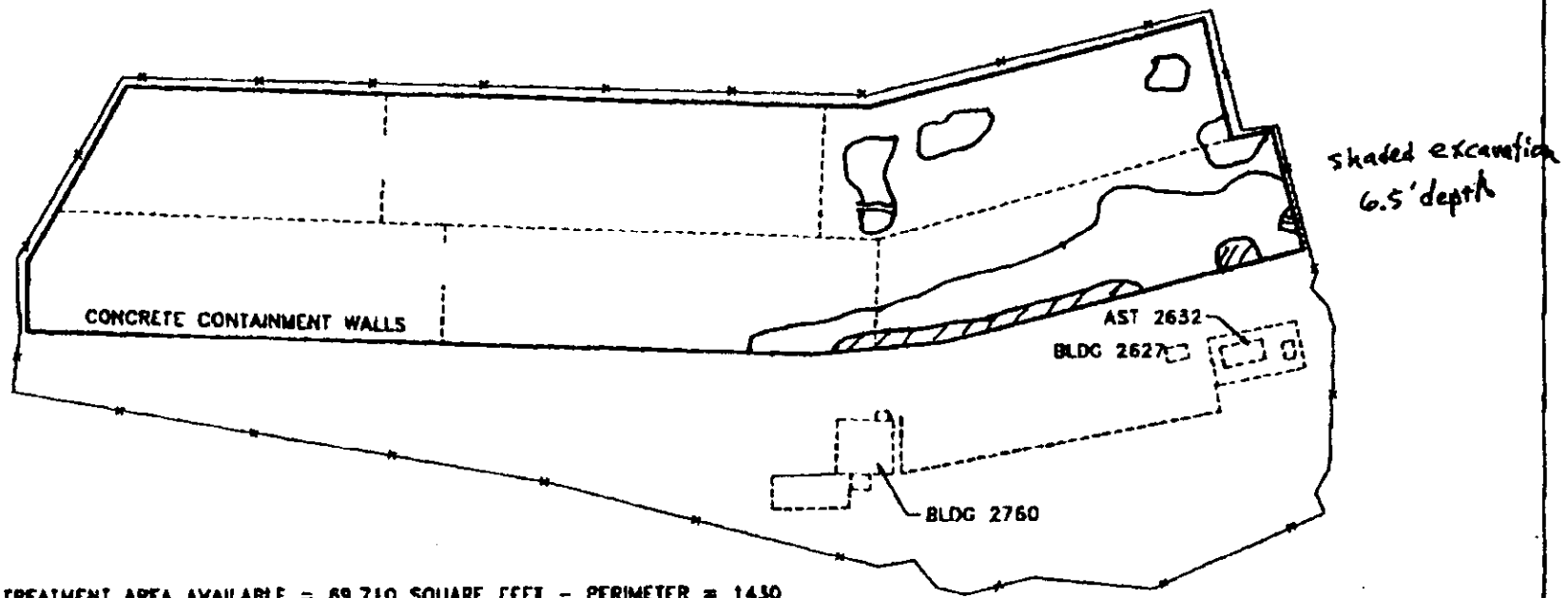


TREATMENT AREA AVAILABLE = 69,710 SQUARE FEET - PERIMETER = 1430

PERIMETER OF EXCAVATIONS = 1520 LINEAR FEET

LEGEND

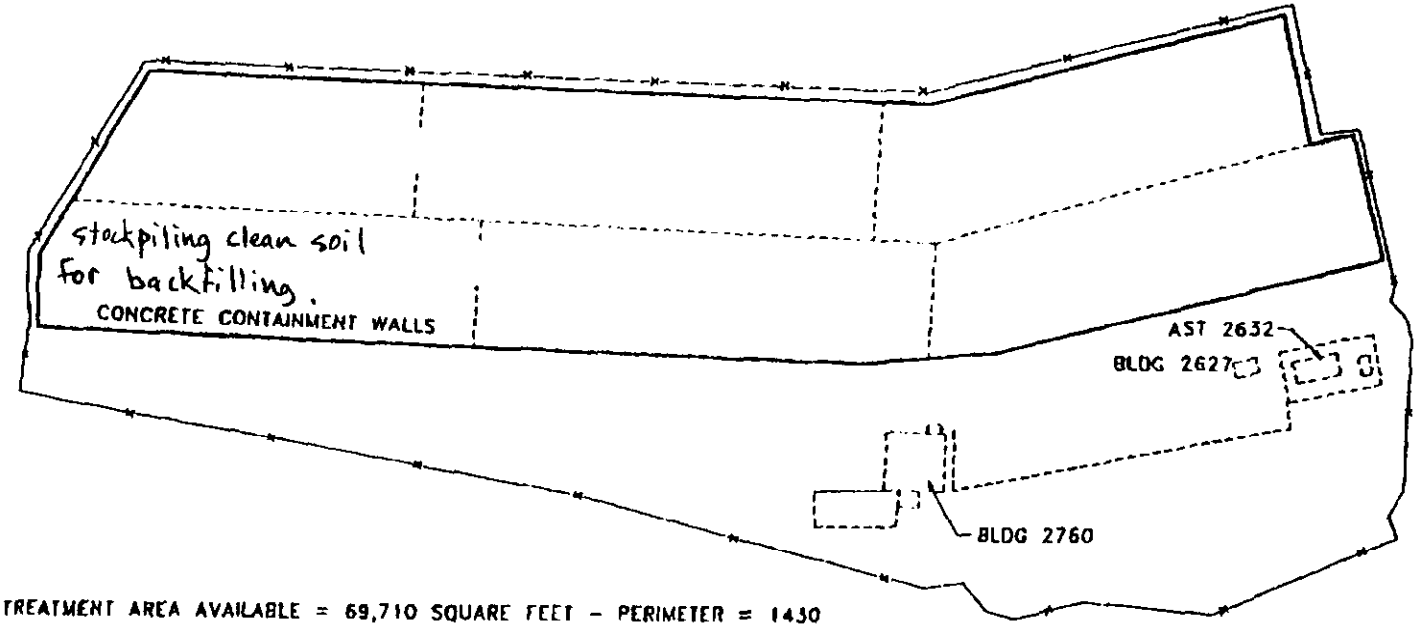
● SOIL SAMPLING LOCATION AND IDENTIFICATION

----- FORMER SITE FEATURES (REMOVED JULY, 1997)

0 40 80
FEET

Sverdrup ENVIRONMENTAL	SITE LOCATION MAP Excavation completed up to 9-9-97 CRANE SURFACE WARFARE CENTER - CRANE, INDIANA	DRN: PTS	DES.:	PROJECT NO.: 000119
		CHKD:	APPD:	FIGURE NO.: 1
		DATE: 7/1/97	REV.: A	

n:\000119\gis\crane\PHASE3.dwg



TREATMENT AREA AVAILABLE = 69,710 SQUARE FEET - PERIMETER = 1430

PERIMETER OF EXCAVATIONS = 1520 LINEAR FEET

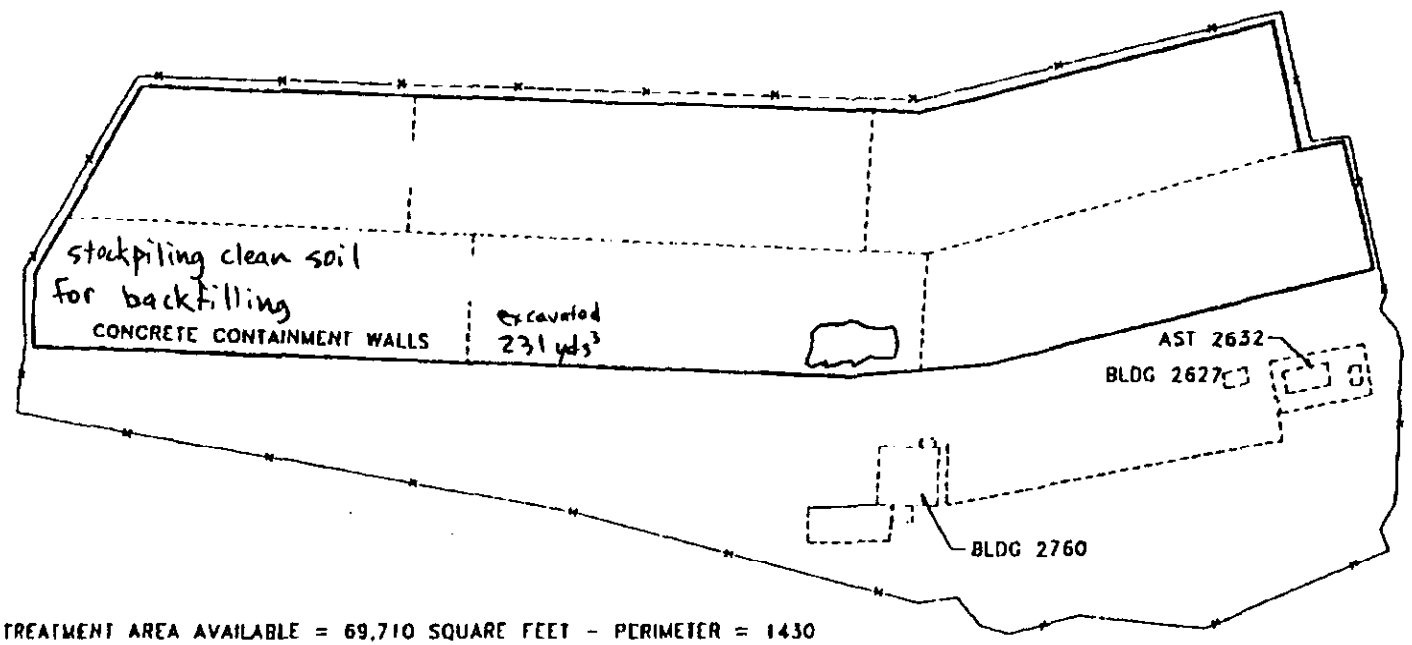
LEGEND

- ● SOIL SAMPLING LOCATION AND IDENTIFICATION
- ----- FORMER SITE FEATURES (REMOVED JULY, 1997)

0 40 80
FEET

9-12-97	SITE LOCATION MAP	DWN: PTS	DES.:	PROJECT NO.: 000119
Sverdrup ENVIRONMENTAL	CRANE SURFACE WARFARE CENTER - CRANE, INDIANA	CHKD:	APPD:	FIGURE NO.: 1
		DATE: 7/1/97	REV.: A	

n:\000119\gis\crane\PHASE3.dwg



TREATMENT AREA AVAILABLE = 69,710 SQUARE FEET - PERIMETER = 1430

PERIMETER OF EXCAVATIONS = 1520 LINEAR FEET

LEGEND

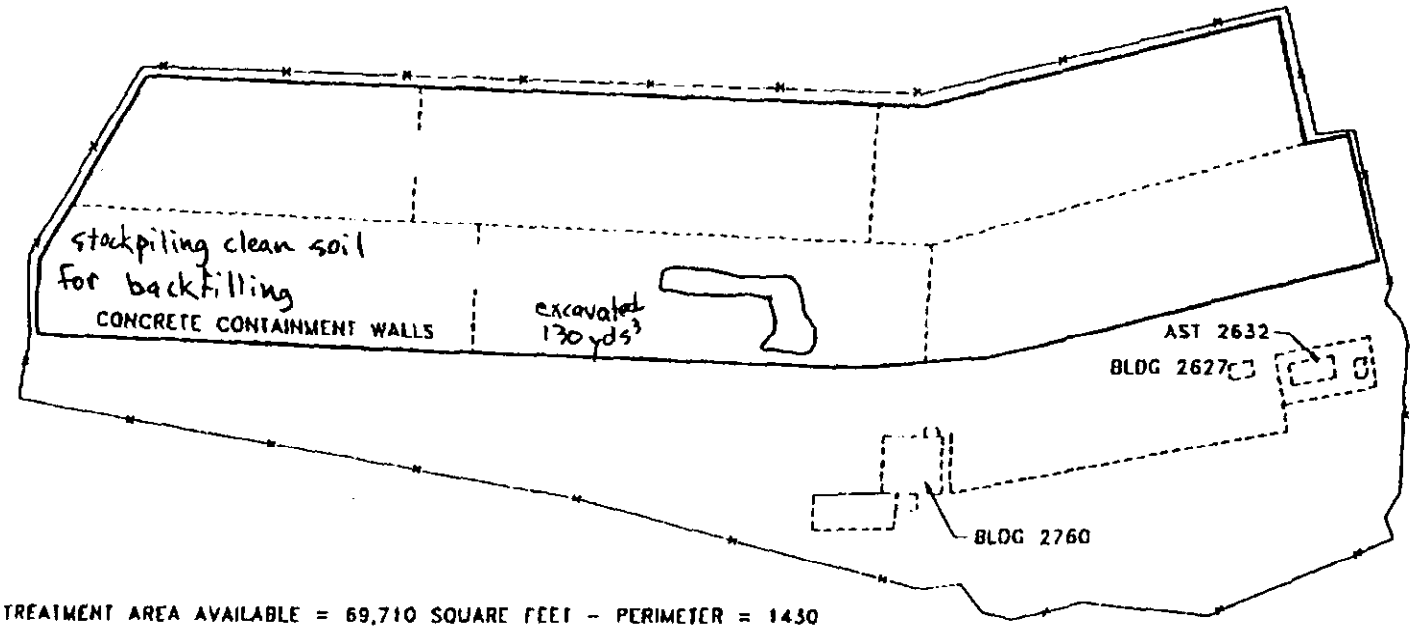
- ● SOIL SAMPLING LOCATION AND IDENTIFICATION
- ----- FORMER SITE FEATURES (REMOVED JULY, 1997)

0 40 80
FEET

9-18-97	SITE LOCATION MAP	DWN: PTS	DES.:	PROJECT NO.: 000119
Sverdrup ENVIRONMENTAL	CRANE SURFACE WARFARE CENTER - CRANE, INDIANA	CHKD:	APPD:	FIGURE NO.: 1
		DATE: 7/1/97	REV.: A	

n:\000119\gis\crane\PHASE3.dwg

08/11/97 08:14 ☎3147708162 SVERDRUP ☑006/006



TREATMENT AREA AVAILABLE = 69,710 SQUARE FEET - PERIMETER = 1430

PERIMETER OF EXCAVATIONS = 1520 LINEAR FEET

LEGEND

- ● SOIL SAMPLING LOCATION AND IDENTIFICATION
- ----- FORMER SITE FEATURES (REMOVED JULY, 1997)

0 40 80
FEET

9-19-97

Sverdrup ENVIRONMENTAL

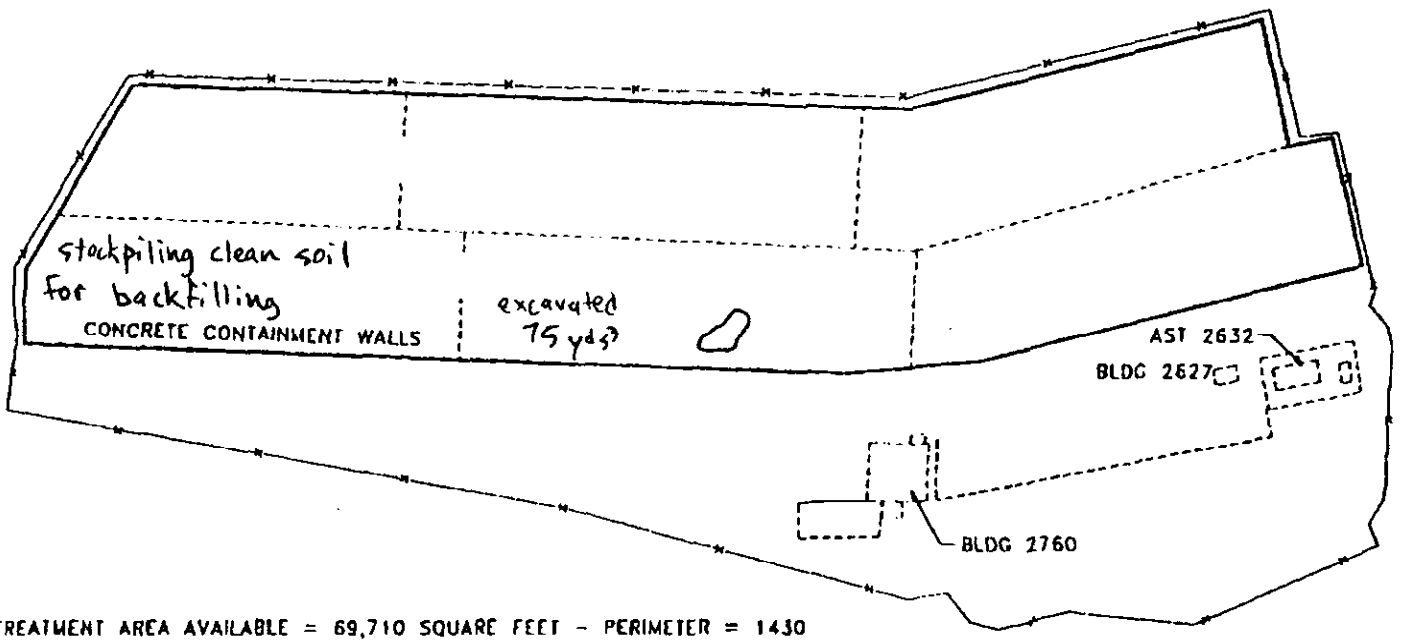
SITE LOCATION MAP

CRANE SURFACE WARFARE CENTER - CRANE, INDIANA

DWN: PTS	DES.:	PROJECT NO.: 000119
CHKD:	APPD:	FIGURE NO.: 1
DATE: 7/1/97	REV.: A	

n:\000119\gis\crane\PHASE3.dwg

08/11/97 08:14 3147705102 SVERDRUP 006/006



TREATMENT AREA AVAILABLE = 69,710 SQUARE FEET - PERIMETER = 1430

PERIMETER OF EXCAVATIONS = 1520 LINEAR FEET

LEGEND

- ● SOIL SAMPLING LOCATION AND IDENTIFICATION
- ----- FORMER SITE FEATURES (REMOVED JULY, 1997)

0 40 80
FEET

9-22-97

Sverdrup ENVIRONMENTAL

SITE LOCATION MAP

CRANE SURFACE WARFARE CENTER - CRANE, INDIANA

DWN: PTS	DES.:	PROJECT NO.: 000119	
CHKD:	APPD:	FIGURE NO.: 1	
DATE: 7/1/97	REV.: A		

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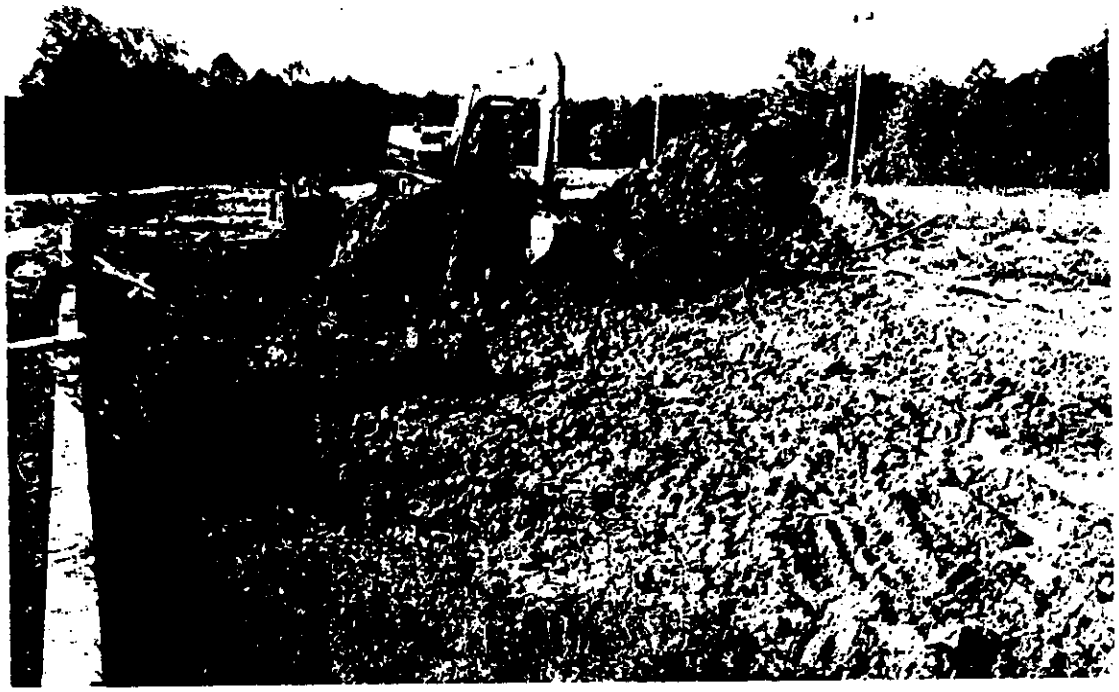
Appendix II

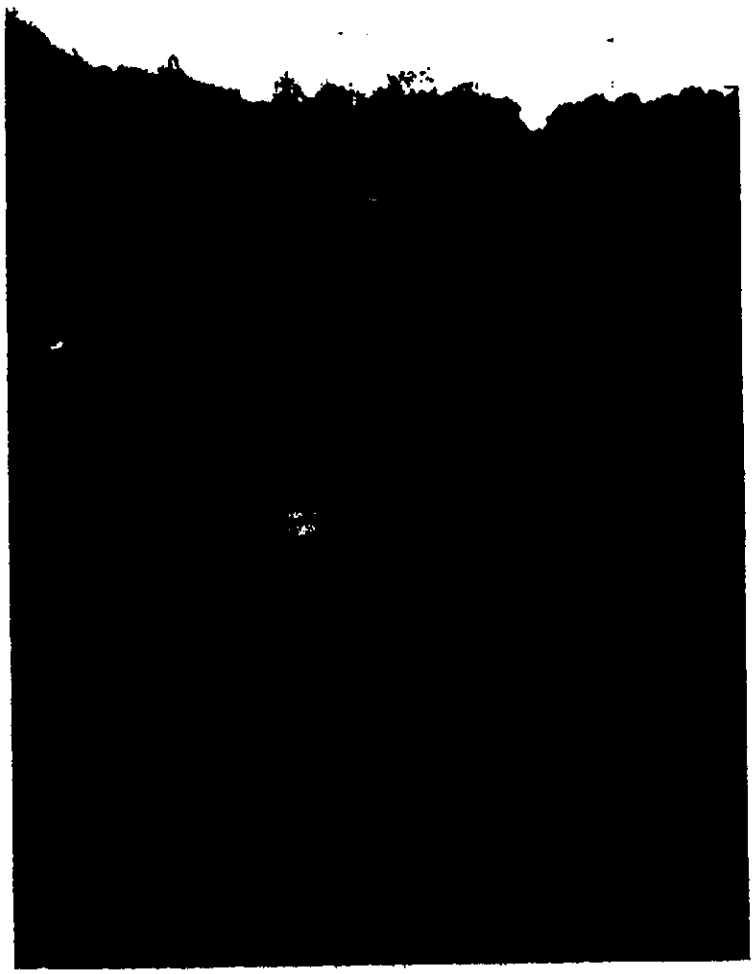
Crane Tank Farm - Views of excavation one day after work began.



Crane Tank Farm - Views of excavation one day after work began.

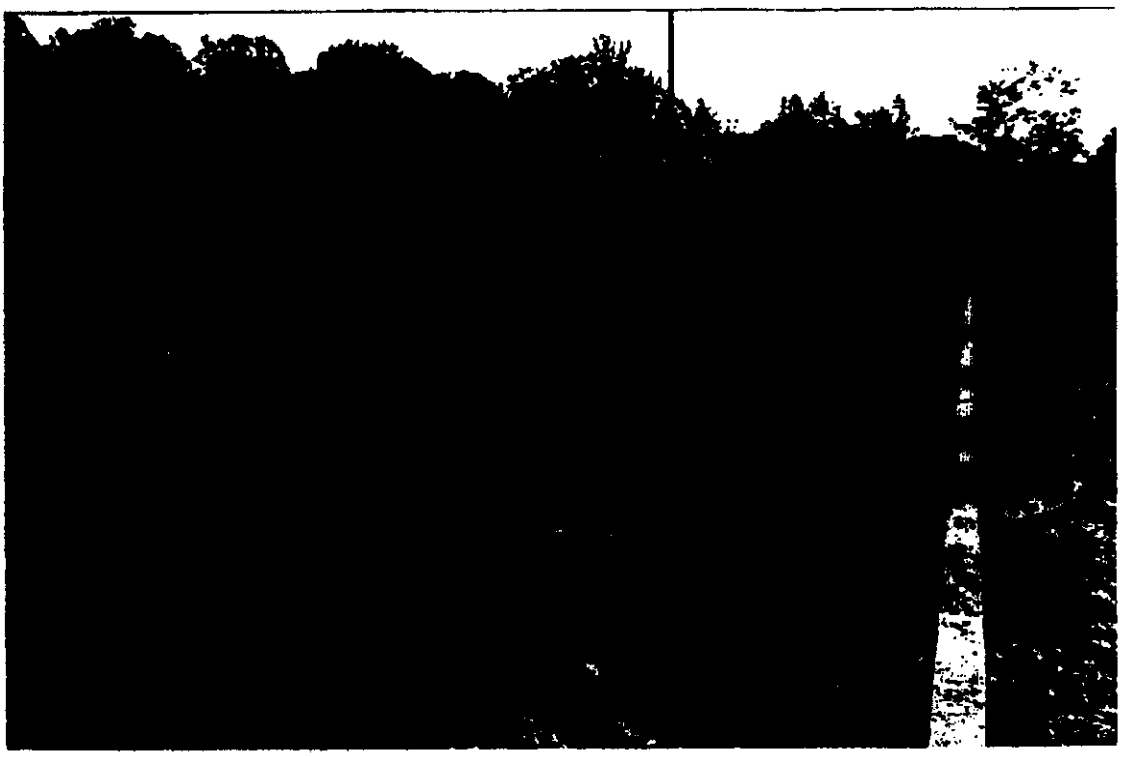
Crane Tank Farm - Views of contaminated soils and gravel before removal.

Crane Tank Farm - Views of contaminated soils and gravel before removal.



Crane Tank Farm - Views of excavation one day after work began.

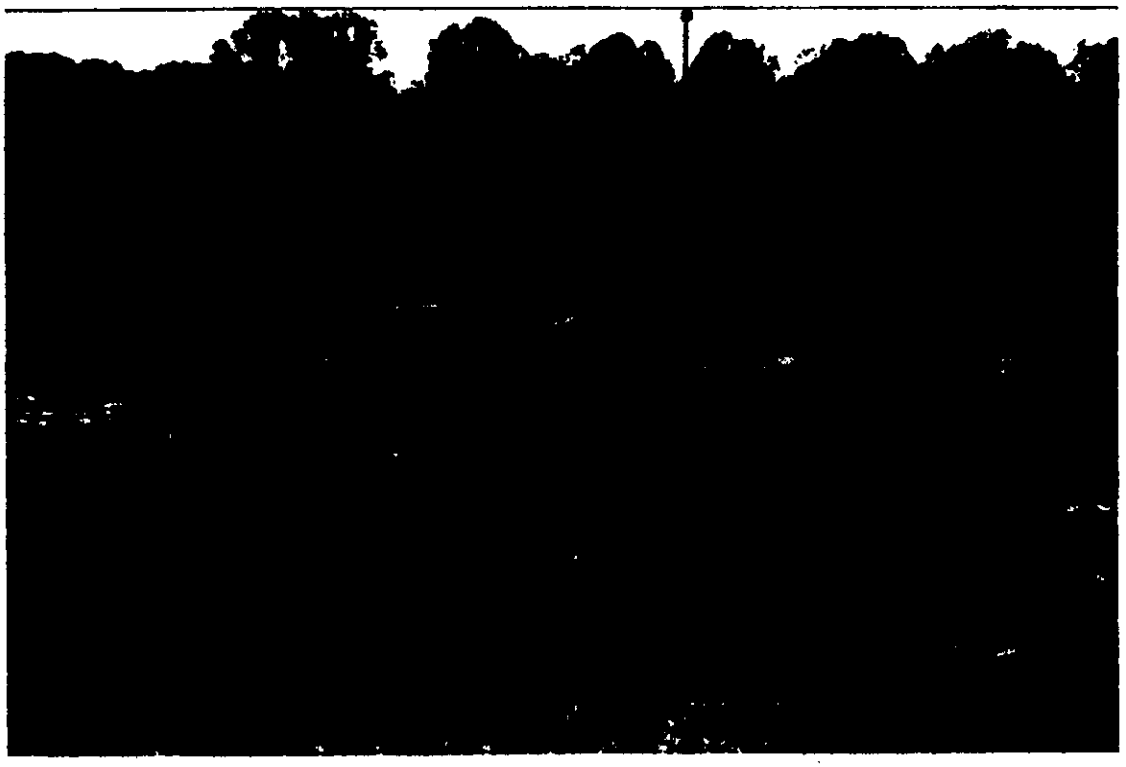
Crane Tank Farm - Views of excavation around southern corner.



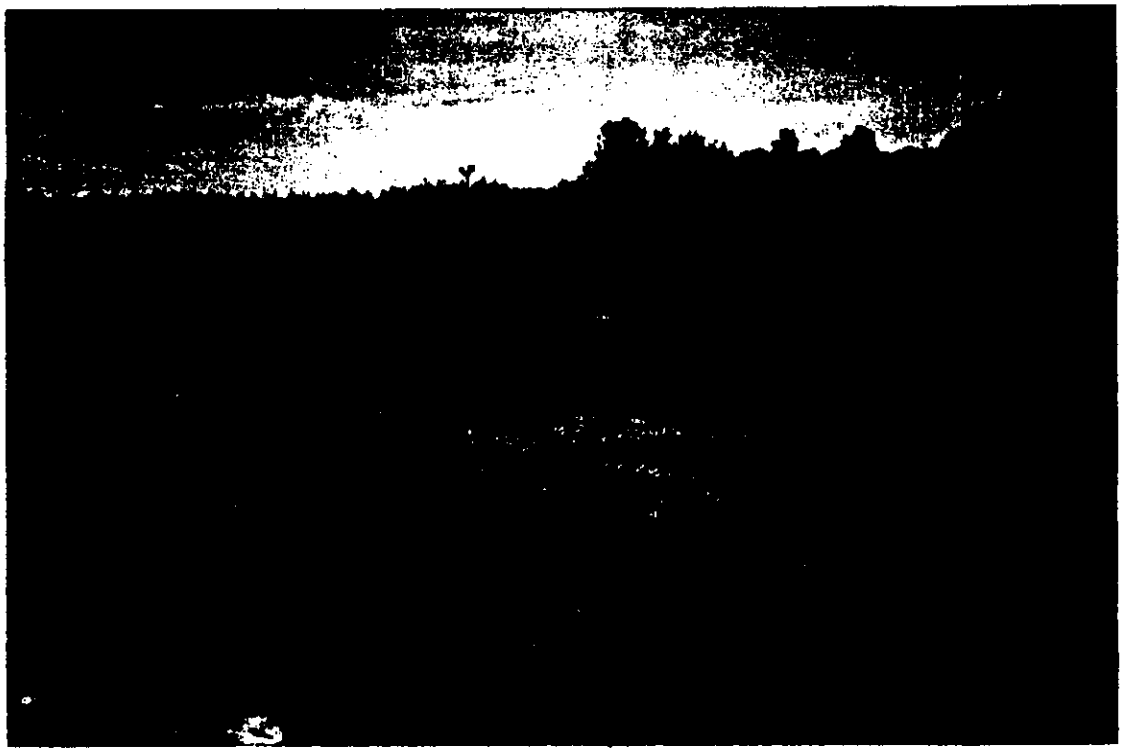
Crane Tank Farm - Views of southern corner bermed and segregated from remainder of containment area.

Crane Tank Farm - Spreading of stockpiled contaminated soil over containment area in 1.5 to 2.0 foot layers.

Crane Tank Farm - Spreading of stockpiled contaminated soil over containment area in 1.5 to 2.0 foot layers.



Crane Tank Farm - View of containment area after Phase III was completed.



Crane Tank Farm - View of containment area after Phase III was completed.

Appendix III

ANALYTICAL REPORT

SVERDRUP-KENTUCKY 6182
ATTN: JIM SELLS
P.O. BOX 700
FORT CAMPBELL, KY 42223

Lab Number: 97-A077178

Sample ID: SOUTH TRENCH-1

Date Collected: 9/11/97

Project: CRANE

Time Collected: 14:30

Project Name: TANK FARM

Date Received: 9/12/97

Sampler: DAN A.

Time Received: 7:30

State Certification: 90038

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	ND	mg/kg	5.00	4.00	1	9/13/97	3:11	Holingwrth	8015M/5030	3880
TPH (Diesel Range)	ND	mg/kg	10.0	4.00	1	9/13/97	3:30	M.Goodrich	8015M/3550	3698

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 9/12/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml C.Gerenser

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	89.	50. - 150.
DRO/TPH Hi Surr., triacontane	86.0	50. - 150.

PROJECT QUALITY CONTROL DATA

Matrix Spike Recovery

Analyte	units	Orig. Val.	MS Val	Spike Conc	Recovery	Target Range	Q.C. Batch
TPH (Gasoline Range)	mg/kg	< 5.00	7.70	10.0	77.00	61. - 142.	3880
TPH (Diesel Range)	mg/kg	< 10.0	59.6	80.0	74.50	43. - 115.	3698

Matrix Spike Duplicate

Analyte	units	Orig. Val.	Duplicate	RPD	Limit	Q.C. Batch
TPH (Gasoline Range)	mg/kg	7.70	8.10	5.06	18.	3880
TPH (Diesel Range)	mg/kg	59.6	56.0	6.23	23.	3698

Laboratory Control Data

Analyte	units	Known Val.	Analyzed Val	% Recovery	Target Range	Q.C. Batch
TPH (Gasoline Range)	mg/kg	10.0	8.10	81.	61. - 142.	3880

Blank Data

Analyte	Blank Value	Units	Q.C. Batch
TPH (Gasoline Range)	< 5.00	mg/kg	3880
TPH (Diesel Range)	< 10.0	mg/kg	3698

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

ANALYTICAL REPORT

VERDRUP-INDIANA 6116
ATT: PETE SAZMA
13723 RIVERPORT DR
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A090561

Sample ID: CELL 6-1

Date Collected: 9/17/97

Project: CRANE

Time Collected:

Project Name: TANK FARM

Date Received: 9/18/97

Sampler: DAN R AYRES

Time Received: 9:00

State Certification:

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Report Limit	Organ Limit	Dil Factor	Date	Time	Analyst	Method	Batch
VOLATILE ORGANICS										
TPH (Gasoline Range)	ND	mg/kg	20.0	4.00	1	10/18/97	10:22	Holingurth	8015M/5030	6752
TPH (Diesel Range)	123.	mg/kg	20.0	4.00	1	10/18/97	22:45	K.Walkup	8015M/3550	7213

ND = not detected at the report limit.

Sample Extraction Data

DATE Extracted 10/16/97 Wt extracted 25.0 gm Extract Volume: 1.0 ml C.Gereaser

<< SURROGATE RECOVERIES >>

Surrogate	% Recovery	Target Range
DTEX/VOC Surr., a,a,a-trifluorotoluene	101	50 - 150
DRO/TPH Ht Surr., trioctadecane	66	50 - 150

Report Approved By: Michael A. Quinn Report Date: 10/20/97

RECEIVED
OCT 23 1997
SVERDRUP CIVIL INC.

Theodore J. Quillin, Ph.D., V.P. Officer
Michael A. Quinn, M.S., Technical Director
Lewis B. Hale, M.S., Laboratory Director

COPY 1

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

ANALYTICAL REPORT

OVERDRUP-INDIANA 6116
ATT: PETE SAZMA
13723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A090562

Sample ID: CELL 6-2

Date Collected: 9/17/97

Project: CRANE

Time Collected:

Project Name: TANK FARM

Date Received: 9/18/97

Sampler: DAN R. AYRES

Time Received: 9:00

State Certification:

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS*										
TPH (Gasoline Range)	ND	mg/Kg	20.0	4.00	1	10/13/97	13:54	Holingurth	8015M/5030	6752
TPH (Diesel Range)	ND	mg/Kg	20.0	4.00	1	10/13/97	23:34	K.Walkup	8015M/3550	7213

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 10/13/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml C.Gereaser

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	109.	50. - 150.
DRO/TPH Hi Surr., triacontane	72.3	50. - 150.

Report Approved By: Michael H. Dunn Report Date: 10/20/97

Theodore J. Duelle, Ph.D., G.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

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Phone 1-615-726-0177

ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
ATT: PETE SAZMA
13723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A090563

Sample ID: CELL 6-3

Date Collected: 9/17/97

Project: CRANE

Time Collected:

Project Name: TANK FARM

Date Received: 9/18/97

Sampler: DAN R. AYRES

Time Received: 9:00

State Certification:

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	ND	mg/kg	20.0	4.00	1	10/18/97	19:27	Holingurth	8015M/5030	6752
TPH (Diesel Range)	ND	mg/kg	20.0	4.00	1	10/19/97	0:22	K.Walkup	8015M/3550	7213

ND = Not detected at the report limit

Sample Extraction Data

Diesel Extracted: 10/16/97 Wt extracted: 30.0 gm Extract Volume: 1.0 ml C.Gerenser

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	108.	50. - 150.
DRO/TPH Surr., orthoterphenyl	73.0	50. - 150.

Report Approved By: Michael A. Dunn Report Date: 10/20/97

Theodore J. Dunilo, Ph.D., Q.A. Officer
Michael A. Dunn, M.S., Technical Director
Lanny B. Hale, M.S., Laboratory Director

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Phone 1-615-726-0177

ANALYTICAL REPORT

RVERDRUP--INDIANA 6116
.TT: PETE SAZMA
.3723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A090564

ample ID: CELL 6-4

Date Collected: 9/17/97

roject: CRANE

Time Collected:

roject Name: TANK FARM

Date Received: 9/18/97

ampler: DAN R. AYRES

Time Received: 9:00

State Certification:

Sample Type: Soil

ATS I D

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	ND	mg/kg	20.0	4.00	1	10/18/97	20:00	Holingurth	8015M/5030	6752
TPH (Diesel Range)	ND	mg/kg	20.0	4.00	1	10/19/97	2:00	K.Walkup	8015M/3550	7213

ND = Not detected at the report limit

Sample Extraction Data

DATE Extracted 10/13/97 Wt extracted 25.0 gm Extract Volume: 1.0 ml C.Gerenser

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a a,a-trifluorotolvene	109	50. - 150.
DRO/TPH Hi Surr., trioctane	72.1	50. - 150

Reports Approved by: Michael H. Dunn Report Date: 10/20/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny S. Hale, B.S., Laboratory Director

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Phone 1-615-726-0177

ANALYTICAL REPORT

VERDRUP-INDIANA 6116
ATT PETE SAZMA
3723 RIVERPORT DR
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A090565

Sample ID: CELL 6-5

Date Collected: 9/17/97

Project: CRANE

Time Collected:

Project Name: TANK FARM

Date Received: 9/18/97

Sampler: DAN R AYRES

Time Received: 9:00

State Certification:

Sample Type: Soil

Site I D

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	ND	mg/kg	20.0	4.00	1	10/18/97	20:34	Holingurth	8015M/5030	6752
TPH (Diesel Range)	ND	mg/kg	20.0	4.00	1	10/19/97	2:49	K.Walkup	8015M/3550	7213

ND = Not detected at the report limit

Sample Extraction Data

DRO Extracted 10/11/97 Wt extracted 25.0 gm Extract Volume: 1.0 ml C.Gerenser

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
DIEX/GRO Surr., a,a,a-trifluorotoluene	111.	50. - 150.
DRO/TPH Hi Surr., triacontane	75.5	50. - 150

Report Approved By: Michael H. Dunn Report Date: 10/20/97

Theodore J. Quellio, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny D. Hale, M.S., Laboratory Director

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2960 Foster Creighton Dr.
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Nashville, TN 37204-0566
Phone 1-615-726-0177

ANALYTICAL REPORT

VERDRUP-INDIANA 6116
ATT: PETE SAZMA
13723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A090566

Sample ID: CELL 6-6

Date Collected: 9/17/97

Project: CRANE

Time Collected:

Project Name: TANK FARM

Date Received: 9/18/97

Sampler: DAN R. AYRES

Time Received: 9:00

State Certification:

Sample Type: Soil

Analyte	Result	Units	Report Limit	Run Limit	Dil Factor	Date	Time	Analyst	Method	Batch
VOLATILE PETROLEUM*										
TPH (Gasoline Range)	ND	mg/kg	20.0	4.00	1	10/18/97	21:07	Holingsworth	8015M/5030	6752
TPH (Diesel Range)	ND	mg/kg	20.0	4.00	1	10/19/97	3:30	M.Walkup	8015M/3550	7213

ND = Not detected at the report limit.

Sample Extraction Data

Date Extracted: 10/19/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml C.Gereaser

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
DRO/GRO Surr., 1,3,5-trifluorotoluene	102.	50. - 150.
DRO/TPH Hi Surr tricosane	66.7	50. - 130.

Reports Approved By: Michael H. Dunn Report Date: 10/20/97

Theodore J. Duelin, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

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Phone 1-615-726-0177

PROJECT QUALITY CONTROL DATA

Matrix Spike Recovery

Analyte	Units	Orig. Val.	MS Val	Spike Conc	Recovery	Target Range	Q.C. Batch
TPH (Gasoline Range)	mg/kg	< 5.00	56.0	50.0	112.00	53. - 136.	6752
TPH (Diesel Range)	mg/kg	< 10.0	53.9	80.0	67.38	43. - 115.	7213

Matrix Spike Duplicate

Analyte	Units	Orig. Val.	Duplicate	RPD	Limit	Q.C. Batch
TPH (Gasoline Range)	mg/kg	56.0	56.0	0.00	18.	6752
TPH (Diesel Range)	mg/kg	53.9	52.4	2.82	23.	7213

Laboratory Control Data

Analyte	Units	Known Val.	Analyzed Val	% Recovery	Target Range	Q.C. Batch
TPH (Gasoline Range)	mg/kg	50.0	56.0	112.	53. - 136.	6752
TPH (Diesel Range)	mg/kg	80.0	86.0	108.	43. - 115.	7213

Blank Data

Analyte	Blank Value	Units	Q.C. Batch
TPH (Gasoline Range)	< 5.00	mg/kg	6752
TPH (Diesel Range)	< 10.0	mg/kg	7213

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SPECIALIZED ASSAYS
ENVIRONMENTAL

7A- 016976

2960 Foster Creighton Drive
Nashville, TN 37204
615-726-0177
FAX 615/726-3404

REFERRING CLIENT
6116

(812) 854-1178 (812) 854 4177

ING CONTROL NUMBER (FOR LAB USE ONLY) 81447 ~~78797~~

PROJECT # CRANE

P.O. #

RS (Signature-Please Print) P. Ayres / Dave P. Ayres

PROJECT NAME TANK FARM

O LAB USE ONLY ACC#	SAMPLE DESCRIPTION	DATE	TIME	COMP	GRAB	# of Cont	ANALYSIS REQUESTED
7-A090561	CELL 6-1	9-17-97			X	1	~~TPH 8015~~ (TPH FLOW)
7-A090562	CELL 6-2				X	1	
7-A090563	CELL 6-3				X	1	
7-A090564	CELL 6-4				X	1	
7-A090565	CELL 6-5				X	1	
7-A090566	CELL 6-6				X	1	
[redacted]	NORTH P. TRENCH-7				X	1	
[redacted]	NORTH P. TRENCH-8				X	1	

See attached

	Date / Time	Received by: (Signature)	Received for Laboratory by	Date / Time
...ished by: (Signature) P. Ayres	9-17-97 4:30			9/18/97 0900
...shed by: (Signature)	Date / Time	Received by: (Signature)	Remarks	
...shed by: (Signature)	Date / Time	Received by: (Signature)		
...uished by: (Signature)	Date / Time	Received by: (Signature)		

...or further assistance in completing the chain of custody form please refer to the instructions found on the opposite sid...

SVERDRUP CIVIL, INC.
CONSTRUCTION OPERATIONS
13723 Riverport Drive
Maryland Heights, Missouri 63043
(314) 770-4017 Fax: (314) 770-5108

FAX COVER SHEET

DATE: 10/13/97 *TIME:*

TO: PAM LANKFORD

COMPANY: SPECIALIZED ASSAYS

FAX NUMBER: 615-726-3404

FROM: PETE SAZAMA

pages: 1

Message:

PAM,

PLEASE RUN TPH ANALYSIS ON SAMPLES

CELL 6-1
CELL 6-2
CELL 6-3
CELL 6-4
CELL 6-5
CELL 6-6

} TPH 8015 - INDIANA

CALL ME @ 314-770-4569 IF ANY QUESTIONS

IF YOU DO NOT RECEIVE ALL THE PAGES
PLEASE CONTACT SVERDRUP AT (314)770-4017

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
ATT: PETE SAZMA
13723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A079676

Sample ID: NORTH P. TRENCH-7

Date Collected: 9/17/97

Project: CRANE

Time Collected:

Project Name: TANK FARM

Date Received: 9/18/97

Sampler: DANY AYRES

Time Received: 9:00

State Certification:

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	ND	mg/kg	5.00	4.00	1	9/19/97	13:34	Hollingsworth	8015M/5030	6195
TPH (Diesel Range)	10.7	mg/kg	10.0	4.00	1	9/19/97	20:19	Cornelius	8015M/3550	6469

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 9/19/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	121.	50. - 150.
DRO/TPH Hi Surr., triacontane	81.0	50. - 150.

Report Approved By: Michael H. Dunn Report Date: 9/20/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

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SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
ATT: PETE SAZMA
13723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A079677

Sample ID: NORTH P. TRENCH-B

Date Collected: 9/17/97

Project: CRANE

Time Collected:

Project Name: TANK FARM

Date Received: 9/18/97

Sampler: DANY AYRES

Time Received: 9:00

State Certification:

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	ND	mg/kg	5.00	4.00	1	9/19/97	14:10	Holingurth	8015M/5030	6195
TPH (Diesel Range)	ND	mg/kg	10.0	4.00	1	9/19/97	21:08	Cornelius	8015M/3550	6469

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 9/19/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	118.	50. - 150.
DRO/TPH Hi Surr., triacontane	78.0	50. - 150.

Report Approved By: Michael H. Dunn Report Date: 9/20/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

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SPECIALIZED ASSAYS, INC.

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Phone 1-615-726-0177

PROJECT QUALITY CONTROL DATA

Matrix Spike Recovery

Analyte	units	Orig. Val.	MS Val	Spike Conc	Recovery	Target Range	Q.C. Batch
TPH (Gasoline Range)	mg/kg	< 5.00	10.5	10.0	105.00	53. - 136.	6195
TPH (Diesel Range)	mg/kg	< 10.0	74.0	80.0	92.50	43. - 115.	6469

Matrix Spike Duplicate

Analyte	units	Orig. Val.	Duplicate	RPD	Limit	Q.C. Batch
TPH (Gasoline Range)	mg/kg	10.5	9.00	15.38	18.	6195
TPH (Diesel Range)	mg/kg	74.0	66.0	11.43	23.	6469

Laboratory Control Data

Analyte	units	Known Val.	Analyzed Val	% Recovery	Target Range	Q.C. Batch
TPH (Gasoline Range)	mg/kg	10.0	10.5	105.	53. - 136.	6195

Blank Data

Analyte	Blank Value	Units	Q.C. Batch
TPH (Gasoline Range)	< 5.00	mg/kg	6195
TPH (Diesel Range)	< 10.0	mg/kg	6469

SPECIALIZED ASSAYS
ENVIRONMENTAL

7A- 016976

2960 Foster Creighton Drive
Nashville, TN 37204
615-726-0177
FAX 615/726-3404

REFERRING CLIENT

(812) 854-1176 (812) 854-4177

BILLING CONTROL NUMBER (FOR LAB USE ONLY) 78797

PROJECT # CRANT

P.O. #

SAMPLERS (Signature-Please Print) Jim P. Fin / Dan P. Ayres

PROJECT NAME TANK FARM

FOR LAB USE ONLY ACC#	SAMPLE DESCRIPTION	DATE	TIME	COMP	GRAB	# OF CONT	ANALYSIS REQUESTED
97-A079670	CELL 6-1	9-17-97			X	1	TPH 8015 (H. & LOW)
97-A079671	CELL 6-2				X	1	
97-A079672	CELL 6-3				X	1	
-A079673	CELL 6-4				X	1	
97-A079674	CELL 6-5				X	1	
97-A079675	CELL 6-6				X	1	
7-A079676	NORTH P. TRENCH-7				X	1	
97-A079677	NORTH P. TRENCH-8				X	1	

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Received for Laboratory by	Date / Time
Dan P. Ayres	9-17-97 4:30			9/18/97 0900
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Remarks	
Relinquished by: (Signature)	Date / Time	Received by: (Signature)		
Relinquished by: (Signature)	Date / Time	Received by: (Signature)		

For further assistance in completing the chain of custody form please refer to the instructions found on the opposite sic

C.S. REP. R.L.

DATE 9/18/97

CLIENT SERVICES CALL REPORT

CLIENT INFORMATION	
ACCOUNT NAME/NUMBER	Sverdrup
PERSON CALLING	Dan Ayers

FEES	SAMPLE REQUIREMENTS

SAMPLE STATUS	
PROJECT NAME	PROJECT NUMBER
ANALYSIS REQUESTED	
DATE SENT/DATE RECEIVED	LAB SAMPLE RANGE/STATUS

BOTTLE REQUEST		
SAMPLE TYPE	NUMBER OF SAMPLES	DATE NEEDED
SHIP TO ADDRESS (IF DIFFERENT)		
ANALYSIS REQUESTED		
ANALYSIS REQUESTED (CONT'D)		TRIP BLANK ?

OTHER

HOLD → CELL 6-1, 6-2, 6-3, 6-4
6-5 + CELL 6-6
Run other 2 samples
North P trench - 7 + 8

SPECIALIZED ASSAYS, INC.
2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
ATT: PETE SAZMA
13723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A076942

Sample ID: SW CORNER 8

Date Collected: 9/10/97

Project: CRANE

Time Collected: 10:30

Project Name: TANK FARM

Date Received: 9/11/97

Sampler: DAN R AYRES

Time Received: 9:00

State Certification:

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	486.	mg/kg	100.	4.00	20	9/12/97	12:19	Holingurth	8015M/5030	3505
TPH (Diesel Range)	7840	mg/kg	200.	4.00	20	9/12/97	16:09	M.Goodrich	8015M/3550	3756

TCLP RESULTS

Analyte	Result	Units	Reg Limit	Matrix Spike Recovery (%)	Date	Method
Lead	< 0.50	mg/l	5.0	90	9/14/97	6010A
TCLP Extraction	COMPLETED				9/12/97	1311

ND = Not detected at the report limit.

Sample Extraction Data

GRO Extracted 9/12/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	115.	50. - 150.
GRO/TPH Hi Surr., triacontane	42.0	50. - 150.

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2960 Foster Creighton Dr.
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Nashville, TN 37204-0566
Phone 1-615-726-0177

ANALYTICAL REPORT

Laboratory Number: 97-A076942
Sample ID: SW CORNER 8

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range

Report Approved By: Theodore J. Duello Report Date: 9/15/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

SPECIALIZED ASSAYS, INC.

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ANALYTICAL REPORT

VERDRUP-INDIANA 6116
ATT: PETE SAZMA
13723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A076943

Sample ID: LOC-11-4'

Date Collected: 9/ 9/97

Project: CRANE

Time Collected: 9:30

Project Name: TANK FARM

Date Received: 9/11/97

Sampler: DAN R AYRES

Time Received: 9:00

State Certification:

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	ND	mg/kg	5.00	4.00	1	9/13/97	1:02	Holingurth	8015M/5030	3502
TPH (Diesel Range)	ND	mg/kg	10.0	4.00	1	9/13/97	19:34	M.Goodrich	8015M/3550	4417

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 9/12/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	115.	50. - 150.
DRO/TPH Hi Surr., triacontane	63.0	50. - 150.

Report Approved By: Theodore J. Duello Report Date: 9/15/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

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ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
ATT: PETE SAZMA
13723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A076944

Sample ID: LOC-8-2'

Date Collected: 9/ 9/97

Project: CRANE

Time Collected: 10:00

Project Name: TANK FARM

Date Received: 9/11/97

Sampler: DAN R AYRES

Time Received: 9:00

State Certification:

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	ND	mg/kg	5.00	4.00	1	9/13/97	1:38	Holingurth	8015M/5030	3502
TPH (Diesel Range)	ND	mg/kg	10.0	4.00	1	9/13/97	20:23	M.Goodrich	8015M/3550	4417

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 9/12/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	115.	50. - 150.
DRO/TPH Hi Surr., triacontane	69.0	50. - 150.

Report Approved By: Theodore J. Duello Report Date: 9/15/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

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SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
ATT: PETE SAZMA
13723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A076945

Sample ID: LOC-B-3.5'

Date Collected: 9/ 9/97

Project: CRANE

Time Collected: 10:10

Project Name: TANK FARM

Date Received: 9/11/97

Sampler: DAN R AYRES

Time Received: 9:00

State Certification:

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	ND	mg/kg	5.00	4.00	1	9/13/97	2:14	Holingurth	8015M/5030	3502
TPH (Diesel Range)	ND	mg/kg	10.0	4.00	1	9/13/97	21:13	M.Goodrich	8015M/3550	4417

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 9/12/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	115.	50. - 150.
DRO/TPH Hi Surr., triacontane	69.0	50. - 150.

Report Approved By: Theodore J. Duello Report Date: 9/15/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

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SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

ANALYTICAL REPORT

VERDRUP-INDIANA 6116
ATT: PETE SAZMA
13723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A076946

Sample ID: LOC-7-2'

Date Collected: 9/ 9/97

Project: CRANE

Time Collected: 11:05

Project Name: TANK FARM

Date Received: 9/11/97

Sampler: DAN R AYRES

Time Received: 9:00

State Certification:

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	ND	mg/kg	5.00	4.00	1	9/13/97	3:25	Hollingsworth	8015M/5030	3502
TPH (Diesel Range)	19.3	mg/kg	10.0	4.00	1	9/13/97	22:02	M.Goodrich	8015M/3550	4417

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 9/12/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	114.	50. - 150.
DRO/TPH Hi Surr., triacontane	75.0	50. - 150.

Report Approved By: Theodore J. Duello Report Date: 9/15/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

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ANALYTICAL REPORT

BVERDRUP-INDIANA 6116
ATT: PETE SAZMA
13723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A076947

Sample ID: LOC-35-3'

Date Collected: 9/ 9/97

Project: CRANE

Time Collected: 11:40

Project Name: TANK FARM

Date Received: 9/11/97

Sampler: DAN R AYRES

Time Received: 9:00

State Certification:

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	29.7	mg/kg	5.00	4.00	1	9/13/97	4:00	Holingurth	8015M/5030	3502
TPH (Diesel Range)	311.	mg/kg	10.0	4.00	1	9/13/97	22:52	M.Goodrich	8015M/3550	4417
VOLATILE ORGANICS										
Acetone	ND	mg/kg	0.0100	0.0100	1	9/12/97	19:32	S. Wani	8260B	4403
Benzene	ND	mg/kg	0.0020	0.0020	1	9/12/97	19:32	S. Wani	8260B	4403
Bromobenzene	ND	mg/kg	0.0020	0.0020	1	9/12/97	19:32	S. Wani	8260B	4403
Bromochloromethane	ND	mg/kg	0.0020	0.0020	1	9/12/97	19:32	S. Wani	8260B	4403
Bromoform	ND	mg/kg	0.0020	0.0020	1	9/12/97	19:32	S. Wani	8260B	4403
Bromomethane	ND	mg/kg	0.0100	0.0100	1	9/12/97	19:32	S. Wani	8260B	4403
2-Butanone	ND	mg/kg	0.0100	0.0100	1	9/12/97	19:32	S. Wani	8260B	4403
n-Butylbenzene	ND	mg/kg	0.0020	0.0020	1	9/12/97	19:32	S. Wani	8260B	4403
sec-Butylbenzene	ND	mg/kg	0.0020	0.0020	1	9/12/97	19:32	S. Wani	8260B	4403
t-Butylbenzene	ND	mg/kg	0.0020	0.0020	1	9/12/97	19:32	S. Wani	8260B	4403
Carbon Disulfide	ND	mg/kg	0.0020	0.0020	1	9/12/97	19:32	S. Wani	8260B	4403
Carbon tetrachloride	ND	mg/kg	0.0020	0.0020	1	9/12/97	19:32	S. Wani	8260B	4403
Chlorobenzene	ND	mg/kg	0.0020	0.0020	1	9/12/97	19:32	S. Wani	8260B	4403
Chloroethane	ND	mg/kg	0.0020	0.0020	1	9/12/97	19:32	S. Wani	8260B	4403
2-Chloroethylvinylether	ND	mg/kg	0.0020	0.0020	1	9/12/97	19:32	S. Wani	8260B	4403
Chloroform	ND	mg/kg	0.0020	0.0020	1	9/12/97	19:32	S. Wani	8260B	4403
Chloromethane	ND	mg/kg	0.0100	0.0100	1	9/12/97	19:32	S. Wani	8260B	4403
2-Chlorotoluene	ND	mg/kg	0.0020	0.0020	1	9/12/97	19:32	S. Wani	8260B	4403
4-Chlorotoluene	ND	mg/kg	0.0020	0.0020	1	9/12/97	19:32	S. Wani	8260B	4403
1,2-Dibromo-3-chloropropane	ND	mg/kg	0.0020	0.0020	1	9/12/97	19:32	S. Wani	8260B	4403
Dibromochloromethane	ND	mg/kg	0.0020	0.0020	1	9/12/97	19:32	S. Wani	8260B	4403
1,2-Dibromoethane	ND	mg/kg	0.0020	0.0020	1	9/12/97	19:32	S. Wani	8260B	4403
Dibromomethane	ND	mg/kg	0.0020	0.0020	1	9/12/97	19:32	S. Wani	8260B	4403

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ANALYTICAL REPORT

Laboratory Number: 97-A076947
Sample ID: LOC-35-3'

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
1,2-Dichlorobenzene	ND	mg/kg	0.0020	0.0020	1	9/12/97	19:32	S. Wani	8260B	4403
1,3-Dichlorobenzene	ND	mg/kg	0.0020	0.0020	1	9/12/97	19:32	S. Wani	8260B	4403
1,4-Dichlorobenzene	ND	mg/kg	0.0020	0.0020	1	9/12/97	19:32	S. Wani	8260B	4403
Dichlorodifluoromethane	ND	mg/kg	0.0020	0.0020	1	9/12/97	19:32	S. Wani	8260B	4403
1,1-Dichloroethane	0.0120	mg/kg	0.0020	0.0020	1	9/12/97	19:32	S. Wani	8260B	4403
1,2-Dichloroethane	ND	mg/kg	0.0020	0.0020	1	9/12/97	19:32	S. Wani	8260B	4403
1,1-Dichloroethene	ND	mg/kg	0.0020	0.0020	1	9/12/97	19:32	S. Wani	8260B	4403
cis-1,2-Dichloroethene	0.0030	mg/kg	0.0020	0.0020	1	9/12/97	19:32	S. Wani	8260B	4403
trans-1,2-Dichloroethene	ND	mg/kg	0.0020	0.0020	1	9/12/97	19:32	S. Wani	8260B	4403
1,2-Dichloropropane	ND	mg/kg	0.0020	0.0020	1	9/12/97	19:32	S. Wani	8260B	4403
1,3-Dichloropropane	ND	mg/kg	0.0020	0.0020	1	9/12/97	19:32	S. Wani	8260B	4403
2,2-Dichloropropane	ND	mg/kg	0.0020	0.0020	1	9/12/97	19:32	S. Wani	8260B	4403
1,1-Dichloropropene	ND	mg/kg	0.0020	0.0020	1	9/12/97	19:32	S. Wani	8260B	4403
cis-1,3-Dichloropropene	ND	mg/kg	0.0020	0.0020	1	9/12/97	19:32	S. Wani	8260B	4403
trans-1,3-Dichloropropene	ND	mg/kg	0.0020	0.0020	1	9/12/97	19:32	S. Wani	8260B	4403
Ethylbenzene	ND	mg/kg	0.0020	0.0020	1	9/12/97	19:32	S. Wani	8260B	4403
Hexachlorobutadiene	ND	mg/kg	0.0020	0.0020	1	9/12/97	19:32	S. Wani	8260B	4403
2-Hexanone	ND	mg/kg	0.0100	0.0100	1	9/12/97	19:32	S. Wani	8260B	4403
Isopropylbenzene	ND	mg/kg	0.0020	0.0020	1	9/12/97	19:32	S. Wani	8260B	4403
4-Isopropyltoluene	ND	mg/kg	0.0020	0.0020	1	9/12/97	19:32	S. Wani	8260B	4403
4-Methyl-2-pentanone	ND	mg/kg	0.0100	0.0100	1	9/12/97	19:32	S. Wani	8260B	4403
Methylene chloride	ND	mg/kg	0.0020	0.0020	1	9/12/97	19:32	S. Wani	8260B	4403
Naphthalene	ND	mg/kg	0.0020	0.0020	1	9/12/97	19:32	S. Wani	8260B	4403
n-Propylbenzene	ND	mg/kg	0.0020	0.0020	1	9/12/97	19:32	S. Wani	8260B	4403
Styrene	ND	mg/kg	0.0020	0.0020	1	9/12/97	19:32	S. Wani	8260B	4403
1,1,1,2-Tetrachloroethane	ND	mg/kg	0.0020	0.0020	1	9/12/97	19:32	S. Wani	8260B	4403
1,1,2,2-Tetrachloroethane	ND	mg/kg	0.0020	0.0020	1	9/12/97	19:32	S. Wani	8260B	4403
Tetrachloroethene	ND	mg/kg	0.0020	0.0020	1	9/12/97	19:32	S. Wani	8260B	4403
Toluene	ND	mg/kg	0.0020	0.0020	1	9/12/97	19:32	S. Wani	8260B	4403
1,2,3-Trichlorobenzene	ND	mg/kg	0.0020	0.0020	1	9/12/97	19:32	S. Wani	8260B	4403
1,2,4-Trichlorobenzene	ND	mg/kg	0.0020	0.0020	1	9/12/97	19:32	S. Wani	8260B	4403
1,1,1-Trichloroethane	ND	mg/kg	0.0020	0.0020	1	9/12/97	19:32	S. Wani	8260B	4403
1,1,2-Trichloroethane	ND	mg/kg	0.0020	0.0020	1	9/12/97	19:32	S. Wani	8260B	4403
Trichloroethene	ND	mg/kg	0.0020	0.0020	1	9/12/97	19:32	S. Wani	8260B	4403
1,2,3-Trichloropropane	ND	mg/kg	0.0020	0.0020	1	9/12/97	19:32	S. Wani	8260B	4403
1,2,4-Trimethylbenzene	ND	mg/kg	0.0020	0.0020	1	9/12/97	19:32	S. Wani	8260B	4403
1,3,5-Trimethylbenzene	ND	mg/kg	0.0020	0.0020	1	9/12/97	19:32	S. Wani	8260B	4403
Vinyl chloride	ND	mg/kg	0.0020	0.0020	1	9/12/97	19:32	S. Wani	8260B	4403
Xylenes	ND	mg/kg	0.0020	0.0020	1	9/12/97	19:32	S. Wani	8260B	4403
Bromodichloromethane	ND	mg/kg	0.0020	0.0020	1	9/12/97	19:32	S. Wani	8260B	4403
Trichlorofluoromethane	ND	mg/kg	0.0020	0.0020	1	9/12/97	19:32	S. Wani	8260B	4403

ND = Not detected at the report limit.

SPECIALIZED ASSAYS, INC.

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Nashville, TN 37204-0566
Phone 1-615-726-0177

ANALYTICAL REPORT

Laboratory Number: 97-A076947
Sample ID: LOC-35-3'

Sample Extraction Data

DRO Extracted 9/12/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	114.	50. - 150.
DRO/TPH Hi Surr., triacontane	76.0	50. - 150.
VOA Surrogate, 1,2-Dichloroethane, d4	104.	62. - 147.
VOA Surrogate, Toluene d8	94.0	84. - 117.
VOA Surrogate, 4-Bromofluorobenzene	101.	64. - 126.

Report Approved By: Theodore J. Duello Report Date: 9/15/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
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Phone 1-615-726-0177

ANALYTICAL REPORT

VERDRUP-INDIANA 6116
ATT: PETE SAZMA
13723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A07694B

Sample ID: LOC-7-5'

Date Collected: 9/ 9/97

Project: CRANE

Time Collected: 11:15

Project Name: TANK FARM

Date Received: 9/11/97

Sampler: DAN R AYRES

Time Received: 9:00

State Certification:

Sample Type: Soil

Site I.D.

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	ND	mg/kg	5.00	4.00	1	9/13/97	4:36	Holingurth	8015M/5030	3502
TPH (Diesel Range)	ND	mg/kg	10.0	4.00	1	9/13/97	23:41	M.Goodrich	8015M/3550	4417

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 9/12/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	114.	50. - 150.
DRO/TPH Hi Surr., triacontane	74.0	50. - 150.

Report Approved By: Theodore J. Duello Report Date: 9/15/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

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PROJECT QUALITY CONTROL DATA

Matrix Spike Recovery

Analyte	units	Orig. Val.	MS Val	Spike Conc	Recovery	Target Range	Q.C. Batch
TPH (Gasoline Range)	mg/kg	< 5.00	11.4	10.0	114.00	53. - 136.	3502
TPH (Gasoline Range)	mg/kg	< 5.00	11.4	10.0	114.00	53. - 136.	3505
TPH (Diesel Range)	mg/kg	< 10.0	61.2	80.0	76.50	43. - 115.	3756
TPH (Diesel Range)	mg/kg	< 10.0	61.2	80.0	76.50	43. - 115.	4417
Benzene	mg/kg	< 0.0020	54.00	50.00	108.00	48. - 150.	4403
Chlorobenzene	mg/kg	< 0.0020	50.00	50.00	100.00	54. - 138.	4403
1,1-Dichloroethene	mg/kg	< 0.0020	51.00	50.00	102.00	36. - 161.	4403
Toluene	mg/kg	< 0.0020	52.00	50.00	104.00	51. - 141.	4403
Trichloroethene	mg/kg	< 0.0020	53.00	50.00	106.00	43. - 140.	4403

Matrix Spike Duplicate

Analyte	units	Orig. Val.	Duplicate	RPD	Limit	Q.C. Batch
TPH (Gasoline Range)	mg/kg	11.4	10.7	6.33	18.	3502
TPH (Gasoline Range)	mg/kg	11.4	10.7	6.33	18.	3505
TPH (Diesel Range)	mg/kg	61.2	60.4	1.32	23.	3756
TPH (Diesel Range)	mg/kg	61.2	60.2	1.65	23.	4417
Benzene	mg/kg	54.00	54.00	0.00	22.	4403
Chlorobenzene	mg/kg	50.00	55.00	9.52	16.	4403
1,1-Dichloroethene	mg/kg	51.00	50.00	1.98	22.	4403
Toluene	mg/kg	52.00	51.00	1.94	26.	4403
Trichloroethene	mg/kg	53.00	53.00	0.00	17.	4403

Laboratory Control Data

Analyte	units	Known Val.	Analyzed Val	% Recovery	Target Range	Q.C. Batch
TPH (Gasoline Range)	mg/kg	10.0	10.7	107.	53. - 136.	3502
TPH (Gasoline Range)	mg/kg	10.0	10.7	107.	53. - 136.	3505

Blank Data

Analyte	Blank Value	Units	Q.C. Batch
TPH (Gasoline Range)	< 5.00	mg/kg	3502
TPH (Gasoline Range)	< 5.00	mg/kg	3505
TPH (Diesel Range)	< 10.0	mg/kg	3756
TPH (Diesel Range)	< 10.0	mg/kg	4417
Lead	< 0.50	mg/l	3142
Acetone	< 0.0100	mg/kg	4403
Benzene	< 0.0020	mg/kg	4403
Bromobenzene	< 0.0020	mg/kg	4403
Bromochloromethane	< 0.0020	mg/kg	4403
Bromoform	< 0.0020	mg/kg	4403
Bromomethane	< 0.0100	mg/kg	4403

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PROJECT QUALITY CONTROL DATA

Blank Data

Analyte	Blank Value	Units	Q.C. Batch
2-Butanone	< 0.0100	ng/kg	4403
n-Butylbenzene	< 0.0020	ng/kg	4403
sec-Butylbenzene	< 0.0020	ng/kg	4403
t-Butylbenzene	< 0.0020	ng/kg	4403
Carbon Disulfide	< 0.0020	ng/kg	4403
Carbon tetrachloride	< 0.0020	ng/kg	4403
Chlorobenzene	< 0.0020	ng/kg	4403
Chloroethane	< 0.0020	ng/kg	4403
2-Chloroethylvinylether	< 0.0020	ng/kg	4403
Chloroform	< 0.0020	ng/kg	4403
Chloromethane	< 0.0100	ng/kg	4403
2-Chlorotoluene	< 0.0020	ng/kg	4403
4-Chlorotoluene	< 0.0020	ng/kg	4403
1,2-Dibromo-3-chloropropane	< 0.0020	ng/kg	4403
Dibromochloromethane	< 0.0020	ng/kg	4403
1,2-Dibromoethane	< 0.0020	ng/kg	4403
Dibromomethane	< 0.0020	ng/kg	4403
1,2-Dichlorobenzene	< 0.0020	ng/kg	4403
1,3-Dichlorobenzene	< 0.0020	ng/kg	4403
1,4-Dichlorobenzene	< 0.0020	ng/kg	4403
Dichlorodifluoromethane	< 0.0020	ng/kg	4403
1,1-Dichloroethane	< 0.0020	ng/kg	4403
1,2-Dichloroethane	< 0.0020	ng/kg	4403
1,1-Dichloroethene	< 0.0020	ng/kg	4403
cis-1,2-Dichloroethene	< 0.0020	ng/kg	4403
trans-1,2-Dichloroethene	< 0.0020	ng/kg	4403
1,2-Dichloropropane	< 0.0020	ng/kg	4403
1,3-Dichloropropane	< 0.0020	ng/kg	4403
2,2-Dichloropropane	< 0.0020	ng/kg	4403
1,1-Dichloropropene	< 0.0020	ng/kg	4403
cis-1,3-Dichloropropene	< 0.0020	ng/kg	4403
trans-1,3-Dichloropropene	< 0.0020	ng/kg	4403
Ethylbenzene	< 0.0020	ng/kg	4403
Hexachlorobutadiene	< 0.0020	ng/kg	4403
2-Hexanone	< 0.0100	ng/kg	4403
Isopropylbenzene	< 0.0020	ng/kg	4403
4-Isopropyltoluene	< 0.0020	ng/kg	4403
4-Methyl-2-pentanone	< 0.0100	ng/kg	4403
Methylene chloride	< 0.0020	ng/kg	4403
Naphthalene	< 0.0020	ng/kg	4403
n-Propylbenzene	< 0.0020	ng/kg	4403
Styrene	< 0.0020	ng/kg	4403
1,1,1,2-Tetrachloroethane	< 0.0020	ng/kg	4403
1,1,2,2-Tetrachloroethane	< 0.0020	ng/kg	4403
Tetrachloroethene	< 0.0020	ng/kg	4403
Toluene	< 0.0020	ng/kg	4403

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Phone 1-615-726-0177

PROJECT QUALITY CONTROL DATA

Blank Data

Analyte	Blank Value	Units	Q.C. Batch
1,2,3-Trichlorobenzene	< 0.0020	mg/kg	4403
1,2,4-Trichlorobenzene	< 0.0020	mg/kg	4403
1,1,1-Trichloroethane	< 0.0020	mg/kg	4403
1,1,2-Trichloroethane	< 0.0020	mg/kg	4403
Trichloroethene	< 0.0020	mg/kg	4403
1,2,3-Trichloropropane	< 0.0020	mg/kg	4403
1,2,4-Trimethylbenzene	< 0.0020	mg/kg	4403
1,3,5-Trimethylbenzene	< 0.0020	mg/kg	4403
Vinyl chloride	< 0.0020	mg/kg	4403
Xylenes	< 0.0020	mg/kg	4403
Bromodichloromethane	< 0.0020	mg/kg	4403
Trichlorofluoromethane	< 0.0020	mg/kg	4403

SPECIALIZED ASSAYS
ENVIRONMENTAL

7A- 011261

2960 Foster Creighton Drive
Nashville, TN 37204
615-726-0177
FAX 615/726-3404

REFERRING CLIENT

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Specialized Assays [illegible]

BILLING CONTROL NUMBER (FOR LAB USE ONLY): 78169

PROJECT #: CEANI

P.O. #:

SAMPLERS (Signature-Please Print): [illegible] / Don Ayres

PROJECT NAME: TANK FARM

FOR LAB USE ONLY ACC#	SAMPLE DESCRIPTION	DATE	TIME	COMP	GRAB	# of CONT	ANALYSIS REQUESTED
97-A076942	SW-CORNER-8	9-11-97	11:30		X	1	TCLP Lead, TPH 8015
97-A076943	LCC-11-4'	9-9-97	9:30			1	TPH 8015
97-A076944	LOC-8-2'		10:00			1	
97-A076945	LOC-8-3.5'		10:10			1	
97-A076946	LOC-7-2'		11:05			1	8260, TPH 8015
97-A076947	LOC-35-3'		11:40			1	
97-A076948	LOC-7-5'		11:15			1	TPH 8015

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Received for Laboratory by:	Date / Time
[illegible]	9-11-97 7:30		Pd R Bufin	9/11/97 9:00
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Remarks	
Relinquished by: (Signature)	Date / Time	Received by: (Signature)		
Relinquished by: (Signature)	Date / Time	Received by: (Signature)		

For further assistance in completing the chain of custody form please refer to the instructions found on the opposite si

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ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
ATT: PETE SAZMA
13723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A078172

Sample ID: NORTH P. TRENCH-1

Date Collected: 9/12/97

Project: CRANE

Time Collected: 13:15

Project Name: TANK FARM

Date Received: 9/13/97

Sampler: DAN AYRES

Time Received: 10:45

State Certification:

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	ND	mg/kg	5.00	4.00	1	9/13/97	19:30	Holingsrth	8015M/5030	3967
TPH (Diesel Range)	ND	mg/kg	20.0	4.00	1	9/15/97	19:46	Cornelius	8015M/3550	4665

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 9/15/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	112.	50. - 150.
DRO/TPH Hi Surr., triacontane	84.0	50. - 150.

Report Approved By: Michael H. Dunn Report Date: 9/16/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

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ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
ATT: PETE SAZMA
13723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A078174

Sample ID: NORTH P. TRENCH-3

Date Collected: 9/12/97

Project: CRANE

Time Collected: 13:40

Project Name: TANK FARM

Date Received: 9/13/97

Sampler: DAN AYRES

Time Received: 10:45

State Certification:

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	ND	mg/kg	5.00	4.00	1	9/13/97	20:45	Holingurth	8015M/5030	3967
TPH (Diesel Range)	ND	mg/kg	20.0	4.00	1	9/15/97	21:27	Cornelius	8015M/3550	4665

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 9/15/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	113.	50. - 150.
DRO/TPH Hi Surr., triacontane	95.0	50. - 150.

Report Approved By: Michael H. Dunn Report Date: 9/16/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

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ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
ATT: PETE SAZMA
13723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A078175

Sample ID: NORTH P. TRENCH-4

Date Collected: 9/12/97

Project: CRANE

Time Collected: 13:50

Project Name: TANK FARM

Date Received: 9/13/97

Sampler: DAN AYRES

Time Received: 10:45

State Certification:

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	ND	mg/kg	5.00	4.00	1	9/13/97	21:21	Holingurth	8015M/5030	3967
TPH (Diesel Range)	ND	mg/kg	20.0	4.00	1	9/15/97	22:17	Cornelius	8015M/3550	4665

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 9/15/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	113.	50. - 150.
DRO/TPH Hi Surr., triacontane	93.0	50. - 150.

Report Approved By: Michael H. Dunn Report Date: 9/16/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

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ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
ATT: PETE SAZMA
13723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A078176

Sample ID: NORTH P. TRENCH-5

Date Collected: 9/12/97

Project: CRANE

Time Collected: 14:05

Project Name: TANK FARM

Date Received: 9/13/97

Sampler: DAN AYRES

Time Received: 10:45

State Certification:

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	ND	mg/kg	5.00	4.00	1	9/13/97	21:58	Holingurth	8015M/5030	3967
TPH (Diesel Range)	ND	mg/kg	20.0	4.00	1	9/15/97	23:07	Cornelius	8015M/3550	4665

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 9/15/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	113.	50. - 150.
DRO/TPH Hi Surr., triacontane	96.0	50. - 150.

Report Approved By: Michael A. Dunn Report Date: 9/16/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

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ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
ATT: PETE SAZMA
13723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A078177

Sample ID: NORTH P. TRENCH-6

Date Collected: 9/12/97

Project: CRANE

Time Collected: 14:15

Project Name: TANK FARM

Date Received: 9/13/97

Sampler: DAN AYRES

Time Received: 10:45

State Certification:

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	ND	mg/kg	5.00	4.00	1	9/13/97	22:34	Hollingsworth	8015M/5030	3967
TPH (Diesel Range)	ND	mg/kg	20.0	4.00	1	9/15/97	23:57	Cornelius	8015M/3550	4665

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 9/15/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	112.	50. - 150.
DRO/TPH Hi Surr., triacontane	102.	50. - 150.

Report Approved By: Michael H. Dunn Report Date: 9/16/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
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PROJECT QUALITY CONTROL DATA

Matrix Spike Recovery

Analyte	units	Orig. Val.	MS Val	Spike Conc	Recovery	Target Range	Q.C. Batch
TPH (Gasoline Range)	mg/kg	< 5.00	24.5	30.0	81.67	53. - 136.	3967
TPH (Diesel Range)	mg/kg	< 10.0	97.2	80.0	121.50#	43. - 115.	4665

Matrix Spike Duplicate

Analyte	units	Orig. Val.	Duplicate	RPD	Limit	Q.C. Batch
TPH (Gasoline Range)	mg/kg	24.5	24.3	0.82	18.	3967
TPH (Diesel Range)	mg/kg	97.2	89.0	8.81	23.	4665

Laboratory Control Data

Analyte	units	Known Val.	Analyzed Val	% Recovery	Target Range	Q.C. Batch
TPH (Gasoline Range)	mg/kg	10.0	8.88	89.	53. - 136.	3967
TPH (Diesel Range)	mg/kg	80.0	82.2	103.	43. - 115.	4665

Blank Data

Analyte	Blank Value	Units	Q.C. Batch
TPH (Gasoline Range)	< 5.00	mg/kg	3967
TPH (Diesel Range)	< 10.0	mg/kg	4665

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ENVIRONMENTAL

7A- 003796

2960 Foster Creighton Drive
Nashville, TN 37204
615-726-0177
FAX 615/726-3404

REFERRING CLIENT
Sverdrup · Indiana 6116
Dan Ayres
Ph.
812 854-1178 FAX (812) 854-4177

ING CONTROL NUMBER (FOR LAB USE ONLY)

PROJECT # CRANE

P.O. #

PLERS (Signature-Please Print) Dan R. Ayres / Dan Ayres

PROJECT NAME TANK FARM

FOR LAB USE ONLY ACC#	SAMPLE DESCRIPTION	DATE	TIME	COMP	GRAB	# of cont	ANALYSIS REQUESTED
97-A078172	North P. Trench-1	9-12-97	1:45		X	1	TPH 8015 (Hi & Low)
97-A078173	North P. Trench-2		1:25		X	1	
97-A078174	North P. Trench-3		1:40		X	1	
97-A078175	North P. Trench-4		1:50		X	1	
97-A078176	North P. Trench-5		2:05		X	1	
97-A078177	North P. Trench-6		2:15		X	1	

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Received for Laboratory by:	Date / Time
Dan R. Ayres	9-13-97 10:45	Pam Langford	Phil R Bufin	9/13/97 10:45
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Remarks	
Pam Langford	9/13/97 1045			
Relinquished by: (Signature)	Date / Time	Received by: (Signature)		
Relinquished by: (Signature)	Date / Time	Received by: (Signature)		

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ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
TT: PETE SAZMA
3723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A071898

ample ID: TF-17

Date Collected: 8/26/97

Project: CRANE

Time Collected: 10:00

roject Name: TANK FARM

Date Received: 8/28/97

ampler: DAN AYRES

Time Received: 8:30

State Certification:

Sample Type: Soil

ite I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	ND	mg/kg	5.00	4.00	1	8/29/97	1:10	Holingurth	8015M/5030	8488
TPH (Diesel Range)	ND	mg/kg	10.0	4.00	1	8/29/97	19:47	M.Goodrich	8015M/3550	9303

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 8/29/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	109.	50. - 150.
DRO/TPH Hi Surr., triacontane	107.	50. - 150.

Report Approved By: Michael H. Dunn Report Date: 8/30/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

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ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
TT: PETE SAZMA
3723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A071899

ample ID: TF-18

Date Collected: 8/26/97

Project: CRANE

Time Collected: 9:00

.roject Name: TANK FARM

Date Received: 8/28/97

ampler: DAN AYRES

Time Received: 8:30

State Certification:

Sample Type: Soil

ite I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	ND	mg/kg	5.00	4.00	1	8/29/97	1:45	Holiagurth	8015M/5030	8488
TPH (Diesel Range)	27.1	mg/kg	10.0	4.00	1	8/29/97	20:35	M.Goodrich	8015M/3550	9303

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 8/29/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	105.	50. - 150.
DRO/TPH Hi Surr., triacontane	94.0	50. - 150.

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ANALYTICAL REPORT

Laboratory Number: 97-A071899
Sample ID: TF-18

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range

Report Approved By: Michael H. Dunn Report Date: 8/30/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

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ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
TT: PETE SAZMA
3723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A071900

ample ID: TF-38

Date Collected: 8/26/97

Project: CRANE

Time Collected: 10:15

.roject Name: TANK FARM

Date Received: 8/28/97

ampler: DAN AYRES

Time Received: 8:30

State Certification:

Sample Type: Soil

ite I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	86.9	mg/kg	25.0	4.00	5	8/29/97	2:21	Hollingsworth	8015M/5030	8488
TPH (Diesel Range)	2380	mg/kg	100.	4.00	10	8/30/97	13:06	M.Goodrich	8015M/3550	9303

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 8/29/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	117.	50. - 150.
DRO/TPH Hi Surr., triacontane	90.0	50. - 150.

Report Approved By: Michael H. Dunn Report Date: 8/30/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

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ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
TT: PETE SAZMA
3723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A071901

ample ID: TF-47

Date Collected: 8/26/97

Project: CRANE

Time Collected: 9:30

roject Name: TANK FARM

Date Received: 8/28/97

ampler: DAN AYRES

Time Received: 8:30

State Certification:

Sample Type: Soil

ite I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	ND	mg/kg	5.00	4.00	1	8/29/97	2:56	Holingurth	8015M/5030	8488
TPH (Diesel Range)	ND	mg/kg	10.0	4.00	1	8/29/97	22:10	M.Goodrich	8015M/3550	9303

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 8/29/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	108.	50. - 150.
DRO/TPH Hi Surr., triacontane	80.0	50. - 150.

Report Approved By: Michael H. Dunn Report Date: 8/30/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

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ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
TT: PETE SAZMA
3723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A071902

ample ID: TF-19

Date Collected: 8/26/97

Project: CRANE

Time Collected: 10:30

roject Name: TANK FARM

Date Received: 8/28/97

ampler: DAN AYRES

Time Received: 8:30

State Certification:

Sample Type: Soil

ite I.D.:

alyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	ND	mg/kg	5.00	4.00	1	8/29/97	3:31	Hollingsrth	8015M/5030	8488
TPH (Diesel Range)	960.	mg/kg	100.	4.00	10	8/29/97	22:57	M.Goodrich	8015M/3550	9303

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 8/29/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	111.	50. - 150.
DRO/TPH Hi Surr., triacontane	80.0	50. - 150.

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ANALYTICAL REPORT

Laboratory Number: 97-A071902
Sample ID: TF-19

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range

Report Approved By: Michael H. Dunn Report Date: 8/30/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

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ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
TT: PETE SAZMA
3723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A071903

ample ID: TF-30

Date Collected: 8/26/97

Project: CRANE

Time Collected: 11:00

roject Name: TANK FARM

Date Received: 8/28/97

ampler: DAN AYRES

Time Received: 8:30

State Certification:

Sample Type: Soil

ite I.D.:

nalyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	ND	mg/kg	5.00	4.00	1	8/29/97	4:07	Holingurth	8015M/5030	8488
TPH (Diesel Range)	42.0	mg/kg	10.0	4.00	1	8/30/97	1:18	M.Goodrich	8015M/3550	9303

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 8/29/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	107.	50. - 150.
DRO/TPH Hi Surr., triacontane	93.0	50. - 150.

Report Approved By: Michael H. Dunn Report Date: 8/30/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

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ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
ATTN: PETE SAZMA
3723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A071904

Sample ID: TF-35

Date Collected: 8/26/97

Project: CRANE

Time Collected: 11:30

Project Name: TANK FARM

Date Received: 8/28/97

Sampler: DAN AYRES

Time Received: 8:30

State Certification:

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	ND	mg/kg	5.00	4.00	1	8/29/97	4:42	Hollingsworth	8015M/5030	8488
TPH (Diesel Range)	23.8	mg/kg	10.0	4.00	1	8/30/97	2:05	M.Goodrich	8015M/3550	9303

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 8/29/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	108.	50. - 150.
DRO/TPH Hi Surr., triacontane	95.0	50. - 150.

Report Approved By: Michael H. Dunn Report Date: 8/30/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

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ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
TT: PETE SAZMA
3723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A071905

ample ID: TF-36

Date Collected: 8/26/97

Project: CRANE

Time Collected: 12:50

roject Name: TANK FARM

Date Received: 8/28/97

ampler: DAN AYRES

Time Received: 8:30

State Certification:

Sample Type: Soil

ite I.D.:

alyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	ND	mg/kg	5.00	4.00	1	8/29/97	6:29	Holingurth	8015M/5030	8488
TPH (Diesel Range)	130.	mg/kg	10.0	4.00	1	8/30/97	3:39	M.Goodrich	8015M/3550	9303

ND = Not detected at the report limit.

Sample Extraction Data

GRO Extracted 8/29/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	103.	50. - 150.
DRO/TPH Hi Surr., triacontane	100.	50. - 150.

Report Approved By: Michael H. Dunn Report Date: 8/30/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

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SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
ATTN: PETE SAZMA
3723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A071906

Sample ID: TF-37

Date Collected: 8/26/97

Project: CRANE

Time Collected: 13:15

Project Name: TANK FARM

Date Received: 8/28/97

Sampler: DAN AYRES

Time Received: 8:30

State Certification:

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	ND	mg/kg	5.00	4.00	1	8/29/97	7:05	Hollingsworth	8015M/5030	8488
TPH (Diesel Range)	49.2	mg/kg	10.0	4.00	1	8/30/97	4:26	M.Goodrich	8015M/3550	9303

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 8/29/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	107.	50. - 150.
DRO/TPH Hi Surr., triacontane	99.0	50. - 150.

Report Approved By: Michael H. Dunn Report Date: 8/30/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

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ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
TT: PETE SAZMA
3723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A071907

ample ID: TF-49

Date Collected: 8/26/97

Project: CRANE

Time Collected: 13:45

roject Name: TANK FARM

Date Received: 8/28/97

ampler: DAN AYRES

Time Received: 8:30

State Certification:

Sample Type: Soil

ite I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	ND	mg/kg	5.00	4.00	1	8/29/97	7:40	Holingsworth	8015M/5030	8488
TPH (Diesel Range)	ND	mg/kg	10.0	4.00	1	8/30/97	5:13	M.Goodrich	8015M/3550	9303

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 8/29/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	107.	50. - 150.
DRO/TPH Hi Surr., triacontane	89.0	50. - 150.

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ANALYTICAL REPORT

Laboratory Number: 97-A071907
Sample ID: TF-49

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range

Report Approved By: Michael H. Dunn Report Date: 8/30/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

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ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
TT: PETE SAZMA
3723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A071908

ample ID: TF-27

Date Collected: 8/26/97

Project: CRANE

Time Collected: 15:00

roject Name: TANK FARM

Date Received: 8/28/97

ampler: DAN AYRES

Time Received: 8:30

State Certification:

Sample Type: Soil

ite I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	ND	mg/kg	5.00	4.00	1	8/29/97	8:15	Holingurth	8015M/5030	8488
TPH (Diesel Range)	ND	mg/kg	10.0	4.00	1	8/30/97	6:00	M.Goodrich	8015M/3550	9303

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 8/29/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	109.	50. - 150.
DRO/TPH Hi Surr., triacontane	100.	50. - 150.

Report Approved By: Michael H. Dunn Report Date: 8/30/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

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ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
ATTN: PETE SAZMA
3723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A071909

Sample ID: TF-29

Date Collected: 8/28/97

Project: CRANE

Time Collected: 15:15

Project Name: TANK FARM

Date Received: 8/28/97

Sampler: DAN AYRES

Time Received: 8:30

State Certification:

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	ND	mg/kg	5.00	4.00	1	8/29/97	8:51	Holingurth	8015M/5030	8488
TPH (Diesel Range)	ND	mg/kg	10.0	4.00	1	8/30/97	6:47	M.Goodrich	8015M/3550	9303

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 8/29/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	106.	50. - 150.
DRO/TPH Hi Surr., triacontane	105.	50. - 150.

Report Approved By: Michael H. Dunn Report Date: 8/30/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

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ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
ATT: PETE SAZMA
3723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A071910

Sample ID: TF-28

Date Collected: 8/26/97

Project: CRANE

Time Collected: 15:45

Project Name: TANK FARM

Date Received: 8/28/97

Sampler: DAN AYRES

Time Received: 8:30

State Certification:

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	ND	mg/kg	5.00	4.00	1	8/29/97	10:17	Holingurth	8015M/5030	8488
TPH (Diesel Range)	ND	mg/kg	10.0	4.00	1	8/30/97	7:34	M.Goodrich	8015M/3550	9303

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 8/29/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	105.	50. - 150.
DRO/TPH Hi Surr., triacontane	87.0	50. - 150.

Report Approved By: Michael H. Dunn Report Date: 8/30/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

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PROJECT QUALITY CONTROL DATA

Matrix Spike Recovery

Analyte	units	Orig. Val.	MS Val	Spike Conc	Recovery	Target Range	Q.C. Batch
TPH (Gasoline Range)	mg/kg	< 5.00	9.75	10.0	97.50	61. - 142.	8488
TPH (Diesel Range)	mg/kg	< 10.0	56.0	80.0	70.00	43. - 115.	9303

Matrix Spike Duplicate

Analyte	units	Orig. Val.	Duplicate	RPD	Limit	Q.C. Batch
TPH (Gasoline Range)	mg/kg	9.75	10.3	5.49	18.	8488
TPH (Diesel Range)	mg/kg	56.0	50.4	10.53	23.	9303

Laboratory Control Data

Analyte	units	Known Val.	Analyzed Val	% Recovery	Target Range	Q.C. Batch
TPH (Gasoline Range)	mg/kg	10.0	9.75	98.	61. - 142.	8488

Blank Data

Analyte	Blank Value	Units	Q.C. Batch
TPH (Gasoline Range)	< 5.00	mg/kg	8488
TPH (Diesel Range)	< 10.0	mg/kg	9303

SPECIALIZED ASSAYS
ENVIRONMENTAL

7A- 011262

2960 Foster Creighton Drive
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FAX 615/726-3404

REFERRING CLIENT

Account: 6116
Sverdrup - Indiana
Dan Ayers
13723 Riverport Drive
Maryland Heights, MO 63043
Ph: 314-770-4012 Fax: 314-770-5108

Specialized Assays: (800) 765-0980

BILLING CONTROL NUMBER (FOR LAB USE ONLY): 76989

PROJECT #: CRANE

P.O. #:

SAMPLERS (Signature/Please Print): Dan R. Ayers / Dan R. Ayres

PROJECT NAME: TANK FARM

FOR LAB USE ONLY ACC#	SAMPLE DESCRIPTION	DATE	TIME	COMP	GRAB	# of CONT	ANALYSIS REQUESTED
71898	TF-17	8-28-97	10:00	X		1	TPH 8015 (High & Low)
71899	TF-18		9:00	X		1	
71900	TF-38		10:15	X		1	
71901	TF-47		9:30	X		1	
71902	TF-19		10:30	X		1	
71903	TF-30		11:00	X		1	
71904	TF-35		11:30	X		1	
71905	TF-36		12:00	X		1	
71906	TF-37		1:15	X		1	
71907	TF-49		1:45	X		1	

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Received for Laboratory by:	Date / Time
Dan R. Ayers	8/27/97 7:30		CBB	8/28/97 8:32
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Remarks	
Relinquished by: (Signature)	Date / Time	Received by: (Signature)		
Relinquished by: (Signature)	Date / Time	Received by: (Signature)		

For further assistance in completing the chain of custody form please refer to the instructions found on the opposite si

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ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
ATT: PETE SAZMA
13723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A071461

Sample ID: TF-5

Date Collected: 8/25/97

Project: CRANE

Time Collected: 11:00

Project Name: TANK FARM

Date Received: 8/27/97

Sampler: DAN AYRES

Time Received: 9:00

State Certification:

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	ND	mg/kg	5.00	4.00	1	8/27/97	22:21	Hollingsworth	8015M/5030	8443
TPH (Diesel Range)	ND	mg/kg	10.0	4.00	1	8/28/97	22:53	Cornelius	8015M/3550	8744

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 8/28/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	98.	50. - 150.
DRO/TPH Hi Surr., triacontane	93.0	50. - 150.

Report Approved By: Danny Hale Report Date: 8/29/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

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Phone 1-615-726-0177

ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
TT: PETE SAZMA
:3723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A071462

ample ID: TF-52

Date Collected: 8/25/97

Project: CRANE

Time Collected: 11:15

Project Name: TANK FARM

Date Received: 8/27/97

ampler: DAN AYRES

Time Received: 9:00

State Certification:

Sample Type: Soil

ite I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	ND	mg/kg	5.00	4.00	1	8/27/97	22:58	Holingurth	8015M/5030	8443
TPH (Diesel Range)	ND	mg/kg	10.0	4.00	1	8/28/97	23:43	Cornelius	8015M/3550	8744

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 8/28/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	92.	50. - 150.
DRO/TPH Hi Surr., triacontane	107.	50. - 150.

Report Approved By: _____ Report Date: 8/29/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

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ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
ATT: PETE SAZMA
13723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A071463

Sample ID: TF-23

Date Collected: 8/25/97

Project: CRANE

Time Collected: 11:25

Project Name: TANK FARM

Date Received: 8/27/97

Sampler: DAN AYRES

Time Received: 9:00

State Certification:

Sample Type: Soil

State I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	ND	mg/kg	5.00	4.00	1	8/27/97	23:36	Holingurth	8015M/5030	8443
TPH (Diesel Range)	ND	mg/kg	10.0	4.00	1	8/29/97	0:33	Cornelius	8015M/3550	8744

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 8/28/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	98.	50. - 150.
DRO/TPH Hi Surr., triacontane	100.	50. - 150.

Report Approved By: Danny Hale Report Date: 8/29/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

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ANALYTICAL REPORT

PAVERDRUP-INDIANA 6116
ATT: PETE SAZMA
13723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A071464

Sample ID: TF-33

Date Collected: 8/25/97

Project: CRANE

Time Collected: 11:40

Project Name: TANK FARM

Date Received: 8/27/97

Sampler: DAN AYRES

Time Received: 9:00

State Certification:

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	ND	mg/kg	5.00	4.00	1	8/28/97	0:13	Holingurth	8015M/5030	8443
TPH (Diesel Range)	ND	mg/kg	10.0	4.00	1	8/28/97	21:02	Cornelius	8015M/3550	8744

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 8/28/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	95.	50. - 150.
DRO/TPH Hi Surr., triacontane	99.0	50. - 150.

Report Approved By: Danny Hale Report Date: 8/29/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

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ANALYTICAL REPORT

VERDRUP-INDIANA 6116
TT: PETE SAZMA
3723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A071465

ample ID: TF-25

Date Collected: 8/25/97

oject: CRANE

Time Collected: 13:15

roject Name: TANK FARM

Date Received: 8/27/97

ampler: DAN AYRES

Time Received: 9:00

State Certification:

Sample Type: Soil

ite I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	ND	mg/kg	5.00	4.00	1	8/28/97	2:05	Holingurth	8015M/5030	8443
TPH (Diesel Range)	ND	mg/kg	10.0	4.00	1	8/29/97	1:23	Cornelius	8015M/3550	8744

ND = Not detected at the report limit.

Sample Extraction Data

GRO Extracted 8/28/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	92.	50. - 150.
GRO/TPH Hi Surr., triacontane	104.	50. - 150.

Report Approved By: _____ Report Date: 8/29/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

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ANALYTICAL REPORT

F'/ERDRUP-INDIANA 6116
ATT: PETE SAZMA
13723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A071466

Sample ID: TF-32

Date Collected: 8/25/97

Project: CRANE

Time Collected: 13:40

Project Name: TANK FARM

Date Received: 8/27/97

Sampler: DAN AYRES

Time Received: 9:00

State Certification:

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	ND	mg/kg	5.00	4.00	1	8/28/97	2:42	Hollingurth	8015M/5030	8443
TPH (Diesel Range)	ND	mg/kg	10.0	4.00	1	8/29/97	2:13	Cornelius	8015M/3550	8744

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 8/28/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	91.	50. - 150.
DRO/TPH Hi Surr., triacontane	102.	50. - 150.

Report Approved By: Danny Hale Report Date: 8/29/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

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ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
ATT: PETE SAZMA
13723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A071467

Sample ID: TF-45

Date Collected: 8/25/97

Project: CRANE

Time Collected: 13:30

Project Name: TANK FARM

Date Received: 8/27/97

Sampler: DAN AYRES

Time Received: 9:00

State Certification:

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS*										
TPH (Gasoline Range)	ND	mg/kg	5.00	4.00	1	8/28/97	3:20	Hollingsworth	8015M/5030	8443
TPH (Diesel Range)	ND	mg/kg	10.0	4.00	1	8/29/97	3:03	Cornelius	8015M/3550	8744

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 8/28/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	92.	50. - 150.
DRO/TPH Hi Surr., triacontane	103.	50. - 150.

Report Approved By: _____ Report Date: 8/29/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

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ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
ATT: PETE SAZMA
13723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A071468

Sample ID: TF-15

Date Collected: 8/25/97

Project: CRANE

Time Collected: 14:00

Project Name: TANK FARM

Date Received: 8/27/97

Sampler: DAN AYRES

Time Received: 9:00

State Certification:

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	ND	mg/kg	5.00	4.00	1	8/28/97	3:57	Holingsrth	8015M/5030	8443
TPH (Diesel Range)	ND	mg/kg	10.0	4.00	1	8/29/97	3:53	Cornelius	8015M/3550	8744

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 8/28/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	92.	50. - 150.
DRO/TPH Hi Surr., triacontane	99.0	50. - 150.

Report Approved By: Danny Hale Report Date: 8/29/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

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SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
ATT: PETE SAZMA
13723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A071469

Sample ID: TF-4

Date Collected: 8/25/97

Project: CRANE

Time Collected: 14:20

Project Name: TANK FARM

Date Received: 8/27/97

Sampler: DAN AYRES

Time Received: 9:00

State Certification:

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
INORGANIC PARAMETERS										
TPH (Gasoline Range)	ND	mg/kg	5.00	4.00	1	8/28/97	4:34	Holingurth	8015M/5030	8443
TPH (Diesel Range)	19.2	mg/kg	10.0	4.00	1	8/29/97	4:43	Cornelius	8015M/3550	8744

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 8/28/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	100.	50. - 150.
DRO/TPH Hi Surr., triacontane	94.0	50. - 150.

Report Approved By: _____ Report Date: 8/29/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

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ANALYTICAL REPORT

EVERDRUP-INDIANA 6116
ATT: PETE SAZMA
13723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A071470

Sample ID: TF-31

Date Collected: 8/25/97

Project: CRANE

Time Collected: 14:30

Project Name: TANK FARM

Date Received: 8/27/97

Sampler: DAN AYRES

Time Received: 9:00

State Certification:

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	ND	mg/kg	5.00	4.00	1	8/28/97	5:11	Holingurth	8015M/5030	8443
TPH (Diesel Range)	ND	mg/kg	10.0	4.00	1	8/29/97	9:34	Cornelius	8015M/3550	8744

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 8/28/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	87.	50. - 150.
DRO/TPH Hi Surr., triacontane	93.0	50. - 150.

Report Approved By: Danny B. Hale Report Date: 8/29/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

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ANALYTICAL REPORT

EVERDRUP-INDIANA 6116
ATT: PETE SAZMA
13723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A071471

Sample ID: TF-34

Date Collected: 8/25/97

Project: CRANE

Time Collected: 15:00

Project Name: TANK FARM

Date Received: 8/27/97

Sampler: DAN AYRES

Time Received: 9:00

State Certification:

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	ND	mg/kg	5.00	4.00	1	8/28/97	5:49	Holiagurth	8015M/5030	8443
TPH (Diesel Range)	56.0	mg/kg	10.0	4.00	1	8/28/97	22:36	Cornelius	8015M/3550	8744

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 8/28/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	88.	50. - 150.
DRO/TPH Hi Surr., triacontane	91.0	50. - 150.

Report Approved By: _____ Report Date: 8/29/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

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ANALYTICAL REPORT

EVERDRUP-INDIANA 6116
ATT: PETE SAZMA
13723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A071472

Sample ID: TF-24

Date Collected: 8/25/97

Project: CRANE

Time Collected: 15:15

Project Name: TANK FARM

Date Received: 8/27/97

Sampler: DAN AYRES

Time Received: 9:00

State Certification:

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	ND	mg/kg	5.00	4.00	1	8/28/97	6:26	Hollingsworth	8015M/5030	8443
TPH (Diesel Range)	ND	mg/kg	10.0	4.00	1	8/28/97	23:23	Cornelius	8015M/3550	8744

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 8/28/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	92.	50. - 150.
DRO/TPH Hi Surr., triacontane	95.0	50. - 150.

Report Approved By: Danny B. Hale Report Date: 8/29/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

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ANALYTICAL REPORT

EVERDRUP-INDIANA 6116
ATT: PETE SAZMA
13723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A071473

Sample ID: TF-26

Date Collected: 8/25/97

Project: CRANE

Time Collected: 15:35

Project Name: TANK FARM

Date Received: 8/27/97

Sampler: DAN AYRES

Time Received: 9:00

State Certification:

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	ND	mg/kg	5.00	4.00	1	8/28/97	7:03	Hollingsworth	8015M/5030	8443
TPH (Diesel Range)	ND	mg/kg	10.0	4.00	1	8/29/97	0:10	Cornelius	8015M/3550	8744

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 8/28/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	93.	50. - 150.
DRO/TPH Hi Surr., triacontane	91.0	50. - 150.

Report Approved By: Danny Hale Report Date: 8/29/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

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PROJECT QUALITY CONTROL DATA

Matrix Spike Recovery

Analyte	units	Orig. Val.	MS Val	Spike Conc	Recovery	Target Range	Q.C. Batch
TPH (Gasoline Range)	mg/kg	< 5.00	9.90	10.0	99.00	61. - 142.	8443
TPH (Diesel Range)	mg/kg	< 10.0	42.4	80.0	53.00	43. - 115.	8744

Matrix Spike Duplicate

Analyte	units	Orig. Val.	Duplicate	RPD	Limit	Q.C. Batch
TPH (Gasoline Range)	mg/kg	9.90	9.30	6.25	18.	8443
TPH (Diesel Range)	mg/kg	42.4	44.8	5.50	23.	8744

Laboratory Control Data

Analyte	units	Known Val.	Analyzed Val	% Recovery	Target Range	Q.C. Batch
TPH (Gasoline Range)	mg/kg	10.0	9.90	99.	61. - 142.	8443
TPH (Diesel Range)	mg/kg	80.0	90.4	113.	43. - 115.	8744

Blank Data

Analyte	Blank Value	Units	Q.C. Batch
TPH (Gasoline Range)	< 5.00	mg/kg	8443
TPH (Diesel Range)	< 10.0	mg/kg	8744

SPECIALIZED ASSAYS
ENVIRONMENTAL

7A- 011253

2960 Foster Creighton Drive
Nashville, TN 37204
615-726-0177
FAX 615/726-3404

REFERRING CLIENT

Account: 6116
Sverdrup - Indiana
Dan Ayers
13723 Riverport Drive
Maryland Heights, MO 63043
Ph: 314-770-4012 Fax: 314-770-5108

Specialized Assays: (800) 765-0980

BILLING CONTROL NUMBER (FOR LAB USE ONLY): 76874

PROJECT #: CRANE

P.O. #:

SAMPLERS (Signature/Please Print): Dan Ayers

PROJECT NAME: TANK FARM

FOR LAB USE ONLY ACC#	SAMPLE DESCRIPTION	DATE	TIME	COMP	GRAB	# OF CONT	ANALYSIS REQUESTED
97-A071461	TF-5	8-25-97	11:00	X		1	TPH 8015 (High & Low)
97-A071462	TF-52		11:15	X		1	
97-A071463	TF-23		11:35	X		1	
97-A071464	TF-33		11:40	X		1	
97-A071465	TF-25		1:15	X		1	
97-A071466	TF-32		1:40	X		1	
97-A071467	TF-45		1:30	X		1	
97-A071468	TF-15		2:00	X		1	
97-A071469	TF-4		2:20	X		1	
97-A071470	TF-31		2:30	X		1	

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Received for Laboratory by:	Date / Time
Dan Ayers	8-26-97 8:00		Bl Rb	8/27/97 9:00
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Remarks	
Relinquished by: (Signature)	Date / Time	Received by: (Signature)		
Relinquished by: (Signature)	Date / Time	Received by: (Signature)		

For further assistance in completing the chain of custody form please refer to the instructions found on the opposite sid

SPECIALIZED ASSAYS
ENVIRONMENTAL

7A- 011254

2960 Foster Creighton Drive
Nashville, TN 37204
615-726-0177
FAX 615/726-3404

REFERRING CLIENT

Account: 6116
Sverdrup - Indiana
Dan Ayers
13723 Riverport Drive
Maryland Heights, MO 63043
Ph: 314-770-4012 Fax: 314-770-5108

Specialized Assays: (800) 765-0980

BILLING CONTROL NUMBER (FOR LAB USE ONLY): 76874

PROJECT #: CRANE

P.O. #:

SAMPLERS (Signature-Please Print): Dan R. Ayers / Dan Ayers

PROJECT NAME: TANK FARM

FOR LAB USE ONLY ACC#	SAMPLE DESCRIPTION	DATE	TIME	COMP	GRAB	# of CONT	ANALYSIS REQUESTED
97-A071471	TF.34	8-25-97	3:00	X		1	TPH 8015 (High & Low)
97-A071472	TF.24		3:15	X		1	
97-A071473	TF.26		3:35	X		1	

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Received for Laboratory by:	Date / Time
Dan R. Ayers	8/26/97 8:00		Pd RB Jones	8/27/97 9:00
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Remarks	
Relinquished by: (Signature)	Date / Time	Received by: (Signature)		
Relinquished by: (Signature)	Date / Time	Received by: (Signature)		

For further assistance in completing the chain of custody form please refer to the instructions found on the opposite si

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2960 Foster Creighton Dr.
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Nashville, TN 37204-0566
Phone 1-615-726-0177

ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
ATT: PETE SAZMA
3723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A068891

Sample ID: TF-6

Date Collected: 8/18/97

Project: CRANE

Time Collected: 14:45

Project Name: TANK FARM

Date Received: 8/20/97

Sampler: DAN AYRES

Time Received: 9:00

State Certification:

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	ND	mg/kg	5.00	4.00	1	8/21/97	0:14	Holingurth	8015M/5030	5587
TPH (Diesel Range)	ND	mg/kg	10.0	4.00	1	8/20/97	20:45	K.Walkup	8015M/3550	5857

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 8/20/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	99.	50. - 150.
DRO/TPH Hi Surr., triacontane	98.0	50. - 150.

Report Approved By: Theodore J. Duello Report Date: 8/22/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

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2960 Foster Creighton Dr.
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Nashville, TN 37204-0566
Phone 1-615-726-0177

ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
TT: PETE SAZMA
3723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A068892

ample ID: TF-7

Date Collected: 8/18/97

Project: CRANE

Time Collected: 15:00

Project Name: TANK FARM

Date Received: 8/20/97

Sampler: DAN AYRES

Time Received: 9:00

State Certification:

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	ND	mg/kg	5.00	4.00	1	8/21/97	0:51	Holingurth	8015M/5030	5587
TPH (Diesel Range)	ND	mg/kg	10.0	4.00	1	8/20/97	21:32	K.Walkup	8015M/3550	5857

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 8/20/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	100.	50. - 150.
DRO/TPH Hi Surr., triacontane	88.0	50. - 150.

Report Approved By: Theodore J. Duello Report Date: 8/22/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

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ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
ATT: PETE SAZMA
3723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A068893

Sample ID: TF-B

Date Collected: 8/18/97

Project: CRANE

Time Collected: 15:15

Project Name: TANK FARM

Date Received: 8/20/97

Sampler: DAN AYRES

Time Received: 9:00

State Certification:

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	93.0	mg/kg	25.0	4.00	5	8/21/97	1:29	Holingurth	8015M/5030	5587
TPH (Diesel Range)	316.	mg/kg	10.0	4.00	1	8/20/97	22:19	K.Walkup	8015M/3550	5857

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 8/20/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	102.	50. - 150.
DRO/TPH Hi Surr., triacontane	104.	50. - 150.

Report Approved By: Theodore J. Duello Report Date: 8/22/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

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ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
TT: PETE SAZMA
3723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A068894

ample ID: TF-9

Date Collected: 8/18/97

Project: CRANE

Time Collected: 15:30

roject Name: TANK FARM

Date Received: 8/20/97

ampler: DAN AYRES

Time Received: 9:00

State Certification:

Sample Type: Soil

ite I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	19.8	mg/kg	10.0	4.00	2	8/21/97	2:06	Holingurth	8015M/5030	5587
TPH (Diesel Range)	304.	mg/kg	10.0	4.00	1	8/20/97	23:06	K.Walkup	8015M/3550	5857

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 8/20/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	96.	50. - 150.
DRO/TPH Hi Surr., triacontane	97.0	50. - 150.

Report Approved By: Theodore J. Duello Report Date: 8/22/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

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ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
ATT: PETE SAZMA
3723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A068895

Sample ID: TF-10

Date Collected: 8/18/97

Project: CRANE

Time Collected: 15:45

Project Name: TANK FARM

Date Received: 8/20/97

Sampler: DAN AYRES

Time Received: 9:00

State Certification:

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	ND	mg/kg	5.00	4.00	1	8/21/97	3:58	Holingurth	8015M/5030	5587
TPH (Diesel Range)	15.6	mg/kg	10.0	4.00	1	8/20/97	23:53	K.Walkup	8015M/3550	5857

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 8/20/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	98.	50. - 150.
DRO/TPH Hi Surr., triacontane	103.	50. - 150.

Report Approved By: Theodore J. Duello Report Date: 8/22/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

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ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
TT: PETE SAZMA
.3723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A068896

ample ID: TF-11

Date Collected: 8/18/97

Project: CRANE

Time Collected: 16:00

Project Name: TANK FARM

Date Received: 8/20/97

ampler: DAN AYRES

Time Received: 9:00

State Certification:

Sample Type: Soil

ite I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	ND	mg/kg	5.00	4.00	1	8/21/97	8:56	Holingurth	8015M/5030	5587
TPH (Diesel Range)	128.	mg/kg	10.0	4.00	1	8/21/97	0:40	K.Walkup	8015M/3550	5857

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 8/20/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	96.	50. - 150.
DRO/TPH Hi Surr., triacontane	122.	50. - 150.

Report Approved By: Theodore J. Duello Report Date: 8/22/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

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Phone 1-615-726-0177

ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
TT: PETE SAZMA
3723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A068897

ample ID: TF-14

Date Collected: 8/18/97

Project: CRANE

Time Collected: 16:15

Project Name: TANK FARM

Date Received: 8/20/97

ampler: DAN AYRES

Time Received: 9:00

State Certification:

Sample Type: Soil

ite I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	ND	mg/kg	5.00	4.00	1	8/21/97	5:12	Holingurth	8015M/5030	5587
TPH (Diesel Range)	ND	mg/kg	10.0	4.00	1	8/21/97	2:14	K.Walkup	8015M/3550	5857

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 8/20/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	102.	50. - 150.
DRO/TPH Hi Surr., triacontane	100.	50. - 150.

Report Approved By: Theodore J. Duello Report Date: 8/22/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

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SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
TT: PETE SAZMA
3723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A068898

ample ID: TF-16

Date Collected: 8/18/97

Project: CRANE

Time Collected: 16:20

Project Name: TANK FARM

Date Received: 8/20/97

ampler: DAN AYRES

Time Received: 9:00

State Certification:

Sample Type: Soil

ite I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
INORGANIC PARAMETERS										
TPH (Gasoline Range)	ND	mg/kg	5.00	4.00	1	8/21/97	5:49	Holingurth	8015M/5030	5587
TPH (Diesel Range)	ND	mg/kg	10.0	4.00	1	8/21/97	3:01	K.Walkup	8015M/3550	5857

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 8/20/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	99.	50. - 150.
DRO/TPH Hi Surr., triacontane	95.0	50. - 150.

Report Approved By: Theodore J. Duello Report Date: 8/22/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

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ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
ATT: PETE SAZMA
3723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A068899

Sample ID: TF-20

Date Collected: 8/18/97

Project: CRANE

Time Collected: 16:40

Project Name: TANK FARM

Date Received: 8/20/97

Sampler: DAN AYRES

Time Received: 9:00

State Certification:

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	ND	mg/kg	5.00	4.00	1	8/21/97	9:33	Holingurth	8015M/5030	5587
TPH (Diesel Range)	10.2	mg/kg	10.0	4.00	1	8/21/97	3:48	K.Walkup	8015M/3550	5857

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 8/20/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	91.	50. - 150.
DRO/TPH Hi Surr., triacontane	101.	50. - 150.

Report Approved By: Theodore J. Duello Report Date: 8/22/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

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ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
TT: PETE SAZMA
3723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A068900

ample ID: TF-21

Date Collected: 8/18/97

Project: CRANE

Time Collected: 16:50

roject Name: TANK FARM

Date Received: 8/20/97

ampler: DAN AYRES

Time Received: 9:00

State Certification:

Sample Type: Soil

ite I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	ND	mg/kg	5.00	4.00	1	8/21/97	7:04	Holingurth	8015M/5030	5587
TPH (Diesel Range)	ND	mg/kg	10.0	4.00	1	8/21/97	4:34	K.Walkup	8015M/3550	5857

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 8/20/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	101.	50. - 150.
DRO/TPH Hi Surr., triacontane	98.0	50. - 150.

Report Approved By: Theodore J. Duello Report Date: 8/22/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

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ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
TT: PETE SAZMA
3723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A068901

ample ID: TF-22

Date Collected: 8/18/97

Project: CRANE

Time Collected: 9:15

roject Name: TANK FARM

Date Received: 8/20/97

ampler: DAN AYRES

Time Received: 9:00

State Certification:

Sample Type: Soil

ite I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	ND	mg/kg	5.00	4.00	1	8/21/97	11:33	Holingurth	8015M/5030	5587
TPH (Diesel Range)	ND	mg/kg	10.0	4.00	1	8/21/97	5:21	K.Walkup	8015M/3550	5857

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 8/20/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	100.	50. - 150.
DRO/TPH Hi Surr., triacontane	92.0	50. - 150.

Report Approved By: Theodore J. Duello Report Date: 8/22/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

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PROJECT QUALITY CONTROL DATA

Matrix Spike Recovery

Analyte	units	Orig. Val.	MS Val	Spike Conc	Recovery	Target Range	Q.C. Batch
TPH (Gasoline Range)	mg/kg	< 5.00	8.69	10.0	86.90	61. - 142.	5587
TPH (Diesel Range)	mg/kg	< 10.0	53.6	80.0	67.00	43. - 115.	5857

Matrix Spike Duplicate

Analyte	units	Orig. Val.	Duplicate	RPD	Limit	Q.C. Batch
TPH (Gasoline Range)	mg/kg	8.69	9.83	12.31	18.	5587
TPH (Diesel Range)	mg/kg	53.6	63.6	17.06	23.	5857

Laboratory Control Data

Analyte	units	Known Val.	Analyzed Val	% Recovery	Target Range	Q.C. Batch
TPH (Gasoline Range)	mg/kg	10.0	9.83	98.	61. - 142.	5587
PH (Diesel Range)	mg/kg	80.0	64.0	80.	43. - 115.	5857

Blank Data

Analyte	Blank Value	Units	Q.C. Batch
TPH (Gasoline Range)	< 5.00	mg/kg	5587
TPH (Diesel Range)	< 10.0	mg/kg	5857

SPECIALIZED ASSAYS
ENVIRONMENTAL

7A- 011250

2960 Foster Creighton Drive
Nashville, TN 37204
615-726-0177
FAX 615/726-3404

REFERRING CLIENT

Account: 6116
Sverdrup - Indiana
Dan Ayers
13723 Riverport Drive
Maryland Heights, MO 63043
Ph: 314-770-4012 Fax: 314-770-5108

Specialized Assays: (800) 765-0980

BILLING CONTROL NUMBER (FOR LAB USE ONLY): 76299

PROJECT #: CRANE

P.O. #:

SAMPLERS (Signature-Please Print): Dan R. Ayres / Dan R. Ayres

PROJECT NAME: TANK FARM

FOR LAB USE ONLY ACC#	SAMPLE DESCRIPTION	DATE	TIME	COMP	GRAB	# of CONT	ANALYSIS REQUESTED
97-A068891	TF-6	8-18-97	2:15	X		1	TPH-8015 (High & Low)
97-A068892	TF-7		3:00	X		1	
97-A068893	TF-8		3:15	X		1	
97-A068894	TF-9		3:30	X		1	
97-A068895	TF-10		3:45	X		1	
97-A068896	TF-11		4:00	X		1	
97-A068897	TF-14		4:15	X		1	
97-A068898	TF-16		4:20	X		1	
97-A068899	TF-20		4:40	X		1	
97-A068900	TF-21		4:50	X		1	

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Received for Laboratory by:	Date / Time
Dan R. Ayres	8-18-97 8:00		J. Jacobs	8/20/97 900
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Remarks	
Relinquished by: (Signature)	Date / Time	Received by: (Signature)		
Relinquished by: (Signature)	Date / Time	Received by: (Signature)		

For further assistance in completing the chain of custody form please refer to the instructions found on the opposite si

SPECIALIZED ASSAYS
ENVIRONMENTAL

7A- 011251

2960 Foster Creighton Drive
Nashville, TN 37204
615-726-0177
FAX 615/726-3404

REFERRING CLIENT

Account: 6116
Sverdrup - Indiana
Dan Ayers
13723 Riverport Drive
Maryland Heights, MO 63043
Ph: 314-770-4012 Fax: 314-770-5108

Specialized Assays: (800) 765-0980

BILLING CONTROL NUMBER (FOR LAB USE ONLY): 76299

PROJECT #: CRANE

P.O. #:

S. (PLERS (Signature-Please Print): Dan R. Ayres / Dan R. Ayres

PROJECT NAME: TANK FARM

OR LAB USE ONLY ACC#	SAMPLE DESCRIPTION	DATE	TIME	COMP	GRAB	# of CONT	ANALYSIS REQUESTED
97-A068901	TF-22	8-18-97	9:15	X		1	TPH-8015 (High & low)

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Received for Laboratory by:	Date / Time
Dan R. Ayres	8-19-97 8:00		[illegible]	8/20/97 900
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Remarks	
Relinquished by: (Signature)	Date / Time	Received by: (Signature)		
Relinquished by: (Signature)	Date / Time	Received by: (Signature)		

For further assistance in completing the chain of custody form please refer to the instructions found on the opposite si

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
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Nashville, TN 37204-0566
Phone 1-615-726-0177

ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
ATT: PETE SAZMA
13723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A067927

Sample ID: TF-1

Date Collected: 8/14/97

Project: CRANE AYRES

Time Collected: 13:00

Project Name:

Date Received: 8/15/97

Sampler: DAN AYRES

Time Received: 15:40

State Certification:

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	ND	mg/kg	5.00	4.00	1	8/16/97	17:51	Holingurth	8015M/5030	4506
TPH (Diesel Range)	ND	mg/kg	10.0	4.00	1	8/16/97	22:52	Cornelius	8015M/3550	4618

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 8/16/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	92.	50. - 150.
DRO/TPH Hi Surr., triacontane	103.	50. - 150.

Report Approved By: Michael H. Dunn Report Date: 8/18/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

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ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
TT: PETE SAZMA
3723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A067928

ample ID: TF-2

Date Collected: 8/14/97

Project: CRANE AYRES

Time Collected: 13:30

Project Name:

Date Received: 8/15/97

ampler: DAN AYRES

Time Received: 15:40

State Certification:

Sample Type: Soil

ite I.D.:

alyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	ND	mg/kg	5.00	4.00	1	8/16/97	18:29	Holingurth	8015M/5030	4506
TPH (Diesel Range)	ND	mg/kg	10.0	4.00	1	8/17/97	1:13	Cornelius	8015M/3550	4618

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 8/16/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	95.	50. - 150.
DRO/TPH Hi Surr., triacontane	118.	50. - 150.

Report Approved By: Michael H. Dunn Report Date: 8/18/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

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ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
ATT: PETE SAZMA
13723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A067929

Sample ID: TF-3

Date Collected: 8/14/97

Project: CRANE AYRES

Time Collected: 14:00

Project Name:

Date Received: 8/15/97

Sampler: DAN AYRES

Time Received: 15:40

State Certification:

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	ND	mg/kg	5.00	4.00	1	8/16/97	19:06	Holingurth	8015M/5030	4506
TPH (Diesel Range)	ND	mg/kg	10.0	4.00	1	8/17/97	2:01	Cornelius	8015M/3550	4618

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 8/16/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	95.	50. - 150.
DRO/TPH Hi Surr., triacontane	99.0	50. - 150.

Report Approved By: Michael H. Dunn Report Date: 8/18/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

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ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
ATT: PETE SAZMA
13723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A067930

Sample ID: TF-12

Date Collected: 8/14/97

Project: CRANE AYRES

Time Collected: 14:30

Project Name:

Date Received: 8/15/97

Sampler: DAN AYRES

Time Received: 15:40

State Certification:

Sample Type: Soil

State I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	ND	mg/kg	5.00	4.00	1	8/16/97	19:44	Holingurth	8015M/5030	4506
TPH (Diesel Range)	ND	mg/kg	10.0	4.00	1	8/17/97	2:47	Cornelius	8015M/3550	4618

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 8/16/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	95.	50. - 150.
DRO/TPH Hi Surr., triacontane	99.0	50. - 150.

Report Approved By: Michael H. Dunn Report Date: 8/18/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

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ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
TT: PETE SAZMA
3723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A067931

ample ID: TF-13

Date Collected: 8/14/97

Project: CRANE AYRES

Time Collected: 15:00

Project Name:

Date Received: 8/15/97

ampler: DAN AYRES

Time Received: 15:40

State Certification:

Sample Type: Soil

te I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	ND	mg/kg	5.00	4.00	1	8/16/97	20:21	Holingurth	8015M/5030	4506
TPH (Diesel Range)	ND	mg/kg	10.0	4.00	1	8/17/97	3:34	Cornelius	8015M/3550	4619

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 8/16/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	95.	50. - 150.
DRO/TPH Hi Surr., triacontane	94.0	50. - 150.

Report Approved By: Michael H. Dunn Report Date: 8/18/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

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PROJECT QUALITY CONTROL DATA

Matrix Spike Recovery

Analyte	units	Orig. Val.	MS Val	Spike Conc	Recovery	Target Range	Q.C. Batch
TPH (Gasoline Range)	mg/kg	< 5.00	11.2	10.0	112.00	61. - 142.	4506

Matrix Spike Duplicate

Analyte	units	Orig. Val.	Duplicate	RPD	Limit	Q.C. Batch
TPH (Gasoline Range)	mg/kg	11.2	11.5	2.64	18.	4506

Laboratory Control Data

Analyte	units	Known Val.	Analyzed Val	% Recovery	Target Range	Q.C. Batch
TPH (Diesel Range)	mg/kg	80.0	63.2	79.	43. - 115.	4618
TPH (Diesel Range)	mg/kg	80.0	63.2	79.	43. - 115.	4619

Blank Data

Analyte	Blank Value	Units	Q.C. Batch
TPH (Gasoline Range)	< 5.00	mg/kg	4506
TPH (Diesel Range)	< 10.0	mg/kg	4618
TPH (Diesel Range)	< 10.0	mg/kg	4619

SPECIALIZED ASSAYS
ENVIRONMENTAL

7A- 011249

2960 Foster Creighton Drive
Nashville, TN 37204
615-726-0177
FAX 615/726-3404

Account: REFERRING CLIENT 8116
Sverdrup - Indiana
Dan Ayers
13723 Riverport Drive
Maryland Heights, MO 63043

Pete Sazama 4567
Ph: 314-770-~~4000~~ Fax: ~~314-770-5400~~

Specialized Assays: (800) 765-0980

BILLING CONTROL NUMBER (FOR LAB USE ONLY): 760066

PROJECT #: CRANE

P.O. #:

SAMPLERS (Signature-Please Print): Dan R. Ayers / Dan Ayres

PROJECT NAME: TANK FARM

FOR LAB USE ONLY ACC#	SAMPLE DESCRIPTION	DATE	TIME	COMP	GRAB	# of CONT	ANALYSIS REQUESTED
97-A067927	TF-1	8-14-97	1:00	X		1	TPH 8015 (High & Low
97-A067928	TF-2	8-14-97	1:30	X		1	
97-A067929	TF-3	8-14-97	2:00	X		1	
97-A067930	TF-12	8-14-97	2:30	X		1	
97-A067931	TF-13	8-14-97	3:00	X		1	

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Received for Laboratory by:	Date / Time
Dan R. Ayers	8-15-97 3:40	Jennifer Jatum	Pel R Bufin	8/15/97 15:4
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Remarks	
Jennifer Jatum	8/15/97 1540			
Relinquished by: (Signature)	Date / Time	Received by: (Signature)		
Relinquished by: (Signature)	Date / Time	Received by: (Signature)		

For further assistance in completing the chain of custody form please refer to the instructions found on the opposite sic

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2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
ATT: PETE SAZMA
3723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A084807

ample ID: LOC 37-2-4'

Date Collected: 9/30/97

Project: CRANE

Time Collected: 9:00

roject Name: TANK FARM

Date Received: 10/ 1/97

ampler: DAN AYRES

Time Received: 9:00

State Certification:

Sample Type: Soil

ite I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	ND	mg/kg	5.00	4.00	1	10/ 1/97	14:25	Holingurth	8015M/5030	778
TPH (Diesel Range)	75.5	mg/kg	10.0	4.00	1	10/ 1/97	19:26	Cornelius	8015M/3550	850

ND = Not detected at the report limit.

Sample Extraction Data

GRO Extracted 10/ 1/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml C.Gereaser

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr , a,a,a-trifluorotoluene	111.	50. - 150.
GRO/TPH Hi Surr., triacontane	111.	50. - 150.

Report Approved By: Michael H. Dunn Report Date: 10/ 2/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

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SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
TT: PETE SAZMA
3723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A084808

ample ID: LOC 38-1-2.5'

Date Collected: 9/30/97

roject: CRANE

Time Collected: 9:15

roject Name: TANK FARM

Date Received: 10/ 1/97

ampler: DAN AYRES

Time Received: 9:00

State Certification:

Sample Type: Soil

ite I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	ND	mg/kg	5.00	4.00	1	10/ 1/97	15:00	Holingurth	8015M/5030	778
TPH (Diesel Range)	87.8	mg/kg	10.0	4.00	1	10/ 1/97	20:13	Cornelius	8015M/3550	850

ND = Not detected at the report limit

Sample Extraction Data

GRO Extracted 10/ 1/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml C.Gereaser

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	110.	50. - 150.
DRO/TPH Hi Surr., triacontane	107.	50. - 150.

Report Approved By: Michael H. Dunn Report Date: 10/ 2/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

COPY 1

SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
ATT: PETE SAZMA
3723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A084809

Sample ID: LOC 22-3'

Date Collected: 9/30/97

Project: CRANE

Time Collected: 9:30

Project Name: TANK FARM

Date Received: 10/ 1/97

Sampler: DAN AYRES

Time Received: 9:00

State Certification:

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	ND	mg/kg	5.00	4.00	1	10/ 1/97	15:34	Holingurth	8015M/5030	778
TPH (Diesel Range)	68.1	mg/kg	10.0	4.00	1	10/ 1/97	21:45	Cornelius	8015M/3550	850

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 10/ 1/97 Wt extracted 25.0 gm Extract Volume: 1.0 ml C.Gerenser

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	112.	50. - 150.
DRO/TPH Hi Surr., triacontane	95.9	50. - 150.

Report Approved By: Michael H. Dunn Report Date: 10/ 2/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

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SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
ATT: PETE SAZMA
3723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A084810

Sample ID: LOC 29-4'

Date Collected: 9/30/97

Project: CRANE

Time Collected: 9:40

Project Name: TANK FARM

Date Received: 10/ 1/97

Sampler: DAN AYRES

Time Received: 9:00

State Certification:

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	ND	mg/kg	5.00	4.00	1	10/ 1/97	16:09	Holingurth	8015M/5030	778
TPH (Diesel Range)	94.9	mg/kg	10.0	4.00	1	10/ 1/97	23:18	Cornelius	8015M/3550	850

ND = Not detected at the report limit.

Sample Extraction Data

ORG Extracted 10/ 1/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml C.Gerenser

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	111.	50. - 150.
DRO/TPH Hi Surr., triacontane	111.	50. - 150.

Report Approved By: Michael H. Dunn Report Date: 10/ 2/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

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SPECIALIZED ASSAYS, INC.

2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

ANALYTICAL REPORT

SVERDRUP-INDIANA 6116
ATT: PETE SAZMA
3723 RIVERPORT DR.
MARYLAND HEIGHTS, MO 63043

Lab Number: 97-A084811

Sample ID: CELL 6-SIDEWALL

Date Collected: 9/30/97

Project: CRANE

Time Collected: 10:20

Project Name: TANK FARM

Date Received: 10/ 1/97

Sampler: DAN AYRES

Time Received: 9:00

State Certification:

Sample Type: Soil

Site I.D.:

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
ORGANIC PARAMETERS										
TPH (Gasoline Range)	ND	mg/kg	5.00	4.00	1	10/ 1/97	16:44	Holingurth	8015M/5030	778
TPH (Diesel Range)	14.6	mg/kg	10.0	4.00	1	10/ 1/97	22:50	Cornelius	8015M/3550	850

ND = Not detected at the report limit.

Sample Extraction Data

DRO Extracted 10/ 1/97 Wt extracted: 25.0 gm Extract Volume: 1.0 ml C.Gereaser

** SURROGATE RECOVERIES **

Surrogate	% Recovery	Target Range
BTEX/GRO Surr., a,a,a-trifluorotoluene	112.	50. - 150.
DRO/TPH Hi Surr., triacontane	97.2	50. - 150.

Report Approved By: Michael H. Dunn Report Date: 10/ 2/97

Theodore J. Duello, Ph.D., Q.A. Officer
Michael H. Dunn, M.S., Technical Director
Danny B. Hale, M.S., Laboratory Director

COPY 1

SPECIALIZED ASSAYS, INC.

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P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

PROJECT QUALITY CONTROL DATA

Matrix Spike Recovery

Analyte	units	Orig. Val.	MS Val	Spike Conc	Recovery	Target Range	Q.C. Batch
TPH (Gasoline Range)	mg/kg	< 5.00	7.50	10.0	75.00	53. - 136.	778
TPH (Diesel Range)	mg/kg	< 10.0	67.9	80.0	84.88	43. - 115.	850

Matrix Spike Duplicate

Analyte	units	Orig. Val.	Duplicate	RPD	Limit	Q.C. Batch
TPH (Gasoline Range)	mg/kg	7.50	8.30	10.13	18.	778
TPH (Diesel Range)	mg/kg	67.9	81.9	18.57	23.	850

Laboratory Control Data

Analyte	units	Known Val.	Analyzed Val	% Recovery	Target Range	Q.C. Batch
TPH (Gasoline Range)	mg/kg	10.0	8.30	83.	53. - 136.	778
TPH (Diesel Range)	mg/kg	80.0	80.1	100.	43. - 115.	850

Blank Data

Analyte	Blank Value	Units	Q.C. Batch
TPH (Gasoline Range)	< 5.00	mg/kg	778
TPH (Diesel Range)	< 10.0	mg/kg	850

COPY 1

SPECIALIZED ASSAYS
ENVIRONMENTAL

7A- 011260

2960 Foster Creighton Drive
Nashville, TN 37204
615-726-0177
FAX 615/726-3404

REFERRING CLIENT

Account: 6116
Sverdrup - Indiana CRANE
Dan Ayers
13725 Riverport Drive
Maryland Heights, MO 63043 812 854-4177
Ph: [redacted] Fax: [redacted]

Specialized Assays: (800) 765-0980

BILLING CONTROL NUMBER (FOR LAB USE ONLY): 80000

PROJECT #: CRANE

P.O. #:

SAMPLERS (Signature-Please Print): Dan R. Ayers / Dan R. Ayers

PROJECT NAME: TANK FARM

FOR LAB USE ONLY ACC#	SAMPLE DESCRIPTION	DATE	TIME	COMP	GRAB	# OF CONT	ANALYSIS REQUESTED
97-A084807	LOC 37-2-4'	9-30-97	9:00		X	1	TPH 8015 (HI & LO)
97-A084808	LOC 38-1-2.5'		9:15		X	1	
97-A084809	LOC 22-3'		9:30		X	1	
97-A084810	LOC 29-4'		9:40		X	1	
97-A084811	CELL 6 - Sidewall	9-30-97	10:20		X	1	TPH 8015 (HI & LOW)

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Received for Laboratory by:	Date / Time
Dan R. Ayers	9/30/97 7:00		J. Jacobs	10/1/97 900
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Remarks	
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	24 Hour	
Relinquished by: (Signature)	Date / Time	Received by: (Signature)		

For further assistance in completing the chain of custody form please refer to the instructions found on the opposite sic

ATTACHMENT F

Department of the Navy
Crane Division
Naval Surface Warfare Center
(for file)
300 Highway 361
Crane Indiana 47522-5001

TANK FARM DEMOLITION AND CLEANUP

Description of work:

PHASE 1: The Tank Farm was located at the North-Western part of the Center, near the Crane gate. It consisted of 9 Aboveground Storage Tanks (AST's) and 1 Underground Storage Tank (UST), along with the associated piping and concrete footers. Three of the above ground storage tanks were very large. (1-200,000 gallon AST and 2-125,000 gallon AST's). Demolition activities and the associated soil remediation resulting from this facilities use and demolition began in early April 1997. The demolition and remediation work was completed in June 1997.

Disposal of contaminated soil: Approximately 3000 cubic yards of fuel oil contaminated soil and sand was excavated from the Tank Farm site. The contaminated soil was transported to the Crane Sanitary Landfill (Landfill Permit 51-2) by a subcontractor of SVERDRUP. This soil was considered a special waste and disposed of through Special Waste Certification No. 40689 and reported to the Indiana Department of Environmental Management (IDEM) on the first quarter, quarterly report for 1998. (Dated 8 January 1998).

Disposal of the AST's: A subcontractor was procured through our Corps contract with SVERDRUP. The subcontractors insured all tanks were pumped and clean before the demolition activity commenced. Any free liquid was pumped by a third contractor using a Vac-truck, and taken off center to a refinery in Indianapolis Indiana. After all the tanks were pumped and dry, the contractor began to take apart each tank using a shearing device. The sequence of events were as follows:

1. All seven tanks were taken down using the shearing device.

2. Piping associated with each above ground storage tank was excavated and removed.

3. The piping was taken to DRMO (Defense Reutilization and Marketing Office) and disposed of.

4. The AST's were sold on site to contractors who are in the business of selling scrap steel.

5. Concrete and other debris were either disposed of at the sanitary landfill or at the direction of the heavy equipment section of the Public Works Department.

Contractor: The work of excavating and disposal of all the above ground tanks was done under the supervision of SVERDRUP Environmental Inc., 13723 Riverport Drive, Maryland Heights Missouri 63043. Oversight for this project was the responsibility of the Corps of Engineers, Louisville District and the Environmental Protection Branch of the Public Works Department, NAVSURFWARCENDIV, Crane In.

PHASE 2: In June 1997, the analytical phase of the project was begun. The intent for this phase was to randomly sample the soil of the entire excavated zone. This was done by the following method:

1. The heavy equipment section of the Public Works Department were brought in to plow the excavated zone, with the intent to expose potentially contaminated dirt to air. The heavy equipment section plowed over this ground with a disc once every two weeks for six weeks. (3 plowings).

2. At the end of the sixth weeks three samples were taken. (see enclosure 1, samples N0265, N0266 and N0267.) These samples came back as clean samples. No other samples were taken based on the results of Enclosure (1).

PHASE 3: Removal of the Oil Water Separator (OWS), located outside of the fenced in area near the site entrance was completed in May 1998. The heavy equipment section of the Public Works Department did the work. The excavated zone was inspected by the Environmental Protection Department and found to be clean. The OWS was taken to a storage area managed by DRMO and sold as scrap steel. (As was all the associated piping)

Phase 4: All concrete associated with the containment footers and any other debris associated with this demolition was deposited in the Crane Solid Fill site (Solid Waste Facility Permit 51-6). The work in hauling the demolition debris was performed by the heavy equipment section of the public works department. Final removal of concrete from retaining walls and the extraction of an exposed pipe was performed in April 1999. The retaining wall was taken to the Construction/Demolition site on Center and disposed of. The exposed pipe was an inactive water line from an emergency sprinkler system. The inactive pipe was dug out and disposed of at the C/D site.

Present site description:

The site is now clean. No Above or Underground Storage Tanks or their associated piping remains. A concrete containment surrounds a force main to a sanitary sewer line. The perimeter fence will remain. It may be used in the future for a holding area for trucks and other vehicles, or for a parking area for trucks awaiting weigh-in at the scales. No other clean up activities are planned at this time. Some rock remains that is scheduled to be taken away by the heavy equipment section to a site that they have designated. The perimeter fence as mentioned above is intact but in disrepair. If reused, it will have to be fixed or demolished and turned in to DRMO for disposal.

ENCL:
(1) Soil Samples from Excavated Site
(2) Pictures of Tank Farm

Synergic Analytics, Inc.

ANALYTICAL REPORT

Attn: Mr Jim Market
CRANE NAVAL CODE 09513 BLDG 3260
300 Highway 361
Crane, IN 47522

Laboratory Id#: 981847-05
Received Date: 9/18/98
Analysis Date and analyst: 9/25/98 / SMB
Extraction Date and analyst: 9/23/98 / MAC

CLIENT SAMPLE INFORMATION

Site Name:
Sampling Point: N0265-09168
Project Number: 061
Sample Number:
Sampling Date: 9/16/98

Analysis For Polychlorinated Biphenyls

COMPOUND	Detection Level	RESULT
Aroclor 1016	100	< 100
Aroclor 1221	100	< 100
Aroclor 1232	100	< 100
Aroclor 1242	100	< 100
Aroclor 1248	100	< 100
Aroclor 1254	100	< 100
Aroclor 1260	100	< 100
Aroclor 1262	100	< 100
Aroclor 1268	100	< 100

UNITS: ug/kg dry weight

Method: EPA-SW846, 8080

'<' indicates less than detection level

450 54th Street S.W. Grand Rapids, MI 49548 Phone: (616) 538-8700 FAX: (616) 538-9055

Enclosure (1)

Synergic Analytics, Inc.

ANALYTICAL REPORT

Attn: Mr Jim Market
CRANE NAVAL CODE 09513 BLDG 3260
300 Highway 361
Crane, IN 47522

Laboratory Id#: 981847-05
Received Date: 9/18/98
Analysis Date and analyst: 9/23/98 / SMB
Leach Date and analyst: 9/21/98 / SMB
Digest Date and analyst: 9/22/98 / SMB

CLIENT SAMPLE INFORMATION

Site Name:
Sampling Point: N0265-09168
Project Number: 061
Sample Number:
Sampling Date: 9/16/98

Analysis For
TCLP METALS ANALYSES

COMPOUND	Detection Level	RESULT
TCLP Low Level Arsenic	0.1	<.1
TCLP Low Level Barium	0.1	0.9
TCLP Low Level Cadmium	0.1	<.1
TCLP Low Level Chromium	0.1	<.1
TCLP Low Level Lead	0.1	<.1
TCLP Low Level Selenium	0.1	<.1
TCLP Low Level Silver	0.1	<.1
TCLP Low Level Copper	0.1	<.1
TCLP Low Level Zinc	0.1	<.1

UNITS: mg/L of leachate

Method: US EPA/600-4-91/010, METHOD 200.8 and 1311

'<' indicates less than detection level

Synergic Analytics, Inc.

ANALYTICAL REPORT

Attn: Mr Jim Market
CRANE NAVAL CODE 09513 BLDG 3260
300 Highway 361
Crane, IN 47522

Laboratory Id#: 981847-05
Received Date: 9/18/98

CLIENT SAMPLE INFORMATION

Site Name:
Sample Number:
Sampling Point: N0265-09168
Project Number: 061
Sampling Date: 9/16/98

ANALYSES	Detection Level	RESULT	Units
Flash Point	32	>200	Degrees F.

Method: EPA-SW846, 1010
Analysis Date and analyst: 9/25/98 / MAC

Sample does not exhibit characteristic of ignitability.

TCLP Mercury	0.1	<.1	ug/L of leachate

Method: EPA-SW846, 7470 (Cold Vapor Technique) and 1311
Analysis Date and analyst: 9/25/98 / MAC
Leach Date and analyst: 9/21/98 / SMB
Digest Date and analyst: 9/25/98 / MAC

Duplicate analysis was performed.

TOX	50	<50	mg/kg

Method: EPA-SW846, 9076 (Total Extractable Halogens-Chlorine)
Analysis Date and analyst: 9/23/98 / PHO

'<' indicates less than detection level

Synergic Analytics, Inc.

ANALYTICAL REPORT

Attn: Mr Jim Market
CRANE NAVAL CODE 09513 BLDG 3260
300 Highway 361
Crane, IN 47522

Laboratory Id#: 981847-06
Received Date: 9/18/98
Analysis Date and analyst: 9/25/98 / SMB
Extraction Date and analyst: 9/23/98 / MAC

CLIENT SAMPLE INFORMATION

Site Name:
Sampling Point: N0266-09168
Project Number: 061
Sample Number:
Sampling Date: 9/16/98

Analysis For Polychlorinated Biphenyls

COMPOUND	Detection Level	RESULT
Aroclor 1016	100	< 100
Aroclor 1221	100	< 100
Aroclor 1232	100	< 100
Aroclor 1242	100	< 100
Aroclor 1248	100	< 100
Aroclor 1254	100	< 100
Aroclor 1260	100	< 100
Aroclor 1262	100	< 100
Aroclor 1268	100	< 100

UNITS: ug/kg dry weight

Method: EPA-SW846, 8080

'<' indicates less than detection level

450 54th Street S.W. Grand Rapids, MI 49548 Phone: (616) 538-8700 FAX: (616) 538-9055

Synergic Analytics, Inc.

ANALYTICAL REPORT

Attn: Mr Jim Market
CRANE NAVAL CODE 09513 BLDG 3260
300 Highway 361
Crane, IN 47522

Laboratory Id#: 981847-06
Received Date: 9/18/98
Analysis Date and analyst: 9/23/98 / SMB
Leach Date and analyst: 9/21/98 / SMB
Digest Date and analyst: 9/22/98 / SMB

CLIENT SAMPLE INFORMATION

Site Name:
Sampling Point: N0266-09168
Project Number: 061
Sample Number:
Sampling Date: 9/16/98

Analysis For
TCLP METALS ANALYSES

COMPOUND	Detection Level	RESULT
TCLP Low Level Arsenic	0.1	<.1
TCLP Low Level Barium	0.1	0.69
TCLP Low Level Cadmium	0.1	<.1
TCLP Low Level Chromium	0.1	<.1
TCLP Low Level Lead	0.1	<.1
TCLP Low Level Selenium	0.1	<.1
TCLP Low Level Silver	0.1	<.1
TCLP Low Level Copper	0.1	<.1
TCLP Low Level Zinc	0.1	<.1

UNITS: mg/L of leachate

Method: US EPA/600-4-91/010, METHOD 200.8 and 1311

Matrix spike & matrix spike duplicate analyses were performed.

'<' indicates less than detection level

450 54th Street S.W. Grand Rapids, MI 49548 Phone: (616) 538-8700 FAX: (616) 538-9055

Synergic Analytics, Inc.

ANALYTICAL REPORT

Attn: Mr Jim Market
CRANE NAVAL CODE 09513 BLDG 3260
300 Highway 361
Crane,IN 47522

Laboratory Id#: 981647-06
Received Date: 9/18/98

CLIENT SAMPLE INFORMATION

Site Name:
Sampling Point: N0266-09168
Project Number: 061
Sample Number:
Sampling Date: 9/16/98

ANALYSES	Detection Level	RESULT	Units
Flash Point	32	>200	Degrees F.

Method: EPA-SW846, 1010

Analysis Date and analyst: 9/25/98 / MAC

Sample does not exhibit characteristic of ignitability.

TCLP Mercury	0.1	<.1	ug/L of leachate

Method: EPA-SW846, 7470 (Cold Vapor Technique) and 1311

Analysis Date and analyst: 9/25/98 / MAC
Leach Date and analyst: 9/21/98 / SMB
Digest Date and analyst: 9/25/98 / MAC

Matrix spike & matrix spike duplicate analyses were performed.

TOX	50	<50	mg/kg

Method: EPA-SW846, 9076 (Total Extractable Halogens-Chlorine)

Analysis Date and analyst: 9/22/98 / PHO

< indicates less than detection level

Synergic Analytics, Inc.

ANALYTICAL REPORT

Attn: Mr Jim Market
CRANE NAVAL CODE 09513 BLDG 3260
300 Highway 361
Crane, IN 47522

Laboratory Id#: 981847-07
Received Date: 9/18/98
Analysis Date and analyst: 9/25/98 / SMB
Extraction Date and analyst: 9/23/98 / MAC

CLIENT SAMPLE INFORMATION

Site Name:
Sampling Point: N0267-09168
Project Number: 061
Sample Number:
Sampling Date: 9/16/98

Analysis For
Polychlorinated Biphenyls

COMPOUND	Detection Level	RESULT
Aroclor 1016	100	< 100
Aroclor 1221	100	< 100
Aroclor 1232	100	< 100
Aroclor 1242	100	< 100
Aroclor 1248	100	< 100
Aroclor 1254	100	< 100
Aroclor 1260	100	< 100
Aroclor 1262	100	< 100
Aroclor 1268	100	< 100

UNITS: ug/kg dry weight

Method: EPA-SW846, 8080

'<' indicates less than detection level

450 54th Street S.W. Grand Rapids, MI 49548 Phone: (616) 538-8700 FAX: (616) 538-9055

Synergic Analytics, Inc.

ANALYTICAL REPORT

Attn: Mr Jim Market
CRANE NAVAL CODE 09513 BLDG 3260
300 Highway 361
Crane, IN 47522

Laboratory Id#: 981847-07
Received Date: 9/18/98
Analysis Date and analyst: 9/23/98 / SMB
Leach Date and analyst: 9/21/98 / SMB
Digest Date and analyst: 9/22/98 / SMB

CLIENT SAMPLE INFORMATION

Site Name:
Sampling Point: N0267-09168
Project Number: 061
Sample Number:
Sampling Date: 9/16/98

Analysis For
TCLP METALS ANALYSES

COMPOUND	Detection Level	RESULT
TCLP Low Level Arsenic	0.1	<.1
TCLP Low Level Barium	0.1	0.75
TCLP Low Level Cadmium	0.1	<.1
TCLP Low Level Chromium	0.1	<.1
TCLP Low Level Lead	0.1	<.1
TCLP Low Level Selenium	0.1	<.1
TCLP Low Level Silver	0.1	<.1
TCLP Low Level Copper	0.1	<.1
TCLP Low Level Zinc	0.1	<.1

UNITS: mg/L of leachate

Method: US EPA/600-4-91/010, METHOD 200.8 and 1311

'<' indicates less than detection level

450 54th Street S.W. Grand Rapids, MI 49548 Phone: (616) 538-8700 FAX: (616) 538-9055

Synergic Analytics, Inc.

ANALYTICAL REPORT

Attn: Mr Jim Market
CRANE NAVAL CODE 09513 BLDG 3260
300 Highway 361
Crane,IN 47522

Laboratory Id#: 981847-07
Received Date: 9/18/98

CLIENT SAMPLE INFORMATION

Site Name:
Sampling Point: N0267-09168
Project Number: 061
Sample Number:
Sampling Date: 9/16/98

ANALYSES	Detection Level	RESULT	Units
Flash Point	32	>200	Degrees F.

Method: EPA-SW846, 1010 Analysis Date and analyst: 9/25/98 / MAC

Sample does not exhibit characteristic of ignitability.

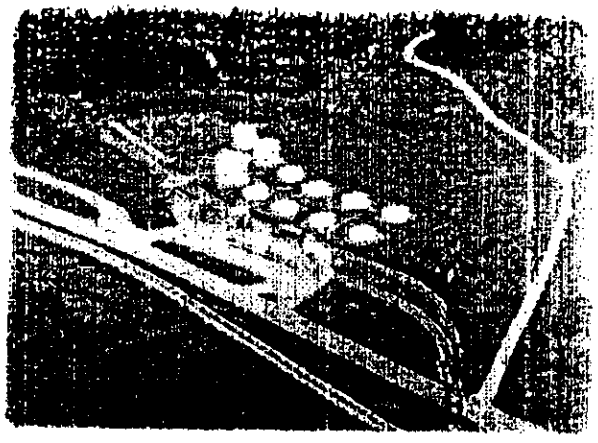
TCLP Mercury	0.1	< .1	ug/L of leachate

Method: EPA-SW846, 7470 (Cold Vapor Technique) and 1311
Analysis Date and analyst: 9/25/98 / MAC
Leach Date and analyst: 9/21/98 / SMB
Digest Date and analyst: 9/25/98 / MAC

TOX	50	< 50	mg/kg

Method: EPA-SW846, 9076 (Total Extractable Halogens-Chlorine) Analysis Date and analyst: 9/23/98 / PHO

'<' indicates less than detection level



I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

James Hunsacker

SIGNATURE

DIRECTOR, ENVIRONMENTAL PROTECTION DEPARTMENT
BY DIRECTION OF THE COMMANDER

TITLE

9/15/00

DATE