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DRAFT COMPREHENSIVE SITE ASSESSMENT REPORT VOLUME 1 MCAS CHERRY POINT NC

12/1/1996

LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

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ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

DRAFT COMPREHENSIVE SITE ASSESSMENT REPORT

VOLUME I

PIT 15
MARINE CORPS AIR STATION
CHERRY POINT, NORTH CAROLINA

Prepared For:

Commander
Naval Facilities Engineering Command
Atlantic Division
Norfolk, Virginia 23511-6287

Prepared By:

Law Engineering and Environmental Services, Inc.
3301 Atlantic Avenue
Raleigh, North Carolina 27604

December, 1996

LAW Job No. 30740-5-0500/Phase 0194

December 11, 1996 DRAFT

Commander
Naval Facilities Engineering Command
Atlantic Division
Norfolk, Virginia 23511-6287

Attention: Mr. John G. Kresky, Code 18213

Subject: **DRAFT COMPREHENSIVE SITE ASSESSMENT REPORT PIT 15 MARINE CORPS AIR STATION CHERRY POINT, NORTH CAROLINA LAW JOB NO. 30740-5-0500/0194**

Dear Mr. Kresky:

In accordance with Naval Facilities Engineering Command Order for Supplies and Services Contract No. N62470-93-D-4020, Delivery Order No. 0194, Law Engineering and Environmental Services, Inc. (LAW) is pleased to present this draft report of our environmental services recently performed at the above referenced project site. The scope of our services included the collection of soil and groundwater samples in Pit 15 of the heavy aircraft refueling area adjacent to Runway 14L at the Marine Corps Air Station in Cherry Point, North Carolina. The objective of our services was to provide assessment of the extent/severity of and possible exposure to subsurface petroleum contamination caused by a previous release of an unknown quantity of jet fuel (JP-5) from the active underground aviation fuel pipeline system.

This report is intended for the exclusive use of Naval Facilities Engineering Command, Atlantic Division. The contents should not be relied upon by any other parties without the expressed written consent of LAW. The findings are relevant to the dates of our site work and should not be relied upon to represent site conditions on other dates.

We appreciate the opportunity to provide environmental services on this project. If any questions arise, please contact us at (919) 876-0416.

Sincerely,

LAW ENGINEERING & ENVIRONMENTAL SERVICES, INC.

Jeffrey Tyburski, P.G.
Senior Geologist

Brian J. Bellis, P.G.
Principal Hydrogeologist

JBT\BJB\pjh
cc: Mr. Bill Powers, MCAS Cherry Point
Ms. Kathy Molino, LANTNAVFACENGCOM (cover letter only)

DRAFT

EXECUTIVE SUMMARY

In accordance with the Naval Facilities Engineering Command Order for Supplies and Services Contract No. N62470-93-D-4020, Delivery Order No. 0194, Law Engineering and Environmental Services, Inc. (LAW) performed a Comprehensive Site Assessment to determine the extent of contamination from a release of jet fuel (JP-5) from an active underground aviation fuel system. The spill occurred on a grass island adjacent to Pit 15 of the heavy aircraft refueling area in the vicinity of Runway 14L at the Marine Corps Air Station in Cherry Point, North Carolina.

The field investigation was conducted between September 30th and October 10th of 1996. The investigation included the installation of four soil borings, and one Type III and six Type II monitoring wells. The scope of work also included the resampling of three existing Type II monitoring wells that were installed during a previous assessment of an adjacent site.

Soil samples were analyzed for total petroleum hydrocarbons (TPH) according to EPA preparation/testing Methods 5030/8015 (volatile fraction), 3550/8015 (semi-volatile fraction). Groundwater samples were analyzed for purgeable aromatic hydrocarbons (EPA Method 602), semi-volatile base/neutral compounds (EPA Method 625), and total lead (EPA Method 239.2 and preparation method 3030C).

Based upon the results of laboratory analysis, it is apparent that both gasoline grade and diesel/jet fuel grade fuels are present in site groundwater. Results indicate the presence of predominantly (JP-5 constituents) with lesser amounts of gasoline constituents.

Free product was detected in both the upgradient, crossgradient and downgradient monitoring wells installed at the site. Although the extent of free product has not been defined at this time, the presence of free product at thicknesses greater than one-foot in wells located approximately 100 feet from the point of release suggests that a larger volume of jet fuel was released at the site than the approximately 800 gallons initially reported. Visual examination of the jet fuel by LAW and MCAS Fuels Division personnel suggest that the free product is primarily comprised of JP-5.

Active potential sources of the gasoline contamination have not been identified within 600 feet of the jet fuel release from Pit 15. Historical information indicates that a runway extension was formerly located

adjacent to the southeast side of the heavy aircraft refueling area. Results from LAW's previous assessment of an adjacent site indicated that a large fuel bladder, a temporary fuel storage container having an estimated capacity of 20,000 to 30,000 gallons, was previously used to store various grades of aviation fuel adjacent to the former runway extension.

A tributary to Mill Creek was formerly located in the heavy aircraft refueling area and was apparently filled-in during the recent construction of runway 14L in the early 1980's. The former fuel bladder is shown in a base drawing as being a "discharge" point for Mill Creek. This suggests that former discharges of aviation fuels into the former tributary of Mill Creek is the likely source of the detected gasoline contamination.

Evidence of vadose zone (unsaturated) soil contamination in the vicinity of the former release of JP-5 from the active pipeline system was not found during this investigation. The data indicate that the excavation activities that occurred during initial excavation and pipeline repair activities were sufficient to remove contaminated soils. However, areas of vadose zone soil contamination may be present along the former bed of the Mill Creek tributary within the general vicinity of Pit 15, from former discharges of gasoline grade aviation fuel from the fuel-bladder system.

The extent of both free phase and dissolved phase groundwater contamination has not been defined and, based on shallow groundwater flow direction, is expected to extend to the northeast toward Runway 14L. Two active water supply wells and Mill Creek are located within 1,500 feet of the site and have been identified as potential receptors. Additional investigation is required to determine the extent of free phase and dissolved phase contamination from both the active pipeline system and the former discharges of aviation fuel. Because the downgradient extent of groundwater contamination is not known at this time, additional investigation will be required to evaluate risk to these potential receptors and to determine if other water-supply wells may be considered potential receptors.

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1.0 INTRODUCTION

1.1 Purpose of Investigation

The Commander of the Atlantic Division Naval Facilities Engineering Command in Norfolk, Virginia contracted with Law Engineering and Environmental Services, Inc. (LAW) to perform a Comprehensive Site Assessment to determine the extent of contamination from a previous release of jet fuel (JP-5) from an active underground aviation fuel system. The spill occurred in a grass island adjacent to Pit 15 located in the heavy aircraft refueling area in the vicinity of Runway 14L at the Marine Corps Air Station in Cherry Point, North Carolina (Drawings 1.1 and 1.2). The purpose of the investigation was to provide assessment of the magnitude and extent of possible free product accumulation, and soil and groundwater contamination, and to assess the potential for exposure to subsurface contaminants resulting from the release of petroleum fuels.

This report is designed to include information requested by the North Carolina Department of Environment, Health and Natural Resources in accordance with the document entitled "Groundwater Section Guidelines for the Investigation and Remediation of Soils and Groundwater dated March 1993" (Revised June 1993).

1.2 Scope of Work

Authorization to proceed with the investigation was granted by the Commander of the Atlantic Division Naval Facilities Engineering Command, Norfolk, Virginia, via Contract No. N62470-93-D-4020, Delivery Order No. 0194 and modification 001. The field investigation was conducted between September 30, 1996 and October 10, 1996. The investigation included the installation of four soil borings and one Type III and six Type II monitoring wells. The scope of work also included the resampling of three existing Type II monitoring wells that were installed during a previous assessment of an adjacent site.

The collected data were used to estimate the horizontal and vertical extent of soil and groundwater contamination and to identify potential receptors that could be affected by the release to support development of a Corrective Action Plan (CAP) for the site. The specific methods employed during

performance of the project activities and the results, conclusions and recommendations are described within the appropriate sections of this report.

1.3 Area of Investigation

Pit 15 is located at the northwestern end of the heavy aircraft refueling area adjacent to runway 14L at Marine Corps Air Station (MCAS) Cherry Point. An underground aviation fuel pipeline system provides jet fuel to each of the seven heavy aircraft refueling pits located in this area (Pits 9 through 15). Grass islands separate each of the heavy aircraft refueling pits in this area.

2.0 SITE HISTORY AND SOURCE CHARACTERIZATION

2.1 Site History and Operation

The heavy aircraft refueling area was constructed in 1985. An old runway extension and support buildings were previously located in the southeastern portion of the heavy aircraft refueling area in the vicinity of Pit 9. This former runway extension is shown on Drawing 1.1 and the USGS topographic map presented as Drawing 1.2. Drawing 1.2 also shows the locations of a roadway and a portion of a tributary to Mill Creek that were formerly located in the vicinity of Pit 15. A portion of an abandoned underground aviation fuel pipeline system is located southwest of Pit 15 and runs parallel to the southwestern edge of the heavy aircraft refueling area (Drawing 2.1). The abandoned pipeline system was originally constructed in the early to mid 1940s and was abandoned when the new pipeline system was constructed in the mid 1980s. The current underground aviation fuel pipeline system provides jet fuel (JP-5) to aircraft refueling stations along runways 14L and 5R. Fuel is supplied from Tank Farms A and B. The area located southwest of Pit 15 that includes the portion of the abandoned pipeline system was previously investigated by Weston/Baker and LAW (see Section 2.3).

2.2 Contaminant Source Inventory

The primary contaminant source includes the reported leak of JP-5 from the portion of active pipeline system located at Pit 15 which occurred in May of 1995 and is described in detail in the following section (Section 2.3) of this report. Other potential sources of contamination include reported overspills during routine aircraft refueling activities within the heavy aircraft refueling area. Petroleum contamination is also present in the vicinity of the portion of the abandoned pipeline system located southwest of Pit 15, and near the former location of an aviation fuel bladder storage system southwest of Pit 15 in the vicinity of Seventh Avenue. The abandoned pipeline system was installed in the early 1940's, was used to transport various grades of aviation fuel, and was abandoned in the early 1980's. The former fuel bladder is estimated to have had a capacity of 20,000 to 30,000 gallons and was apparently used to store various grades of aviation fuel (Table 2.1). An undated map (R.W. DWG. No. 4778) shows the former location of the fuel bladder as a "discharge point" into a tributary to Mill Creek. The map does not specifically identify the type of discharge.

The Refueler Truck Storage and Parking Area (MWSS274 Refeulers) is located southwest of the portion of the abandoned pipeline system that is adjacent to Pit 15. Tanker trucks are reportedly washed at the facility and wash water containing petroleum is discharged into oil/water separators (Table 2.1).

2.3 Previous Investigations

On May 18, 1995, jet fuel was discovered to be seeping into a subgrade valve box to the aviation fuel hydrant system for Pit 15. The section of the fuel system leading to Pit 15 was reportedly shut off immediately after this discovery. Representatives from the Air Station Spill Response Team and the Environmental Affairs Department (EAD) responded to the spill. Upon arrival, there was no surficial evidence of the leak. The standing fuel was pumped out of the valve box. Inspection of the gasket seals to the valve box indicated that they were intact and suggested that the leak occurred from the pipeline (MCAS, EAD, 1995).

Facilities Maintenance personnel were called in to remove the concrete slab to the valve box and expose the piping system. During the excavation activities, it was discovered that a weld located on the hydrant pipeline system had developed three or four pin-hole leaks. This section of the pipeline is located approximately eight feet below land surface. On May 19, 1995, the leaking section of the pipeline was repaired. The line was repressurized and the excavation was left open over the weekend to monitor the effectiveness of the repair. No evidence of leakage from the repaired section of the pipeline was observed while the excavation was open (MCAS, EAD, 1995).

During excavation activities, it was noticed that the soil located immediately adjacent to the leak was saturated with fuel. Because of the suspected small size of the leak relative to the daily throughput of fuel to the heavy aircraft distribution system, it was difficult for base personnel to determine the exact quantity of fuel released. Based upon the observed soil conditions, the size of the excavation, and discussions with the Fuels Officer, it was estimated that approximately 800 gallons of fuel had been lost (MCAS, EAD, 1995).

Approximately 20 tons of soil were excavated and stockpiled at a location near the leak site. The excavation reportedly covered an area measuring approximately 15 feet by 15 feet and was approximately 14 feet deep. The contaminated soil was shipped by American Soils Corporation to the ASC Recycling Facility (Nash Brick Company) in Ita, North Carolina (MCAS, EAD, 1995). Review of base records indicates that samples were not collected from the excavation for laboratory analyses based upon future plans to assess the extent of soil and groundwater contamination.

Two free product recovery wells (66GW51 and 66GW52) were installed adjacent to the leak location on September 21, 1995 by ATEC Associates, Inc. Each of the two wells was installed to a depth of 25 feet below land surface (bls) and was constructed of 4-inch diameter schedule 40 PVC. The screened portion of each well extends from 5 to 25 feet bls. Free product is currently being recovered from each of the two wells on a daily basis using a passive bailing system. Maximum free product thicknesses have measured at approximately 2.6 feet for well 66GW52 and 0.02 feet for well 66GW51. The water table is estimated to be located between 12 and 13 feet bls. As of July, 1996, approximately 1.65 gallons of free

product have been removed from well 66GW51 and approximately 153 gallons of free product have been removed from well 66GW52 (MCAS, EAD, 1995).

Two assessments have been conducted in the vicinity of Pit 15 prior to the reported release. The first investigation was conducted by Weston/Baker in January of 1992 and involved the installation of several monitoring wells and soil borings to investigate the extent of soil and groundwater contamination in the vicinity of the portion of the abandoned aviation fuel pipeline adjacent to the heavy aircraft refueling area. As part of this investigation, one Type II monitoring well (56GW21) was installed on the southwestern end of the grass island to Pit 15 (Drawing 2.2). The results of this investigation did not indicate the presence of contamination in groundwater from this well but did indicate the presence of groundwater contamination along the pipeline near the central portion of the heavy aircraft refueling area (Roy F. Weston, Inc. and Baker Environmental, Inc, 1992).

LAW conducted a follow-up investigation in this area in May and June of 1994. As part of that investigation, a Type II/Type III monitoring well pair (66GW06 and 66GW46) was installed on the northeastern portion of the grass island to Pit 14, and one Type II monitoring well (66GW41) was installed on the southwestern portion of the grass island to Pit 14 (Drawing 2.2). Analysis of groundwater collected from these monitoring wells, and from previously installed monitoring well 56GW21, only indicated the presence of low concentrations of volatile and semi-volatile constituents in groundwater from monitoring well pair 66GW06/66GW46. Although the data suggested that the groundwater may have been contaminated from overspills during aircraft refueling operations, the data also suggested that low concentrations of petroleum contamination may have migrated into the Pit 14/Pit 15 area from an upgradient source. Efforts to remediate these upgradient sources areas are currently in progress (LAW, 1995).

Dames and Moore, and Tracer Research Corporation performed *Tracer Tight* ™ leak testing on the 24,525 linear feet of underground aviation fuel pipeline that currently comprises the base's active aviation fuel pipeline system. This investigation also included the testing of the portion of the pipeline system located in the heavy aircraft refueling area, including Pit 15. The field investigation was conducted between October 11, 1995 and January 18, 1996 after the release from the pipeline system at Pit 15. The

methods of the investigation and results are summarized in a report entitled Final Report, Engineering Evaluation, Aviation Fuel Distribution System Integrity Testing, Marine CORPS Air Station, Cherry Point, NC, dated February 9, 1996. No evidence was reportedly found to indicate that the portion of the pipeline system in the vicinity of Pit 14 and Pit 15 was leaking. However, trace concentrations of Total Volatile Hydrocarbons (TVHCs) from the prior release were detected in soil-gas probes installed in Pits 14 and 15 (Dames and Moore, 1996).

3.0 MIGRATION PATHWAYS AND POTENTIAL RECEPTORS

3.1 Water-Well Inventory

Two active water-supply wells are located within 1,500 feet of the site from the point of release on Pit 15. Well No. 1 is located to the northwest and downgradient of Pit 15 and Well No. 3 is located to the west and is cross-gradient. Three other water-supply wells are located to the northwest and downgradient of Pit 15 (Well Nos. 2, 5, and 6) and are within 3000 feet of the site (see Drawing 2.1). Until the magnitude of the release of petroleum from Pit 15 can be fully determined, it appears that Well No. 1 is a potential receptor of the release of petroleum at Pit 15. The potential also exists for downgradient water supply wells to be located within 1500 feet of the downgradient extent of the groundwater contaminant plume once the extent of groundwater contamination has been defined.

3.2 Utility Survey

Underground utilities currently located within the immediate vicinity of Pit 15 include the active underground aviation fuel system, electrical and communication lines and storm water lines. Portions of the active pipeline system are reportedly located between 8 and 14 feet below land surface (bls) in the vicinity of Pit 15 which places it in contact or close contact with the seasonally high water table. A stormwater culvert is located approximately 30 feet east of the former leak location and is buried between 4 and 6 feet bls (Drawing 2.2). This culvert is connected to a system of culverts for each of the heavy aircraft refueling pits. This system carries storm water to the north to northwest and drains into the drainage swale located between the heavy aircraft refueling area and Runway 14L. Water from the

northern portion of Runway 14L and associated taxiways and refueling areas is directed into this large drainage swale. Water from the drainage swale is directed into a large culvert that extends under Runway 14L north of Pit 15 and drains into Mill Creek.

3.3 Potential Receptor Survey

3.3.1 Biological Receptors

Fuel contamination, in any one of four physical states or "phases" (residual, vapor, liquid, dissolved), may be transmitted to receptors via ingestion, inhalation, or absorption. As petroleum fuel seeps into the subsurface, it will undergo a transformation process that results in adsorption of hydrocarbons onto soil particles (residual phase) and release of volatile hydrocarbons into pore spaces (vapor phase). If any product remains after adsorption and volatilization takes place, it will continue to move vertically downward, in the absence of preferred lateral routes of migration, until reaching the capillary fringe area or a relatively impermeable barrier if one is located above the capillary fringe. At this point, the fuel (liquid phase) will tend to spread throughout the capillary fringe and the transformation process will continue with the dissolution of hydrocarbons into groundwater (dissolved phase). An evaluation of the relationship between contaminated media and exposure pathways at the project site is summarized in Table 3.1.

Receptors may be potentially exposed to the hydrocarbons found in the soil primarily through inhalation of volatilized compounds and dermal contact with soil at hydrocarbon contamination sites. Exposure to potential contaminants may occur if the site is disturbed via construction or remediation activities or if maintenance personnel access the subsurface valve pit vaults without proper personal protective equipment. Because this would be an occupational exposure, the receptor analysis for these exposure pathways should be considered as part of the site remediation design plan or operation/maintenance plan.

Exposure via ingestion most commonly occurs from consumption of drinking water obtained from contaminated wells or contaminated public water supplies. Based on available information regarding water supply, two drinking-water supply wells are located within 1,500 feet, one of which is located

downgradient of the site. The information available at this time suggests that the downgradient well (Well No. 1) may be a potential receptor of the release.

3.3.2 Structural Receptors

Structural receptors within the area of investigation include the stormwater culvert system and the active aviation fuel pipeline system. The information available at this time does not indicate that contamination has migrated along these utilities.

3.3.3 Hydrologic Receptors

The results of the hydrologic receptors survey indicate that it is unlikely that subsurface contaminants at the project site constitute an imminent or near-future concern to Mill Creek. However, Mill Creek should be considered a potential receptor until the magnitude and extent of the release can be determined.

4.0 SOILS INVESTIGATION

4.1 Site Topography

The project area lies at an elevation of approximately 20 to 25 feet above mean sea level and slopes slightly to the north. The grass island between Pits 14 and 15 lies at a slightly lower elevation than the surrounding concrete tarmac and is frequently ponded with surface water during rainfall events. Surface water from Pit 15 drains into two stormwater culverts located at the northeast and southwest ends of Pit 15 which are connected to a stormwater drainage system. This system drains into a large drainage swale that is located between Runway 14L and the heavy aircraft refueling area. Water from this drainage swale is directed into a culvert that runs under runway 14L and drains into Mill Creek. Mill Creek flows for approximately 4500 feet before it drains into Slocum Creek (Drawings 1.1 and 1.2).

4.2 Regional Geology

MCAS Cherry Point is located on the Atlantic Coastal Plain Physiographic Province which consists of a massive wedge of unconsolidated and consolidated sediments deposited on rock of Precambrian age, i.e., 600+ million-year-old (my) rock. Near surface unconsolidated sediments in the vicinity of MCAS Cherry Point consist of a sequence of Pliocene and Pleistocene-aged (10,000 years to 5 my) sands and silty sands with interbedded clays, silts and marls (*Brown, 1958; Floyd, 1969*). These major sedimentary sequences were deposited during transgressive and regressive cycles primarily produced by the rise and fall in sea level (*Ward, Baal and Carter, 1991*). Because these units are very similar in texture and appearance, characterization of these units based solely upon their lithology (sedimentary characteristics) is difficult without reference to the sequence and biostratigraphic framework (characterization of geologic units based upon differences in assemblages of fossil remains, *Ward, Baal and Carter, 1991*). Consequently, previous reports on the geology of the eastern shore of North Carolina have incorporated a more uniform approach to differentiating major stratigraphic units (formations). More recent studies conducted in the mid-to-late 1980s have provided a more detailed approach in differentiating formations which is primarily based on differences in biostratigraphic framework.

The Coastal Plain of North Carolina was inundated by repeated marine transgressions due to fluctuating sea levels during the Pliocene and Pleistocene (0.01 to 5 my). During this same time interval, minor tectonic changes altered the elevation of the continental shelf relative to sea level which formed large shallow depressions which served as depositional basins for eroded sediment. These depositional environments consisted of back barrier (beach) lagoonal settings, shallow inner-bay estuarine environments, and open shallow (ocean) shelf. These strata were deposited unconformably on older beds ranging from late Miocene (5-24 my) to late Cretaceous (63-138 my) age. Overlapped were deltaic and shallow marine sands of the Cretaceous, silts and glauconitic sands of Paleocene age, limestones and calcareous quartz arenites of Eocene age (38-55 my) and Oligocene age (24-38 my), and calcareous and phosphatic sands of the Miocene Epoch (*Ward, Baal and Carter, 1991*).

Major geologic units that have been mapped in the MCAS Cherry Point area that comprise the significant near-surface hydrogeologic units include the Eocene-aged Castle Hayne Formation, oligocene-aged River

Bend Formation, Miocene-aged Pungo River Formation, Pliocene-aged Yorktown Formation, Pleistocene-aged James City Formation, and the Pleistocene-aged Flanner Beach Formation (Surficial Deposits).

The Castle Hayne Formation consists of the New Hanover, Comfort and Spring Garden members which generally consist of a massive molluscan, bryozon-echinoid skeletal sandy limestone with a basal phosphate pebble conglomerate. Based upon interpretation of gamma-ray logs from a water supply well located south of runway 14L at MCAS Cherry Point *(Murray and Keoughan, U.S.G.S., 1990)* the top of the Castle Hayne is estimated to be located at an elevation of approximately 200 to 225 feet below sea level (BSL). The River Bend Formation, which unconformably overlies the Castle Hayne Formation, is similar in composition and consists of a sandy limestone with areas of sandy, molluscan-mold limestone. This unit is reported to have a thickness of approximately 85 feet, the top of which is estimated to be located at an elevation of approximately 125 feet BSL. The Pungo River Formation is consistent in composition with the Castle Hayne and River Bend Formations and is a phosphate rich-unit containing interbedded phosphatic clays, limestones, silty claystones, coquinas and phosphatic sands. The unit is estimated to have a thickness of approximately 50 feet and the top of the unit is approximately 75 feet BSL.

The Yorktown Formation consists of a silty to clayey, dark bluish-green medium to fine argillaceous (cemented) glauconitic sand with varying amounts of shell fragments. This unit is reported as being approximately 30 to 35 feet thick and the top of the unit is located approximately 45 feet BSL. The James City Formation overlies the Yorktown Formation and consists of a very shelly sand which is reported to be less than 25 feet thick. The top of the Formation is reported to be located approximately 40 to 45 feet BSL.

Recognition and differentiation of the James City Formation in well cuttings or on geophysical logs is considered to be extremely tentative (*Brown, 1988*). The Flanner Beach Formation is reported to comprise the near-surface geology of the area *(Murray and Keoughan, U.S.G.S., 1990)*. However, this Formation is currently not recognized in literature by the North Carolina Geological Survey (Brown, 1988). The James City and Flanner Beach Formations may be referred to as surficial deposits (undivided)

due to this similarity in composition. The James City Formation may also be identified as part of the Yorktown Formation as a thin sandy shell hash layer overlying the Yorktown Formation. For ease of interpretation and reader understanding, we will refer to the Flanner Beach Formation as surficial deposits. Because our field data for this investigation and previous investigations do not contain readily identifiable indicators of the James City Formation, and because this Formation appears to be discontinuous across the base and very similar in composition to the Flanner Beach Formation, we will consider it along with the Flanner Beach Formation as surficial deposits (undivided).

4.3 Site Soils and Geology

Site soils and the geology of the project area were characterized during the drilling phase of the project. The project was initiated on September 30 and was completed on October 10, 1996. A total of four soil borings, one Type III and six Type II monitoring wells were installed during the investigation. One of the six Type II monitoring wells was constructed of 6-inch diameter PVC to allow for the collection of larger volumes of free product. The soil borings were backfilled with bentonite upon completion. Locations of these borings/wells are shown in Drawing 2.2.

Drilling for each of the four soil borings and each of the six Type II monitoring well borings and the boring for the outer casing for the Type III monitoring well was accomplished using hollow-stem auger techniques in general accordance with ASTM D-1452. The inner casing for the Type III monitoring well was installed using mud rotary drilling techniques. All down-hole drilling equipment was steam cleaned and/or scrubbed with an Alconox and water solution with a distilled water rinse prior to work at each drilling location. Soil cuttings were temporarily disposed of in a roll-off box provided by Waste Industries and were subsequently disposed of at the Frisby Technologies facility in Havelock, North Carolina.

Soil samples were collected from each of the boreholes for classification during the drilling operation and were generally obtained at continuous depth intervals to the water table, which was encountered between approximately 11.0 and 12.0 feet bls. Soil samples were collected below the water table at five-foot centers thereafter to boring termination.

Boring depths ranged from approximately 18.5 to 20 feet bls for the 2-inch diameter Type II monitoring wells, 22 feet for the 6-inch diameter Type II monitoring well, and 42 feet bls for the Type III monitoring well. Soil borings that were not converted into monitoring wells were generally terminated at 10 to 14 feet bls. Soil samples were collected with a 24 inch long, 1.375-inch I.D. (2-inch O.D.) split spoon sampler. Split spoon sampling was performed in general accordance with ASTM D-1586 and the number of blows required to drive the sampler each six-inch increment was recorded on the field boring log (Appendix B).

Representative portions of each sample were placed in pre-labeled plastic bags and sealed for subsequent headspace testing. The soil samples were identified in the field using visual/manual techniques described in ASTM D-2487 and ASTM D-2488. The soil was classified in accordance with the Unified Soil Classification System and a record of each test boring was produced. The soil test boring records are presented in Appendix B.

A tan to light gray and brown fine sand to silty fine sand with occasional clay interbeds generally comprises the near surface geology of the site to a depth of approximately 9 to 11 feet bls at which depth the sand grades from a fine to medium texture. The Yorktown Formation was encountered at a depth of approximately 42 feet bls. The Yorktown Formation consists of a dark grayish to bluish-green fine sand to silty fine sand with shell fragments. These findings are consistent with the geologic characteristics of adjacent sites in the vicinity of Runway 14L.

Two soil samples were submitted for grain size distribution analysis. The first sample was collected at a depth of 18.5 to 20.0 feet bls from Type II monitoring well boring 66GW57 and was characterized as a brown medium sand. The second soil sample was collected from a depth of 38.5 to 40.0 from Type III monitoring well boring 55GW58. Results of the grain size analysis indicate that the sample from monitoring well boring 66GW57 consists of 97.1% sand, 0.1% silt and 2.8% clay. The sample from monitoring well boring 66GW58 consists of 93.5% sand and 6.5% silt and clay. Grain size distribution analysis results are presented in Appendix C.

Two cross-sections, the locations which are shown in Drawing 4.1, were developed for the site to present lithologic interpretations. The cross-sections, as developed from the boring records, are illustrated in Drawing 4.2.

4.4 Soil Contamination Assessment

The main objective of the soil investigation was to determine if vadose zone soil contamination is present outside the area where contaminated soils were previously excavated during repair of the pipeline leak and to identify if other outlying areas of vadose zone soil contamination are present. The soil samples were submitted to LAW's National Laboratory in Pensacola, Florida and were analyzed for total petroleum hydrocarbons (TPH) according to EPA preparation/testing Methods 5030/8015 (volatile fraction) and 3550/8015 (semi-volatile fraction). Custody of the samples was maintained by LAW field staff until sample shipment.

In addition to the samples collected from the soil borings, a composite sample of soil stored within the roll-off box was collected for laboratory testing. Soil was composited from three locations evenly spaced along the center line of the roll-off box. Each portion of the composite sample was obtained using a hand auger. The composite soil sample was tested for total petroleum hydrocarbons (TPH) according to EPA preparation/testing Methods 5030/8015 (volatile fraction), 3550/8015 (semi-volatile fraction).

Laboratory test results for samples collected during the investigation are provided in Table 4.1 and laboratory test reports are provided in Appendix I. Evidence of soil contamination in excess of laboratory detection limits was not detected within unsaturated (vadose zone) soils. Based upon review of groundwater analytical data (see section 5.4), it is apparent that both gasoline grade and diesel (jet fuel) grade fuels are present in saturated soils. Test results from the analysis of the composite soil sample from the roll-off indicate that the petroleum product is predominantly comprised of jet fuel with lesser amounts of gasoline grade fuels. Former discharges of aviation fuel into the filled-in portion of the Mill Creek tributary appears to be the likely source of the gasoline-grade petroleum contamination. Drawing 4.1 depicts the estimated extent of soil contamination in the Pit 15 area of investigation.

Results of the headspace screening are presented in Table 4.2. Screening results for soil samples collected in the vadose zone showed marginal correlation with laboratory test results. Screening results for soil samples collected at the water table showed elevated readings which are likely related to the presence of free product. Screening results showed a significant decrease of volatile organic vapors with increasing depth below the free product zone.

5.0 GROUNDWATER INVESTIGATION

5.1 Regional Hydrogeology

The Castle Hayne, River Bend, Pungo River and Yorktown Formations and surficial deposits (James City and Flanner Beach Formations) comprise the near surface geology of the MCAS from a depth of approximately 300 feet to the land surface at MCAS Cherry Point (Section 4.2). Many of these geologic formations are very similar to each other in composition, and therefore, demonstrate similar hydrogeologic properties. Because of this, formations similar in composition have been grouped together to define the major aquifers that underlie the site. These aquifers, from bottom to top, are recognized as the Castle Hayne, Yorktown and surficial aquifers. The Castle Hayne aquifer, which includes the Castle Hayne, River Bend and Pungo River Formations, is one of the major aquifers in eastern North Carolina and is heavily utilized for drinking water by Cherry Point and the City of Havelock. The Yorktown aquifer typically includes the Yorktown Formation but is also reported to include the James City Formation *(Murray and Keoughan, 1990)*. The surficial deposits comprise the surficial aquifer.

Information presented by Murray and Keoughan *(1990)* indicate that an upper and lower confining unit define the upper and lower portions of the Yorktown aquifer. This information was obtained through a gamma-log of a well installed south of runway 14L. Data obtained from field classification and grain size analysis of soil samples collected within the first 12 feet of the Yorktown aquifer/Formation by LAW on previous investigations at MCAS Cherry Point indicate that it consists of a dark green to blue slightly silty to clayey very fine sand with shell fragments. Reviewed grain size analysis data suggests that the upper portion of the Yorktown aquifer is less permeable than the surficial aquifer which may support its being referred to as an aquitard. It is important to note that the permeability of an aquitard by definition, is not

sufficient to allow completion of effective production wells but can be permeable enough to transmit water in quantities that are significant in the study of regional groundwater flow (*Freeze and Cherry, 1979*).

5.2 Site Hydrogeology

Site specific data used to characterize the local hydrogeology was obtained through the installation of groundwater monitoring wells. A total of one Type III and six Type II monitoring wells were installed during this investigation. One of the six Type II monitoring wells was constructed using 6-inch diameter PVC to assist in the recovery of free product. In addition, existing monitoring wells 56GW21, 66GW06 and 66GW41 were resampled to provide current groundwater chemistry data along the upgradient and crossgradient portions of the site. Groundwater elevation data was also determined for each of the newly installed wells and existing wells within the area of investigation to assist in the determination of groundwater flow direction across the site. Two 6-inch diameter free product recovery wells were previously installed at the site and are currently being used for free product recovery.

Well installation was conducted in accordance with the procedures outlined in the workplan (Appendix A). These specifications included decontamination of the drilling equipment and well construction materials with a pressure steam cleaning unit. The monitoring well heads are protected by lockable, steel, flush mount covers cast into the concrete tarmac or ground. Monitoring well installation details for the Type II and Type III wells are included in Appendix D.

Depths to groundwater within all monitoring wells installed at the site and nearby existing Type II monitoring wells 56GW21, 66GW06, 66GW41 and Type III monitoring well 66GW46 (paired with Type II monitoring well 66GW06) were measured on October 10, 1996. Depth to groundwater measurements could not be recorded for existing free product recovery well 66GW51 and 66GW52 due to the presence of passive free product recovery systems within the wells. The measurements are included on the Monitoring Well Casing and Water Elevation Worksheets contained in Appendix E. The top of casing elevations of newly installed monitoring wells and the six existing monitoring wells were determined by

surveyors from Taylor, Wiseman and Taylor, Surveyors, and are also included in the worksheets contained in Appendix E.

The screened intervals for each of the Type II monitoring wells intersect the water table, were installed to depths between 18.0 and 19.5 feet bls, and were constructed using 10 feet of 0.010-inch slotted screen. The screened interval for each Type II well was generally installed into a brown medium sand. The water table was generally encountered at a depths between 11.0 and 12.0 feet bls in areas not containing free product. In areas where free product was encountered, the water table was found to be depressed to depths between 14.45 and 17.40 feet due to the overlying aviation fuel (JP-5). The Type III monitoring well 66GW58 was paired with a Type II monitoring well 58GW57 and was installed just above or slightly into the top of the Yorktown Formation which is located approximately 42 feet bls. The screened interval of the Type III well consists of 5 feet of 0.010-inch slotted screen which was installed into a gray medium sand. The 6-inch diameter Type II monitoring well (66GW59) was installed to a depth of 22 feet bls and was constructed using 20 feet of 0.010-inch continuous slot screen. The well was paired with Type II/Type III monitoring well pair 66GW57/66GW58 and was primarily designed for free product recovery. The well was installed to a depth of 22 feet bls to ensure that the unslotted joint between each of the two 10 foot screened sections did not intersect the free product zone in order to enhance the efficiency of free product recovery.

A downward vertical hydraulic gradient was measured at Type II/Type III well pair 66GW57/66GW58 and existing well pair 66GW06/66GW46. The vertical hydraulic-gradient determinations for the site are presented in Table 5.3 and are discussed further in Section 5.6.

Based on groundwater elevations measured in the Type II monitoring wells, a water-table elevation contour map was prepared to illustrate shallow groundwater flow directions and gradients for the project area (see Drawing 5.1). Because the water table has been depressed in areas where free product is present, LAW calculated corrected water-table elevation by multiplying the free product thickness for each well by 0.8, an average density of jet fuel-grade petroleum, and adding this value to the groundwater elevation at each well. This method allows for determination of shallow groundwater flow direction at

sites containing free product. Corrected water-table elevations for wells containing free product are presented in Appendix E

Water-table elevation data indicate a general north to northeasterly direction of groundwater flow across the area of investigation. This finding is consistent with the flow direction determined during our previous assessments of the Building 4075/Pipeline site which included Pit 15. Shallow groundwater flow is directed toward Mill Creek. Water-table elevations were found to be 0.95 to 1.4 feet higher than those encountered during our previous 1995 investigation. This is likely a result of recent heavy rainfall events during hurricanes and tropical storms in the fall of 1996. The presence of a seasonally high water table was considered in determining the depth of installation for each of the Type II monitoring wells installed during this investigation.

5.3 Extent of Free Product

Type II monitoring wells were constructed to allow for detection of free product within the surficial aquifer. According to the North Carolina Department of Environment, Health and Natural Resources, free product is defined as a regulated substance that is present as a non aqueous phase liquid (e.g., liquid not dissolved in water).

Water-level and free product measurements obtained from site monitoring wells are included in the Monitoring Well Casing and Water Elevation Worksheet presented in Appendix E. Measurements taken during this investigation revealed the presence of free product in Type II monitoring wells 66GW53 through 66GW57 and 66GW59. Free product is also present in existing free product recovery wells 66GW51 an 66GW52; however, free product measurements could not be obtained from these wells due to the presence of passive free product recovery systems. Free product was not detected in existing Type II monitoring wells 56GW21, 66GW41 and 66GW06 which concurs with the data from our previous 1995 investigation. Free product thicknesses ranged from 1.95 to 4.05 feet with the exception of monitoring well 66GW55 where a slight petroleum sheen was observed. Visual examination of the free product by LAW and MCAS Fuels Division personnel suggests that the free product is predominantly comprised of slightly weathered jet fuel (JP-5).

The extent of free product has not been defined. The presence of free product in upgradient, crossgradient and downgradient monitoring wells, each located approximately 100 feet from the point of the pipeline release, and free product thicknesses averaging over 3 feet suggest that the quantity of fuel released from the pipeline was greater than the initial estimate of 800 gallons. The presence of over four feet of free product in downgradient monitoring well 66GW53 suggests that the lense of free product has migrated downgradient from Pit 15 since the time the release occurred. Drawing 5.2 shows the currently estimated distribution of free product across the site.

5.4 Dissolved Groundwater Contamination

Newly installed Type II monitoring well 66GW55 and Type III monitoring well 66GW58 were developed after completion. Type II monitoring wells 66GW53 through 66GW54, 66GW56, 66GW57 and 66GW59 were not developed or sampled due to the presence of measurable quantities of free product. Approximate volumes of water removed during development and observations of turbidity are listed in Table 5.1. The development water was temporarily containerized on-site and then taken off-site to P&W Oil Company, Inc. located in Leland, North Carolina.

The surficial aquifer was allowed to stabilize between October 4 and October 10, 1996 to account for disturbances from drilling and sampling activities and from a large rainfall event from a tropical storm that moved through Cherry Point on October 7th and 8th. On October 10, 1996 the depths to groundwater for wells containing free product were determined using an electronic oil/water interface probe. Depths to groundwater measurements in wells not containing free product were obtained using a slope-indicator water-level meter. The distance from the measuring point to each respective depth was measured and recorded. The data collected and observations made were recorded on the Monitoring Well Casing and Water Elevation Worksheet (Appendix E).

Existing monitoring wells 56GW21, 66GW06 and 66GW41 and newly installed monitoring wells 66GW55 and 66GW58 were purged prior to sample collection to remove stagnant water from the well casing and sand pack to provide representative samples of groundwater. The wells were purged using a

disposable bailer. Specific conductance, pH, and water temperature were measured and recorded throughout the purging process. Well purging continued until more than three standing well volumes of water were removed and indicator parameters had stabilized. Data obtained during purging activities are included in Appendix F. Water samples were then collected and decanted gently from the bailer into pre-labeled sample containers. These containers were sealed, and stored in chilled coolers. Custody of the samples was maintained by LAW field staff until samples were relinquished for laboratory analysis. Water generated during the well purging and development process was temporarily containerized on-site and then disposed of at P&W Oil Company, Inc along with the development water.

On October 7, 1996 existing monitoring wells 56GW21, 66GW06 and 66GW41 and newly installed monitoring wells 66GW55 and 66GW58 were sampled. Groundwater samples from each well were sampled for purgeable aromatic compounds (EPA Method 602) and semivolatile compounds (EPA Method 625) and total lead (EPA Method 239.2 using preparation method 3030C). A duplicate groundwater sample was also collected from monitoring well 66GW55 according to the methods described above. Additionally one bailer rinse blank was collected from the bailer used to sample Type III monitoring well 66GW58 and one trip blank were submitted for laboratory testing. Both samples were analyzed for purgeable aromatic compounds using EPA Method 602. Laboratory test results are summarized in Table 5.2 and copies of the laboratory test reports are provided in Appendix I. Maps showing the concentrations of benzene, total BTEX and total semi-volatile compounds within the shallow portion of the surficial aquifer are provided in Drawings 5.3 through 5.5, respectively.

Laboratory test results only indicated the presence of volatile and semivolatile dissolved phase groundwater contaminants from Type II monitoring well 66GW55 and Type III monitoring well 66GW58. Volatile constituents benzene, ethylbenzene and xylenes and semivolatile constituent naphthalene were detected in excess of their respective North Carolina Groundwater Quality Standards in the groundwater sample from monitoring well 66GW55. These constituents were also detected in the groundwater sample from Type III monitoring well 66GW58 but at concentrations below the North Carolina Groundwater Quality Standards. Volatile constituents toluene, 1,2-dichlorbenzene, 1,4-dichlorbenzene and MTBE were also detected in groundwater at concentrations below their respective groundwater quality standards. Semivolatile constituent bis(2-Ethylhexyl)Phthalate was also detected in monitoring well 66GW58. The

laboratory test results for the three existing monitoring wells resampled during this investigation are generally consistent with the data obtained from the analysis of groundwater from these wells during our previous 1995 investigation.

The data obtained during this investigation indicate that the extent of dissolved-phase groundwater contamination has not been defined. Test results from the analysis of groundwater samples collected from the site also indicate the presence of elevated concentrations of volatile compounds. These data support composite soil testing results which indicate that gasoline-grade fuels are present at the site in groundwater in addition to the jet fuel released from the active pipeline system.

Lead was detected in each of the five monitoring wells sampled during this investigation at concentrations exceeding its regulatory standard. The presence of lead does not appear to be associated with the release of petroleum and appears to be naturally occurring with the exception of the concentration of lead detected in monitoring well 66GW55. Lead was detected at a concentration of 1760 µg/L in groundwater from this well but was only detected at a concentration of 174 µg/L in the duplicate sample. Additional sampling is required to determine if lead is present in the petroleum detected at the site. Leaded fuels have reportedly not been transported through the active pipeline system since its installation in the early 1980's. This suggests that the gasoline grade fuel from the fuel bladder and abandoned aviation fuel line areas would be the only unnaturally occurring sources of lead at the site.

5.5 Hydraulic Properties

Estimations of the hydraulic properties of the surficial aquifer were determined using data collected from slug tests and grain size analysis data obtained during this investigation and during our previous assessments of nearby sites Building 130 and Building 4075. Based upon the information described above, an average hydraulic conductivity of 41 feet/day and an effective porosity of 40% was determined for the surficial aquifer (Appendix G). Hydraulic conductivity estimates obtained from slug test data for monitoring wells 66GW55 and 66GW58 were not used in this determination because they were found to be an order of magnitude lower than those obtained through alternative methods. Average linear groundwater flow velocity was calculated based on the measured horizontal hydraulic gradient, the

average hydraulic conductivity, and the estimated effective porosity. The average linear groundwater flow velocity was calculated according to the following equation.

$$v = (K \times dh/dl)/n_e$$

K = Hydraulic Conductivity
dh/dl = Hydraulic gradient
n_e = effective porosity

Using estimated values for effective porosity of 40%, a hydraulic gradient of 0.003, and the average hydraulic conductivity estimate of 41 feet/day, the average linear velocity of groundwater flow within the surficial aquifer is expected to be approximately 0.34 ft/day (Appendix G). It is important to note that the value for effective porosity is an estimate based on predominant soil types encountered during construction of monitoring wells at the project site. It should also be noted that the velocity calculated above is an approximate average for groundwater flow within the surficial aquifer at the project site and this portion of the Marine Corps Air Station.

5.6 Vertical Gradient Determinations

Groundwater exhibits both horizontal and vertical components of flow within an aquifer. The hydraulic gradient is the difference in hydraulic head along a flow path divided by the distance of the flow path. The vertical component of the gradient may be either upward or downward within the aquifer.

The vertical gradient is calculated by first determining the difference in the static groundwater elevations at each well. Second, the elevation of the middle of the screened interval is determined for each well. Finally, the difference in the static groundwater elevations is divided by the difference in the mid-screen elevations. This value is arbitrarily assigned a positive value if the vertical component of groundwater flow is downward and a negative value if the vertical component is upward. The vertical gradients determined at Type II/Type III well pairs 66GW57/66GW58 and 66GW06/66GW46 are summarized in Table 5.3, and indicate a generally downward vertical component of groundwater flow.

5.7 Rate of Contaminant Migration

The rate at which contaminants migrate through the subsurface is affected by several geohydrochemical processes including molecular diffusion, mechanical mixing, sorption-desorption, ion-exchange, hydrolysis and biodegradation. Because the resources involved in attempting to model the effects of these processes at the project site are significant, we have chosen to apply a relatively simple analytical technique with which to arrive at a conservative estimate of contaminant migration rates for the site (USEPA, 1985). The analytical technique takes into account only sorption-desorption of the contaminant constituent, expressed in terms of the "retardation factor", and the average linear groundwater flow velocity at the site (Appendix H). For purposes of these calculations, we used an average linear groundwater flow velocity in the surficial aquifer of 0.34 ft/day. Resulting calculations, contained in Appendix H, suggest that the approximate rate of movement for the compounds detected within the surficial aquifer (V_c) range between the following:

COMPOUND	RATE Vc (Feet/Day)
Benzene (volatile)	1.14×10^{-1}
MTBE (volatile)	2.52×10^{-1}
Naphthalene (semi-volatile)	7.25×10^{-3}

Please note that these migration rates are only gross estimates and may vary considerably from actual field migration rates.

6.0 QUALITY CONTROL PROCEDURES

6.1 Equipment Decontamination

Quality control procedures for equipment handling and decontamination were followed according to the procedures detailed in the Workplan presented in Appendix A. As specified by base personnel,

decontamination of the drilling equipment was performed at the wash rack located within the Tank Farm A facility.

6.2 Sample Collection and Shipment/Quality Control

Details of quality control procedures for sample collection, handling and shipment are included in the Workplan. To provide checks on the integrity and quality of the field sampling program performed at the project site, three quality control measures were employed. First, a rinse blank was submitted to the laboratory to evaluate the cleanliness of the disposable bailers. Second, a trip blank was submitted to the laboratory during shipment of the monitoring well samples to check the integrity of the sample containers and ascertain whether contaminants may have entered the samples during transport to and from the job site. Third, duplicate soil and groundwater samples were collected to check the laboratory's ability to produce results. Laboratory quality controls included the use of lab blanks throughout the analytical procedures to check for laboratory induced contamination.

Test results from the analysis of the bailer rinse blank and trip blank samples did not indicate the presence of petroleum constituents. Test results for the duplicate soil sample indicated a good correlation of results between samples. Test results for the duplicate groundwater sample from monitoring well 66GW55 generally indicated a good correlation of results for individual contaminants except for concentrations of xylenes and total lead. Concentrations of xylenes and total lead were generally 10 times lower in the duplicate groundwater sample. As a conservative measure, the higher concentrations have been utilized for site characterization.

7.0 CONCLUSIONS AND RECOMMENDATIONS

7.1 Overview and Objectives of Soil and Groundwater Remediation

Based upon our assessment activities at the site, a spatial distribution of petroleum hydrocarbon contamination at levels exceeding regulatory standards exists within groundwater at the site. Free product

has also been detected. Preliminary recommendations described additional activities that will be needed to meet regulatory requirements.

7.1.1 Soil

Vadose zone soil contamination from the former release of jet fuel from the active aviation fuel pipeline system the was not detected at the site. The absence of soil contamination in the vicinity of the release indicates that excavation activities that occurred during the repair of the pipeline were sufficient to remove grossly contaminated soils. The source of the gasoline contamination detected in the composite soil sample and in groundwater samples appears to be from discharges of aviation fuel from a former fuel bladder system into the portion of the Mill Creek tributary that was filled-in during the construction of the heavy aircraft refueling area. Areas of vadose zone soil contamination may be located within the former creek bed.

7.1.2 Groundwater

Free product consisting of jet fuel (JP-5) was identified in groundwater at the site. The presence of free product in groundwater constitutes a violation of the North Carolina Groundwater Quality Standards. Additionally, several dissolved-phase volatile and semi-volatile constituents have been detected at concentrations above North Carolina Groundwater Quality Standards.

The decision to remediate groundwater quality to the level of respective North Carolina Groundwater Quality Standards depends upon regulatory requirements, the measured and/or perceived present and future utility of the groundwater resource, the risks associated with the potential exposure to the contaminants, and the availability of resources with which to implement and operate a groundwater restoration project. Remediation is warranted in a situation where the risk to public health or welfare is unavoidable and unacceptable as a result of exposure to groundwater contaminants. As indicated in Section 3.3 and Table 3.1 of this report, present exposure to groundwater contaminants in the vicinity of the project site is considered possible due to the presence of a water supply well and Mill Creek within 1,500 feet, downgradient, of the site. Additional investigation is required to further assess the potential for

the water supply well and Mill Creek to be impacted by the release and to determine if additional water supply wells are located within 1500 feet of the downgradient edge of the groundwater contaminant plume once the extent of contamination has been determined.

Because groundwater standards have been exceeded due to the release of petroleum in the Pit 15 area, rules adopted by the EMC and enforced by DWQ require that a corrective action plan for the restoration of groundwater quality be prepared. The feasibility and justification for alternative remedial options ranging from natural attenuation (no action) to active remediation are addressed in a corrective action plan. Currently there are insufficient data to support the preparation of a Corrective Action Plan because the extent of free phase and dissolved-phase groundwater contamination cannot be determined at this time.

7.2 Conclusions

Based upon our assessment activities at the site, it is apparent that both gasoline grade and diesel/jet fuel grade fuels are present in groundwater. Results indicate the presence of predominantly JP-5 constituents with lesser amounts of gasoline constituents.

Free product was detected in both the upgradient, crossgradient and downgradient monitoring wells installed at the site. Although the extent of free product has not been defined at this time, the presence of free product at thicknesses greater than one foot in wells located approximately 100 feet from the point of release suggests that a larger volume of jet fuel was released at the site approximately 800 gallons than the initially reported. Visual examination of the jet fuel by LAW and MCAS Fuels Division personnel suggests that the free product is primarily comprised of jet fuel (JP-5).

Active potential sources of the gasoline contamination have not been identified within 600 feet of the former location of the release of jet fuel from Pit 15. Historical information indicates that a runway extension was formerly located adjacent to the southeast side of the heavy aircraft refueling area. Results from LAW's previous assessment of an adjacent site indicated that a large fuel bladder, a temporary fuel storage container having an estimated capacity of 20,000 to 30,000 gallons, was previously used to store various grades of aviation fuel adjacent to the former runway extension.

A portion of a tributary to Mill Creek was formerly located in the heavy aircraft refueling area and was apparently filled-in during the recent construction of this area in the early 1980's. The former fuel bladder is shown in a base drawings being a "discharge" point for this tributary. This suggests that former discharges of aviation fuels into the filled-in portion of the tributary to Mill Creek maybe a source of the detected gasoline contamination.

The extent of both free phase and dissolved phase groundwater contamination has not been defined and, based on shallow groundwater flow direction, is expected to extend to the northeast toward Runway 14L. Two active water supply wells and Mill Creek are located within 1,500 feet of the site and have been identified as potential receptors. Additional investigation is required to determine the extent of free phase and dissolved phase contamination from both the active pipeline system and former discharges of aviation fuel into the tributary to Mill Creek to evaluate risk posed by the release to these potential receptors, and to determine if other water supply wells may be located within 1500 feet of the downgradient edge of the groundwater plume.

7.3 Recommendations

Our recommendations for the site are as follows:

- Conduct additional investigation to determine the extent of both free phase and dissolved phase groundwater contamination and to determine if areas of gasoline-grade vadose zone soil contamination area located in the former tributary of Mill Creek.
- Continue current free product recovery activities at the site and evaluate interim remedial techniques to maximize the recovery of larger volumes of free product.
- Provide a copy of the final version of this report to DWQ for their files.

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TABLE 2.1
CONTAMINANT SOURCE INVENTORY
PIT 15
MARINE CORPS AIR STATION
CHERRY POINT, NORTH CAROLINA
LAW JOB NO. 30740-5-0500/0194

POTENTIAL SOURCE	PRODUCT TYPE	INSTALLATION DATE	SIZE	STATUS
Aviation Fuel Active Underground Pipeline System	Jet Fuel (JP-5)	1983	Various sizes of aluminum pipe	Active
Abandoned Underground Aviation Fuel Pipeline System	Gasoline, JP-3, JP-6	1940's	20-inch to 4-inch diameter pipes	Abandoned
Refueler Truck Storage and Parking Area (MWSS274 Refuelers)	Various grades of petroleum	Early 1980's	Tanker trucks are washed at facility. Wash water containing petroleum is discharged into oil-water separators.	Active
Overspills Heavy aircraft refueling area	JP-5	Early 1980's	Various	Refueling area is curently active
Fuel Bladder	Various grades	Unknown	Estimated 20,000 - 30,000 gallons	Removed 1982 - 1983

NOTE: Please reference Section 2.2 of this report for a detailed description of the above-mentioned potential contaminant sources and Section 8.0 for a list of references .

TABLE 3.1
SUMMARY OF EXPOSURE PATHWAYS
PIT 15
MARINE CORPS AIR STATION
CHERRY POINT, NORTH CAROLINA
LAW JOB NO. 30740-5-0500/0194

CONTAMINATED MEDIUM	INGESTION (EATING)	INGESTION (DRINKING)	INHALATION	ADSORPTION
Soil	Exposure Unlikely[1]	NA	Exposure Unlikely [1]	Exposure Unlikely [1]
Groundwater	NA	Exposure Possible [2]	Exposure Possible[2]	Exposure Possible [2]
Surface Water	NA	Exposure Unlikely [3]	Exposure Unlikely[3]	Exposure Unlikely[3]
Vapor	NA	NA	Exposure Unlikely[4]	NA

NOTES:

NA Not Applicable

(1) Potential for exposure only if subsurface is disturbed.

(2) PIT 15 is located within 1500 feet (upgradient) of an active water supply well. Three active water supply wells are located within 3000 ft of PIT 15, two of which are located downgradient of the site.

(3) The discharge of contaminated groundwater from the release of fuel at PIT 15 into Mill Creek, a tributary of Slocum Creek, is unlikely at this time.

(4) Exposure to petroleum vapors is unlikely unless the subsurface is disturbed.

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TABLE 4.1
SUMMARY OF LABORATORY ANALYTICAL RESULTS
SOIL SAMPLES
PIT 15
MARINE CORPS AIR STATION
CHERRY POINT, NORTH CAROLINA
LAW ENGINEERING JOB NO. 30740-5-0500-0194

SAMPLE LOCATION	SAMPLE DEPTH (FT.)	LABORATORY RESULTS	
		TPH-GASOLINE (mg/Kg)	TPH-DIESEL (JET FUEL) (mg/Kg)
66SB19	4.0-6.0	ND	ND
	8.0-10.0	ND	ND
66SB20	6.0-8.0	ND	ND
	8.0-10.0	ND	ND
66SB21	4.0-6.0	ND	ND
	6.0-8.0	ND	ND
66SB22	2.0-4.0	ND	ND
	8.0-10.0	ND	ND
66SB39 [Duplicate of 66SB19 (8-10)]	8.0-10.0	ND	ND
66GW53	6.0-7.5	ND	ND
	8.5-10.0	ND	ND
66GW54	6.0-7.5	ND	ND
	8.5-10.0	ND	ND
66GW55	3.5-5.0	ND	ND
	8.5-10.0	ND	ND
66GW56	6.0-7.5	ND	ND
	8.5-10.0	ND	ND
66GW57	6.0-7.5	ND	ND
	8.5-10.0	ND	ND
66GW58	NA	NA	NA
66GW59	NA	NA	NA
Roll-Off Box (Composite)	--	390	1990

The regulatory standard for gasoline-range TPH is 10 mg/kg (milligrams per kilograms)
The regulatory standard for diesel-range TPH is 40 mg/Kg.
ND - Not Detected
NA - Samples collected from this boring were not submitted for laboratory analysis.

TABLE 4.2 (Page 1 of 2)
SUMMARY OF HEADSPACE SCREENING
PIT 15
MARINE CORPS AIR STATION
CHERRY POINT, NORTH CAROLINA
LAW JOB NO. 30740-5-0500/0194

WELL LOCATION	DEPTH (ft bls)	OVA READING (ppm)	COMMENTS
66SB19	0.0-2.0	0.6	Laboratory Samples
	2.0-4.0	0.7	Collected at:
	4.0-6.0	1.2	4.0-6.0 ft bls
	6.0-8.0	1.0	8.0-10.0 ft bls
	8.0-10.0	1.1	
66SB20	0.0-2.0	0.4	Laboratory Samples
	2.0-4.0	1.3	Collected at:
	4.0-6.0	2.0	6.0-8.0 ft bls
	6.0-8.0	2.0	8.0-10.0 ft bls
	8.0-10.0	2.3	
66SB21	0.0-2.0	0.3	Laboratory Samples
	2.0-4.0	1.3	Collected at:
	4.0-6.0	5.0	4.0-6.0 ft bls
	6.0-8.0	6.0	6.0-10.0 ft bls
	8.0-10.0	1.1	
	10.0-12.0*	170	
66SB22	0.0-2.0	0.1	Laboratory Samples
	2.0-4.0	1.5	Collected at:
	4.0-6.0	0.1	2.0-4.0 ft bls
	6.0-8.0	0.2	8.0-10.0 ft bls
	8.0-10.0	0.8	
	10.0-12.0	1.7	
	12.0-14.0*	2000+	
66GW53	3.5-5.0	0.2	Laboratory Samples
	6.0-7.5	1.4	Collected at:
	8.5-10.0	0.8	6.0-7.5 ft bls
	13.5-15.0*	150	8.5-10.0 ft bls
	18.5-20.0*	2.5	
66GW54	3.5-5.0	0.2	Laboratory Samples
	6.0-7.5	6.2	Collected at:
	8.5-10.0	32	6.0-7.5 ft bls
	13.5-15.0*	8.0	8.5-10.0 ft bls
	18.5-20.0*	6.9	

* Soil sample collected at/or below the water-table.
ft bls = feet below land surface

TABLE 4.2 (Page 2 of 2)
SUMMARY OF HEADSPACE SCREENING
PIT 15
MARINE CORPS AIR STATION
CHERRY POINT, NORTH CAROLINA
LAW JOB NO. 30740-5-0500/0194

WELL LOCATION	DEPTH (ft bls)	OVA READING (ppm)	COMMENTS
66GW55	3.5-5.0 6.0-7.5 8.5-10.0 13.5-15.0* 18.5-20.0*	2.8 2.7 6.1 3.2 2.1	Laboratory Samples Collected at: 3.5-5.0 ft bls 8.5-10.0 ft bls
66GW56	3.5-5.0 6.0-7.5 8.5-10.0 13.5-15.0* 18.5-20.0*	0.3 8.1 0.8 180 0.4	Laboratory Samples Collected at: 6.0-7.5 ft bls 8.5-10.0 ft bls
66GW57	3.5-5.0 6.0-7.5 8.5-10.0 13.5-15.0* 18.5-20.0*	0.8 0.5 0.1 152 16	Laboratory Samples Collected at: 6.0-7.5 ft bls 8.5-10.0 ft bls
66GW58 (1)	38.5-40.0* 43.5-45.0*	2.0 30.0	No samples submitted for laboratory analysis.
66GW59 Soil samples were not collected during the installation of this boring.			No samples submitted for laboratory analysis.

* Soil sample collected at/or below the water-table.

(1) Type II monitoring well 66GW57 is located adjacent to (paired with) Type III monitoring well 66GW58. See headspace results for monitoring well 66GW57 for additional information for this location.

ft bls = feet below land surface

TABLE 5.1
SUMMARY OF MONITORING WELL DEVELOPMENT
PIT 15
MARINE CORPS AIR STATION
CHERRY POINT, NORTH CAROLINA
LAW JOB NO. 30740-5-0500/0194

MONITORING WELL IDENTIFICATION NO.	FINAL TURBIDITY (SUBJECTIVE)*	APPROXIMATE VOLUME OF WATER REMOVED (GAL.)
66GW53	--	--
66GW54	--	--
66GW55	2	10.0
66GW56	--	--
66GW57	--	--
66GW58	1	30.0
66GW59	--	--

NOTES:

-- Monitoring well not developed due to the presence of over 2 feet of free product.
* (1) Clear; (2) Slight; (3) Moderate; (4) High

TABLE 5.2
(Page 1 of 2)
SUMMARY OF LABORATORY ANALYTICAL RESULTS
GROUNDWATER SAMPLES
PIT 15
MARINE CORPS AIR STATION
CHERRY POINT, NORTH CAROLINA
LAW JOB NO. 30740-5-0500/0194

PARAMETER	WELL #	56GW21	66GW06	66GW41	66GW53	66GW54	66GW55	66GW105 (Duplicate of 66GW55)	N.C. GROUNDWATER STANDARDS (ug/L)
	SCREENED INTERVAL (FT)	8.5-18.5	5.0-15.0	8.5-18.5	9.0-19.0	8.5-18.5	9.5-19.5	9.5-19.5	
	SAMPLE DATE	10/7/96	10/7/96	10/7/96	NA	NA	10/7/96	10/7/96	
EPA METHOD 602									
Benzene		ND	ND	ND	NA	NA	45.4	41.0	1.0
Ethylbenzene		ND	ND	ND	NA	NA	78.5	71.4	29
Toluene		ND	ND	ND	NA	NA	120.0	112.0	1000
Xylenes (total)		ND	ND	ND	NA	NA	580.0	54.0	530
Total BTEX		ND	ND	ND	NA	NA	823.9	278.4	NA
Methyl tert-butyl ether		ND	ND	ND	NA	NA	ND	ND	200
1,2-Dichlorobenzene		ND	ND	ND	NA	NA	13.8	13.1	62
1,4-Dichlorobenzene		ND	ND	ND	NA	NA	ND	ND	75
EPA METHOD 625									
Naphthalene		ND	ND	ND	NA	NA	398	353	21
bis (2-Ethylhexyl) Phthalate		ND	ND	ND	NA	NA	69.6	ND	*
Total Semi-volatiles		ND	ND	ND	NA	NA	398 [1]	353	NA
Total Lead 239.2 (3030C)		29.1	102	35.1	NA	NA	1760	174	15

All results are ug/L.
(1) bis (2-Ethylhexyl) phthalate is not considered to be a component of aviation fuel and was not added into the value for total semi-volatile compounds.
NA Not applicable--well not sampled due to the presence of free product.
ND Not detected; see laboratory reports for applicable detection limits.
* Groundwater standards = Laboratory detect limit
Shaded Area = Concentrations detected above NC groundwater standards

TABLE 5.2
(Page 2 of 2)
SUMMARY OF LABORATORY ANALYTICAL RESULTS
GROUNDWATER SAMPLES
PIT 15
MARINE CORPS AIR STATION
CHERRY POINT, NORTH CAROLINA
LAW JOB NO. 30740-5-0500/0194

PARAMETER	WELL #	66GW56	66GW57	66GW58	66GW59	66 Trip Blank (AB01817)	Bailer Rinse (Blank) (66GW58)	N.C. GROUNDWATER STANDARDS (ug/L)
	SCREENED INTERVAL (FT)	8.0-18.0	9.5-19.5	37.0-42.0	2.0-22.0	NA	NA	
	SAMPLE DATE	NA	NA	10/7/96	NA	10/7/96	10/7/96	
EPA METHOD 602								
Benzene		NA	NA	ND	NA	ND	ND	1.0
Ethylbenzene		NA	NA	0.665	NA	ND	ND	29
Toluene		NA	NA	0.938	NA	ND	ND	1000
Xylenes (total)		NA	NA	4.68	NA	ND	ND	530
Total BTEX		NA	NA	6.283	NA	ND	ND	NA
Methyl tert-butyl ether		NA	NA	2.21	NA	ND	ND	200
1,2-Dichlorobenzene		NA	NA	ND	NA	ND	ND	62
1,4-Dichlorobenzene		NA	NA	1.63	NA	ND	ND	75
EPA METHOD 625								
Naphthalene		NA	NA	2.36	NA	--	--	21
bis (2-Ethylhexyl) Phthalate		NA	NA	ND	NA	--	--	*
Total Semi-volatiles		NA	NA	2.36	NA	--	--	NA
Total Lead 239.2 (3030C)		NA	NA	24.8	NA	--	--	15

All results are ug/L.
(1) bis (2-Ethylhexyl) phthalate is not considered to be a component of aviation fuel and was not added into the value for total semi-volatile compounds.
NA Not applicable--well not sampled due to the presence of free product.
ND Not detected; see laboratory reports for applicable detection limits.
* Groundwater standards = Laboratory detect limit
-- Sample not analyzed for this parameter.
Shaded Area = Concentrations detected above NC groundwater standards

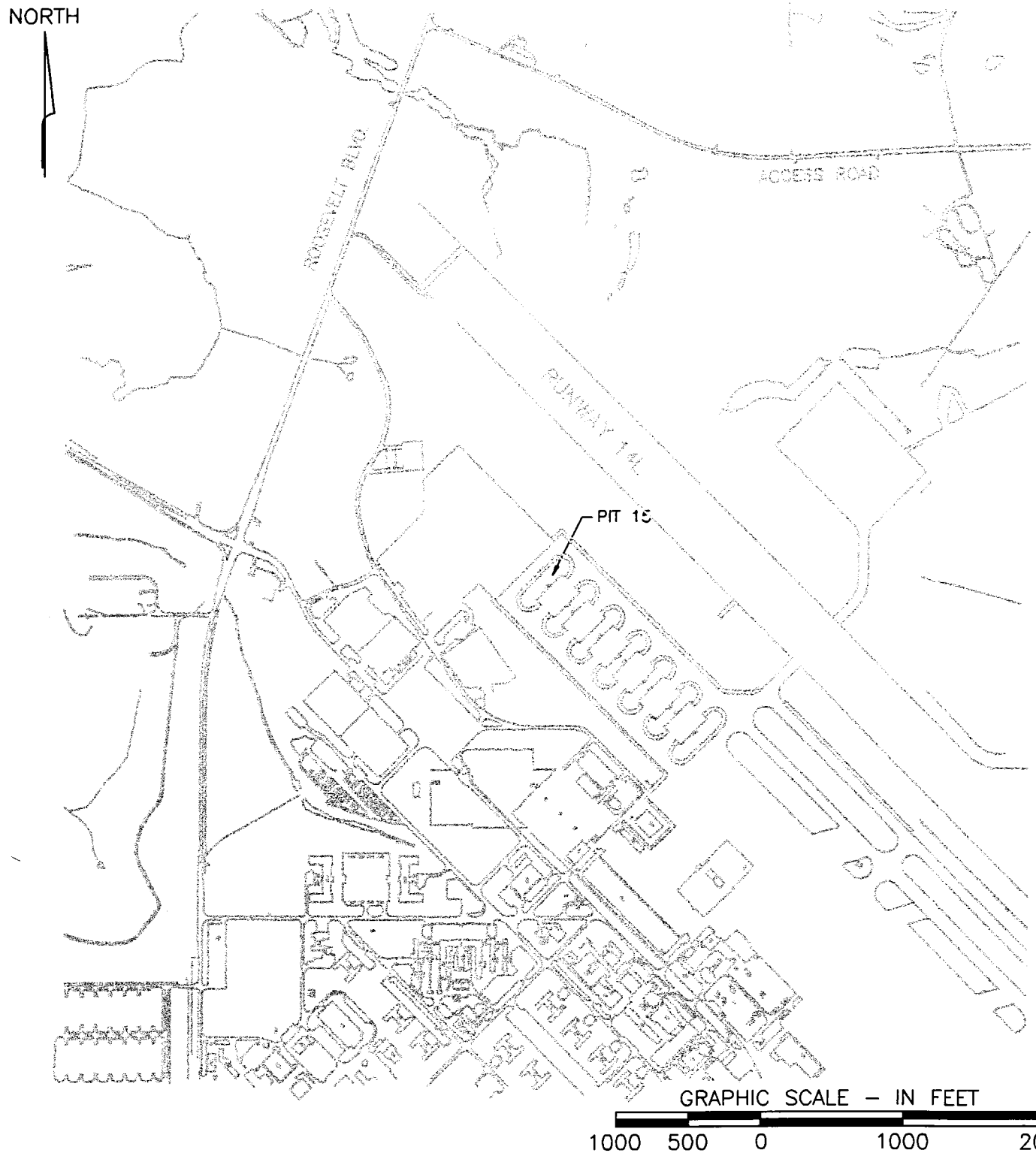
TABLE 5.3
SUMMARY OF VERTICAL HYDRAULIC GRADIENT DETERMINATIONS
PIT 15
MARINE CORPS AIR STATION
CHERRY POINT, NORTH CAROLINA
LAW JOB NO. 30740-5-0500/0194

	WELL PAIR		WELL PAIR	
	66GW06 (TYPE II)	**66GW46 (TYPE III)**	**66GW57 (TYPE II)**	**66GW58 (TYPE III)**
TOCE (ft.)	22.06	21.79	22.11	22.27
Approx. Mid-Screen Depth (ft.)	13.71	39.5	16.37	39.5
Approx. Mid-Screen Elevation (ft.)	8.35	-17.71	5.74	-17.23
SWLE (ft.)	9.64	8.98	9.18	9.01
ΔSWLE (ft.)	0.66		0.17	
ΔMid-Screen Elevation (ft.)	26.06		22.97	
Vertical Gradient	+0.025		+0.007	

NOTES:

TOCE Top of Casing Elevation
SWLE Static Water Level Elevation
Negative gradient indicates upward movement
Positive gradient indicates downward movement

Qualitative description of vertical gradient
<0.001; negligible
>0.001 <0.1; slight
>0.1; significant



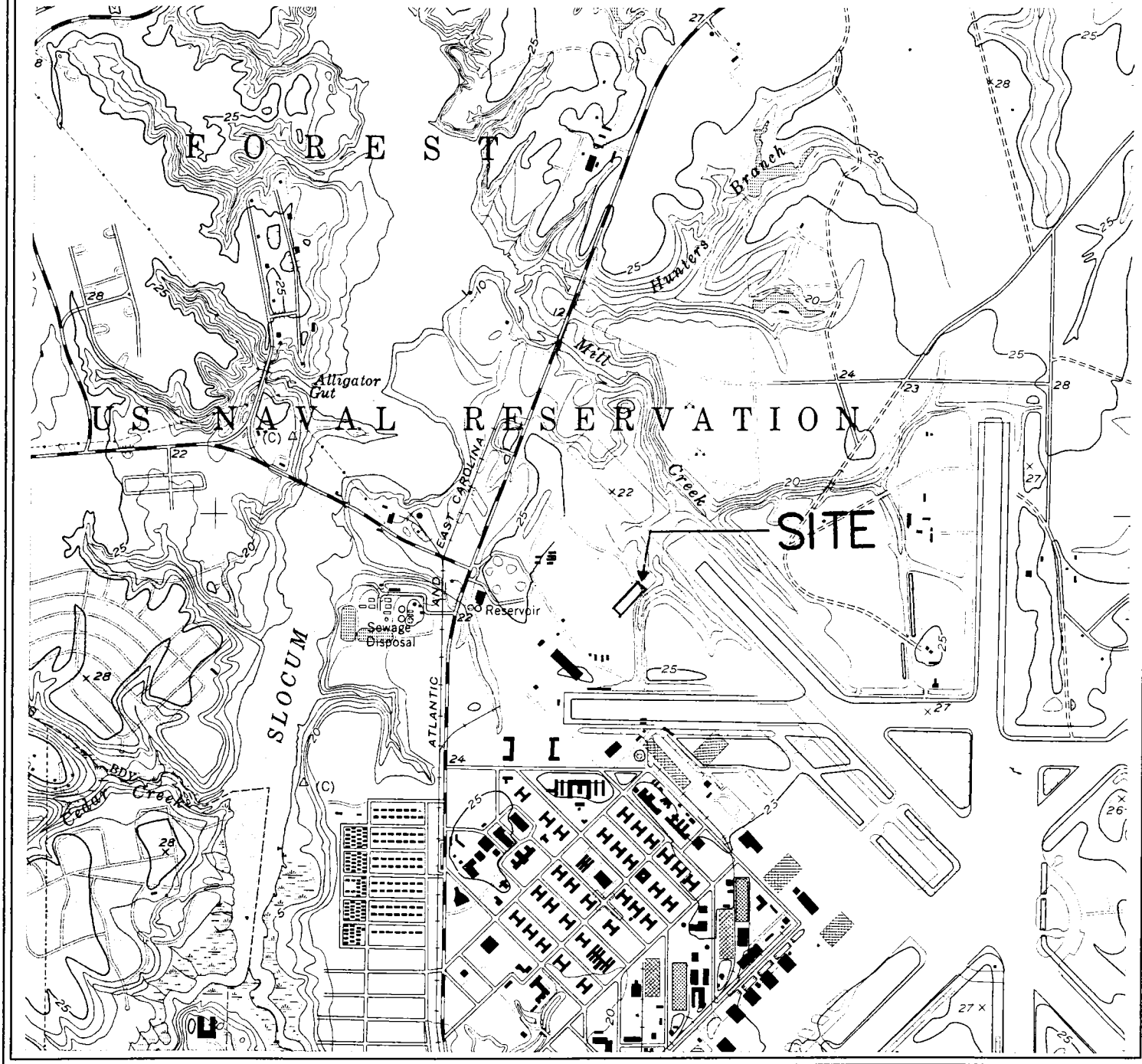
N0194-11 (1:1000)

LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.
RALEIGH, NORTH CAROLINA

SITE MAP
PIT 15
MCAS CHERRY POINT
CHERRY POINT, NORTH CAROLINA

DRAWN: JTW	DATE: DECEMBER 1996
DFT CHECK: RWS	SCALE: 1"=1000'
ENG CHECK:	JOB: 30740-5-0500/0194
APPROVAL:	DWG: 1.1

REFERENCE:



NORTH

HAVELOCK, N.C.
34076-H8-TF-024

1949
PHOTOREVISED 1983
DMA 5653 IV NW-SERIES V842

CONTOUR INTERVAL 10 FEET

GRAPHIC SCALE FEET
2000 1000 0 2000 4000

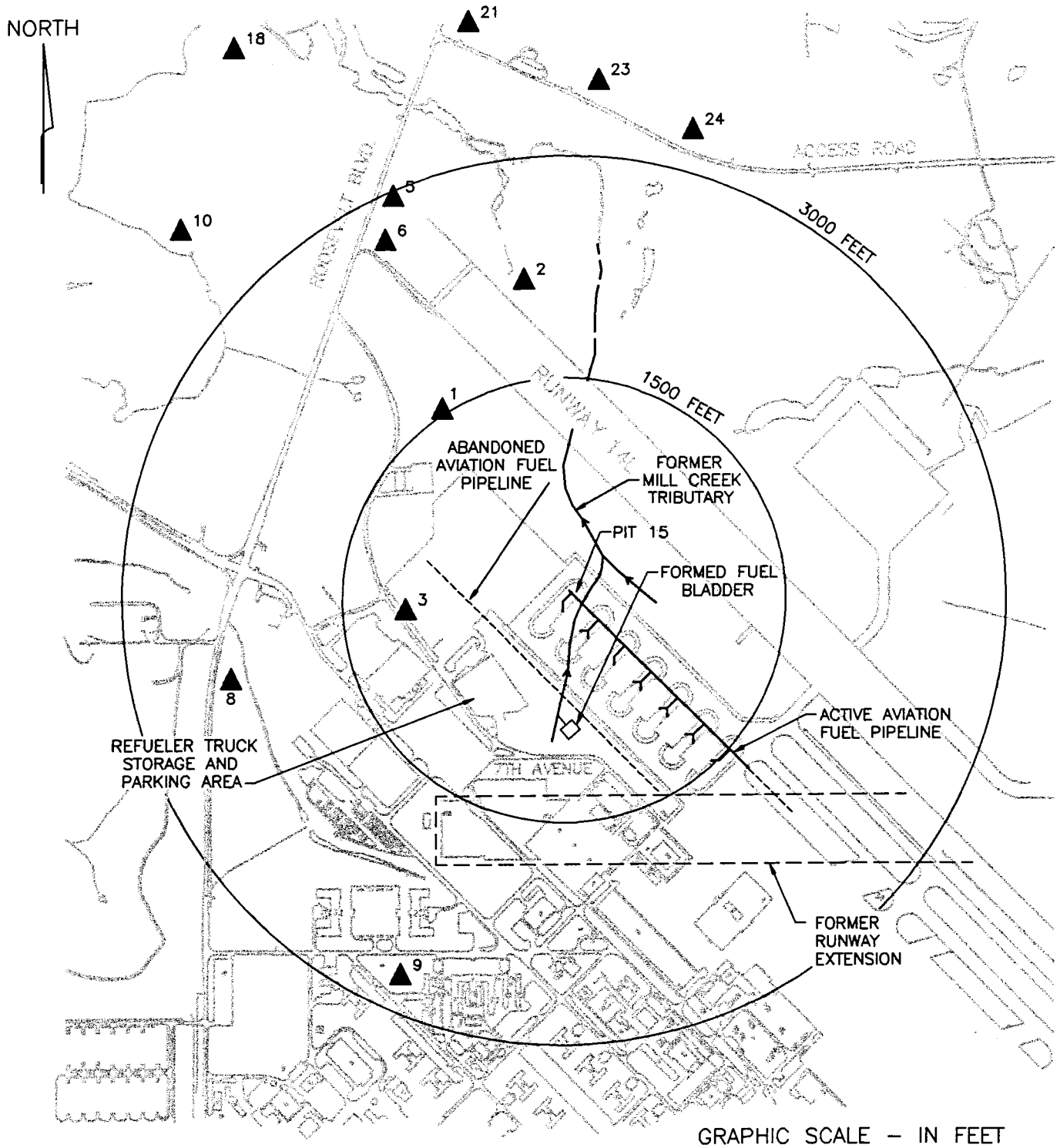
QUADRANGLE LOCATION

NOTE: SITE LOCATIONS ARE APPROXIMATE.

LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.
RALEIGH, NORTH CAROLINA

TOPOGRAPHIC SITE MAP
PIT 15
CHERRY POINT, NORTH CAROLINA
MCAS CHERRY POINT

DRAWN: JEW	DATE: DECEMBER 1996
DFT CHECK: RWS	SCALE: 1:24000
ENG CHECK:	JOB: 30740-5-0500/0194
APPROVAL:	DWG: 1.2



LEGEND

▲9 ACTIVE WATER SUPPLY WELL LOCATION

NOTE:
WELL AND CONTAMINANT SOURCE LOCATIONS ARE APPROXIMATE AND ARE BASED UPON MAP INFORMATION PROVIDED BY MCAS EAD.

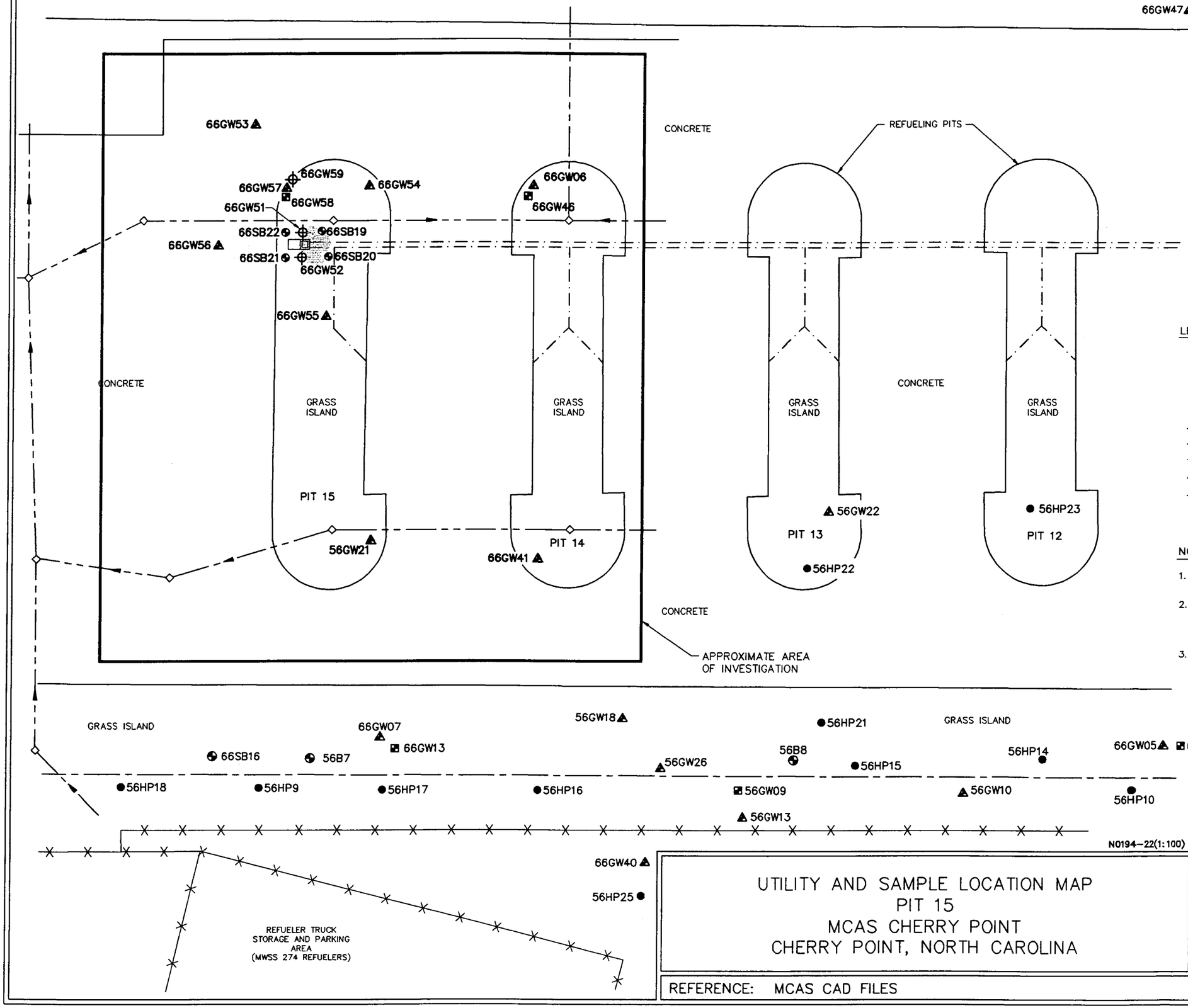
N0194-21 (1:1000)

LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.
RALEIGH, NORTH CAROLINA

CONTAMINANT SOURCE INVENTORY & WATER SUPPLY WELL/POTENTIAL RECEPTOR LOCATION MAP
MCAS CHERRY POINT
CHERRY POINT, NORTH CAROLINA

DRAWN: JW	DATE: DECEMBER 1996
DFT CHECK: RWS	SCALE: 1"=1000'
ENG CHECK:	JOB: 30740-5-0500/0194
APPROVAL:	DWG: 2.1

REFERENCE:



DRAFT

LEGEND

▲(56,66)GW01	TYPE II (SHALLOW) MONITORING WELL LOCATION
■(56,66)GW01	TYPE III (DEEP) MONITORING WELL LOCATION
●(56,66)HP01	HYDROPUNCH LOCATION – S=SHALLOW, D=DEEP
⊕(56,66)B01	SOIL BORING LOCATION
⊕(56,66)GW51	LOCATION OF FREE PRODUCT RECOVERY WELL
— · — · — · —	EXISTING PIPELINE (ACTIVE)
——— – ———	ABANDONED 6" DIAMETER PIPELINE A
—×—×—×—×—	CHAIN-LINK FENCE
——— – ———	STORM WATER
———◇———	STORM WATER INLET
	APPROXIMATE LEAK LOCATION

NOTES:

1. DRAWING REFERENCED FROM NAVAL FACILITIES ENGINEERING COMMAND DRAWING NO.S 772863, 4077486, 4167065, 4167066, AND 3925.
2. EXISTING MONITORING WELLS 56GW21, 56GW41, 56GW46, 56GW06, 56GW51 AND 56GW52 AND MONITORING WELLS AND SOIL BORINGS 56GW53–56GW59 AND 56SB19–56SB22 WERE SURVEYED BY TAYLOR, WISEMAN AND TAYLOR DURING THIS INVESTIGATION.
3. MONITORING WELL AND SOIL BORING LOCATIONS SURVEYED BY McKIM & CREED. VERTICAL DATUM IS BASED ON MONUMENT 13–93 WITH A MEAN GIVEN ELEVATION OF 27.12 FEET (MEAN SEA LEVEL). SURVEY DATA COULD NOT BE LOCATED FOR HYDROPUNCH LOCATIONS 56HP# AND SOIL BORING LOCATIONS 56SB# AND WERE OBTAINED FROM MAPS IN THE REPORT BY WESTON/BAKER DATED AUGUST 13, 1992.

GRAPHIC SCALE – IN FEET

100 50 0 100 200

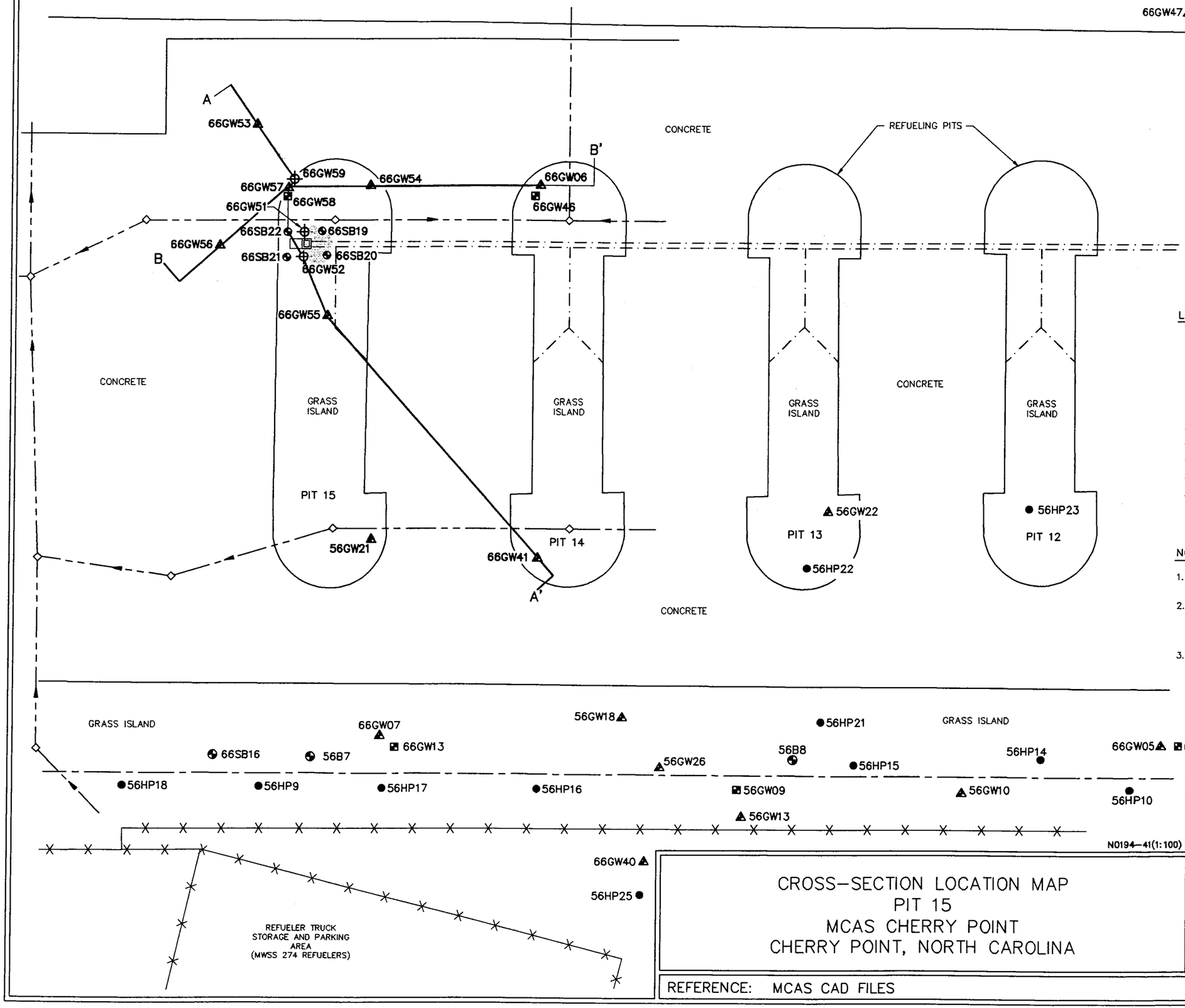
N0194–22(1:100)

LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.
RALEIGH, NORTH CAROLINA

UTILITY AND SAMPLE LOCATION MAP
PIT 15
MCAS CHERRY POINT
CHERRY POINT, NORTH CAROLINA

DRAWN: JEW	DATE: DECEMBER 1996
DFT CHECK: RWS	SCALE: 1"=100'
ENG CHECK:	JOB:30740–5–0500/194
APPROVAL:	DWG: 2.2

REFERENCE: MCAS CAD FILES



DRAFT

LEGEND

A —— A'	CROSS SECTION LOCATION
▲(56,66)GW01	TYPE II (SHALLOW) MONITORING WELL LOCATION
▣(56,66)GW01	TYPE III (DEEP) MONITORING WELL LOCATION
●(56,66)HP01	HYDROPUNCH LOCATION – S=SHALLOW, D=DEEP
◔(56,66)B01	SOIL BORING LOCATION
⊕(56,66)GW51	LOCATION OF FREE PRODUCT RECOVERY WELL
—·—·—·—	EXISTING PIPELINE (ACTIVE)
——— – ———	ABANDONED 6" DIAMETER PIPELINE A
—×—×—×—×—	CHAIN-LINK FENCE
——— – ———	STORM WATER
——◇——	STORM WATER INLET
	APPROXIMATE LEAK LOCATION

NOTES:

1. DRAWING REFERENCED FROM NAVAL FACILITIES ENGINEERING COMMAND DRAWING NO.S 772863, 4077486, 4167065, 4167066, AND 3925.
2. EXISTING MONITORING WELLS 56GW21, 56GW41, 56GW46, 56GW06, 56GW51 AND 56GW52 AND MONITORING WELLS AND SOIL BORINGS 56GW53–56GW59 AND 56SB19–56SB22 WERE SURVEYED BY TAYLOR, WISEMAN AND TAYLOR DURING THIS INVESTIGATION.
3. MONITORING WELL AND SOIL BORING LOCATIONS SURVEYED BY McKIM & CREED. VERTICAL DATUM IS BASED ON MONUMENT 13-93 WITH A MEAN GIVEN ELEVATION OF 27.12 FEET (MEAN SEA LEVEL). SURVEY DATA COULD NOT BE LOCATED FOR HYDROPUNCH LOCATIONS 56HP# AND SOIL BORING LOCATIONS 56SB# AND WERE OBTAINED FROM MAPS IN THE REPORT BY WESTON/BAKER DATED AUGUST 13, 1992.

GRAPHIC SCALE – IN FEET

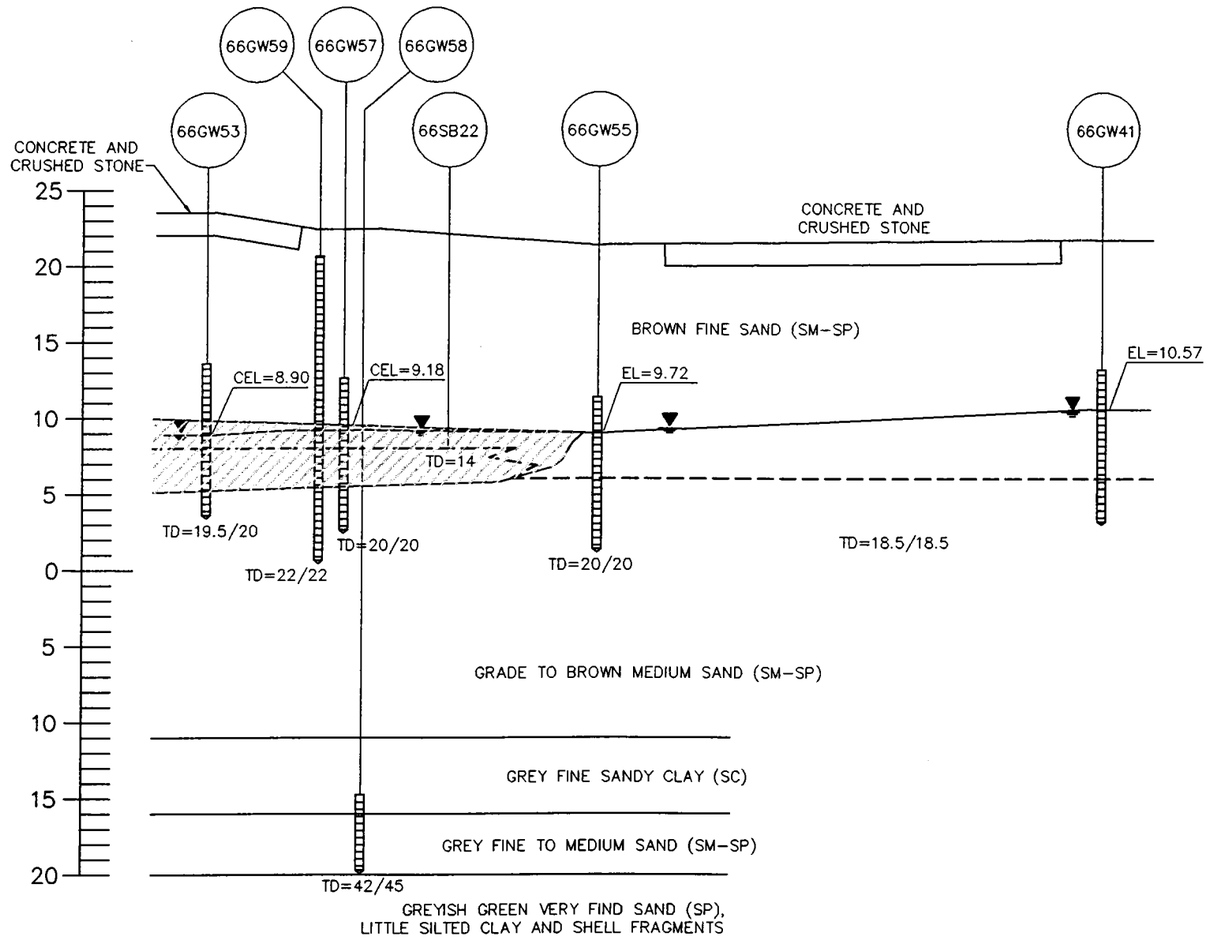
100 50 0 100 200

LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.
RALEIGH, NORTH CAROLINA

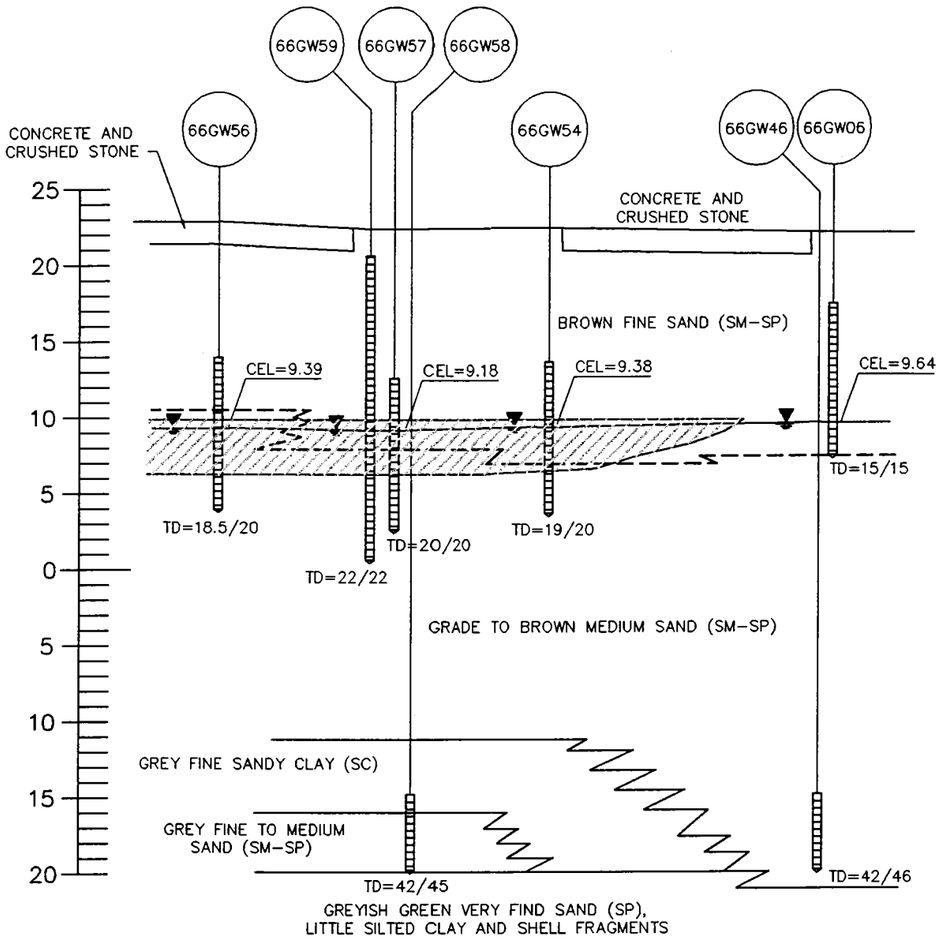
CROSS-SECTION LOCATION MAP
PIT 15
MCAS CHERRY POINT
CHERRY POINT, NORTH CAROLINA

DRAWN: JRJ	DATE: DECEMBER 1996
DFT CHECK: RWS	SCALE: 1"=100'
ENG CHECK:	JOB:30740-5-0500/194
APPROVAL:	DWG: 4.1

REFERENCE: MCAS CAD FILES



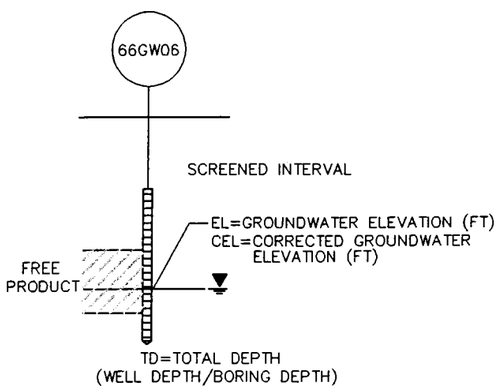
SECTION A–A'



SECTION B–B'

DRAFT

LEGEND



SCALE
HORIZONTAL: 1"=100'
VERTICAL: 1"=10'

GRAPHIC SCALE – IN FEET
100 50 0 100 200

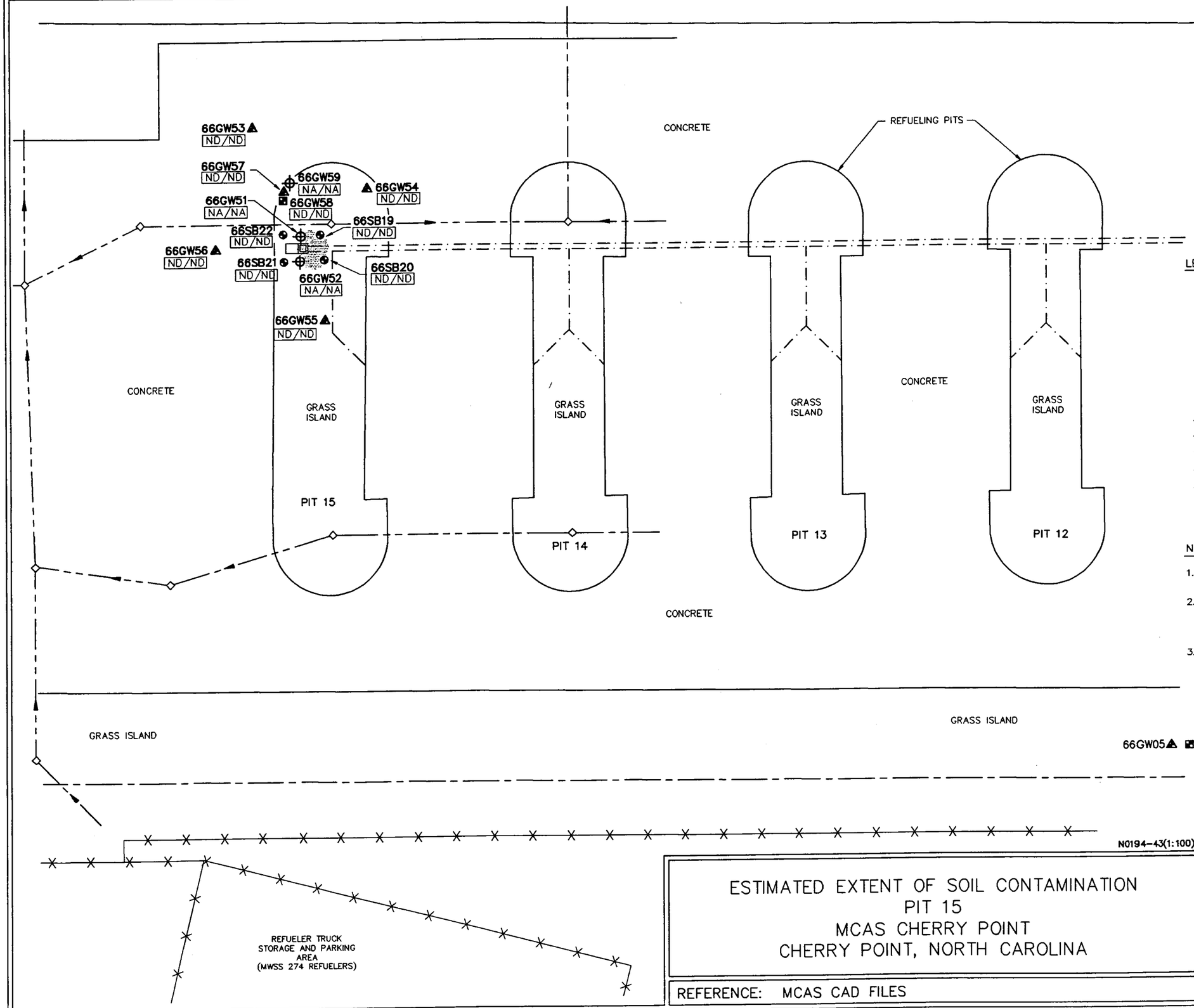
N0194-42 (1:10)

LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.
RALEIGH, NORTH CAROLINA

CROSS-SECTION MAP
PIT 15
MCAS CHERRY POINT
CHERRY POINT, NORTH CAROLINA

DRAWN: JRW	DATE: DECEMBER 1996
DFT CHECK: RWS	SCALE: AS NOTED
ENG CHECK:	JOB: 30740-5-0500/0194
APPROVAL:	DWG: 4.2

REFERENCE:



DRAFT

LEGEND

10/10	CONCENTRATION OF TPH-GASOLINE/ TPH DIESEL (JET FUEL) – ug/L
ND	NOT DETECTED
NA	NOT ANALYZED
▲(56,66)GW01	TYPE II (SHALLOW) MONITORING WELL LOCATION
■(56,66)GW01	TYPE III (DEEP) MONITORING WELL LOCATION
●(56,66)HP01	HYDROPUNCH LOCATION – S=SHALLOW, D=DEEP
●(56,66)B01	SOIL BORING LOCATION
⊕(56,66)GW51	LOCATION OF FREE PRODUCT RECOVERY WELL
	EXISTING PIPELINE (ACTIVE)
	ABANDONED 6" DIAMETER PIPELINE A
	CHAIN-LINK FENCE
	STORM WATER
	STORM WATER INLET
	APPROXIMATE LEAK LOCATION

NOTES:

1. DRAWING REFERENCED FROM NAVAL FACILITIES ENGINEERING COMMAND DRAWING NO.S 772863, 4077486, 4167065, 4167066, AND 3925.
2. EXISTING MONITORING WELLS 56GW21, 56GW41, 56GW46, 56GW06, 56GW51 AND 56GW52 AND MONITORING WELLS AND SOIL BORINGS 56GW53–56GW59 AND 56SB19–56SB22 WERE SURVEYED BY TAYLOR, WISEMAN AND TAYLOR DURING THIS INVESTIGATION.
3. MONITORING WELL AND SOIL BORING LOCATIONS SURVEYED BY McKIM & CREED. VERTICAL DATUM IS BASED ON MONUMENT 13–93 WITH A MEAN GIVEN ELEVATION OF 27.12 FEET (MEAN SEA LEVEL). SURVEY DATA COULD NOT BE LOCATED FOR HYDROPUNCH LOCATIONS 56HP# AND SOIL BORING LOCATIONS 56SB# AND WERE OBTAINED FROM MAPS IN THE REPORT BY WESTON/BAKER DATED AUGUST 13, 1992.

GRAPHIC SCALE – IN FEET

66GW05▲ ■66GW14

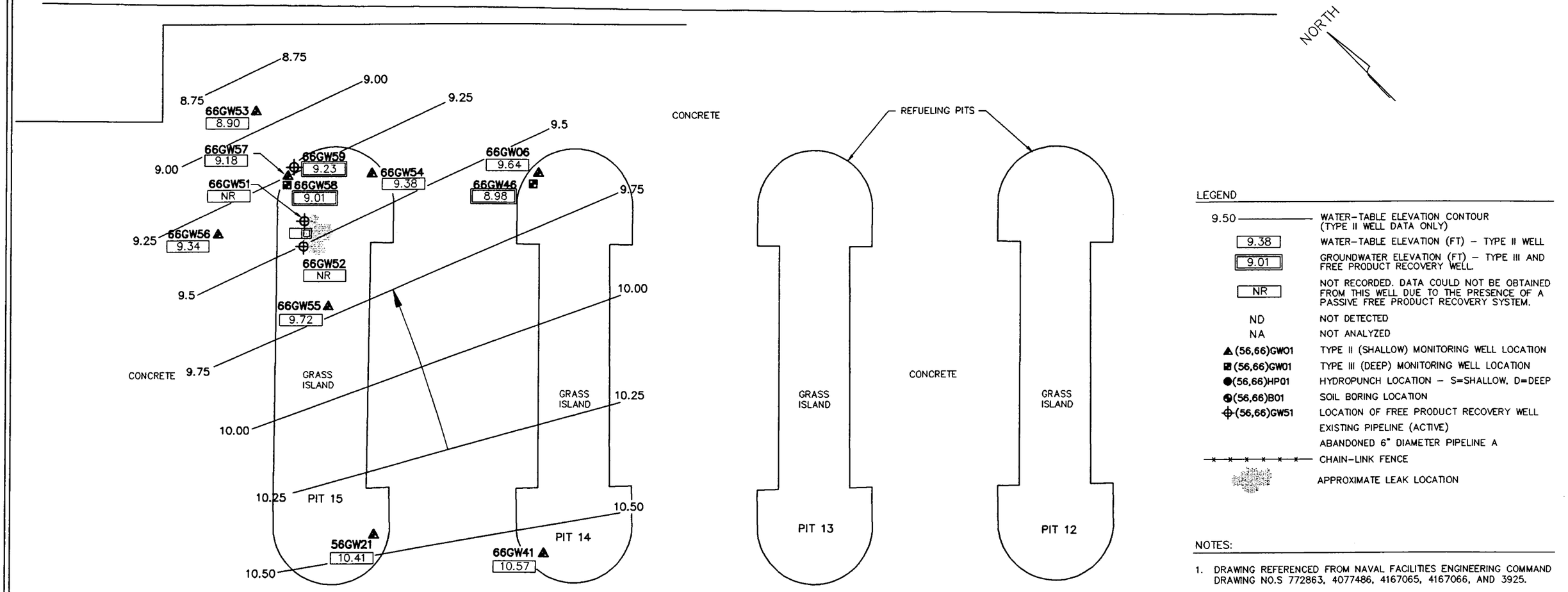
100 50 0 100 200

LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.
RALEIGH, NORTH CAROLINA

ESTIMATED EXTENT OF SOIL CONTAMINATION
PIT 15
MCAS CHERRY POINT
CHERRY POINT, NORTH CAROLINA

DRAWN: JRW	DATE: DECEMBER 1996
DFT CHECK: RWS	SCALE: 1"=100'
ENG CHECK:	JOB:30740-5-0500/194
APPROVAL:	DWG: 4.3

REFERENCE: MCAS CAD FILES



LEGEND

9.50 ———	WATER-TABLE ELEVATION CONTOUR (TYPE II WELL DATA ONLY)
9.38	WATER-TABLE ELEVATION (FT) – TYPE II WELL
9.01	GROUNDWATER ELEVATION (FT) – TYPE III AND FREE PRODUCT RECOVERY WELL
NR	NOT RECORDED. DATA COULD NOT BE OBTAINED FROM THIS WELL DUE TO THE PRESENCE OF A PASSIVE FREE PRODUCT RECOVERY SYSTEM.
ND	NOT DETECTED
NA	NOT ANALYZED
▲(56,66)GW01	TYPE II (SHALLOW) MONITORING WELL LOCATION
■(56,66)GW01	TYPE III (DEEP) MONITORING WELL LOCATION
●(56,66)HP01	HYDROPUNCH LOCATION – S=SHALLOW, D=DEEP
⊕(56,66)B01	SOIL BORING LOCATION
⊕(56,66)GW51	LOCATION OF FREE PRODUCT RECOVERY WELL
	EXISTING PIPELINE (ACTIVE)
	ABANDONED 6" DIAMETER PIPELINE A
–x–x–x–x–x–x–	CHAIN-LINK FENCE
	APPROXIMATE LEAK LOCATION

NOTES:

1. DRAWING REFERENCED FROM NAVAL FACILITIES ENGINEERING COMMAND DRAWING NO.S 772863, 4077486, 4167065, 4167066, AND 3925.
2. EXISTING MONITORING WELLS 56GW21, 56GW41, 56GW46, 56GW06, 56GW51 AND 56GW52 AND MONITORING WELLS AND SOIL BORINGS 56GW53–56GW59 AND 56SB19–56SB22 WERE SURVEYED BY TAYLOR, WISEMAN AND TAYLOR DURING THIS INVESTIGATION.
3. MONITORING WELL AND SOIL BORING LOCATIONS SURVEYED BY McKIM & CREED. VERTICAL DATUM IS BASED ON MONUMENT 13-93 WITH A MEAN GIVEN ELEVATION OF 27.12 FEET (MEAN SEA LEVEL). SURVEY DATA COULD NOT BE LOCATED FOR HYDROPUNCH LOCATIONS 56HP# AND SOIL BORING LOCATIONS 56SB# AND WERE OBTAINED FROM MAPS IN THE REPORT BY WESTON/BAKER DATED AUGUST 13, 1992.

GRAPHIC SCALE – IN FEET

100 50 0 100 200

N0194-51(1:100)

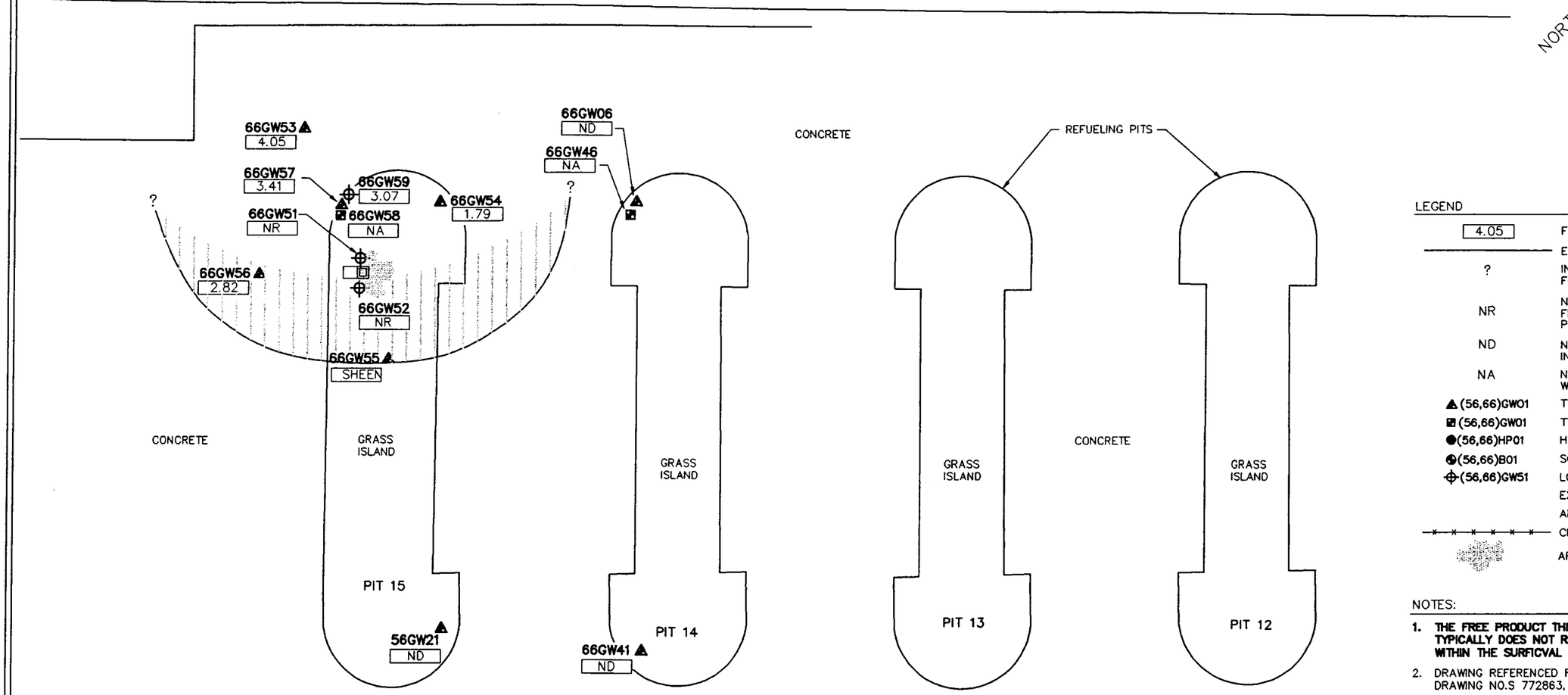
DRAFT

LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.
RALEIGH, NORTH CAROLINA

WATER-TABLE ELEVATION CONTOUR MAP
PIT 15
MCAS CHERRY POINT
CHERRY POINT, NORTH CAROLINA

DRAWN: JFW	DATE: DECEMBER 1996
DFT CHECK: RWS	SCALE: 1"=100'
ENG CHECK:	JOB:30740-5-0500/194
APPROVAL:	DWG: 5.1

REFERENCE: MCAS CAD FILES

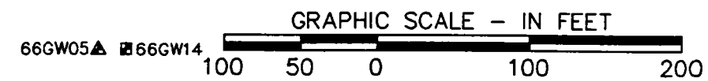


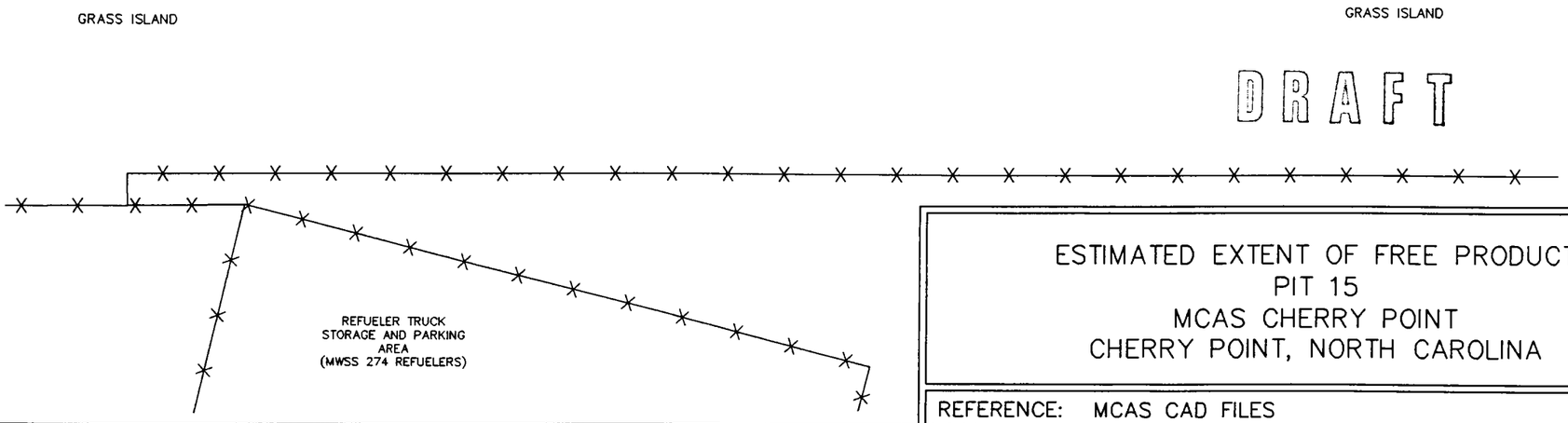
LEGEND

4.05	FREE PRODUCT THICKNESS (FEET). SEE NOTE 1.
———	ESTIMATED EXTENT OF FREE PRODUCT
?	INSUFFICIENT DATA TO DETERMINE THE EXTENT OF FREE PRODUCT BEYOND THIS POINT.
NR	NOT RECORDED. DATA COULD NOT BE OBTAINED FROM THIS WELL DUE TO THE PRESENCE OF A PASSIVE FREE PRODUCT RECOVERY SYSTEM.
ND	NOT DETECTED. FREE PRODUCT NOT DETECTED IN THIS WELL.
NA	NOT APPLICABLE. WELL IS SCREENED BELOW THE WATER TABLE.
▲(56,66)GW01	TYPE II (SHALLOW) MONITORING WELL LOCATION
◪(56,66)GW01	TYPE III (DEEP) MONITORING WELL LOCATION
●(56,66)HP01	HYDROPUNCH LOCATION – S=SHALLOW, D=DEEP
⊕(56,66)B01	SOIL BORING LOCATION
⊕(56,66)GW51	LOCATION OF FREE PRODUCT RECOVERY WELL
	EXISTING PIPELINE (ACTIVE)
	ABANDONED 6" DIAMETER PIPELINE A
×—×—×—×—×—	CHAIN-LINK FENCE
	APPROXIMATE LEAK LOCATION

NOTES:

1. **THE FREE PRODUCT THICKNESS MEASUREMENT FOR EACH WELL TYPICALLY DOES NOT REPRESENT THE ACTUAL FREE PRODUCT WITHIN THE SURFICVAL AQUIFIER.**
2. DRAWING REFERENCED FROM NAVAL FACILITIES ENGINEERING COMMAND DRAWING NO.S 772863, 4077486, 4167065, 4167066, AND 3925.
3. EXISTING MONITORING WELLS 56GW21, 56GW41, 56GW46, 56GW06, 56GW51 AND 56GW52 AND MONITORING WELLS AND SOIL BORINGS 56GW53–56GW59 AND 56SB19–56SB22 WERE SURVEYED BY TAYLOR, WISEMAN AND TAYLOR DURING THIS INVESTIGATION.
4. MONITORING WELL AND SOIL BORING LOCATIONS SURVEYED BY McKIM & CREED. VERTICAL DATUM IS BASED ON MONUMENT 13–93 WITH A MEAN GIVEN ELEVATION OF 27.12 FEET (MEAN SEA LEVEL). SURVEY DATA COULD NOT BE LOCATED FOR HYDROPUNCH LOCATIONS 56HP# AND SOIL BORING LOCATIONS 56SB# AND WERE OBTAINED FROM MAPS IN THE REPORT BY WESTON/BAKER DATED AUGUST 13, 1992.





DRAFT

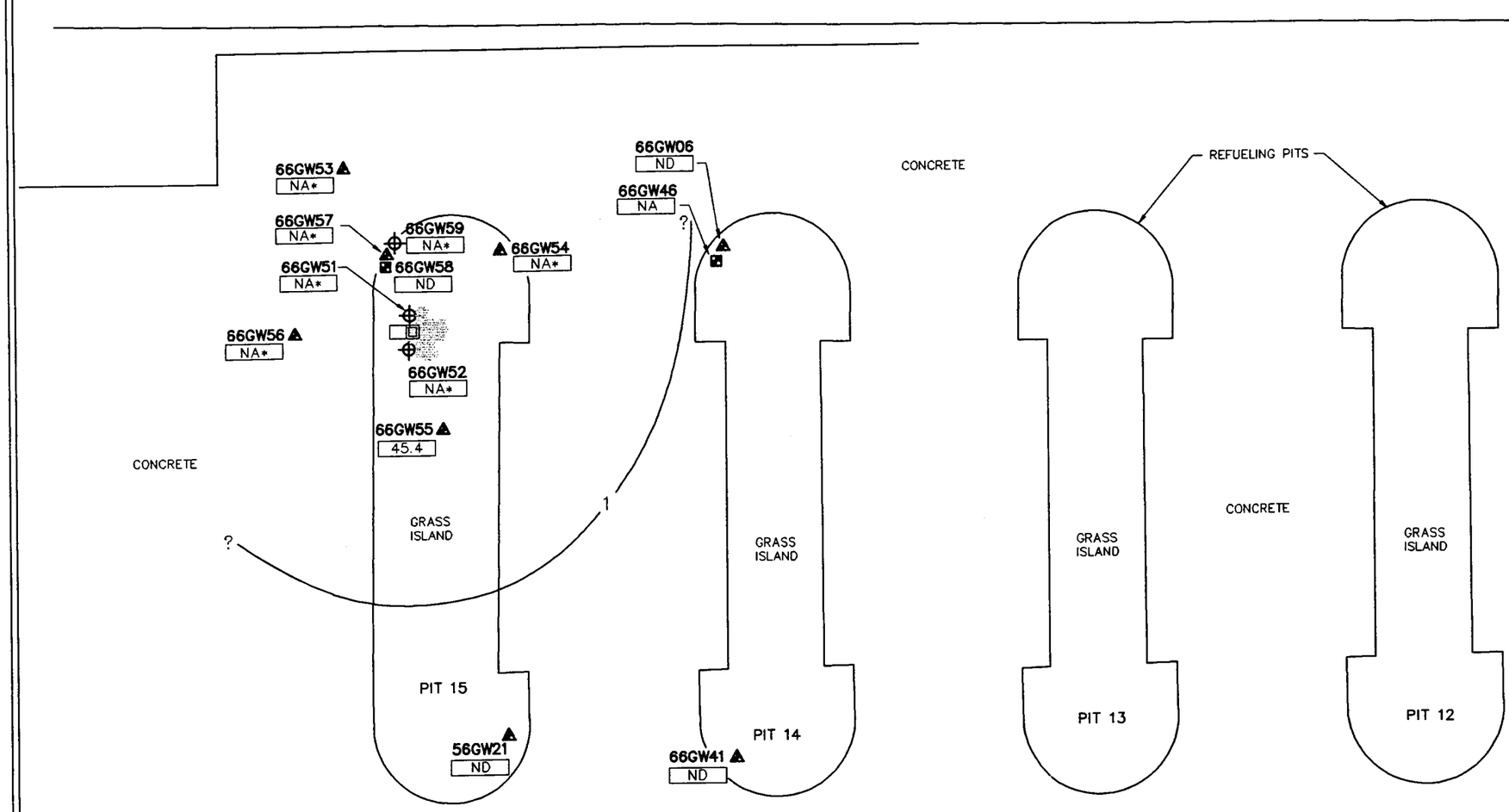
N0194–52(1:100)

LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.
RALEIGH, NORTH CAROLINA

ESTIMATED EXTENT OF FREE PRODUCT PIT 15 MCAS CHERRY POINT CHERRY POINT, NORTH CAROLINA

DRAWN: JW	DATE: DECEMBER 1996
DFT CHECK: RWS	SCALE: 1"=100'
ENG CHECK:	JOB:30740–5–0500/194
APPROVAL:	DWG: 5.2

REFERENCE: MCAS CAD FILES



LEGEND

45.4	BENZENE CONCENTRATION (ug/L)
1 ———	BENZENE CONCENTRATION (ug/L)
?	INSUFFICIENT DATA TO DETERMINE THE EXTENT OF BENZENE BEYOND THIS POINT.
NA	NOT ANALYZED FOR THIS PARAMETER DURING THIS INVESTIGATION.
ND	NOT DETECTED
NA*	NOT ANALYZED FOR THIS PARAMETER DUE TO THE PRESENCE OF FREE PRODUCT.
▲(56,66)GW01	TYPE II (SHALLOW) MONITORING WELL LOCATION
■(56,66)GW01	TYPE III (DEEP) MONITORING WELL LOCATION
●(56,66)HP01	HYDROPUNCH LOCATION – S=SHALLOW, D=DEEP
⊕(56,66)B01	SOIL BORING LOCATION
⊕(56,66)GW51	LOCATION OF FREE PRODUCT RECOVERY WELL
	EXISTING PIPELINE (ACTIVE)
	ABANDONED 6" DIAMETER PIPELINE A
×–×–×–×–×	CHAIN–LINK FENCE
	APPROXIMATE LEAK LOCATION

NOTES:

1. THE NORTH CAROLINA GROUNDWATER QUALITY STANDARD FOR BENZENE IS 1.0 ug/L.
2. DRAWING REFERENCED FROM NAVAL FACILITIES ENGINEERING COMMAND DRAWING NO.S 772863, 4077486, 4167065, 4167066, AND 3925.
3. EXISTING MONITORING WELLS 56GW21, 56GW41, 56GW46, 56GW06, 56GW51 AND 56GW52 AND MONITORING WELLS AND SOIL BORINGS 56GW53–56GW59 AND 56SB19–56SB22 WERE SURVEYED BY TAYLOR, WISEMAN AND TAYLOR DURING THIS INVESTIGATION.
4. MONITORING WELL AND SOIL BORING LOCATIONS SURVEYED BY McKIM & CREED. VERTICAL DATUM IS BASED ON MONUMENT 13–93 WITH A MEAN GIVEN ELEVATION OF 27.12 FEET (MEAN SEA LEVEL). SURVEY DATA COULD NOT BE LOCATED FOR HYDROPUNCH LOCATIONS 56HP# AND SOIL BORING LOCATIONS 56SB# AND WERE OBTAINED FROM MAPS IN THE REPORT BY WESTON/BAKER DATED AUGUST 13, 1992.

GRASS ISLAND

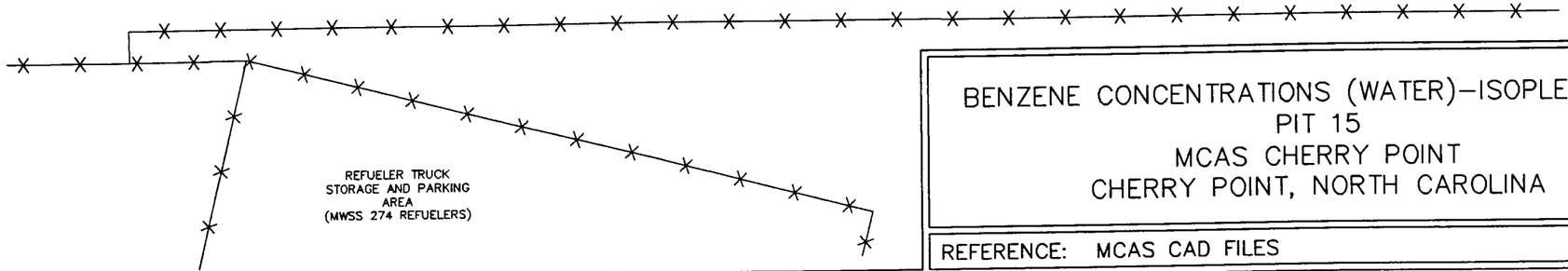
GRASS ISLAND

66GW05▲ ■66GW14

GRAPHIC SCALE – IN FEET

100 50 0 100 200

DRAFT



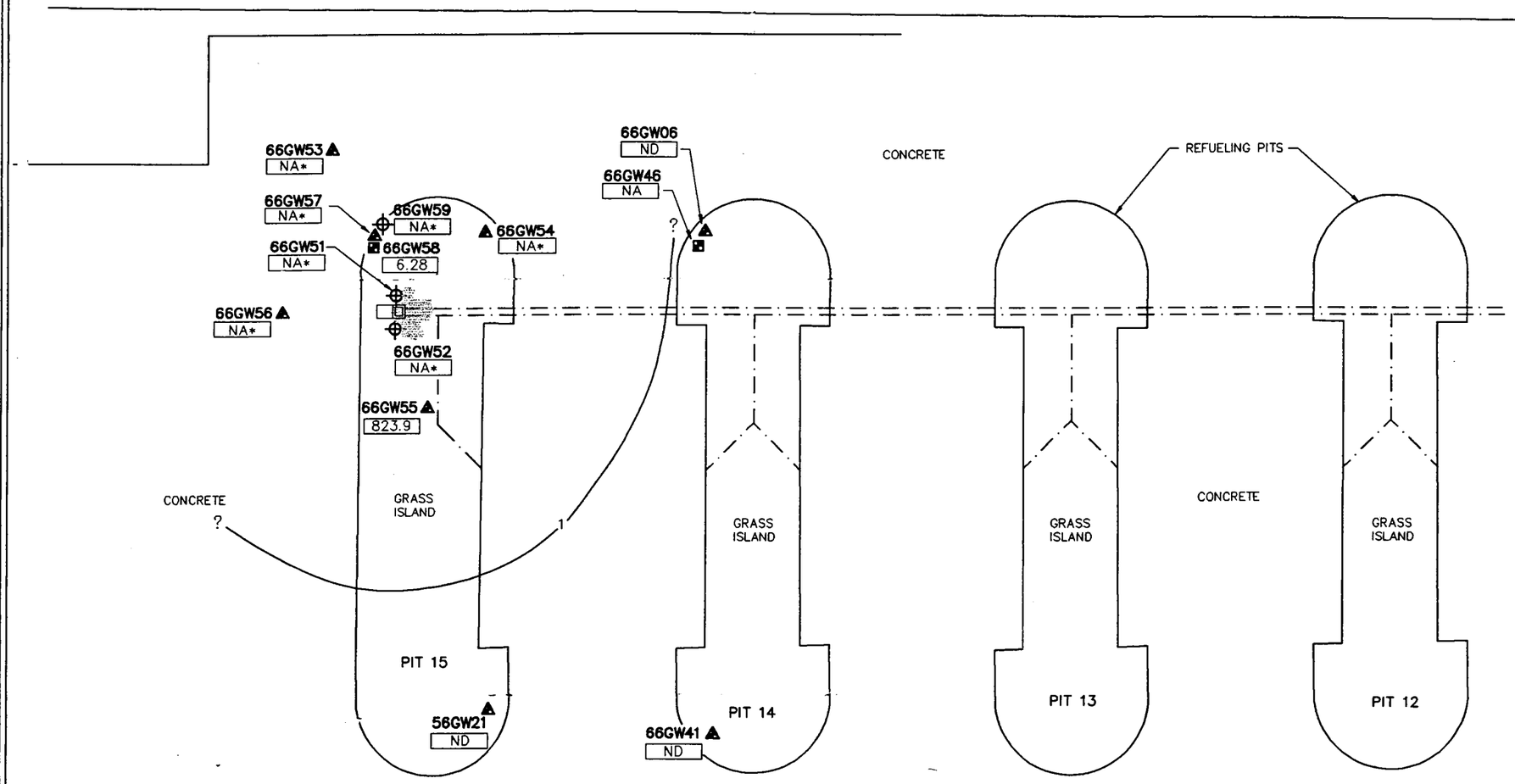
N0194–53(1:100)

LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.
RALEIGH, NORTH CAROLINA

BENZENE CONCENTRATIONS (WATER)–ISOPLETH MAP
PIT 15
MCAS CHERRY POINT
CHERRY POINT, NORTH CAROLINA

DRAWN: JRW	DATE: DECEMBER 1996
DFT CHECK: RWS	SCALE: 1"=100'
ENG CHECK:	JOB:30740–5–0500/194
APPROVAL:	DWG: 5.3

REFERENCE: MCAS CAD FILES



NORTH

DRAFT

LEGEND

823.9	TOTAL BTEXCONCENTRATION (ug/L)
1	TOTAL BTEX CONCENTRATION ISOPLETH (ug/L)
?	INSUFFICIENT DATA TO DETERMINE THE EXTENT OF TOTAL BTEX BEYOND THIS POINT.
NA	NOT ANALYZED FOR THIS PARAMETER DURING THIS INVESTIGATION.
ND	NOT DETECTED
NA*	NOT ANALYZED FOR THIS PARAMETER DUE TO THE PRESENCE OF FREE PRODUCT.
▲(56,66)GW01	TYPE II (SHALLOW) MONITORING WELL LOCATION
■(56,66)GW01	TYPE III (DEEP) MONITORING WELL LOCATION
●(56,66)HP01	HYDROPUNCH LOCATION – S=SHALLOW, D=DEEP
⊕(56,66)B01	SOIL BORING LOCATION
⊕(56,66)GW51	LOCATION OF FREE PRODUCT RECOVERY WELL
— · — · — · —	EXISTING PIPELINE (ACTIVE)
— – — – —	ABANDONED 6" DIAMETER PIPELINE A
— x — x — x —	CHAIN–LINK FENCE
	APPROXIMATE LEAK LOCATION

NOTES:

1. THERE IS NO NORTH CAROLINA GROUNDWATER QUALITY STANDARD FOR TOTAL BTEX.
2. DRAWING REFERENCED FROM NAVAL FACILITIES ENGINEERING COMMAND DRAWING NO.S 772863, 4077486, 4167065, 4167066, AND 3925.
3. EXISTING MONITORING WELLS 56GW21, 56GW41, 56GW46, 56GW06, 56GW51 AND 56GW52 AND MONITORING WELLS AND SOIL BORINGS 56GW53–56GW59 AND 56SB19–56SB22 WERE SURVEYED BY TAYLOR, WISEMAN AND TAYLOR DURING THIS INVESTIGATION.
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GRAPHIC SCALE – IN FEET

100 50 0 100 200

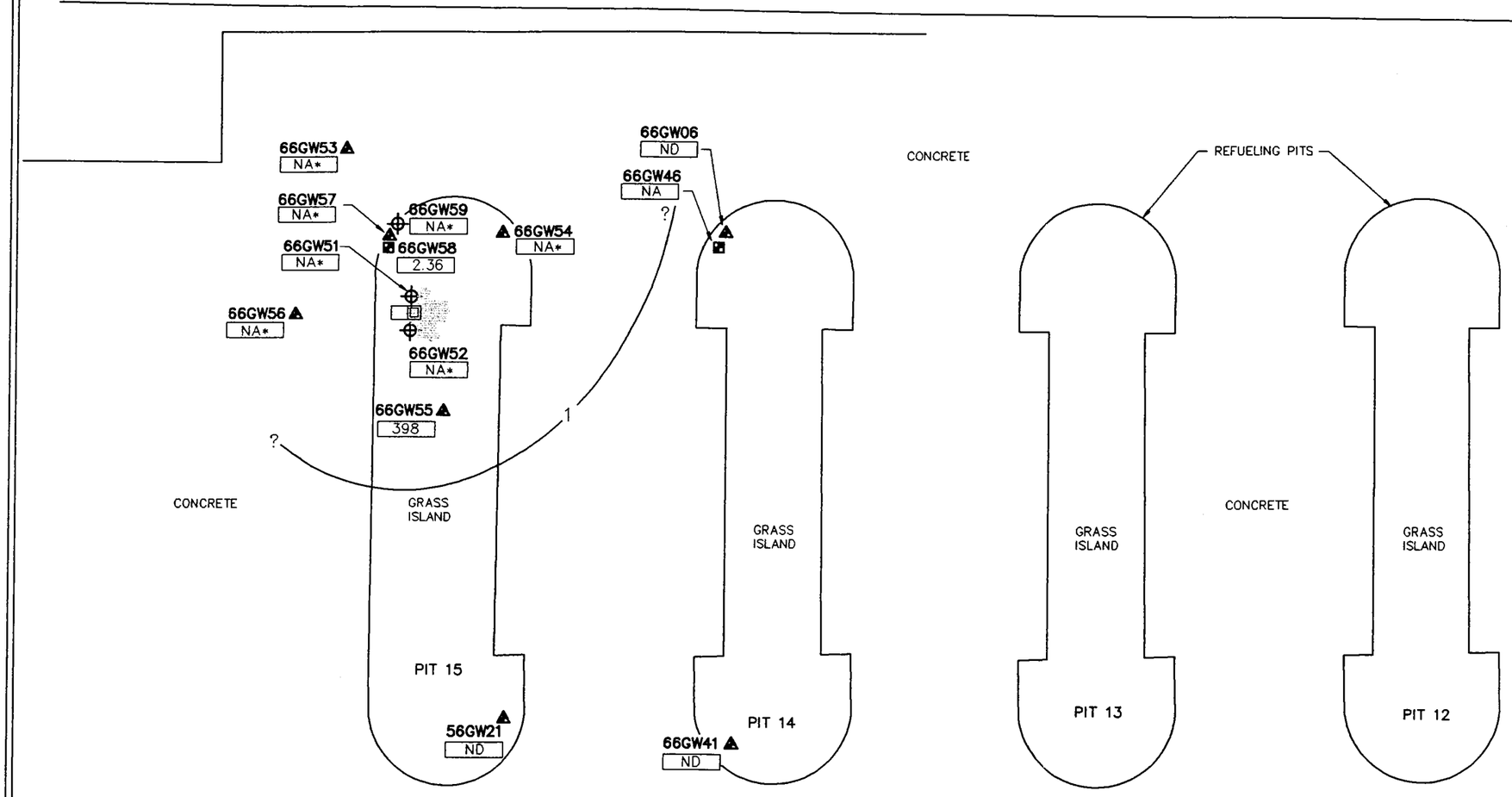
NO194–54(1:100)

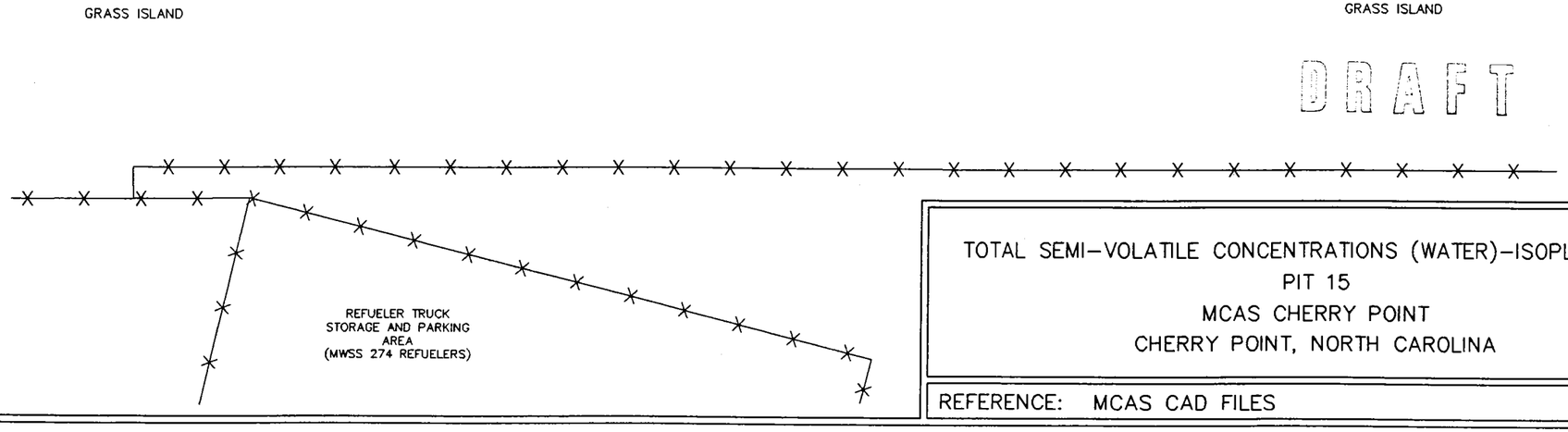
LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.
RALEIGH, NORTH CAROLINA

TOTAL BTEX CONCENTRATIONS (WATER)–ISOPLETH MAP
PIT 15
MCAS CHERRY POINT
CHERRY POINT, NORTH CAROLINA

DRAWN: JW.	DATE: DECEMBER 1996
DFT CHECK: RWS	SCALE: 1"=100'
ENG CHECK:	JOB:30740–5–0500/194
APPROVAL:	DWG: 5.4

REFERENCE: MCAS CAD FILES





NORTH

LEGEND

398	TOTAL SEMI-VOLATILE CONCENTRATION (ug/L)
1	TOTAL SEMI-VOLATILE CONCENTRATION ISOPLETH (ug/L)
?	INSUFFICIENT DATA TO DETERMINE THE EXTENT OF TOTAL SEMI-VOLITAL CONCENTRATIONS BEYOND THIS POINT.
NA	NOT ANALYZED FOR THIS PARAMETER DURING THIS INVESTIGATION.
ND	NOT DETECTED
NA*	NOT ANALYZED FOR THIS PARAMETER DUE TO THE PRESENCE OF FREE PRODUCT.
▲(56,66)GW01	TYPE II (SHALLOW) MONITORING WELL LOCATION
■(56,66)GW01	TYPE III (DEEP) MONITORING WELL LOCATION
●(56,66)HP01	HYDROPUNCH LOCATION – S=SHALLOW, D=DEEP
⊕(56,66)B01	SOIL BORING LOCATION
⊕(56,66)GW51	LOCATION OF FREE PRODUCT RECOVERY WELL
	EXISTING PIPELINE (ACTIVE)
	ABANDONED 6" DIAMETER PIPELINE A
	CHAIN-LINK FENCE
	APPROXIMATE LEAK LOCATION

NOTES:

1. THERE IS NO NORTH CAROLINA GROUNDWATER QUALITY STANDARD FOR TOTAL SEMI-VOLATILES.
2. DRAWING REFERENCED FROM NAVAL FACILITIES ENGINEERING COMMAND DRAWING NO.S 772863, 4077486, 4167065, 4167066, AND 3925.
3. EXISTING MONITORING WELLS 56GW21, 56GW41, 56GW46, 56GW06, 56GW51 AND 56GW52 AND MONITORING WELLS AND SOIL BORINGS 56GW53-56GW59 AND 56SB19-56SB22 WERE SURVEYED BY TAYLOR, WISEMAN AND TAYLOR DURING THIS INVESTIGATION.
4. MONITORING WELL AND SOIL BORING LOCATIONS SURVEYED BY McKIM & CREED. VERTICAL DATUM IS BASED ON MONUMENT 13-93 WITH A MEAN GIVEN ELEVATION OF 27.12 FEET (MEAN SEA LEVEL). SURVEY DATA COULD NOT BE LOCATED FOR HYDROPUNCH LOCATIONS 56HP# AND SOIL BORING LOCATIONS 56SB# AND WERE OBTAINED FROM MAPS IN THE REPORT BY WESTON/BAKER DATED AUGUST 13, 1992.

66GW05▲ ■66GW14

GRAPHIC SCALE – IN FEET

100 50 0 100 200

DRAFT

N0194-55(1:100)

LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.
RALEIGH, NORTH CAROLINA

TOTAL SEMI-VOLATILE CONCENTRATIONS (WATER)-ISOPLETH MAP
PIT 15
MCAS CHERRY POINT
CHERRY POINT, NORTH CAROLINA

DRAWN: JRW	DATE: DECEMBER 1996
DFT CHECK: RWS	SCALE: 1"=100'
ENG CHECK:	JOB:30740-5-0500/194
APPROVAL:	DWG: 5.5

REFERENCE: MCAS CAD FILES

DRAFT

APPENDIX A

COMPREHENSIVE SITE ASSESSMENT WORKPLAN

LEAKING UNDERGROUND PIPELINE
COMPREHENSIVE SITE ASSESSMENT WORKPLAN

PIT 15
MARINE CORPS AIR STATION
CHERRY POINT, NORTH CAROLINA

Navy Contract No. 62470-93-D-4020

Law Engineering Job No. 30740-5-0500/0194

Law Engineering and Environmental Services, Inc.
Raleigh, North Carolina

September 24, 1996

September 24, 1996

LANTNAVFACENGCOM
1510 Gilbert Street
Atlantic Division
Naval Facilities Engineering Command
Norfolk, Virginia 23511-6287

Attention: David Daly, Code 1821

Subject: **LEAKING UNDERGROUND PIPELINE**
COMPREHENSIVE SITE ASSESSMENT WORKPLAN
PIT 15
MARINE CORPS AIR STATION
CHERRY POINT, NORTH CAROLINA
NAVY CONTRACT NO. N62470-93-D-4020
LAW JOB NO. 30740-5-0500/0194

Dear Mr. Daly:

Please find enclosed one copy of the above referenced Workplan. This document covers those tasks designed to identify and delineate subsurface petroleum-related contamination and estimate its direction and rate of movement within groundwater at the above referenced site. Please review the enclosed document and contact us regarding any questions or comments. Also note that we plan to begin field activities on or about Monday, September 30, 1996. LAW appreciates the opportunity to continue to provide services to you and LANTDIV on your environmental projects. We look forward to hearing from you soon.

Sincerely,

LAW ENGINEERING & ENVIRONMENTAL SERVICES, INC.

Jeffrey Tyburski, P.G.
Senior Geologist

Brian J.Bellis, P.G.
Principal Hydrogeologist

JBT/BJB/pjp

cc: Bill Powers - Cherry Point, w/enclosure
Kathy Molino - Contracts, correspondence only

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APPENDICES

1.0 INTRODUCTION

1.1 Purpose and Scope of Investigation

The purpose of this leaking underground pipeline Comprehensive Site Assessment (CSA) Workplan (Workplan) is to serve as a guidance document and procedural manual for performing tasks to aid in determining the magnitude and extent of soil and groundwater contamination, identifying possible free product accumulation, and assessing potential exposure to possible subsurface petroleum-related contaminants at the site identified as Pit 15 located at the northwestern end of the heavy aircraft refuling area adjacent to runway L14 at Cherry Point Marine Corps Air Station (MCAS). The location of the project site within the MCAS is shown in Drawing 1.1. The location of Pit 15 is shown on Drawing 1.2.

Pit 15 is located on the northwestern end of the heavy aircraft refuling area adjacent to runway L14. Jet fuel is supplied to the heavy aircraft refuling area through a system of pressurized underground piping. A leak from this piping system was discovered on May 18, 1995 in the grass island adjacent to Pit 15. The leak was repaired and contaminated soils were excavated. Free product has been detected in two recovery wells that have been installed at the site. The objective of the CSA is to define adequately the horizontal and vertical extent of vadose zone (unsaturated) soil contamination and groundwater contamination from the release of petroleum from the underground aviation fuel system at Pit 15.

This Workplan was prepared in accordance with the scope of work developed by the Naval Facilities Engineering Command and requirements listed as Tasks I through X of the document entitled "Comprehensive Site Assessments at LUST Sites: Groundwater Section Guidelines for the Investigation and Remediation of Soils and Groundwater" prepared by the Groundwater Section of the North Carolina Department of Environment, Health and Natural Resources (NCDEHNR), March, 1993 (including latest revisions).

2.0 PREVIOUS INVESTIGATIONS, REMEDIATION AND/OR CLOSURES

On May 18, 1995, jet fuel was discovered to be seeping into a subgrade valve box to the aviation fuel hydrant system to Pit 15. The section of the fuel system leading to Pit 15 was reportedly shut off immediately after this discovery. Representatives from the Air Station Spill Response Team and the Environmental Affairs Department (EAD) responded to the spill. Upon arrival, the was no surficial evidence of the leak. The standing fuel was pumped out of the valve box. Inspection of the gasket seals to the valve box indicated that they were intact and suggested that the leak occurred from the pipeline (MCAS, EAD, 1995).

Facilities Maintenance personnel were called in to remove the concrete slab to the valve box and expose the piping system. During the excavation activities, it was discovered that the weld located on the hydrant pipeline system had developed three or four pin-hole leaks. This section of the pipeline is located approximately eight feet below land surface. On May 19, 1995, the leaking section of the pipeline was repaired. The line was repressurized and the excavation was left open over the weekend to monitor the effectiveness of the repair. No evidence of leakage from the repaired section of the pipeline was reportedly observed while the excavation was open (MCAS, EAD, 1995).

During excavation activities, it was noticed that the soil located immediately adjacent to the leak was saturated with fuel. Because of the small size of the leak relative to the daily throughput of fuel to the heavy aircraft distribution system, it was reportedly difficult for base personnel to determine the exact quantity of fuel released. Based upon the soil conditions, size of the excavation and discussions with the Fuels Officer, it was estimated that approximately 800 gallons of fuel had been lost (MCAS, EAD, 1995).

Approximately 20 tons of soil was excavated and stockpiled at a location near the leak site. The excavation reportedly covered an area measuring approximately 15 feet by 15 feet and was

approximately 14 feet deep. The contaminated soil was shipped by American Soils Corporation to the ASC Recycling Facility (Nash Brick Company) in Ita, North Carolina (MCAS, EAD, 1995). Review of base records indicates that samples were not collected from the excavation for laboratory analyses based upon the apparent presence of petroleum-contaminated soils and future plans to assess the extent of soil and groundwater contamination.

Two free product recovery wells (66GW51 and 66GW52) were installed adjacent to the leak location on September 21, 1995 by ATEC Associates, Inc. Each of the two wells was installed to a depth of 25 feet below land surface (bls) and was constructed of 4-inch diameter schedule 40 PVC. The screened portion of each well extends from 5 to 25 feet bls. Free Product is currently being recovered from each of the two wells on a daily basis using a passive bailing system. Maximum free product thicknesses have measured at approximately 2.6 feet for well 66GW52 and 0.02 feet for well 66GW51. The water table is estimated to be located between 12 and 13 feet bls. As of July, 1996, approximately 1.65 gallons of free product have been removed from well 66GW51 and approximately 153 gallons of free product have been removed from well 66GW52 over a five month period (MCAS, EAD, 1995).

Two assessments have been conducted in the vicinity of Pit 15 prior to the reported release. The first investigation was conducted by Weston/Baker in January of 1992 and involved the installation of several monitoring wells and soil boring to investigate the extent of soil and groundwater contamination in the vicinity of an abandoned aviation fuel pipeline. The abandoned pipeline is located approximately 525 feet southwest of the Pit 15 leak location. As part of this investigation, one Type II monitoring well (56GW21) was installed on the southwestern end of the grass island to Pit 15 (Drawing 1.2). The results of this investigation did not indicate the presence of contamination in groundwater from this well (Roy F. Weston, Inc. and Baker Environmental, Inc, 1992).

LAW conducted a follow-up investigation in this area in May and June of 1994. As part of this investigation, a Type II/Type III monitoring well pair (66GW06 and 66GW46) was installed on the

northeastern portion of the grass island to Pit 14 and one Type II monitoring well (66GW41) was installed on the southwestern portion of the grass island to Pit 14 (Drawing 1.2). Analysis of groundwater collected from these monitoring wells and from previously installed monitoring well 56GW21 only indicated the presence of low concentrations of volatile and semi-volatile constituents in groundwater from monitoring well pair 66GW06/66GW46. Although the data suggested that the groundwater may have been contaminated from overspills during aircraft refuling operations, the data also suggested that low concentrations of petroleum contamination may have migrated into the Pit 14/Pit 15 area from an upgradient sources. Effort to remediate these upgradient sources areas is currently in progress (LAW, 1995).

Dames and Moore and Tracer Research Corporation performed *Tracer Tight* ™ leak testing on the 24,525 linear feet of underground aviation fuel pipeline that currently comprises the bases' active aviation fuel pipeline system. This investigation also included the testing of the portion of the pipeline system located in the heavy aircraft refuling area, including Pit 15. The field investigation was conducted between October 11, 1995 and June 18, 1996 after the release from the pipeline system at Pit 15. The methods of the investigation and results are summarized in a report entitled Final Report, Engineering Evaluation, Aviation Fuel Distribution System Integrity Testing, Marine CORPS Air Station, Cherry Point, NC, dated February 9, 1996. No evidence was reportedly found to indicate that the portion of the pipeline system in the vicinity of Pit 14 and Pit 15 had leaked. However, trace concentrations of Total Volatile Hydrocarbons (TVHCs) were detected in soil-gas probes installed in Pits 14 and 15 (Dames and Moore, 1996).

3.0 SITE DESCRIPTION

Information regarding the history and physical characteristics of the site is used to identify and evaluate known and/or potential source(s) of contamination and conditions which assist in determining sampling locations. Potential contaminant migration pathways which could influence subsurface contaminant

migration characteristics and limit intrusive subsurface investigation also are identified. These typically include surface or near surface features, such as asphalt pavement, surface-water impoundments, and buried utility trenches.

3.1 Area of Investigation

Pit 15 is located at the northwestern end of the heavy aircraft refuling area adjacent to runway 14L at Cherry Point Marine Corps Air Station (MCAS). An underground aviation fuel pipeline system provides jet fuel to each of the seven heavy aircraft refuling pits located in this area (Pits 9 through 15). Grass islands separate each of the heavy aircraft refuling pits in this area (Drawing 1.2).

3.2 Site History and Operation

The heavy aircraft refueling area was constructed in 1985. An old runway extension and support buildings were previously located in this area and are shown on the USGS topographic map presented as Drawing 1.1. A portion of an abandoned underground aviation fuel pipeline system is located southwest of Pit 15. The abandoned pipeline system was originally constructed in the early to mid 1940s and was abandoned when the new pipeline system was constructed in the mid 1980s.

3.3 Contaminant Source Inventory

The primary contaminant source includes the reported leak from the portion of active pipeline system located at Pit 15 which occurred in May of 1995. Other potential sources of contamination include reported overspills during routine aircraft refuling activities. As previously described, petroleum contamination is known to extend into the study area from releases of aviation fuel from the portion of the abandoned pipeline system located southwest of Pit 15 and a former aviation fuel bladder storage system that is also located southwest of Pit 15 in the vicinity of Seventh Avenue.

3.4 Water Well Inventory/Water Supply

Several water supply wells are located within 1500 feet of Pit 15. According to EAD, all of these wells have been abandoned within recent years. Information regarding the locations and screened intervals of these wells will be provided in the CSA report for this site.

3.5 Utility Survey

Underground utilities currently located within the immediate vicinity of Pit 15 include the active underground aviation fuel system, water lines and electrical lines. The locations of these utilities will be marked in the field by base personnel prior to the start of drilling activities.

4.0 SITE CHARACTERIZATION

The Site Characterization involves the collection of information to characterize the physical setting of the project area. Information regarding the geology/hydrogeology, topography, and other physical characteristics of the site and vicinity will be evaluated to identify conditions that could potentially affect the migration of petroleum contaminants. The information available at this time is summarized in the following subsections.

4.1 Regional Geology/Hydrogeology

Cherry Point MCAS is located on the Atlantic Coastal Plain Physiographic Province which consists of a massive wedge of unconsolidated and consolidated sediments deposited on precambrian-aged, i.e., 600+ million-year-old (my) rock. Near surface unconsolidated sediments in the vicinity of Cherry Point MCAS consist of a sequence of Pliocene and Pleistocene-aged (10,000 years to 5 my) sands and silty sands with interbedded clays, silts and marls. These major sedimentary sequences were deposited during

transgressive and regressive cycles primarily produced by rise and fall in sea level. Because these units are very similar in texture and appearance, characterization of these units solely based upon their lithogy (sedimentary characteristics) is difficult without reference to the sequence and biostratigraphic framework (characterization of geologic units based upon differences in assemblages of fossil remains, *Ward, Bailey and Carter, 1991*). Because of this, previous reports on the geology of the eastern shore of North Carolina have incorporated a more uniform approach to differentiating major stratigraphic units (formations). More recent studies conducted in the mid-to-late 1980s have provided a more detailed approach in differentiating formations which is primarily based on differences in biostratigraphic framework.

The Coastal Plain of North Carolina was inundated by repeated marine transgressions due to fluctuating sea levels during the Pliocene and Pleistocene. During this same time interval, minor tectonic changes altered the elevation of the continental shelf relative to sea level, which formed large shallow depressions that served as depositional basins for eroded sediment. These depositional environments consisted of back barrier (beach) lagoon settings, shallow inner-bay estuarine environments, and open, shallow (ocean) shelf. These strata were deposited unconformably on older beds ranging from late Miocene (5-24 my) to late Cretaceous (63-138 my) age. Overlapped were deltaic and shallow marine sands of the Cretaceous, silts and glauconitic sands of the paleocene, limestones and calcareous quartz arenites of the Eocene (38-55 my) and oligocene (24-38 my), and calcareous and phosphatic sands of the Miocene (*Ward, Bailey and Carter, 1991*).

Major geologic units that have been mapped in the Cherry Point MCAS area that comprise the significant near-surface hydrogeologic units include the Eocene-age Castle Hayne Formation, Oligocene-age River Bend Formation, Miocene-age Pungo River Formation, Pliocene-age Yorktown Formation, Pleistocene-age James City Formation, and the Pleistocene-age Flanner Beach Formation (surficial deposits).

The Castle Hayne Formation consists of the New Hanover, Comfort and Spring Garden members which generally consist of a massive molluscan, bryozon-echinoid skeletal sandy limestone with a basal phosphate pebble conglomerate. Based upon interpretation of gamma-ray logs from a water supply well located south of runway L14 at Cherry Point MCAS *(Murray and Keoughan, U.S.G.S., 1990)* the top of the Castle Hayne is estimated to be located at an elevation of approximately 200 to 225 feet below sea level (BSL) at Cherry Point MCAS. The River Bend Formation unconformably overlies the Castle Hayne Formation, is similar in composition, and consists of a sandy limestone with areas of sandy molluscan-mold limestone. This unit is reported to have a thickness of approximately 85 feet, the top of which is estimated to be located at an elevation of approximately 125 feet BSL. The Pungo River Formation is consistent in composition with the Castle Hayne and River Bend Formations and is a phosphate rich-unit containing interbedded phosphatic clays, limestones, silty claystones, coquinas and phosphatic sands. The unit is estimated to have a thickness of approximately 50 feet and the top of the unit is approximately 75 feet BSL.

The Yorktown Formation consists of a silty to clayey dark bluish-green medium to fine argillaceous (cemented) glauconitic sand with varying amounts of shell fragments. This unit is reported as being approximately 30-35 feet thick and the top of the unit is located approximately 75 feet BSL. The James City Formation overlies the Yorktown Formation and consists of a very shelly sand which is reported to be less than 25 feet thick. The top of the Formation is reported to be located approximately 25-30 feet BSL.

Recognition and differentiation of the James City Formation in well cuttings or on geophysical logs is considered to be extremely tentative (Brown, 1988). The Flanner Beach Formation is reported to comprise the near-surface geology of the area *(Murray and Keoughan, U.S.G.S., 1990)*. However, this Formation is currently not recognized in literature by the North Carolina Geological Survey (Brown, 1988). The James City and Flanner Beach Formations may be referred to as surficial deposits (undivided) due to this similarity in composition. The James City Formation may also be identified as part of the

Yorktown Formation as a thin sandy shell hash layer overlying the Yorktown Formation. For ease of interpretation and reader understanding, we will refer to the Flanner Beach Formation as surficial deposits. Because our field data from previous investigations do not contain readily identifiable indicators of the James City Formation, and because this Formation appears to be relatively insignificant and discontinuous across the base, LAW will refer to it as the silty fine to medium sand with shell fragments overlying the Yorktown Formation.

The Castle Hayne, River Bend, Pungo River and Yorktown Formations and surficial deposits (James City and Flanner Beach Formations) comprise the near surface geology of Cherry Point MCAS within 300 feet of land surface. Many of these geologic formations are very similar to each other in composition, and therefore, demonstrate similar hydrogeologic properties. Because of this, formations similar in composition have been grouped together to define the major aquifers that underlie the site. These aquifers are recognized as the Castle Hayne, Yorktown and surficial aquifers. The Castle Hayne aquifer includes the Castle Hayne, River Bend and Pungo River Formations. It is one of the major aquifers in eastern North Carolina and is heavily utilized by Cherry Point and the City of Havelock. The Yorktown Formation typically includes the Yorktown Formations but is also reported to include the James City Formation *(Murray and Keoughan, U.S.G.S., 1990)*. The surficial deposits (Flanner Beach Formation) comprises the surficial aquifer.

Information presented by Murray and Keoughan *(U.S.G.S., 1990)* indicate that an upper and lower confining unit define the upper and lower portions of the Yorktown aquifer. This information was obtained through a gamma-log of a well installed south of runway L14. Data obtained from field classification and grain size analysis of soil samples collected within the first 12 feet of the Yorktown aquifer/Formation by LAW on current and previous investigations at Cherry Point MCAS indicate that it consists of a dark green to blue, slightly silty to clayey, very fine sand with shell fragments. A review of grain size analysis data suggests that the upper portion of the Yorktown aquifer is less permeable than the surficial aquifer which may support its being referred to as an aquitard. It should be noted that the

permeability of an aquitard by definition, is not sufficient to allow completion of production wells but can be permeable enough to transmit water in quantities that are significant in the study of regional groundwater flow (Freeze and Cherry, 1979).

4.2 Site Geology/Hydrogeology and Soils

The information obtained from previous LAW investigations in the general vicinity indicate that near-surface soils consist of silty fine to medium sands with thin clay interbeds. The water table is located approximately 12 to 13 feet BLS. The Yorktown aquifer (Formation) is expected to be present at a depth of 40 to 45 feet bls in this area.

4.3 Site Topography and Other Surface Characteristics

The project area lies at an elevation of approximately 20 to 25 feet above mean sea level and slopes slightly to the north toward a drainage feature of Mill Creek. Mill Creek flows for approximately 4500 feet before it drains into Slocum Creek. The grass island between Pits 14 and 15 lies at a slightly lower elevation than the surrounding concrete tarmac and is frequently ponded with surface water during rainfall events.

5.0 POTENTIAL RECEPTORS

The information collected in sections 2.0, 3.0, and 4.0 will be evaluated to provide a preliminary listing of potential receptors that could be affected by the known/suspected releases of petroleum. Potential receptors of contamination, as defined by the North Carolina Division of Environmental Management, included surface water bodies, groundwater supply wells, and subsurface structures.

Potential receptors may include the water supply wells located within 1500 feet of the site. Mill Creek is located within 1500 feet of the site and may also be considered to be a potential receptor.

6.0 SUBSURFACE INVESTIGATION METHODS

The main objectives of the subsurface investigation are to:

(1) define the approximate lateral and vertical extent of free product accumulation and dissolved-phase groundwater contamination resulting from discharges of petroleum fuels at the site;

(2) determine the approximate direction and rate of migration of groundwater contaminant constituents at the project site including the identification of preferential pathways of contaminant migration; and

(3) define the extent of vadose zone soil contamination.

To accomplish this four soil borings will be advanced in native soils around the area where petroleum-contaminated soils were excavated to allow collection of soil samples for laboratory testing. Three existing upgradient Type II monitoring wells 56GW21, 66GW41 and 66GW06 will also be resampled. Additional groundwater and soil samples will be collected through the installation of one Type III and five Type II monitoring wells. Field activities will be performed in adherence to procedures and guidelines contained in the project Health and Safety Plan (Appendix A). The specific methods to be employed are outlined in the following paragraphs.

6.1 Soil Test Borings

A total of four soil test borings will be advanced on the site to provide a means of assessing the lateral extent of soil contamination. The soil borings will be advanced in native soils at the edge of the former

excavation area using a mechanical drill rig. In addition, six soil borings will be advanced to accommodate installation of five Type II and one Type III monitoring wells. The four soil borings that are not converted into monitoring wells will be grouted to the surface after completion.

Each soil boring will be advanced for the collection of soil samples for field classification, organic vapor screening and laboratory testing to evaluate the extent of vadose zone contamination. Hollow-stem augers will be used to advance the soil borings and split spoons will be utilized for soil sample collection at five-foot intervals as described in Section 7.1.

The on-site geologist/engineer will examine the soil samples from the borings to obtain lithological data to define near-surface geologic conditions and will continuously monitor soils for evidence of contamination using visual and olfactory methods, and through the use of a portable organic vapor analyzer. Special emphasis will be placed on visual evaluation of soils by field personnel for evidence of contamination since the presence of heavier hydrocarbons characteristically cannot be entirely detected by organic vapor analyzer instrumentation such as a photoionization detector (PID), or flame ionization detector (FID).

The soil borings for the Type II monitoring wells will be advanced to a depth of approximately 5-7 feet below the water table to a depth of approximately 18 to 20 feet bls. The pilot borings for the Type III wells will be advanced into the first three to five feet of the Yorktown Formation which is estimated to occur at a depth between 40 and 45 feet bls. Borings that are intended for the collection of soil samples only will be advanced to depths of approximately 12 feet bls. Boring depths may be modified slightly based on actual hydrogeological characteristics.

The locations of the four soil borings and the Type III and five Type II monitoring wells are shown on Drawing 1.2. The identification numbers for the four soil borings that will not be converted into monitoring wells are as follows:

66SB19 through 66SB22

6.2 Monitoring Well Design, Installation, and Development

A total of 6 monitoring wells will be installed on the site and will include one Type III (deep) and five Type II (shallow) wells. The information obtained from well gauging, sampling, slug testing, and groundwater testing activities will be used to: define further the lithology beneath the project site; generate a water-table potentiometric surface map for the area, and determine the directions of groundwater flow across the project site; ascertain the lateral extent and approximate thickness of the free product plume (if present); establish the approximate geometric dimensions (vertical and lateral) of the dissolved-phase contaminant plume(s); and provide for reproducible sampling points in the upper and lower portions of the surficial aquifer. The assigned well identification numbers for this site are as follows:

66GW53 through 66GW58

6.2.1 Monitoring Well Locations

Based upon the physical characteristics of the site and information from LAW's previous investigations, Type II wells will be located at positions that will assist in delineating the horizontal extent of groundwater contamination. The Type III well will be paired with one of the newly installed Type II wells to ascertain vertical components of groundwater flow and delineate the vertical extent of contamination. We anticipate that wells will be installed at the locations shown on Drawing 1.2. These locations may change based upon the results of the utility clearance. It is anticipated that all monitoring well locations will require concrete coring.

6.2.2 Monitoring Well Design and Construction

Type II monitoring wells will be constructed of 2-inch diameter PVC with 10-feet of 0.010-inch machine slotted well screens. Approximately 5-7 feet of each well screen will be installed below the water table. Care will be taken to ensure that the well screens will intersect the water table to allow for the detection of free product.

The outer casing for Type III monitoring wells will be six-inches in diameter. The bottom of the outer casing will be installed no less than ten-feet above the Yorktown Formation (aquifer) which is estimated to be located between 40 an 45 feet bls. The two-inch diameter well screen and riser will be installed on top of the Yorktown Formation (aquifer), the bottom of which will consist of 5-feet of 0.010-inch slotted screen.

Schedule 40 PVC riser pipe will be used for all wells, except in traffic and flightline areas, where Schedule 80 PVC riser pipe will be utilized. Piping will be flush jointed and threaded, and wells will be constructed without the use of glue. Sand packs will be constructed of washed silica Torpedo sand (ASTM C190).

The well drilling will be performed using a truck-mounted rig fully equipped for dry auger and mud rotary drilling. All wells will be installed by a qualified driller registered in the State of North Carolina and well installation will be supervised in the field by experienced staff who specialize in subsurface investigations. No grease or oil will be used on drill pipe joints. However, Teflon tape, vegetable oil, or phosphate-free laboratory detergent such as Liquinox will be used for lubrication, if required.

6.2.3 Detailed Monitoring Well Installation Procedures

The PVC screen and riser pipe used in well construction will be pre-cleaned and packaged by the manufacturer. All well casing and screens will be transported and stored at the site in original packaging. Personnel handling these items will not handle tools or drilling equipment while installing the well. Clean, new disposable latex rubber gloves will be worn when handling well screens or casing. Personnel who are handling the drilling equipment will not be allowed to handle the well screens or casing until a new "clean" pair of gloves are worn.

The Type II monitoring wells will be installed as follows:

- Boreholes will typically be advanced with nominal 4.25-inch I.D. (8.25-inch O.D.) hollow stem auger to a depth appropriate for the screened portion of the well to intersect the shallow water table, collect soil samples, and install the well. If "heaving or running" sands are encountered, a 2.5-inch I.D. auger may initially be advanced to collect split spoon soil samples followed by a 4.25-inch I.D. hollow stem auger with a bottom plug.

- Soil samples for chemical analysis will be collected via split spoon sampling in accordance with procedures outlined in Sections 7.1 of this Workplan.

- The desired sections of 2-inch well screen and riser pipe will be assembled and lowered to the bottom of the augers.

- The lengths of all screen and riser casing sections and bottom plugs will be measured and recorded.

- Washed silica filter sand will be poured into the augers to construct a continuous filter pack within the augers which will extend from approximately one foot below the bottom of the well screen to a maximum of two feet above the slotted section. The depth to the sand pack will be frequently measured through the augers using a decontaminated weight attached to a fiberglass measuring tape while "pulling" the augers from the hole without rotating them to maintain the sand inside the augers as the filter pack is constructed.

- An approximately 2-foot-thick bentonite seal will be emplaced above the sand filter pack by pouring bentonite pellets into the augers in the manner described above. Distilled

water will be added to the annular space at ten-minute intervals to aid in the hydration of the bentonite seal. The bentonite seal will be allowed to hydrate in accordance with manufacturer's recommendations.

- The annular space above the bentonite seal will be tremie grouted from the bottom to within approximately 3 feet of land surface with neat cement grout.

- After allowing the grout to set, the concrete pad and well head cover will be installed to complete the installation.

- In non-traffic areas, each well head will be protected with three Schedule 40, protective steel pipes, 3-inch I.D., imbedded in a minimum of 2.5-feet of 3,000 psi concrete. A security pipe with a hinged locking cap, having an embedment depth of 2.5 feet into the concrete, will be installed over the well casing. The security pipes will extend 3.0 feet above the ground surface and will be filled with concrete and painted day-glow yellow or an equivalent. A concrete apron constructed of 3,000 psi concrete and measuring 5-foot by 5-foot by 0.5 foot will be constructed around each well located in non-traffic areas.

- In traffic areas, a flush manhole cover will be built into a three foot square, concrete collar, which will be 9 inches thick. If the well is installed through a paved or concrete surface, the annular space between the casing and the borehole will be grouted to a depth of at least 2.5 feet and finished with a concrete collar. If the well is not installed through a paved or concrete surface, then a concrete apron, measuring 5 foot by 5 foot by 0.5 foot will be constructed around each well. The collar and pad will be constructed of 3,000 psi concrete and will be crowned to meet the finished grade of surrounding pavement as required.

- Final well construction details will be provided on the forms included as Drawing 6.2.3.

The Type III monitoring wells will be installed in two phases, as follows:

- The borehole for the outer casing will be advanced using an 8.25-inch I.D. (12.25-inch O.D.) hollow stem auger to an estimated depth approximately 10-feet above the Yorktown Formation (30 to 35 feet bls).

- The desired length of 6-inch PVC outer casing will be assembled and lowered to the bottom of the augers.

- The 6-inch outer casing will be grouted into place and allowed to set for a minimum of 48 hours prior to installation of the 2-inch well point through the outer casing.

- The inner 2-inch casing will be installed utilizing mud rotary drilling techniques. A 5 7/8-inch diameter hole will be drilled through the 6-inch outer casing to a terminal depth of approximately 10 feet below the outer casing. Soil samples will be collected to determine the exact depth of the Yorktown Formation and the final depth of the inner casing.

- A five foot length of 2-inch diameter, 0.010-inch slot PVC screen will be installed on top of the Yorktown Formation (aquifer), approximately 10-feet below the outer casing PVC riser to the surface.

- The lengths of all screen and riser casing sections and bottom plugs will be measured and recorded.

- Washed silica filter sand will be poured into the boring to construct a continuous filter pack within the boring which will extend from below the bottom of the well screen to a maximum of two feet above the slotted section. The depth to the sand pack will be frequently measured within the borehole using a decontaminated weight attached to a fiberglass measuring tape.

- A 2-foot-thick bentonite seal will be emplaced above the sand filter pack by pouring bentonite pellets into the borehole in the manner described above.

- The annular space above the bentonite seal will be tremie grouted from bottom to within approximately 3 feet of land surface with neat cement grout.

- After allowing the grout to set, the concrete pad and well head cover will be installed to complete the installation. The well head will be completed in accordance with the specifications for the Type II wells.

6.2.4 Monitoring Well Development

Wells will be developed by continuous low yield pumping or bailing and the pumps will be set near the bottom of each well. As the wells are developed, groundwater turbidity will be visually monitored as an indicator parameter and will be noted visually and recorded. Well development will continue until the turbidity stabilizes. Monitoring Well Development Worksheets, as shown in Drawing 6.2.4, will be used

to record the results of the field analyses. Water generated during the well development activities will be handled according the procedures specified in Section 6.3.

6.2.5 Groundwater-Level and Free Product Thickness Measurement

Prior to well purging for sample collection, water level and free product thickness measurements will be performed in all monitoring wells at the site no sooner than 24 hours after completion of well development activities. Measurements will be collected in all monitoring wells at the site on the same day to provide a complete set of comparable measurements. These measurements will be used to calculate hydraulic gradients, determine directions of groundwater flow at the site, and estimate thickness of free product (if present) in the subsurface beneath the site.

Water level and free product thickness measurements will be performed using an electronic interface probe. The liquid levels will be measured by slowly lowering the instrument probe into the well. When the probe reaches the water or free product surface, the circuit is completed and a buzzer is activated. A constant buzzing indicates free product while an intermittent buzzing indicates water. The distance from the surveyed marker on the top of the well casing to either the water or free product level is then measured and recorded. If free product is present, the thickness will be measured to the nearest 0.01 foot. Depth to water will also be measured to the nearest 0.01 foot. The instrument probe will be decontaminated between wells by detergent wash and distilled water rinse. A complete set of water level measurements taken on the same day will be recorded on the Water Elevation Worksheet (Drawing 6.4).

6.3 Disposal of Borehole Cuttings and Wastewater

Borehole cuttings will be containerized in a roll-off box at the project site and covered with plastic or tarp to prevent infiltration of rainwater and release of windblown particles. Ultimate disposal of the material at a permitted facility will be based on analytical results and/or regulatory consultation to ascertain whether

the waste material is designated hazardous or non-hazardous. Development, and purge water will be containerized and removed from the site for disposal of an off-site permitted facility. All soil and groundwater will be placed in DOT-approved containers and will be properly labeled prior to any shipment. Manifests will be prepared for all waste shipped from the site.

6.4 Surveying

Horizontal and vertical locations of all wellheads and soil borings will be surveyed in reference to mean sea level. Surveys will be supervised by a registered land surveyor.

7.0 SAMPLE COLLECTION METHODS

The following sections describe the methods that will be utilized to collect soil and groundwater samples for this project. All samples will be collected by OSHA-certified personnel who are trained and experienced in sample collection procedures.

7.1 Test Boring Soil Sample Collection and Field Screening Methods

Field screening will be conducted during drilling of the test borings to assess whether or not petroleum hydrocarbons are present in the unsaturated vadose zone and to identify areas of suspected near-surface releases. **Soil samples for general site characterization will be obtained continuously above the water table and at five-foot intervals thereafter. A soil sample will be collected at the bottom of each soil test boring for field classification.** The soil samples will be obtained using a split spoon sampler driven in accordance with ASTM D-1586. Soil samples will be classified in the field by an experienced environmental staff member trained in using visual/manual classification techniques as described in ASTM D-2487 and D-2488. The soils will be classified in accordance with the Unified Soils Classification

System and a test boring record of each borehole will be produced. A sample test boring record used for final presentation of standard test boring data is shown as Drawing 6.1.

Two portions of each sample will be removed from the sampling device and placed in pre-labeled, airtight, plastic "twin" bags. After several minutes, the gas contained in the "headspace" or void area within one of the twin bags will be tested with a PID or an OVA. The headspace method involves placing a measured amount of a representative soil sample in a zip lock plastic bag. After a five-minute waiting period to allow volatile organic compounds to vaporize within the air (headspace) within the bag, a portable PID or FID will be used to test the air within the bag for the presence of volatile organics that are within the detection limits of the instrumentation. **These data will be evaluated in the field and used to select two soil samples (collected at least 2.0 feet above the water table) from each soil boring for laboratory analysis.** The soil samples selected will included those that will appear to be most contaminated based upon the judgment of field personnel.

No change in screening or laboratory instrumentation will occur during the site investigation in order to enhance consistency of results unless the instrumentation is damaged and needs replacement.

All soil samples collected for laboratory analyses will be immediately placed on ice. Soil will be collected and placed into containers in the following order in accordance with the type of analyses scheduled for that sample:

Collection Order	Bottle Size and Type	Total Number of Bottles per Sample	Preservative
TPH 5030/3550	Glass Septae Jar, 2 oz. Amber Glass Wide Mouth, 8 oz.	2 1	<4°C <4°C

See Section 8.0 for the specific type and quantity of analyses that will be conducted for this project.

7.2 Groundwater Sample Collection

The groundwater sampling program has been developed to determine the magnitude and extent of free product accumulation and dissolved-phase groundwater contamination that are present as a result of petroleum fuel releases at the project site. The sampling program will consist of purging and collecting one groundwater sample from each of the newly-constructed wells. Purging and sampling will proceed from the least contaminated areas to the most contaminated areas based on observations made during the well installations, measurement of free phase product, and distance from the known source of contamination. The sampling program will include collection of samples for off-site laboratory analysis; field analysis of pH, specific conductance, and temperature; static groundwater level measurements; and product thickness measurements.

The Monitoring Well Sampling and Field Data Worksheet (Drawing 7.3) will be used to record all measurements made during well purging and sampling. This form was designed to be used as a checklist and as documentation for all groundwater sampling activities for an individual well.

Each well will be purged prior to sample collection to draw new water into the well in an effort to collect samples that are representative of the surrounding aquifer. Three standing well volumes of water will be removed from each well. Specific conductance, pH, and water temperature will be measured periodically during well purging. Wells that can be purged to dryness while purging less than three well volumes will be sampled as soon as the well has recovered to yield sufficient water volume for a sample. All purge water removed from the wells will be disposed in accordance with procedures for disposal of development water as described in Section 6.3 of this Workplan.

Well purging will be accomplished using decontaminated, clear Teflon or disposable bailers. New nylon rope will be used at each monitoring well location. Care will be taken to prevent contact between the rope and the ground during well purging and sample collection. Purging techniques will be performed in

accordance with standard practices followed by comparable professionals working in the petroleum contamination assessment field. The volume of water to be purged is calculated using the following equation:

$$V = \pi r^2 h$$

where:

π = 3.14159
r = Radius of well casing
h = Height of water column in well (total well depth - depth to groundwater prior to purging)
V = Volume of water in well (standing well volume)

Minimum purge volume = V x 3

Samples will be collected following completion of well purging in accordance with the following procedures:

- Chemical preservatives, if applicable, will be added to sample bottles by the laboratory.
- Sample bottles will be labeled prior to sample collection.
- Sample bottles will be filled directly from the Teflon bailer.
- The pH, temperature, and specific conductance of the sample will be measured and recorded. These measurements will be taken from a sample deposited in a separate container. Visual characteristics of the sample, including the presence of insoluble materials, will be recorded on field sampling forms.
- Caps will be secured on bottles.
- Volatile organic sample containers will be placed in plastic bags and the bags sealed.

All monitoring well groundwater samples collected for laboratory analyses will be immediately placed on ice. Groundwater will be collected and placed into containers in the following order based upon the type of laboratory analyses scheduled for that sample:

Collection Order EPA Method	Bottle Size and Type	Total Number of Bottles per Sample	Preservative
602 (Purgeable Aromatics)	Clear Glass Vial/40 ml	3	HCL
625 (Base Neutrals)	Amber Glass/1 Liter Jar	1	<4°C
Total Lead 239.2 with 3030C Preparation	Nalgene (Plastic)/500 ml bottle	1	Nitric Acid

See Section 8.0 for the specific type and quantity of analyses that will be conducted for this project.

7.3 Sample Identification

Prior to collecting each soil and groundwater sample, sample bottles will be labeled with the following information:

- Date and time of sample collection;
- Project identification number;
- Sample location number;
- Initials of person who collected sample;
- Type of preservative added to sample; and
- Parameter(s) or parameter group to be analyzed.

Additional specific information, such as sampling interval, may be added. The sample location number on the label will correspond to the sample location numbers assigned on the field site map.

7.4 Chain of Custody and Transportation Procedures

7.4.1 Chain of Custody Procedures

Chain of Custody (COC) procedures will be followed to establish documentation to trace sample possession from the time of collection until completion of analysis. In order to accomplish this objective, as few people as possible will handle sample(s) and the sampler will be responsible for the care and custody of the samples until they are delivered to the laboratory. An accurate record of sample collection, transport and analysis will be maintained and documented.

The COC Record will be used by personnel responsible for ensuring the integrity of samples from the time of collection to shipment to the laboratory. The laboratory will not proceed with sample analysis without a correctly prepared COC Record and Analytical Request Form. The laboratory will be responsible for maintaining COC of the sample(s) from time of receipt to disposal. COC procedures will be instituted and followed throughout the investigation.

The COC Record will be signed by each individual who has maintained custody of the samples. General preparation of the COC Record for samples to be delivered to the laboratory will be as follows:

- Samples will be accompanied by a COC at all times.
- The COC Record will be initiated in the field by the person collecting the samples. Every sample will be assigned a unique identification number as described in Section 7.3 that is entered on the COC Record.
- The Record will be completed in the field identifying the project, sampling team, LAW assigned project number, etc.
- If the person collecting the sample does not transport the samples to the laboratory or deliver the sample containers for shipment, the first block for "Relinquished By _____ _____ will be signed by the sampler.
- The person transporting the samples to the laboratory or delivering them for shipment will sign the Record as "Relinquished By _____."

7.4.2 Transportation Procedures

Collected soil and groundwater samples will be transported by courier to Law's Analytical Laboratory in Pensacola Florida. Prior to the start of the field investigation, necessary arrangements will be made with the laboratory to assure proper and prompt delivery and log in of the collected samples. Shipment and COC procedures are as follows:

- Samples will be packed properly for shipment so that bottles will not dislodge and/or break. The samples will be kept cool using zip-lock bags full of ice.
- Samples will be shipped via an overnight delivery service and the air bill number will be recorded to facilitate tracking of the package.
- The waybill will serve as an extension of the COC Record between the final field custodian and receipt in the laboratory.
- The COC record will be sealed in a watertight container and placed in the shipping container. The shipping container sealed with packing tape prior to being given to the carrier.
- The shipping container will be marked "fragile" to notify all handlers that special care should be taken in handling the samples.

7.5 Equipment Decontamination

The centralized decontamination area will be located on a portable wash-pad. All decontamination water will be containerized for disposal.

7.5.1 Drill Rig

The drill rig will be cleaned and handled in accordance with the following guidelines:

- Drill rigs and all support equipment will be cleaned of excess grease, oils and caked-on soil prior to arrival at the site. Equipment which leaks fuel, coolant, or lubricants will not be used on site.
- Equipment such as pumps and pump lines will be flushed thoroughly with potable water prior to use.

7.5.2 Soil and Groundwater Sample Collection Equipment

Teflon bailers used for groundwater sampling will be routinely decontaminated and stored after each sampling event as follows:

- Washed with phosphate-free detergent and tap water using a brush to remove any particulate matter or surface film.
- Hot tap-water rinse (if available) or distilled or deionized water rinse.
- Rinsed thoroughly with a 10% nitric acid mixture.
- Rinsed thoroughly with distilled or deionized water.
- Rinsed with isopropanol.
- Rinsed thoroughly with distilled or deionized water.
- Allowed to air dry.
- Wrapped completely with aluminum foil and sealed in airtight plastic bags.

Disposable bailers may also be utilized to collect groundwater samples.

Split spoons, submersible well development pump equipment, and other sample collection equipment will be decontaminated between sample events as follows:

- Tap water rinse.
- Washed with phosphate-free detergent and tap water using a brush to remove any particulate matter or surface film.
- Tap water rinse.
- Rinsed thoroughly with distilled or deionized water.
- Rinsed with isopropanol.*
- Allowed to air dry or rinse with distilled or deionized water.*
- Wrapped completely with aluminum foil and sealed in airtight plastic bags or placed on clean plastic if planned for immediate reuse.

* These items may be excluded in the decontamination process for split spoons.

Hollow stem augers, rods, and other downhole equipment will be decontaminated between borings as follows:

- High temperature and pressure water rinse
- If noticeable petroleum hydrocarbon was present in the previous boring, wash with phosphate-free detergent and tap water using a brush.
- High temperature and pressure tap water rinse.
- Allowed to air dry.
- Placed and covered with clean plastic until next use.

7.5.3 Rinsate Sample Collection Method

Water rinsate samples will be collected for QA/QC purposes. Water from the same brand or batch of distilled or deionized water that is used in the decontamination process outlined above will be used to pour over and into the bailer. The rinsate water will be directly collected into the sample bottles. The collected samples will be analyzed in accordance with the parameters listed in Section 8.0 to confirm that equipment decontamination is being conducted adequately and that no cross contamination is occurring between sample locations. If the rinsate samples reveal the presence of contamination, a sample of the source rinsate water will be collected and analyzed for the same laboratory parameters.

8.0 SAMPLE ANALYSIS

The analytical methods for this project are outlined below and in Table 8.1. Samples will be analyzed at Law's Pensacola, Florida analytical laboratory. Analytical methods for soils will include TPH (EPA preparation/testing Methods 3550/8015 and 5030/8015. Groundwater samples will be analyzed for purgeable aromatic hydrocarbons (EPA Method 602) semi-volatile organic compounds (EPA 625, Base Neutrals) and total lead (EPA Method 239.2 with 3030C preparation). The number and type of samples to be analyzed and the types of analyses to be conducted are summarized in Table 8.1.

9.0 COLLECTION AND ANALYSIS OF AQUIFER CHARACTERISTICS DATA

9.1 Slug Tests

Subsequent to development of the shallow monitoring wells, three standard rising head tests will be conducted at two shallow Type II wells which do not contain free product and at one Type III well.

Rising head tests will be conducted by removing water from the well and allowing the water level to stabilize back to static conditions. This rate will be used to calculate an estimate of the hydraulic conductivity of the aquifer immediately surrounding the well screen using the method of Hvorslev (1951). The hydraulic conductivity (k) will be calculated as follows:

$$k = \frac{r^2 \ln (L/R)}{2LT_o}$$

where: r = well radius (ft)D
L = saturated sandpack length (ft)d
R = borehole radius (ft)
T_o = Time required for the recovering water level to be within 37 percent of the static water level with respect to the total drawdown created.

10.0 EVALUATION OF ASSESSMENT DATA

An evaluation of the assessment monitoring data will be performed to establish and map the spatial boundaries of contaminant plume(s) concentration gradients throughout the contaminated area. Accomplishment of this objective will aid in; (1) identifying contaminant source areas, migration pathways and potential receptors; and; if necessary, (2) establishing a basis for corrective action plans.

The initial step in the evaluation process involves data reduction. Analytical results will be reviewed and mapped to their respective sample locations. The following data will be presented in tabular form:

- Sampling point identification number (or quality control designation).
- Sampling date.
- Practical quantitation limit.
- Reported concentration.
- Reported approximate concentration, if below practical quantitation limit.

A quantitative ranking of constituent concentration/sampling point combinations will be performed to identify likely source areas, delineate the approximate boundaries of the contamination plume, and establish concentration gradients of detected contaminants within the plume. Based on these results, horizontal and vertical limits of the plume area(s) and contaminant isopleth contours will be mapped to the project area.

11.0 ESTIMATION OF THE RATE OF CONSTITUENT MIGRATION

Groundwater travel time or average linear groundwater flow velocity will serve as the basis for estimating the rate of contaminant migration at the facility. Groundwater flow rates should represent the maximum rate of contaminant migration with variations among contaminants due to geohydrochemical processes including molecular diffusion, mechanical mixing, sorption-desorption, ion-exchange, hydrolysis and biodegradation. However, due to the difficulties in estimating the effects of many of the processes on contaminant migration rates and the desire to produce relatively conservative (higher) estimates, only sorption processes will be incorporated into rate calculations.

Groundwater flow velocities will be calculated using the following modification of Darcy's Law:

$$V = K*(dh/dl)/n_e$$

where: K = Hydraulic conductivity (ft/day)
n_e = Effective porosity (unitless)
dh/dl = Hydraulic gradient (ft/ft)

Initial estimates of hydraulic conductivity will be determined from grain-size analyses and slug test results and will be compared to data collected during our previous investigations. Estimates for effective porosity for soils of similar grain size distribution to those at the site will be determined from the literature. Hydraulic gradients will be calculated from water level measurements obtained as described in Section 6.2.5.

Distribution coefficients for metals will be obtained directly from published literature, whereas, distribution coefficients for organic chemicals will be calculated from octanol water partition coefficients and estimates of organic carbon content of the aquifer media. Octanol-water partitioning coefficients for organic constituents will be obtained directly from published literature. Estimates of bulk density and porosity will be determined from results of visual/manual classification of soils and standard penetration resistance tests as described in Section 6.1. Average velocities of contaminant constituents will then be calculated in accordance with the following equation (USEPA, 1985):

$$v_c = v/R$$

where: v_c = Average velocity of contaminant constituent (ft/day)
v = Average linear groundwater flow velocity (ft/day)
R = Retardation factor (unitless)

12.0 PROJECT SCHEDULE

A schedule for implementation of the Comprehensive Site Assessment Workplan, along with appropriate milestones, is exhibited in Drawing 12.1. One drill rig and a Site Manager will be dedicated to the site

throughout all phases of the investigation. Development, purging, sampling and testing of the wells will occur after all wells have been installed.

13.0 REFERENCES

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Groundwater Section, North Carolina Department of Environment, Health and Natural Resources, Groundwater Section Guidelines for the Investigation and Remediation of Soils and Groundwater, March, 1993.

Horton and Victor, The Geology of the Carolinas. Carolina Geological Society Fiftieth Anniversary Volume, 1991.

Law Engineering and Environmental Services, Inc., "Leaking Pipeline and Underground Storage Tank Site Assessment Report, Building 4075 Pipeline, MCAS Cherry Point, NC", dated January 5, 1995.

Murray, L.C., and Keoughan, 1990, U.S. Geological Survey, "Hydrogeologic, Water-Level, Air and Water-Quality Data from Monitoring Wells at the U.S. Marine Corps Air Station, Cherry Point, North Carolina, Report 89-4200, Raleigh, NC, 86p.

North Carolina Department of Environment, Health, and Natural Resources, Division of Environmental Management, Groundwater Section, August, 1990, Guidelines for Remediation of Soil contaminated by Petroleum. August.

United States Environmental Protection Agency (USEPA), 1985. Water Quality Assessment: A Screening Procedure for Toxic and Conventional Pollutants in Surface and Groundwater - Parts I & II, Environmental Research Laboratory, Office of Research and Development, Athens, Georgia.

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TABLE

TABLE 8.1
SAMPLE ANALYSIS SUMMARY TABLE

Pit 15

SAMPLE COLLECTION METHOD	NUMBER OF SAMPLE LOCATIONS	TOTAL ANALYSIS QUANTITY														
		SOIL								WATER						
		TPH 3550/ 5030	TPH 9071/ 8021	TPH SW 846/ 9071	TOTAL LEAD	TCLP METALS	FLASH POINT	PH	GRAIN SIZE	502.2	601	602	625	8 RCRA METALS	TOTAL LEAD* (H^2O) 239.2	
Soil Borings	4	8	--	--	--	--	--	--	--	--	--	--	--	--	--	
Handauger Borings	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Sample Existing Wells	3	--	--	--	--	--	--	--	--	--	--	3	3	--	3	
Type II Wells/Borings	5	10	--	--	--	--	--	--	1	--	--	5	5	--	5	
Type III Wells/Borings	1	--	--	--	--	--	--	--	--	--	--	1	1	--	1	
6-Inch Well/Borings	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
Trip Blank	--	--	--	--	--	--	--	--	--	--	--	1	1	--	1	
Duplicate	--	2	--	--	--	--	--	--	--	--	--	1	1	--	1	
Rinsate	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	
TOTAL Number of Analysis		20	0	0	0	0	0	0	1	0	0	12	11	0	11	

* EPA Method 239.2/3030C preparation

DRAWINGS

66GW47▲ ■66GW48

NORTH

NOTE: PROPOSED SAMPLE LOCATIONS ARE MARKED WITH BOLD TEXT

APPROXIMATE AREA OF INVESTIGATION FOR PIT #15

REFUELING PITS

▲66GW53

▲66GW54

66GW58▲

66GW46■ ▲66GW06

66SB22

66GW51

66SB19

66GW56▲

APPROXIMATE LEAK LOCATION

66SB20

66SB21

66GW52

66GW55▲

CONCRETE

PIT 15

APPROXIMATE SHALLOW GROUNDWATER FLOW DIRECTION

56GW21▲

PIT 14

66GW41▲

56B6

▲56GW22

PIT 13

56HP22

56HP23

PIT 12

TYPE II MONITORING WELLS 56GW21, 66GW06 AND 66GW41 WILL BE RESAMPLED DURING THE INVESTIGATION OF PIT 15.

GRASS ISLAND

66GW07▲

66SB16

56B7

■66GW13

56GW18▲

56HP21

GRASS ISLAND

56GW26▲

56B8

56HP15

56HP14

66GW05▲ ■66GW14

56HP18

56HP9

56HP17

56HP16

■56GW09

56GW10

56HP10

▲56GW13

50500L06(1:100)

66GW40▲

56HP25

REFUELER TRUCK STORAGE AND PARKING AREA (MWSS 274 REFUELERS)

LEGEND

▲(56,66)GW01	TYPE II (SHALLOW) MONITORING WELL LOCATION
■(56,66)GW01	TYPE III (DEEP) MONITORING WELL LOCATION
●(56,66)HP01	HYDROPUNCH LOCATION – S=SHALLOW, D=DEEP
⊕(56,66)B01	SOIL BORING LOCATION
⊕(56,66)GW51	LOCATION OF FREE PRODUCT RECOVERY WELL
— · — · — · —	EXISTING PIPELINE (ACTIVE)
— — — — —	ABANDONED 6" DIAMETER PIPELINE A
-x-x-x-x-x-	CHAIN-LINK FENCE

NOTES:

1. DRAWING REFERENCED FROM NAVAL FACILITIES ENGINEERING COMMAND DRAWING NO.S 772863, 4077486, 4167065, 4167066, AND 3925.
2. MONITORING WELL AND SOIL BORING LOCATIONS SURVEYED BY McKIM & CREED. VERTICAL DATUM IS BASED ON MONUMENT 13–93 WITH A MEAN GIVEN ELEVATION OF 27.12 FEET (MEAN SEA LEVEL). SURVEY DATA COULD NOT BE LOCATED FOR HYDROPUNCH LOCATIONS 56HP# AND SOIL BORING LOCATIONS 56SB# AND WERE OBTAINED FROM MAPS IN THE REPORT BY WESTON/BAKER DATED AUGUST 13, 1992.

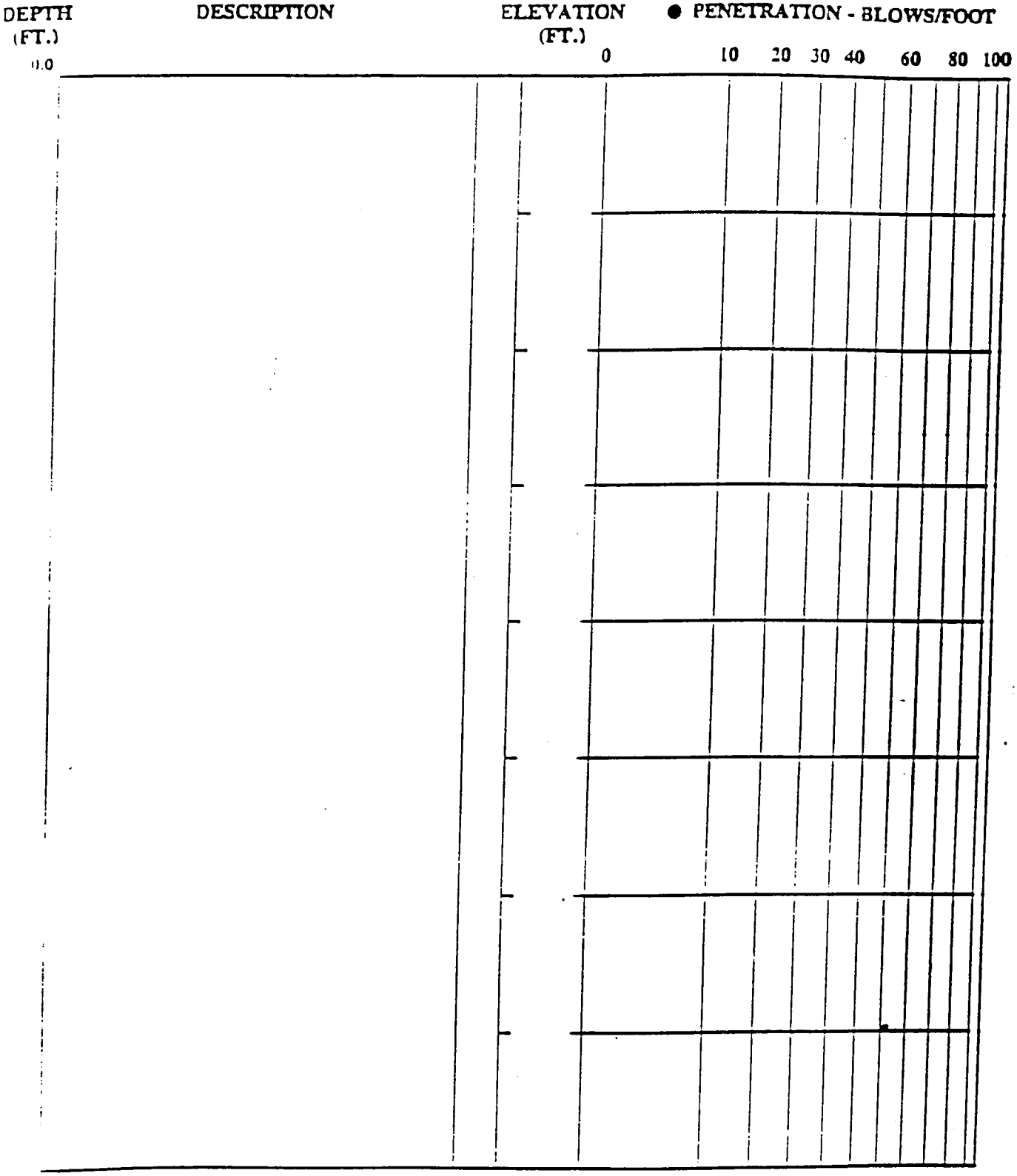
LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.
RALEIGH, NORTH CAROLINA

SITE MAP AND SAMPLE LOCATION PLAN
PIT #15
MCAS CHERRY POINT
CHERRY POINT, NORTH CAROLINA

DRAWN: JPW	DATE: SEPTEMBER, 1996
DFT CHECK: RWS	SCALE: 1"=100'
ENG CHECK: JT	JOB:30740-5-0500/194
APPROVAL: BAB	DWG: 1.2

REFERENCE:

DRAWING 6.1



REMARKS:

TEST BORING RECORD

BORING NUMBER
DATE DRILLED
PROJECT NUMBER
PROJECT
PAGE 1 OF 1

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED ABOVE

DRAWING 6.2.2

North Carolina - Department of Environment, Health, and Natural Resources
Division of Environmental Management - Groundwater Section
P.O. Box 29535 - Raleigh, N.C. 27626-0535
Phone (919) 733-3221

FOR OFFICE USE ONLY
QUAD. NO. _____ SERIAL NO. _____
Lat. _____ Long. _____ RO _
Minor Basin _____
Basin Code _____
Header Ent. _____ GW-1 Ent.

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: _____

STATE WELL CONSTRUCTION
DRILLER REGISTRATION NUMBER: _____ PERMIT NUMBER: _____

1. WELL LOCATION: (Show sketch of the location below)
   Nearest Town: _____ County: _____
   _____
   (Road, Community, or Subdivision and Lot No.)
2. OWNER _____
   ADDRESS _____
   (Street or Route No.)
   _____
   City or Town State Zip Code
3. DATE DRILLED _____ USE OF WELL _____
4. TOTAL DEPTH _____
5. CUTTINGS COLLECTED YES ☐ NO ☐
6. DOES WELL REPLACE EXISTING WELL? YES ☐ NO ☐
7. STATIC WATER LEVEL Below Top of Casing: _____ FT.
   (Use "+" if Above Top of Casing)
8. TOP OF CASING IS _____ FT. Above Land Surface*

* Casing Terminated at or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118

9. YIELD (gpm): _____ METHOD OF TEST _____
10. WATER ZONES (depth): _____
    _____
11. CHLORINATION: Type _____ Amount _____
12. CASING:

	Depth		Diameter	Wall Thickness or Weight/Ft.	Material
From	To	Ft.			
From	To	Ft.			
From	To	Ft.			

13. GROUT:

	Depth		Material	Method
From	To	Ft.		
From	To	Ft.		

14. SCREEN:

	Depth		Diameter	Slot Size	Material
From	To	Ft.	in.	in.	
From	To	Ft.	in.	in.	
From	To	Ft.	in.	in.	

15. SAND/GRAVEL PACK:

	Depth		Size	Material
From	To	Ft.		
From	To	Ft.		

16. REMARKS: _____

DEPTH From	DEPTH To	DRILLING LOG Formation Description

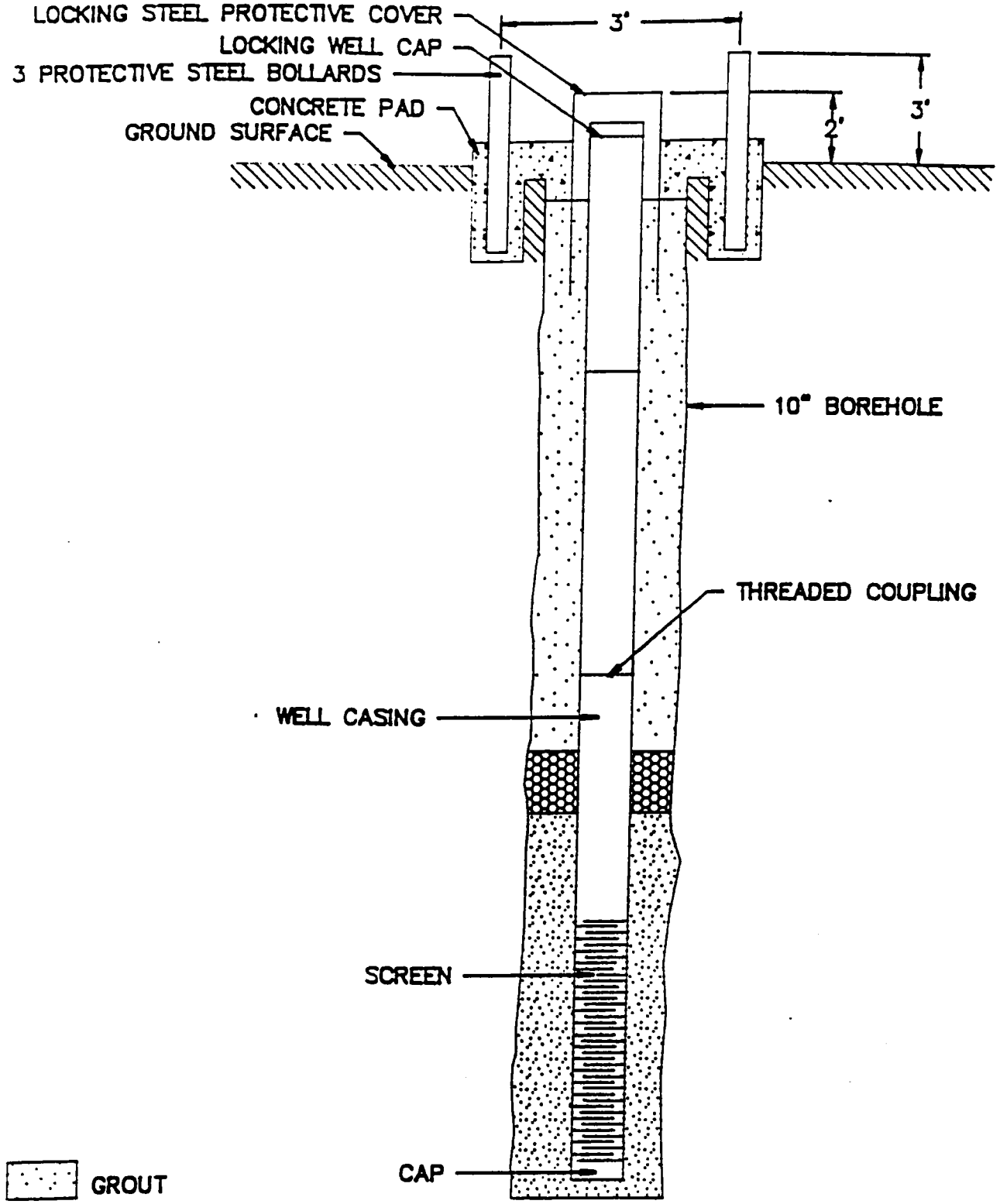
If additional space is needed use back of form

LOCATION SKETCH

(Show direction and distance from at least two State Roads, or other map reference points)

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

_____ _____



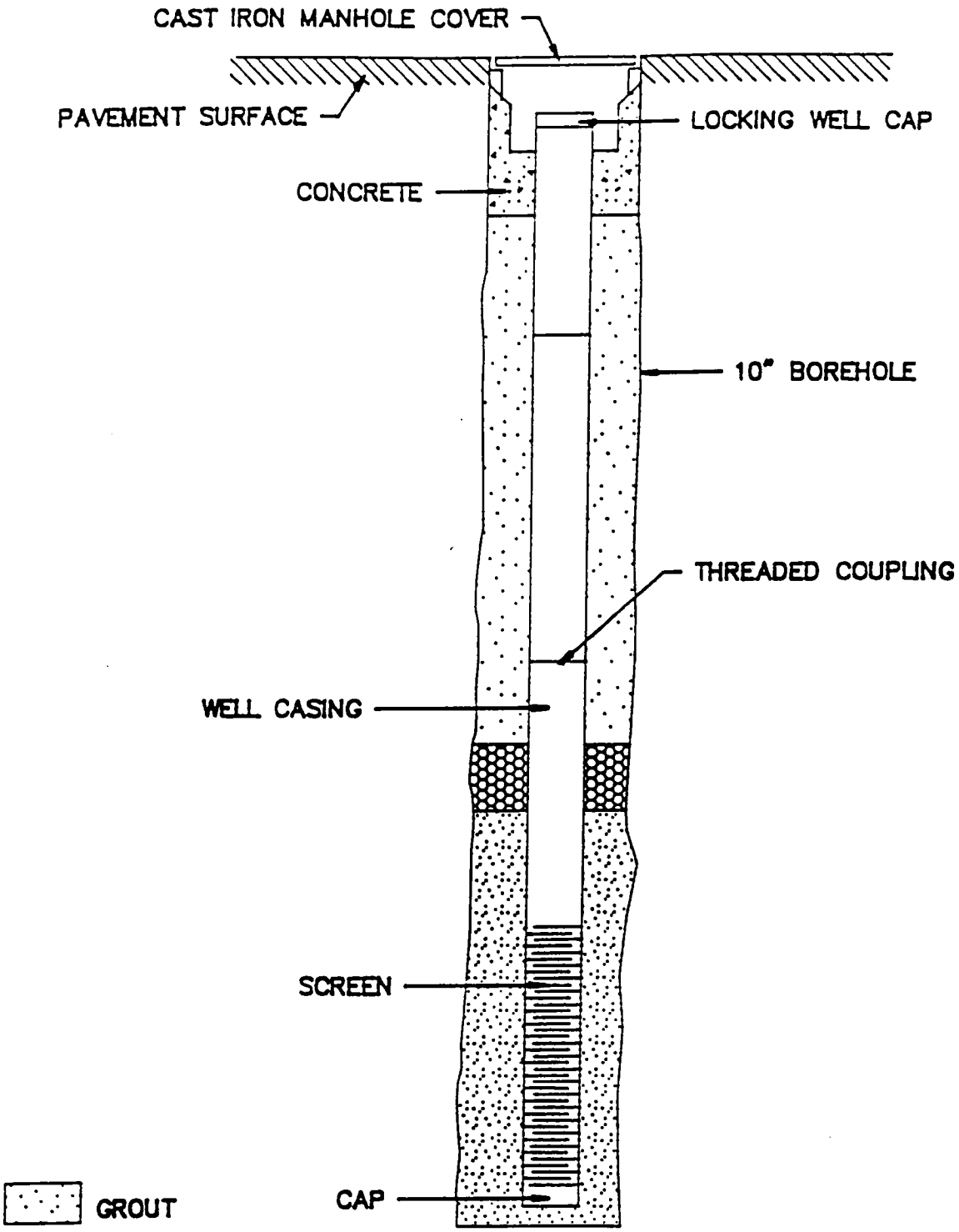
6-2-3A

LAW ENGINEERING
RALEIGH, NORTH CAROLINA

TYPE II MONITORING WELL SCHEMATIC

DRAWN: [illegible]	DATE: NOVEMBER 1993
DFT CHECK:	SCALE: NOT TO SCALE.
ENG CHECK:	JOB NO. 475-[illegible]
APPROVAL:	DWG NO. 6.2.3-A

REFERENCE DWGS:



6-2-38

LAW ENGINEERING
RALEIGH, NORTH CAROLINA

TYPE II MONITORING WELL SCHEMATIC

DRAWN:	DATE: NOVEMBER 1993
DFT CHECK:	SCALE: NOT TO SCAL.
ENG CHECK:	JOB NO. 475–
APPROVAL:	DWG NO. 6.2.3–B

REFERENCE DWGS:

DRAWING 6.2.4

LAW ENGINEERING
3301 ATLANTIC AVENUE
RALEIGH, NORTH CAROLINA 27604

MONITORING WELL DEVELOPMENT WORKSHEET

LAW JOB NUMBER _____ MONITORING WELL NUMBER _____

SITE NAME _____

DATE (MO/DAY/YR) _____ TIME (MILITARY) _____

FIELD PERSONNEL _____

WEATHER CONDITIONS _____

TOTAL WELL DEPTH (TWD) _____ 1/10 FT. (DEPTH BELOW MEASURING POINT

HEIGHT OF MEASURING POINT ABOVE LAND SURFACE _____ 1/10 FT.

DESCRIPTION OF MEASURING POINT _____

DEPTH TO GROUNDWATER (DGW) _____ 1/100 FT. (DEPTH BELOW MEASURING POINT)

METHOD OF WELL EVACUATION TEFLON BAILER _____ OTHER: _____

TOTAL VOLUME OF WATER REMOVED _____ 1/10 GAL. CASING DIAMETER _____ In.

CASING MATERIAL PVC _____ S.S. _____ TEFLON _____ OTHER _____

SCREENED INTERVAL (FROM ID PLATE) _____ (DEPTHS BELOW LAND SURFACE - FT.)

STEEL GUARD PIPE AROUND CASING YES____ NO_____ COMMENTS _____

LOCKING CAP YES____ NO_____ _____

PROTECTIVE POST/ABUTMENT YES____ NO_____ _____

NONPOTABLE LABEL YES____ NO_____ _____

ID PLATE YES____ NO_____ _____

WELL INTEGRITY SATISFACTORY YES____ NO_____ _____

WELL YIELD LOW_____ MODERATE_____ HIGH_____ COMMENTS _____

FIELD ANALYSES

VOLUME (1/10 GAL.)				
TURBIDITY*				

*VISUAL DETERMINATION ONLY
(1) CLEAR (2) SLIGHT (3) MODERATE (4) HIGH

DRAWING 6.4

LAW ENGINEERING
3301 ATLANTIC AVENUE
RALEIGH, NORTH CAROLINA 27604

ENVIRONMENTAL DEPARTMENT

MONITORING WELL CASING AND WATER ELEVATION WORKSHEET

PROJECT NAME _____ JOB NUMBER _____

LOCATION _____ DATE _____

DESCRIPTION OF SURVEY DATUM _____

FIELD PERSONNEL _____

MEASURING DEVICE(S) _____

WELL NUMBER	MEASURING POINT CALCULATIONS			DEPTH TO WATER (FT)	ELEV OF WATER (FT)	PRODUCT THICKNESS (FT)	COMMENTS (ODOR, WELL CONC PROTECTIVE COVE CONDITION)
	ROD HEIGHT (FT)	INSTRUMENT HEIGHT (FT)	ELEV OF MEASURING POINT (1) (FT)				

(1) Measuring point top of casing unless otherwise noted.
ND = None detected: equipment capable of measuring ≥0.01 feet.

DRAWING 7.2

HEADSPACE ANALYSIS RESULTS

SITE/JOB NAME _____ DATE _____

SAMPLER NAME _____ TEMPERATURE _____

JOB NUMBER _____ SUNNY _____ CLOUDY _____

SAMPLE I.D.	SAMPLE DEPTH	SOIL TYPE/DESCRIPTION	BACKGROUND READING (PPM)	SAMPLE READING (PPM)	ACTUAL * READING (PPM)

PID or FID Model _____

Electron Volts of Lamp _____

Type of Calibration Gas _____

Concentration (PPM) _____

CALIBRATION(S)			
Date			
Time			
Background Readings (PPM)			

LAW ENGINEERING
3301 ATLANTIC AVENUE
RALEIGH, NORTH CAROLINA 27604

MONITORING WELL AND SAMPLING FIELD DATA WORKSHEET

LAW JOB NUMBER_____ MONITORING WELL NUMBER_____

SITE NAME _____

DATE (MO/DAY/YR)_____ TIME (MILITARY)_____

FIELD PERSONNEL _____

WEATHER CONDITIONS _____

TOTAL WELL DEPTH (TWD) _____1/10 FT. (DEPTH BELOW MEASURING POINT)

HEIGHT OF MEASURING POINT ABOVE LAND SURFACE _____1/10 FT.

DESCRIPTION OF MEASURING POINT _____

DEPTH TO GROUNDWATER (DGW) _____1/100 FT. (DEPTH BELOW MEASURING POINT)

LENGTH OF WATER COLUMN (LWC) = TWD - DGW = _____1/100 FT.

ONE STANDING WELL VOLUME (SWV) = LWC X_____1/10 GAL.

THREE STANDING WELL VOLUMES = 3XSWV = _____1/10 GAL = STANDARD EVACUATION VOLUME

METHOD OF WELL EVACUATION TEFLON BAILER _____ OTHER:_____

TOTAL VOLUME OF WATER REMOVED _____1/10 GAL. CASING DIAMETER _____ In.

CASING MATERIAL PVC_____ S.S._____ TEFLON_____ OTHER_____

SCREENED INTERVAL (FROM ID PLATE) _____ (DEPTHS BELOW LAND SURFACE - FT.)

STEEL GUARD PIPE AROUND CASING YES____ NO_____ COMMENTS_____

LOCKING CAP YES____ NO_____ _____

PROTECTIVE POST/ABUTMENT YES____ NO_____ _____

NONPOTABLE LABEL YES____ NO_____ _____

ID PLATE YES____ NO_____ _____

WELL INTEGRITY SATISFACTORY YES____ NO_____ _____

WELL YIELD LOW_____ MODERATE_____ HIGH_____ COMMENTS_____

FIELD ANALYSES

VOLUME (1/10 GAL.)				
pH (S.U.)				
SP. COND. (μMHOS/CM)				
WATER TEMP. (°C)				
TURBIDITY*				

*VISUAL DETERMINATION ONLY
(1) CLEAR (2) SLIGHT (3) MODERATE (4) HIGH

08416

CHAIN OF CUSTODY RECORD

Law Engineering & Environmental Services, Inc.
3355 McLemore Drive
Pensacola, FL 32514
(904) 857-0606

SAMPLING INFORMATION
NPDES NUMBER

NAME OF FACILITY: _____

STREET ADDRESS: _____

PROJECT NAME | **JOB NO.**

SAMPLERS (SIGNATURE)

SAMPLING DATE

TIME	GRAB	COMP.	*SOURCE CODE	SAMPLE STATION DESCRIPTION	TOTAL NO. OF CONTAINERS	40 ml G VOA HCl	1 L G - AMBER	8 oz. G, W/M	2 oz. G, W/M	1 L G (H_2SO_4)	500 ml - AMBER	1 L. PL (HNO_3)	1 L. PL (H_2SO_4)	1L. PL (NaOH+Ascorbic Acid)	1 L. PL (Zn Acetate + NaOH)	1 L. PL	4 oz. PL W/M	250 ml PL	1 L. TEFLON					LENL LAB NO.

RELINQUISHED BY: (SIGNATURE)	DATE / TIME	RECEIVED BY: (SIGNATURE)	DATE / TIME	RELINQUISHED BY: (SIGNATURE)	RECEIVED BY LABORATORY: (SIGNATURE)	DATE / TIME

DISTRIBUTION: ORIGINAL AND YELLOW COPIES ACCOMPANY SAMPLE SHIPMENT TO LABORATORY. PINK COPY RETAINED BY SAMPLERS. YELLOW COPY RETAINED BY LABORATORY.

REMARKS _____

***SOURCE CODES**

RECOVERY WELL - RW
RCRA MONITORING WELL - MW
SOIL / SEDIMENT - SO
SLUDGE - SL
NPDES DISCHARGE - ND
DRINKING WATER - DW
HAZARDOUS WASTE - HW
SURFACE WATER - SW
NON-AQUEOUS - NA

Law Engineering &
Environmental Services, Inc.
3355 McLemore Drive
Pensacola, FL 32514
(904) 857-0606

Analytical Request Form

To: _____ Attn: _____

From: _____ _____
(Branch/Company Name) (Dept or Name)

COC Number: _____

Project Name: _____ Project Number: _____

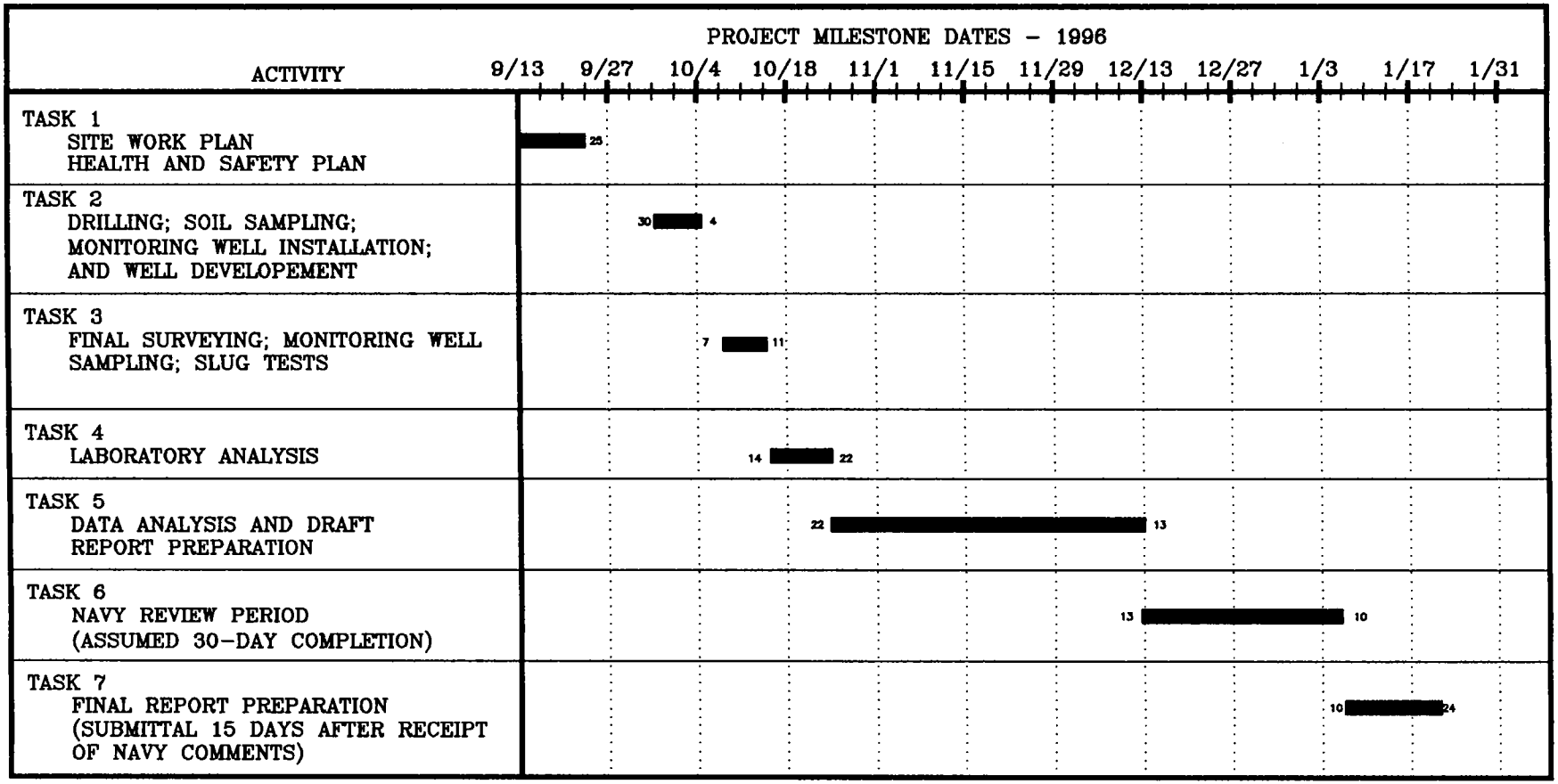
Date Shipped: _____ Date results requested: _____

Sample ID	Analysis Requested	Detection Limits Req.	Sample Type	Method

Comments:

DRAWING NO. 12.1 – PROJECT SCHEDULE

DEPARTMENT OF THE NAVY
ATLANTIC DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
LEAKING UNDERGROUND PIPELINE SITE ASSESSMENT
PIT 15
MARINE CORPS AIR STATION – CHERRY POINT, NORTH CAROLINA



PIT15

APPENDIX A

HEALTH AND SAFETY PLAN

HEALTH AND SAFETY PLAN
SOIL AND GROUNDWATER ASSESSMENT ACTIVITIES

PIT 15
MARINE CORPS AIR STATION
CHERRY POINT, NORTH CAROLINA

Issued: September 24, 1996
Navy Contract No. 62470-93-D-4020
Law Engineering Job No. 30740-5-0500/0194

Law Engineering and Environmental Services, Inc.
Raleigh, North Carolina

HEALTH AND SAFETY PLAN
SOIL AND GROUNDWATER ASSESSMENT ACTIVITIES

PROJECT:	Pit 15
LOCATION OF SITE:	Cherry Point, MCAS
LAW JOB NO.	30740-5-0500/0194
CLIENT:	United States Navy - Atlantic Division

REVIEW AND APPROVAL

Principal Hydrogeologist	Brian J. Bellis, P.G.	___
Project Manager	Jeffrey B. Tyburski, P.G.	___
Safety Officer	Mike Kalar	___

DATE OF PLAN PREPARATION

September 24, 1996

DATES OF PLANNED FIELD ACTIVITIES

September 30, 1996 through October 11, 1996

SAFETY MEETING CONDUCTED: (LOCATION)_____(DATE):_____

EMERGENCY PHONE NUMBERS

Hospital: Hospital route is shown on attached Drawing 1.

	ON BASE	OFF BASE
Hospital:	**5451**	**247-1616**
EMS:	**4419**	**466-4419**
Fire:	**3333**	**466-3333**
Police:	**110**	**466-3615**
Operator:	**113**	**0**
Information:	**115**	**466-2811**

Principal Project Professional:	Brian J. Bellis, P.G.	(919) 781-8214 (H)
Health and Safety Officer:	Mike Kalar	(919) 876-0416
Law Engineering Contact:	Jeffrey B. Tyburski	(919) 876-0416
Activity Contact:	Bill Powers	(919) 466-4598

Location for on-site emergency gathering will be determined during Site Safety Meeting.

DESCRIPTION OF POTENTIAL HAZARDS

-Fire or explosion
-Exposure to petroleum fuels through inhalation, skin absorption or ingestion
-Vehicular and aircraft traffic

PERSONNEL ACCESS

Personnel who attended LAW's site safety meeting and are authorized to enter this site:

1)_____ 7)_____
2)_____ 8)_____
3)_____ 9)_____
4)_____ 10)_____
5)_____ 11)_____
6)_____ 12)_____

Other personnel authorized to enter on a limited basis with an escort:

1)_____
2)_____

PLANNED FIELD ACTIVITIES

Advance four soil borings, install five Type II and one Type III monitoring wells, develop monitoring wells, collect soil and groundwater samples, conduct slug tests and survey well locations.

MONITORING PROCEDURES

Air monitoring will be performed to evaluate employee exposures to total hydrocarbons (as methane equivalents) will be performed using a direct reading HNU photoionization detector (PID) or Foxboro® Organic Vapor Analyzer (OVA) Flame Ionization Detector (FID). Monitoring will be performed for approximately three minutes at a minimum of one test per hour. However, additional sampling intervals may be increased as if site conditions warrant (i.e. evidence of free product, increase in detectable odors, site workers sensitivity).

Based upon a review of the current OSHA PEL's and ACGIH TLV's, LAW has established an "Action Level" of 50 ppm to protect workers from potential airborne exposures to total hydrocarbons. Presently no OSHA PEL or ACGIH TLV has been established for Fuel Oil, but an OSHA PEL and ACGIH TLV of 10 parts per million (ppm) has been published for naphthalene. Naphthalene is a constituent typically found to range between 0.11% to 0.14% by volume in Fuel Oil.

Action level is a term used by the Occupational Safety and Health Administration (OSHA) and the National Institute of Occupational Safety and Health (NIOSH) to express the level of toxicant which requires medical surveillance, and is usually one half of the Permissible Exposure Limit (PEL). Action Levels for this project are as follows:

• 0.0 ppm	75 ppm	Level D Protection
• 50 ppm	100 ppm	Stop work and conduct additional monitoring to determine if ambient concentrations of total hydrocarbons have decreased. Conduct additional ring using Drager tubes specific for naphthalene to determine if ambient levels exceed 10 ppm.
• > 150 ppm		Stop work

Should concentrations exceed 50 ppm in the breathing zone (sustained for 1 to 2 minutes), all site work will cease and the site will be evacuated pending guidance from the Health and Safety Officer.

LEVELS OF PROTECTION

Based upon current knowledge of the project, it is anticipated that the field activities can be accomplished using Level D Personal Protective Equipment (PPE). Modified Level D protection includes the use of work uniform, hard hat, nitrile inner gloves, solvex or nitrile gauntlet style outer gloves, American National Standards Institute (ANSI) approved eye protection and foot protection.

If air sampling via the use of Drager tubes indicates that the concentration of 10 ppm is exceeded for naphthalene, personnel will evacuate the site and notify the LAW HSO that Level C PPE and respirators will be required to continue the field activities. Level C protection includes National Institute for Occupational Safety and Health (NIOSH) fullface negative pressure respirator equipped with combination organic vapor HEPA cartridges, polycoated tyvec fullbody protection, nitrile inner liner gloves, solvex/nitrile gauntlet-style outer gloves, ANSI-approved safety toe shoes, and hard hat.

DECONTAMINATION (Petroleum products)

Skin	-	wash with soap and water
Clothing	-	wash with detergent and rinse thoroughly
Equipment	-	steam clean or detergent wash

MEDICAL SURVEILLANCE

Avoid frequent or prolonged skin contact. Monitor skin and eyes for dermatitis, allergic reaction, and eye irritation. If these or other symptoms develop, seek qualified medical attention. Workers with histories of liver, kidney, or nervous disorders should be advised as to possible increased risk.

Symptoms of Acute Exposure to Fuel Oil and Naphthalene include: High vapor levels can cause irritation of the respiratory tract, headaches, nausea and mental confusion. Loss of consciousness occurs with very high concentrations. Liquid contact with skin may cause defatting, drying and irritation. Both vapor and liquid phases are irritating to the eyes.

EMERGENCY PROCEDURES (Petroleum products)

•	Skin	wash with soap and water, rinse well
•	Inhalation	move to fresh air at least 50 feet upwind from vapor source. Seek qualified medical attention.
•	Eyes	flush for a minimum of ten minutes with clean water while holding eyes open. Seek qualified medical attention.
•	Ingestion	do not induce vomiting. If conscious, give water or milk to drink. Seek qualified medical attention.

HEAT STRESS

Symptoms of heat stress include pale, cool or moist skin, excessive sweating, dizziness, nausea, and muscle spasms. Symptoms of heat stroke include red, hot and unusually dry skin, reduced perspiration, nausea, dizziness or confusion, rapid pulse rate and coma.

To prevent heat stress, adjust work schedule, provide shaded rest areas, and maintain body fluids.

FIRE ANTS AND OTHER STINGING INSECTS

Pay particular attention to stinging insects that inhabit the ground during all site activities. Bites or stings by fire ants and ground bees can be dangerous to personnel who have allergies to such stings. Awareness and avoidance of insect nests is the best protection and it is that those individuals who know they are allergic recommended to such insect bites carry appropriate medication. Insect bites should be treated with antiseptics or rubbing alcohol maintained in the vehicle first aid kit.

IN THE EVENT OF POTENTIAL OR ACTUAL FIRE OR EXPLOSION

Evacuate the area immediately. Assemble in the predesignated area and conduct a head count of all personnel. Notify fire department. DO NOT attempt to fight the fire. Notify Project Manager.

WORK PRECAUTIONS

1. No smoking, eating, drinking or chewing of gum or tobacco products while on the site. Avoid hand to mouth contact. A designated smoking and break area may be established off-site. Any such facility must be a minimum of 100 feet from any vapor source and shall be tested for flammable gasses and vapors at the start of work and prior to scheduled break periods each day.

2. Hard hats, safety glasses and steel-toed boots are required to be worn at all times during drilling activities. Persons exposed to vehicular traffic will wear warning vests.

3. When the potential exists for skin contact with liquid hydrocarbons, impervious gloves and foot coverings are required to be worn.

4. Decontamination of equipment, clothing and personnel shall be in accordance with the previous section entitled "Decontamination".

5. Personnel must wash all exposed skin areas with soap and water before departing the site or going on break.
6. Prior to the start of work, all LAW employees and Subcontractor personnel shall be briefed on the contents of this plan by the LAW Field Representative.

FIELD REPRESENTATIVE SUMMARY

During the work covered by this Safety Plan, there were:

___No observed violations of the Safety Plan provisions.

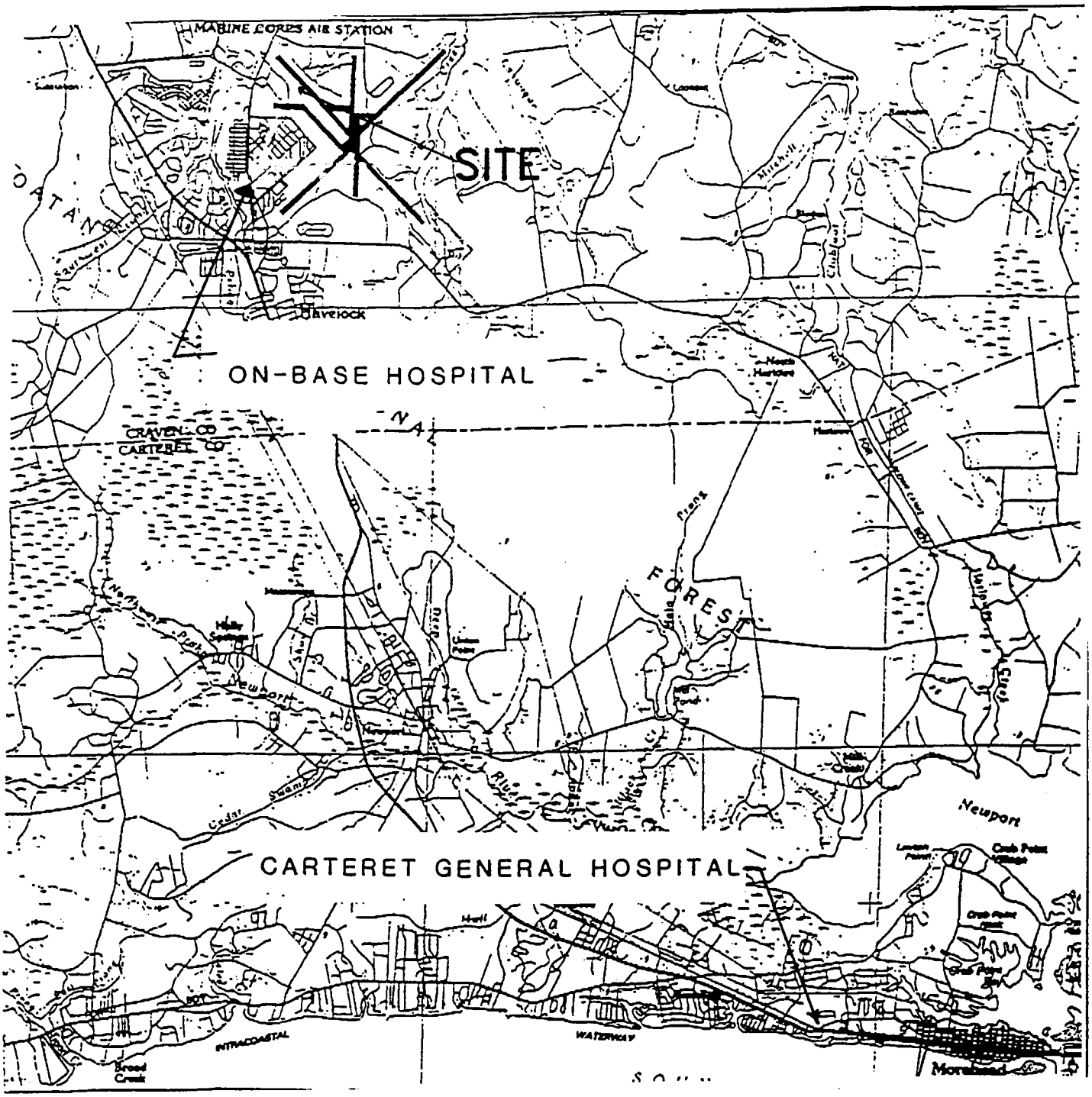
_____ The following violations of the Safety Plan provisions (give details in space below and indicate corrective action taken for each violation noted).

_____
_____
_____
_____
_____

Signature_____ Date_____
Field Representative

Attachments

Drawing 1 Hospital Route Map



NORTH

GRAPHIC SCALE – IN MILES

2 1 0 2 4

LAW ENGINEERING
RALEIGH, NORTH CAROLINA

HOSPITALS AND EVACUATION ROUTES
PIT #15
MARINE CORPS AIR STATION
CHERRY POINT, NORTH CAROLINA

DRAWN: RRF	DATE: SEPTEMBER, 1996
DFT CHECK:	SCALE: AS SHOWN
ENG CHECK:	JOB: 30740-5-0500/194
APPROVAL:	DWG: 1

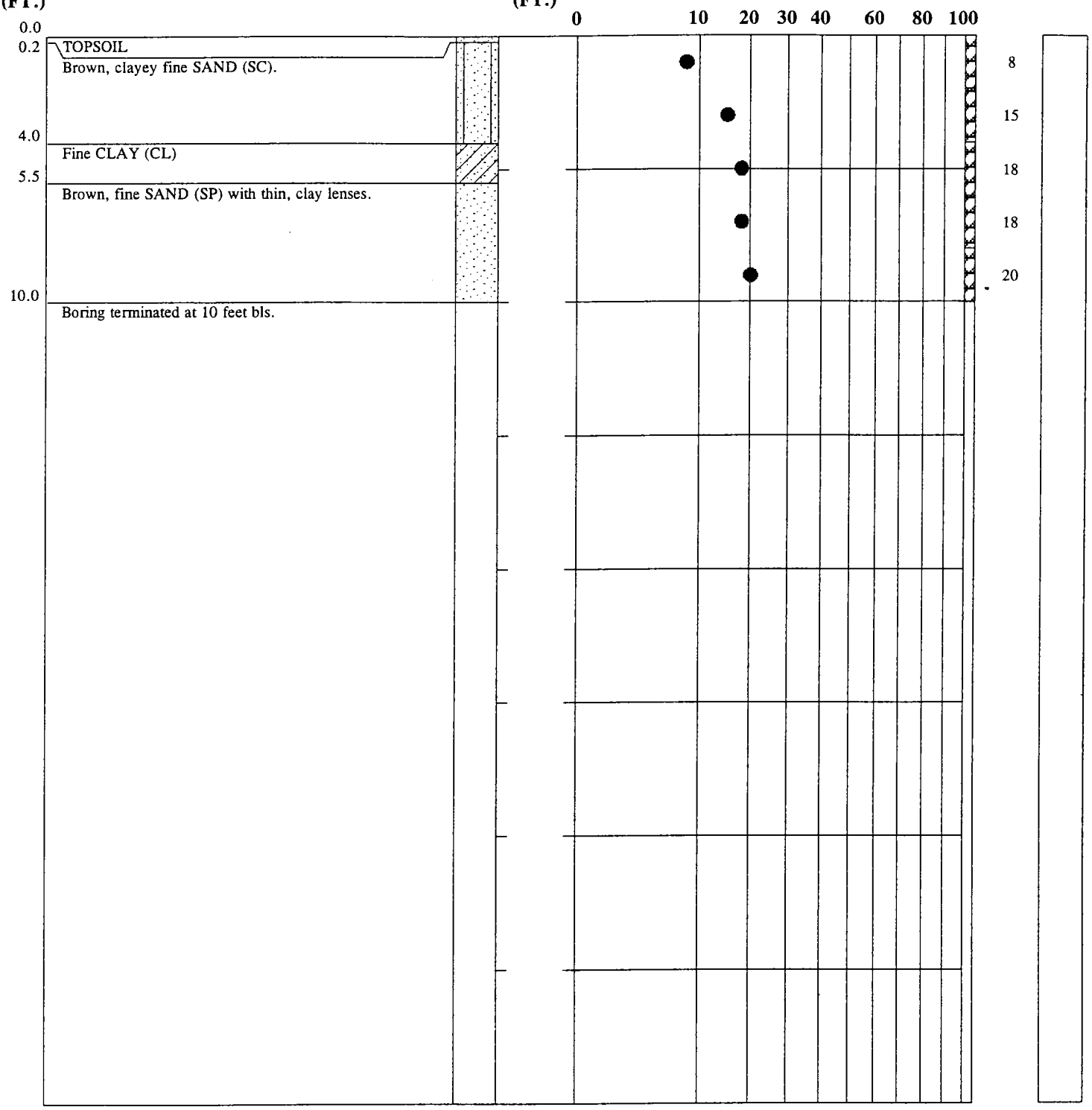
REFERENCE:

DRAFT

APPENDIX B

SOIL TEST BORING RECORDS

DRAFT



REMARKS:

Boring abandoned with bentonite upon completion.

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED ABOVE

TEST BORING RECORD

BORING NUMBER	66SB19
DATE DRILLED	October 4, 1996
PROJECT NUMBER	30740-5-0500/0194
PROJECT	MCAS CHERRY POINT PIT 15
PAGE 1 OF 1	

LAW ENGINEERING

DRAFT

DEPTH (FT.)	DESCRIPTION	ELEVATION (FT.)	PENETRATION - BLOWS/FOOT (0 10 20 30 40 60 80 100)
0.0			
0.2	TOPSOIL Brown, clayey SAND (SC)		14 21
6.0	Brown silty fine SAND (SM).		18 19
8.0	Brown fine SAND (SP).		31
10.0	Boring terminated at 10 feet bls.		

REMARKS:

Boring abandoned with bentonite upon completion.

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED ABOVE

TEST BORING RECORD

BORING NUMBER	66SB20
DATE DRILLED	October 4, 1996
PROJECT NUMBER	30740-5-0500/0194
PROJECT	MCAS CHERRY POINT PIT 15
PAGE 1 OF 1	

LAW ENGINEERING

DRAFT

DEPTH (FT.)	DESCRIPTION	ELEVATION (FT.)
0.0		
0.2	TOPSOIL Brown, fine SAND (SP), little silt.	
4.5	Brown clayey fine SAND (SC).	
5.8	Grey to brown fine SAND (SP).	
10.0	Grade to medium SAND (SP). Strong petroleum odor.	
12.0	Boring terminated at 12 feet bls.	

● PENETRATION - BLOWS/FOOT

0 10 20 30 40 60 80 100

12
12
9
16
13
14

REMARKS:

Broing abandoned with bentonite upon completion.

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED ABOVE

TEST BORING RECORD

BORING NUMBER	66SB21
DATE DRILLED	October 4, 1996
PROJECT NUMBER	30740-5-0500/0194
PROJECT	MCAS CHERRY POINT PIT 15
PAGE 1 OF 1	

LAW ENGINEERING

DRAFT

DEPTH (FT.)	DESCRIPTION	ELEVATION (FT.)	PENETRATION - BLOWS/FOOT
0.0			0 10 20 30 40 60 80 100
1.0	Fine, sandy TOPSOIL.		
	Brown, fine SAND (SP) little silt.		14
			14
			14
			22
			21
10.0	Grade to medium SAND (SP). Slight petroleum odor. Sample moist.		13
			6
14.0	Sample wet--free product grey staining.		
	Boring terminated at 14 feet bls.		

REMARKS:

Boring abandoned with bentonite upon completion.

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED ABOVE

TEST BORING RECORD

BORING NUMBER	66SB22
DATE DRILLED	October 1, 1996
PROJECT NUMBER	30740-5-0500/0194
PROJECT	MCAS CHERRY POINT PIT 15
PAGE 1 OF 1	

LAW ENGINEERING

DRAFT

DEPTH (FT.)	DESCRIPTION	ELEVATION (FT.)
0.0		
1.0	Concrete.	
1.5	Stone.	
	Grey to brown, fine SAND (SP) little silt.	
5.8		
	Light brown, silty fine SAND (SM).	
15.0		
	Gray to fine to medium SAND (SP). Medium to strong petroleum odor--clay lenses (0.25 inches).	
18.0		
	Grade to medium SAND (SP). No odors.	
20.0		
	Boring terminated to 20 feet bls.	

● PENETRATION - BLOWS/FOOT

0 10 20 30 40 60 80 100

23
10
8
34
6

REMARKS:

Type II monitoring well installed to 19.5 feet bls.
Free product detected in well.

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED ABOVE

TEST BORING RECORD

BORING NUMBER	66GW53
DATE DRILLED	October 2, 1996
PROJECT NUMBER	30740-5-0500/0194
PROJECT	MCAS CHERRY POINT PIT 15
PAGE 1 OF 1	

LAW ENGINEERING

DRAFT

DEPTH (FT.)	DESCRIPTION	ELEVATION (FT.)
0.0		
0.3	TOPSOIL Fine, sandy CLAY (SC).	
5.0	Light brown, fine SAND (SP). Little silt.	
14.9	Medium to strong petroleum odor. Grade to medium SAND (SP).	
20.0	Boring terminated at 20 feet bls.	

● PENETRATION - BLOWS/FOOT

0 10 20 30 40 60 80 100

15
11
21
18
21

REMARKS:

Type II monitoring well installed to 19 feet bls.
Free product detected in well.

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED ABOVE

TEST BORING RECORD

BORING NUMBER	66GW54
DATE DRILLED	October 2, 1996
PROJECT NUMBER	30740-5-0500/0194
PROJECT	MCAS CHERRY POINT PIT 15
PAGE 1 OF 1	

LAW ENGINEERING

DRAFT

DEPTH (FT.)	DESCRIPTION	ELEVATION (FT.)	PENETRATION - BLOWS/FOOT
0.0			0 10 20 30 40 60 80 100
0.4	TOPSOIL Brown, fine SAND (SP). Little silt.		12 15 15
14.0	Grade to medium SAND (SP). Little to no petroleum odor.		11
20.0	Boring terminated at 20 feet bls.		31

REMARKS:

Type II monitoring well installed to 20 feet bls. Petroleum sheen present in groundwater from well.

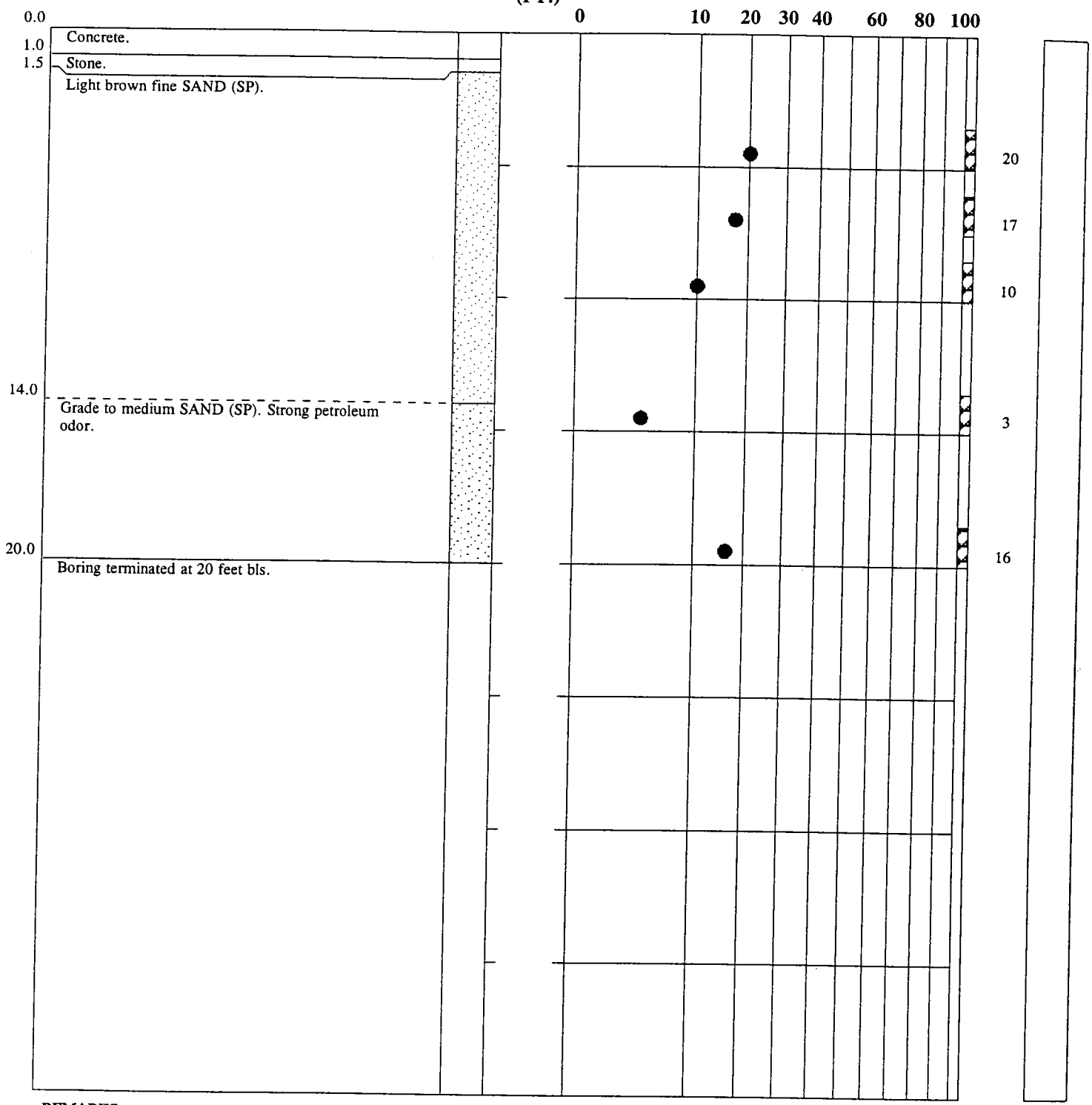
SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED ABOVE

TEST BORING RECORD

BORING NUMBER	66GW55
DATE DRILLED	October 4, 1996
PROJECT NUMBER	30740-5-0500/0194
PROJECT	MCAS CHERRY POINT PIT 15
PAGE 1 OF 1	

LAW ENGINEERING

DRAFT



REMARKS:

Type II monitoring well installed to 18.5 feet bls.
Free product detected in well.

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED ABOVE

TEST BORING RECORD

BORING NUMBER	66GW56
DATE DRILLED	October 2, 1996
PROJECT NUMBER	30740-5-0500/0194
PROJECT	MCAS CHERRY POINT PIT 15
PAGE 1 OF 1	

LAW ENGINEERING

DRAFT

DEPTH (FT.)	DESCRIPTION	ELEVATION (FT.)
0.0		
0.3	TOPSOIL Brown to grey fine SAND (SP). Little silt.	
14.0	Grade to medium SAND (SP). Strong petroleum odor. Grey staining.	
20.0	Boring terminated at 20 feet bls.	

● PENETRATION - BLOWS/FOOT

0 10 20 30 40 60 80 100

12
17
19
23
8

REMARKS:

Type II monitoring well installed to 20 feet bls. Free product detected in well. Well is paired with Type III well 66GW58.

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED ABOVE

TEST BORING RECORD

BORING NUMBER	66GW57
DATE DRILLED	October 3, 1996
PROJECT NUMBER	30740-5-0500/0194
PROJECT	MCAS CHERRY POINT PIT 15
PAGE 1 OF 1	

LAW ENGINEERING

DRAFT

DEPTH (FT.)	DESCRIPTION	ELEVATION (FT.)	● PENETRATION - BLOWS/FOOT 0 10 20 30 40 60 80 100
0.0			
33.3	Outer casing set to 33.3 feet bls.		
	Grey, fine, sandy CLAY (SC).		
38.8			
39.5	Grey, silty, fine SAND (SM).		21
	Grey, medium SAND (SP). Little silt and gravel.		
42.0	Grayish green very fine SAND (SP), little silt and clay and shell fragments.		
45.0			22
	Boring terminated at 45 feet bls.		

REMARKS:

See (paired) boring log for adjacent Type II monitoring well 66GW57 for additional information. Type III monitoring well installed to 42 feet bls upon completion. Free porduct recovery well 66GW59 was installed based upon the soil classification data obtained during the installation of Type III well 66GW58 and adjacent Type II well 66GW57.

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED ABOVE

TEST BORING RECORD

BORING NUMBER	66GW58
DATE DRILLED	October 3, 1996
PROJECT NUMBER	30740-5-0500/0194
PROJECT	MCAS CHERRY POINT PIT 15
PAGE 1 OF 1	

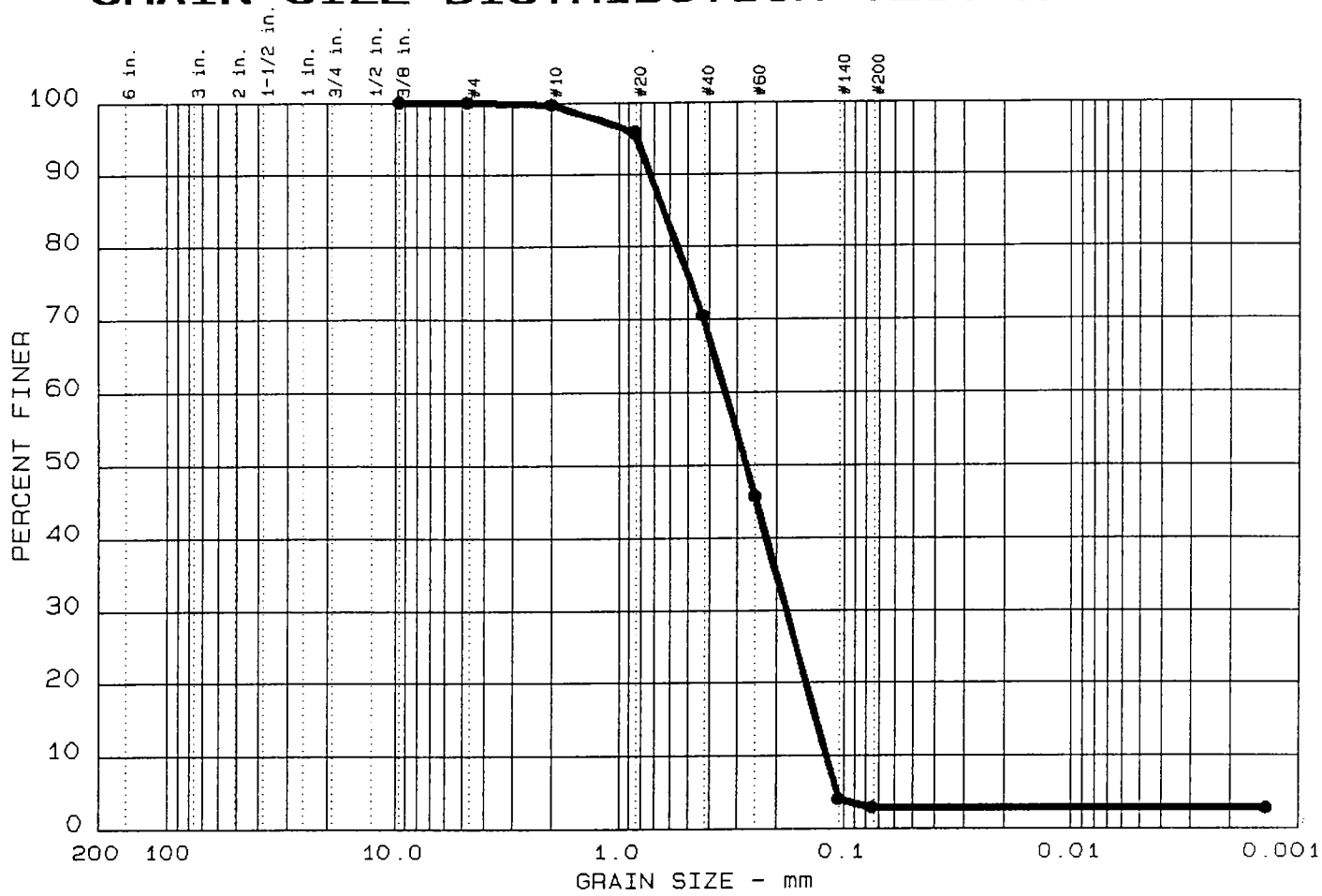
LAW ENGINEERING

APPENDIX C

GRAIN SIZE RESULTS AND HYDRAULIC CONDUTIVITY ESTIMATIONS

DRAFT

GRAIN SIZE DISTRIBUTION TEST REPORT



	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	0.0	97.1	0.1	2.8

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	ND	ND	0.63	0.34	0.27	0.181	0.1326	0.1195	0.81	2.8

MATERIAL DESCRIPTION	USCS	AASHTO
● 66GW57 18.5'-20.0'	ND	ND

Project No.: 30740-5-0500-0194-16
Project: PIT 15
● Location: 66GW57 18.5'-20.0'

Date: 10-25-96

Remarks:
ND=NOT DETERMINED.
SPECIFIC GRAVITY IS ASSUMED.

GRAIN SIZE DISTRIBUTION TEST REPORT

LAW ENGINEERING, INC.

Figure No. 14

DRAFT

GRAIN SIZE DISTRIBUTION TEST DATA Test No.: 14

Date: 10-25-96
Project No.: 30740-5-0500-0194-16
Project: PIT 15

Sample Data

Location of Sample: 66GW57 18.5'-20.0'
Sample Description: 66GW57 18.5'-20.0'
USCS Class: ND Liquid limit: ND
AASHTO Class: ND Plasticity index: ND

Notes

Remarks: ND=NOT DETERMINED. SPECIFIC GRAVITY IS ASSUMED.
Fig. No.: 14

Mechanical Analysis Data

	Initial
Dry sample and tare=	279.79
Tare =	0.00
Dry sample weight =	279.79

Sample split on number 10 sieve
Split sample data:
Sample and tare = 85.87 Tare = 0 Sample weight = 85.87
Cumulative weight retained tare= 0
Tare for cumulative weight retained= 0

Sieve	Cumul. Wt. retained	Percent finer
0.375 inches	0.00	100.0
# 4	0.10	100.0
# 10	0.97	99.7
# 20	3.23	95.9
# 40	25.13	70.5
# 60	46.52	45.7
# 140	82.43	4.0
# 200	83.39	2.9

Hydrometer Analysis Data

Separation sieve is number 10
Percent -# 10 based on complete sample= 99.7
Weight of hydrometer sample: 85.87
Calculated biased weight= 86.17
Automatic temperature correction
Composite correction at 20 deg C =-3.5

Meniscus correction only=-1

Specific gravity of solids= 2.65
Specific gravity correction factor= 1.000
Hydrometer type: 152H Effective depth L= 16.294964 - 0.164 x Rm

Elapsed time, min	Temp, deg C	Actual reading	Corrected reading	K	Rm	Eff. depth	Diameter mm	Percent finer
1440.0	22.0	5.5	2.4	0.0133	4.5	15.6	0.0014	2.8

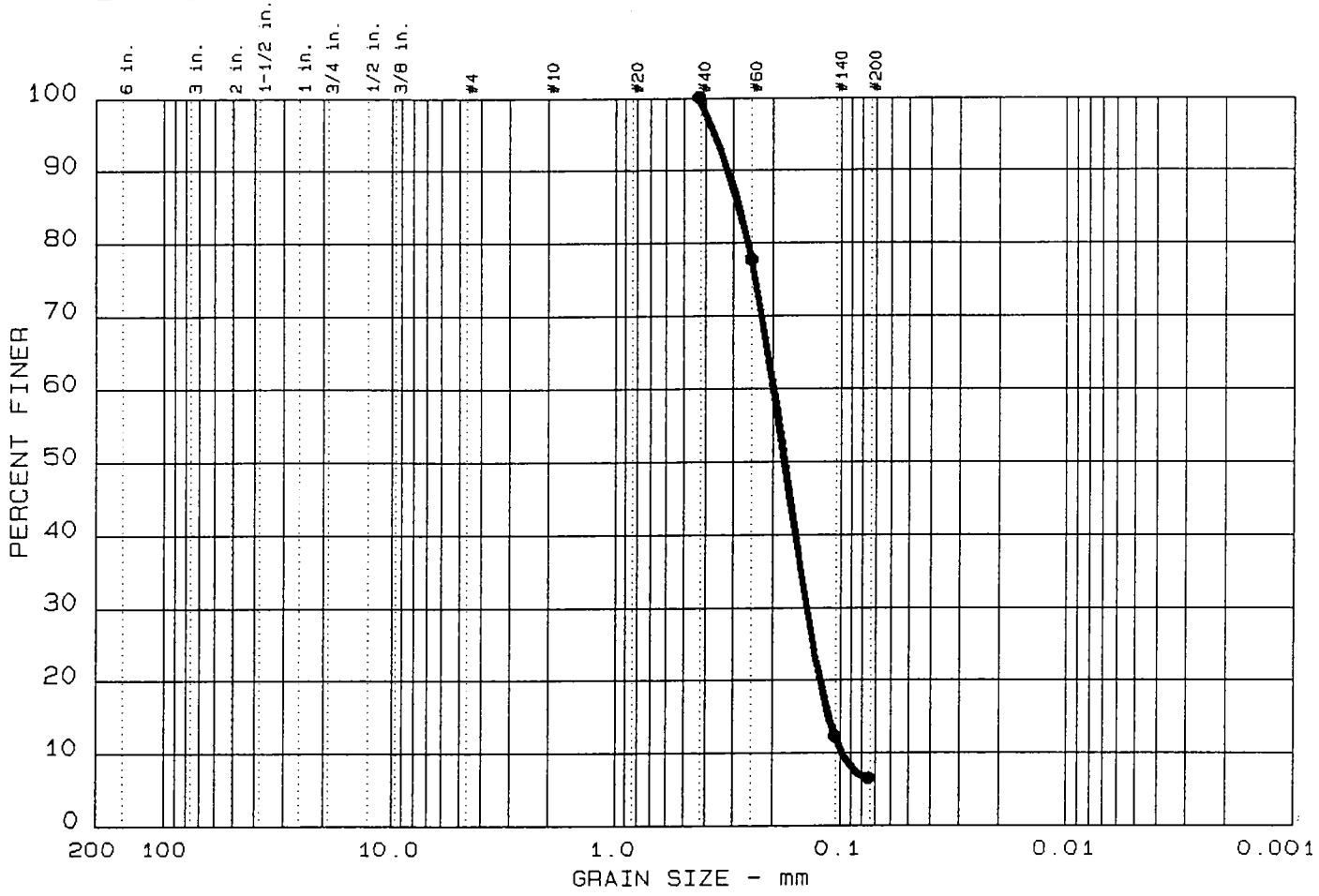
Fractional Components

Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve
% + 75mm. = 0.0 % GRAVEL = 0.0 % SAND = 97.1
% SILT = 0.1 % CLAY = 2.8

D85= 0.63 D60= 0.338 D50= 0.272
D30= 0.1809 D15= 0.13259 D10= 0.11954
Cc = 0.8091 Cu = 2.8314

DRAFT

GRAIN SIZE DISTRIBUTION TEST REPORT



	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	0.0	93.5	6.5	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_C	C_U
●	ND	NP	0.28	0.20	0.18	0.141	0.1127	0.0991	1.01	2.0

MATERIAL DESCRIPTION	USCS	AASHTO
● 66GW58 38.5'-40.0'	ND	ND

Project No.: 30740-5-0500-0194-16
Project: PIT 15
● Location: 66GW58 38.5'-40.0'

Date: 10-25-96

GRAIN SIZE DISTRIBUTION TEST REPORT

LAW ENGINEERING, INC.

Remarks:

ND=NOT DETERMINED

TEST PERFORMED ON -#40 MATERIAL ALONE.

NON-PLASTIC SOIL

Figure No. 15

DRAFT

GRAIN SIZE DISTRIBUTION TEST DATA Test No.: 15

Date: 10-25-96
Project No.: 30740-5-0500-0194-16
Project: PIT 15

Sample Data

Location of Sample: 66GW58 38.5'-40.0'
Sample Description: 66GW58 38.5'-40.0'
USCS Class: ND Liquid limit: ND
AASHTO Class: ND Plasticity index: NP

Notes

Remarks: ND=NOT DETERMINED. TEST PERFORMED ON -#40 MATERIAL ALONE. NON-PLASTIC SOIL
Fig. No.: 15

Mechanical Analysis Data

	Initial
Dry sample and tare=	296.63
Tare =	83.70
Dry sample weight =	212.93

Tare for cumulative weight retained= 0

Sieve	Cumul. Wt. retained	Percent finer
# 40	0.00	100.0
# 60	47.62	77.6
# 140	186.89	12.2
# 200	199.15	6.5

Fractional Components

Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve
% + 75mm. = 0.0 % GRAVEL = 0.0 % SAND = 93.5
% FINES = 6.5

D85= 0.28 D60= 0.199 D50= 0.178
D30= 0.1411 D15= 0.11272 D10= 0.09908
Cc = 1.0081 Cu = 2.0114

DRAFT

LAW ENGINEERING
GEOTECHNICAL, ENVIRONMENTAL & CONSTRUCTION MATERIALS CONSULTANTS

3301 ATLANTIC AVE.
P.O. BOX 18288
RALEIGH, NC 27619
919-876-0416

JOB NO. 30740-S-0500/0194 SHEET 1 OF 2
JOB NAME PIT 15
SUBJECT Hydraulic Conductivity
BY J.T DATE 10/25/96
CHECKED BY BJB DATE 11/3/96

CALCULATION OF HYDRAULIC CONDUCTIVITY FROM GRAIN SIZE DATA

From Grain Size Analysis
Sand = 97.1 %
Silt = 0.1 %
Clay = 2.8 %

Sample: 666W57
collected @ 18.5-20.0 ft bls

A) Hazen Method

$$K = A (d_{10})^2$$

where: K = Hydraulic Conductivity (cm/sec)
A = Coefficient equal to 1 if K is in cm/sec and d_{10} is in mm
d_{10} = Grain Size diameter (in mm) at which 10% of the soil particles are finer, and 90% are coarser.

$K = 1(0.1195)^2 = 0.0143$ cm/sec = 0.858 cm/min = 51.48 cm/hr ⇒
⇒ 1235.52 cm/day = 40.5 ft/day ✓

DRAFT

LAW
ENGINEERING AND ENVIRONMENTAL SERVICES, INC
3301 ATLANTIC AVENUE
RALEIGH, NC 27604

JOB NO. 30740-5-0500 SHEET 1 OF
PHASE 0194 TASK
JOB NAME PIT 15
BY J.T DATE 10/28/96
CHECKED BY BJB DATE 12/3/96

666W58
(38.5-40.0 ft bls)

Sherrard, Dunnigan and Talbot

$K = 0.35 (d_{15})^2$

were $C_u < 10$

$K = (0.35)\ (0.1127)^2 = 0.0045$ cm/sec = 0.27 cm/min = 16.2 cm/hr ⇒

⇒ 388.8 cm/day = 12.76 ft/day ✓

The K value for loose sand can be estimated as 1.5 to 3.0 times the equation value. As a conservative measure we have used 3 times the equation value

⇒ 38.3 ft/day ✓

DRAFT

APPENDIX D

WELL CONSTRUCTION RECORDS

North Carolina - Department of Environmental, Health and Natural Resources
Division of Environmental Management - Groundwater Section
P.O. Box 29535 - Raleigh, N.C. 27626-0535
Phone (919) 733-3221

DRAFT

FOR OFFICE USE ONLY
QUAD. NO._____ SERIAL NO._____
Lat._____ Long._____ RO_____
Minor Basin_____
Basin Code_____
Header Ent._____ GW-1 Ent.

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: LAW Engineering **STATE WELL CONSTRUCTION**
DRILLER REGISTRATION NUMBER: 332 **PERMIT NUMBER:** 66GW53

1. WELL LOCATION: (Show sketch of the location below)
Nearest Town: Havelock County: Craven
PIT 15
(Road, Community, or Subdivision and Lot No.)

2. OWNER Commanding General
ADDRESS MCAS Cherry Point
(Street or Route No.)
Cherry Point NC 28533
City or Town State Zip Code

3. DATE DRILLED 10/2/96 USE OF WELL Monitoring

4. TOTAL DEPTH 19.5

5. CUTTINGS COLLECTED YES ☒ NO ☐

6. DOES WELL REPLACE EXISTING WELL ? YES ☐ NO ☒

7. STATIC WATER LEVEL Below Top of Casing: 17.40 FT.
(Use "+" if Above Top of Casing)

8. TOP OF CASING IS 0 FT. Above Land Surface*
***Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118**

9. YIELD (gpm): NA METHOD OF TEST_____

10. WATER ZONES (depth): surficial aquifer

11. CHLORINATION: Type NA Amount_____

12. CASING:

	Depth			Diameter	Wall Thickness or Weight/Ft.	Material
From	0	To 9	Ft.	2"	sch40	PVC
From		To	Ft.			
From		To	Ft.			

13. GROUT:

	Depth			Material	Method
From	0	To 4	Ft.	Grout	Pour
From	4	To 6	Ft.	Bentonite	Pour

14. SCREEN

	Depth			Diameter	Slot Size	Material
From	9	To 19	Ft.	2"	0.010"	PVC
From		To	Ft.			
From		To	Ft.			

15. SAND/GRAVEL PACK:

	Depth			Size	Material
From	6	To 19.5	Ft.	Torpedo	Sand
From		To	Ft.		

16. REMARKS: NOTE: Well contains free product

DEPTH From	DEPTH To	DRILLING LOG Formation Description
See attached		
boring log		
(Appendix B)		

If additional space is needed use back of form

LOCATION SKETCH
(Show direction and distance from at least two State Roads, or other map reference points)

Attached Site Location Map

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

SIGNATURE OF CONTRACTOR OR AGENT — DATE 10/23/96

Submit original to Division of Environmental Management and copy to well owner.

North Carolina - Department of Environmental, Health and Natural Resources
Division of Environmental Management - Groundwater Section
P.O. Box 29535 - Raleigh, N.C. 27626-0535
Phone (919) 733-3221

DRAFT

FOR OFFICE USE ONLY
QUAD. NO._____ SERIAL NO._____
Lat._____ Long._____ RO_____
Minor Basin_____
Basin Code_____
Header Ent._____ GW-1 Ent.

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: LAW Engineering STATE WELL CONSTRUCTION
DRILLER REGISTRATION NUMBER: 332 PERMIT NUMBER: 66GW54

1. WELL LOCATION: (Show sketch of the location below)
Nearest Town: Havelock County: Craven
PIT 15
(Road, Community, or Subdivision and Lot No.)

2. OWNER Commanding General
ADDRESS MCAS Cherry Point
(Street or Route No.)
Cherry Point NC 28533
City or Town State Zip Code

3. DATE DRILLED 10/2/96 USE OF WELL Monitoring

4. TOTAL DEPTH 19

5. CUTTINGS COLLECTED YES ☒ NO ☐

6. DOES WELL REPLACE EXISTING WELL ? YES ☐ NO ☒

7. STATIC WATER LEVEL Below Top of Casing: 14.49 FT.
(Use "+" if Above Top of Casing)

8. TOP OF CASING IS 0 FT. Above Land Surface*
***Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118**

9. YIELD (gpm): NA METHOD OF TEST_____

10. WATER ZONES (depth): surficial aquifer

11. CHLORINATION: Type NA Amount_____

12. CASING:

	Depth			Diameter	Wall Thickness or Weight/Ft.	Material
From	0	To 8.5	Ft.	2"	sch40	PVC
From		To	Ft.			
From		To	Ft.			

13. GROUT:

	Depth			Material	Method
From	0	To 5	Ft.	Grout	Pour
From	5	To 7	Ft.	Bentonite	Pour

14. SCREEN

	Depth			Diameter	Slot Size	Material
From	8.5	To 18.5	Ft.	2"	0.010"	PVC
From		To	Ft.			
From		To	Ft.			

15. SAND/GRAVEL PACK:

	Depth			Size	Material
From	7	To 19	Ft.	Torpedo	Sand
From		To	Ft.		

16. REMARKS: NOTE: Well contains free product

DEPTH From	DEPTH To	DRILLING LOG Formation Description
See attached		
boring log		
(Appendix B)		

If additional space is needed use back of form

LOCATION SKETCH
(Show direction and distance from at least two State Roads, or other map reference points)

Attached Site Location Map

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

SIGNATURE OF CONTRACTOR OR AGENT — DATE 10/23/96

Submit original to Division of Environmental Management and copy to well owner.

North Carolina - Department of Environmental, Health and Natural Resources
Division of Environmental Management - Groundwater Section
P.O. Box 29535 - Raleigh, N.C. 27626-0535
Phone (919) 733-3221

DRAFT

FOR OFFICE USE ONLY
QUAD. NO._____ SERIAL NO._____
Lat._____ Long._____ RO_____
Minor Basin_____
Basin Code_____
Header Ent._____ GW-1 Ent.

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: LAW Engineering **STATE WELL CONSTRUCTION**
DRILLER REGISTRATION NUMBER: 332 **PERMIT NUMBER:** 66GW55

1. WELL LOCATION: (Show sketch of the location below)
Nearest Town: Havelock County: Craven
PIT 15
(Road, Community, or Subdivision and Lot No.)

2. OWNER Commanding General
ADDRESS MCAS Cherry Point
(Street or Route No.)
Cherry Point NC 28533
City or Town State Zip Code

3. DATE DRILLED 10/4/96 USE OF WELL Monitoring

4. TOTAL DEPTH 20

5. CUTTINGS COLLECTED YES ☒ NO ☐

6. DOES WELL REPLACE EXISTING WELL ? YES ☐ NO ☒

7. STATIC WATER LEVEL Below Top of Casing: 11.93 FT.
(Use "+" if Above Top of Casing)

8. TOP OF CASING IS 0 FT. Above Land Surface*
***Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118**

9. YIELD (gpm): NA METHOD OF TEST_____

10. WATER ZONES (depth): surficial aquifer

11. CHLORINATION: Type NA Amount_____

12. CASING:

	Depth			Diameter	Wall Thickness or Weight/Ft.	Material
From	0	To 9.5	Ft.	2"	sch40	PVC
From		To	Ft.			
From		To	Ft.			

13. GROUT:

	Depth			Material	Method
From	0	To 4	Ft.	Grout	Pour
From	4	To 6	Ft.	Bentonite	Pour

14. SCREEN

	Depth			Diameter	Slot Size	Material
From	9.5	To 19.5	Ft.	2"	0.010"	PVC
From		To	Ft.			
From		To	Ft.			

15. SAND/GRAVEL PACK:

	Depth			Size	Material
From	6	To 20	Ft.	Torpedo	Sand
From		To	Ft.		

16. REMARKS: NOTE: A petroleum sheen is present in groundwater from this well.

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

[signature] 10/23/96
SIGNATURE OF CONTRACTOR OR AGENT DATE

Submit original to Division of Environmental Management and copy to well owner.

DEPTH From	DEPTH To	DRILLING LOG Formation Description
See attached		
boring log		
(Appendix B)		

If additional space is needed use back of form

LOCATION SKETCH
(Show direction and distance from at least two State Roads, or other map reference points)

Attached Site Location Map

North Carolina - Department of Environmental, Health and Natural Resources
Division of Environmental Management - Groundwater Section
P.O. Box 29535 - Raleigh, N.C. 27626-0535
Phone (919) 733-3221

DRAFT

FOR OFFICE USE ONLY
QUAD. NO._____ SERIAL NO._____
Lat._____ Long._____ RO_____
Minor Basin_____
Basin Code_____
Header Ent._____ GW-1 Ent.

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: LAW Engineering **STATE WELL CONSTRUCTION**
DRILLER REGISTRATION NUMBER: 332 **PERMIT NUMBER:** 66GW56

1. WELL LOCATION: (Show sketch of the location below)
Nearest Town: Havelock County: Craven
PIT 15
(Road, Community, or Subdivision and Lot No.)

2. OWNER Commanding General
ADDRESS MCAS Cherry Point
(Street or Route No.)
Cherry Point NC 28533
City or Town State Zip Code

3. DATE DRILLED 10/2/96 USE OF WELL Monitoring

4. TOTAL DEPTH 18.5

5. CUTTINGS COLLECTED YES ☒ NO ☐

6. DOES WELL REPLACE EXISTING WELL ? YES ☐ NO ☒

7. STATIC WATER LEVEL Below Top of Casing: 15.38 FT.
(Use "+" if Above Top of Casing)

8. TOP OF CASING IS 0 FT. Above Land Surface*
***Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118**

9. YIELD (gpm): NA METHOD OF TEST_____

10. WATER ZONES (depth): surficial aquifer

11. CHLORINATION: Type NA Amount_____

12. CASING:

	Depth		Diameter	Wall Thickness or Weight/Ft.	Material
From 0	To 8	Ft.	2"	sch40	PVC
From	To	Ft.			
From	To	Ft.			

13. GROUT:

	Depth		Material	Method
From 0	To 4	Ft.	Grout	Pour
From 4	To 6	Ft.	Bentonite	Pour

14. SCREEN

	Depth		Diameter	Slot Size	Material
From 8	To 18	Ft.	2"	0.010"	PVC
From	To	Ft.			
From	To	Ft.			

15. SAND/GRAVEL PACK:

	Depth		Size	Material
From 6	To 18.5	Ft.	Torpedo	Sand
From	To	Ft.		

16. REMARKS: NOTE: Well contains free product.

DRILLING LOG	
DEPTH From	To
See attached boring log (Appendix B)	

If additional space is needed use back of form

LOCATION SKETCH
(Show direction and distance from at least two State Roads, or other map reference points)

Attached Site Location Map

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

SIGNATURE OF CONTRACTOR OR AGENT — DATE 10/23/96

Submit original to Division of Environmental Management and copy to well owner.

North Carolina - Department of Environmental, Health and Natural Resources
Division of Environmental Management - Groundwater Section
P.O. Box 29535 - Raleigh, N.C. 27626-0535
Phone (919) 733-3221

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QUAD. NO._____ SERIAL NO._____
Lat._____ Long._____ RO_____
Minor Basin_____
Basin Code_____
Header Ent._____ GW-1 Ent.

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: LAW Engineering **STATE WELL CONSTRUCTION**
DRILLER REGISTRATION NUMBER: 332 **PERMIT NUMBER:** 66GW57

1. WELL LOCATION: (Show sketch of the location below)
Nearest Town: Havelock County: Craven
PIT 15
(Road, Community, or Subdivision and Lot No.)

2. OWNER Commanding General
ADDRESS MCAS Cherry Point
(Street or Route No.)
Cherry Point NC 28533
City or Town State Zip Code

3. DATE DRILLED 10/3/96 USE OF WELL Monitoring

4. TOTAL DEPTH 20

5. CUTTINGS COLLECTED YES ☒ NO ☐

6. DOES WELL REPLACE EXISTING WELL ? YES ☐ NO ☒

7. STATIC WATER LEVEL Below Top of Casing: 15.66 FT.
(Use "+" if Above Top of Casing)

8. TOP OF CASING IS 0 FT. Above Land Surface*
***Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118**

9. YIELD (gpm): NA METHOD OF TEST_____

10. WATER ZONES (depth): surficial aquifer

11. CHLORINATION: Type NA Amount_____

12. CASING:

	Depth			Diameter	Wall Thickness or Weight/Ft.	Material
From	0	To 9.5	Ft.	2"	sch40	PVC
From		To	Ft.			
From		To	Ft.			

13. GROUT:

	Depth			Material	Method
From	0	To 4	Ft.	Grout	Pour
From	4	To 6	Ft.	Bentonite	Pour

14. SCREEN

	Depth			Diameter	Slot Size	Material
From	9.5	To 19.5	Ft.	2"	0.010"	PVC
From		To	Ft.			
From		To	Ft.			

15. SAND/GRAVEL PACK:

	Depth			Size	Material
From	6	To 20	Ft.	Torpedo	Sand
From		To	Ft.		

16. REMARKS: NOTE: Well contains free product.

DEPTH From	DEPTH To	DRILLING LOG Formation Description
See attached		
boring log		
(Appendix B)		

If additional space is needed use back of form

LOCATION SKETCH
(Show direction and distance from at least two State Roads, or other map reference points)

Attached Site Location Map

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

SIGNATURE OF CONTRACTOR OR AGENT — DATE 10/23/96

Submit original to Division of Environmental Management and copy to well owner.

North Carolina - Department of Environmental, Health and Natural Resources
Division of Environmental Management - Groundwater Section
P.O. Box 29535 - Raleigh, N.C. 27626-0535
Phone (919) 733-3221

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QUAD. NO._____ SERIAL NO._____
Lat._____ Long._____ RO_____
Minor Basin_____
Basin Code_____
Header Ent._____ GW-1 Ent.

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: LAW Engineering **STATE WELL CONSTRUCTION**
DRILLER REGISTRATION NUMBER: 332 **PERMIT NUMBER:** 66GW58

1. WELL LOCATION: (Show sketch of the location below)
Nearest Town: Havelock County: Craven
PIT 15
(Road, Community, or Subdivision and Lot No.)

2. OWNER Commanding General
ADDRESS MCAS Cherry Point
(Street or Route No.)
Cherry Point NC 28533
City or Town State Zip Code

3. DATE DRILLED 10/3/96 USE OF WELL Monitoring

4. TOTAL DEPTH 42

5. CUTTINGS COLLECTED YES ☒ NO ☐

6. DOES WELL REPLACE EXISTING WELL ? YES ☐ NO ☒

7. STATIC WATER LEVEL Below Top of Casing: 13.26 FT.
(Use "+" if Above Top of Casing)

8. TOP OF CASING IS 0 FT. Above Land Surface*
***Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118**

9. YIELD (gpm): NA METHOD OF TEST_____

10. WATER ZONES (depth): surficial aquifer

11. CHLORINATION: Type NA Amount_____

12. CASING:

	Depth			Diameter	Wall Thickness or Weight/Ft.	Material
From	0	To 37	Ft.	2"	sch40	PVC
From	0	To 33.3	Ft.	6"	sch40	PVC
From		To	Ft.			

13. GROUT:

	Depth			Material	Method
From	0	To 31.0	Ft.	Grout	Tremie
From	31	To 33.5	Ft.	Bentonite	Pour

14. SCREEN

	Depth			Diameter	Slot Size	Material
From	37	To 42	Ft.	2"	0.010"	PVC
From		To	Ft.			
From		To	Ft.			

15. SAND/GRAVEL PACK:

	Depth			Size	Material
From	33.5	To 42	Ft.	Torpedo	Sand
From		To	Ft.		

16. REMARKS:_____

DEPTH From	DEPTH To	DRILLING LOG Formation Description
See attached		
boring log		
(Appendix B)		

If additional space is needed use back of form

LOCATION SKETCH
(Show direction and distance from at least two State Roads, or other map reference points)

Attached Site Location Map

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

[signature] 10/23/96
SIGNATURE OF CONTRACTOR OR AGENT DATE

Submit original to Division of Environmental Management and copy to well owner.

North Carolina - Department of Environmental, Health and Natural Resources
Division of Environmental Management - Groundwater Section
P.O. Box 29535 - Raleigh, N.C. 27626-0535
Phone (919) 733-3221

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QUAD. NO._____ SERIAL NO._____
Lat._____ Long._____ RO_____
Minor Basin_____
Basin Code_____
Header Ent._____ GW-1 Ent.

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: LAW Engineering **STATE WELL CONSTRUCTION**
DRILLER REGISTRATION NUMBER: 332 **PERMIT NUMBER:** 66GW59

1. WELL LOCATION: (Show sketch of the location below)
Nearest Town: Havelock County: Craven
PIT 15
(Road, Community, or Subdivision and Lot No.)

2. OWNER Commanding General
ADDRESS MCAS Cherry Point
(Street or Route No.)
Cherry Point NC 28533
City or Town State Zip Code

3. DATE DRILLED 10/9/96 USE OF WELL Monitoring

4. TOTAL DEPTH 22

5. CUTTINGS COLLECTED YES ☒ NO ☐

6. DOES WELL REPLACE EXISTING WELL ? YES ☐ NO ☒

7. STATIC WATER LEVEL Below Top of Casing: 5.57 FT.
(Use "+" if Above Top of Casing)

8. TOP OF CASING IS 0 FT. Above Land Surface*
***Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118**

9. YIELD (gpm): NA METHOD OF TEST_____

10. WATER ZONES (depth): surficial aquifer

11. CHLORINATION: Type NA Amount_____

12. CASING:

	Depth			Diameter	Wall Thickness or Weight/Ft.	Material
From	0	To 2	Ft.	6"	sch40	PVC
From		To	Ft.			
From		To	Ft.			

13. GROUT:

	Depth			Material	Method
From	0	To 0.5	Ft.	Grout	Pour
From	0.5	To 1.75	Ft.	Bentonite	Pour

14. SCREEN

	Depth			Diameter	Slot Size	Material
From	2	To 22	Ft.	6"	0.010"	PVC-Circumslot
From		To	Ft.			
From		To	Ft.			

15. SAND/GRAVEL PACK:

	Depth			Size	Material
From	1.75	To 22	Ft.	Torpedo	Sand
From		To	Ft.		

16. REMARKS: NOTE: Well contains free product.

DEPTH From	DEPTH To	DRILLING LOG Formation Description
See attached boring log (Appendix B)		

If additional space is needed use back of form

LOCATION SKETCH
(Show direction and distance from at least two State Roads, or other map reference points)

Attached Site Location Map

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

SIGNATURE OF CONTRACTOR OR AGENT — DATE 10/23/96

Submit original to Division of Environmental Management and copy to well owner.

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APPENDIX E

MONITORING WELL CASING AND WATER ELEVATION WORKSHEET

LAW
ENGINEERING AND ENVIRONMENTAL SERVICES

MONITORING WELL CASING AND WATER ELEVATION WORKSHEET

PROJECT NAME PIT 15 **JOB NUMBER** 30740-5-0500-0194 **DATE:** October 10, 1996

LOCATION RUNWAY 14L, MACS CHERRY POINT, NORTH CAROLINA

DESCRIPTION OF SURVEY DATUM Vertical datum is based on existing military grid monument 4-90. Horizontal datum is based on NCGS monument 3.90. All well readings made from the measuring point at the top of the well casing.

FIELD PERSONNEL Jeff Tyburski **MEASURING DEVICE (S)** Oil/Water Interface Probe

WELL I.D.	MONITORING WELL TYPE	TOC EL[1]	DEPTH TO GROUND WATER	DEPTH TO FREE PRODUCT	GROUND WATER ELEVATION	FREE PRODUCT ELEVATION	FREE PRODUCT THICKNESS	CORRECTED GROUND WATER ELEVATION [2]	LAND SURFACE ELEVATION	WELL DEPTH/ SCREEN INT.
Existing Wells										
566W21	TYPE II	22.03	11.62	NA	10.41	NA	ND	NA	22.07	19/8.5-18.5
666W06	TYPE II	22.06	12.42	NA	9.64	NA	ND	NA	22.15	15/5-15
666W41	TYPE II	21.78	11.21	NA	10.57	NA	ND	NA	22.14	18.5/8.5-18.5
666W46	TYPE III	21.79	12.81	NA	8.98	NA	ND	NA	22.15	42/37-42
666W51	TYPE II/FP	21.69	--	--	--	--	--	--	21.56	25/5-25
666W52	TYPE II/FP	21.46	--	--	--	--	--	--	21.35	25/5-25
Monitoring Wells - current investigation										
666W53	TYPE II	23.06	17.40	13.35	5.66	9.71	4.05	8.90	23.51	19.5/9-19
666W54	TYPE II	22.29	14.49	12.52	7.80	9.77	1.97	9.38	22.45	19/8.5-18.5
666W55	TYPE II	21.65	11.93	SHEEN	9.72	9.72	SHEEN	9.72	21.68	20/9.5-19.5
666W56	TYPE II	22.51	15.38	12.56	7.13	9.95	2.82	9.39	22.89	18.5/8-18
666W57	TYPE II	22.11	15.66	12.25	6.45	9.86	3.41	9.18	22.42	20/9.5-19.5
666W58	TYPE III	22.27	13.26	NA	9.01	NA	ND	NA	22.42	42/37-42
666W59	TYPE II/FP	22.34	15.57	12.50	6.77	9.84	3.07	9.23	22.42	22/2-22

All measurements are recorded in feet.
[1]Measuring point is the top of casing (TOC) unless noted otherwise. This elevation is typically not equal to the land surface elevation shown in this table.
[2]A corrected groundwater elevation was calculated to account for the depression of the water table by the overlying free product. This was conducted by multiplying the free product thickness by the density of the fuel (estimated to be 0.8) and adding this value to the groundwater elevation.
ND= None detected; equipment capable of measuring 0.01 feet
NA= Not applicable
FP=6 inch diameter free product recovery well
--Depth to groundwater and free product thickness measurement could not be obtained due to the presence of a passive free product recovery system in the well.

BAE1

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APPENDIX F

MONITORING WELL SAMPLING AND FIELD DATA WORKSHEETS

DRAFT

LAW ENGINEERING
3301 ATLANTIC AVENUE
RALEIGH, NORTH CAROLINA 27604

MONITORING WELL AND SAMPLING FIELD DATA WORKSHEET

LAW JOB NUMBER 30740-5-0500/0194 MONITORING WELL NUMBER 56GW21

SITE NAME MCAS Cherry Point - PIT 15

DATE (MO/DAY/YR) 10/7/96 TIME (MILITARY) 12:25

FIELD PERSONNEL J. Tyburski

WEATHER CONDITIONS Overcast 70°F

TOTAL WELL DEPTH (TWD) 18.5 1/10 FT. (DEPTH BELOW MEASURING POINT)

HEIGHT OF MEASURING POINT ABOVE LAND SURFACE 0.0 1/10 FT.

DESCRIPTION OF MEASURING POINT TOC

DEPTH TO GROUNDWATER (DGW) 11.80 1/100 FT. (DEPTH BELOW MEASURING POINT)

LENGTH OF WATER COLUMN (LWC) = TWD - DGW = 6.7 1/100 FT.

ONE STANDING WELL VOLUME (SWV) = LWC X 0.17 = 1.14 1/10 GAL.

THREE STANDING WELL VOLUMES = 3XSWV = 3.42 1/10 GAL = STANDARD EVACUATION VOLUME

METHOD OF WELL EVACUATION TEFLON BAILER _____ OTHER: Disposable bailer

TOTAL VOLUME OF WATER REMOVED 4.0 1/10 GAL. CASING DIAMETER _____ In.

CASING MATERIAL PVC X S.S. _____ TEFLON _____ OTHER _____

SCREENED INTERVAL (FROM ID PLATE) 8.5-18.5 (DEPTHS BELOW LAND SURFACE - FT.)

STEEL GUARD PIPE AROUND CASING	YES ____	NO X	COMMENTS _____
LOCKING CAP	YES X	NO ____	Metal cover is broken
PROTECTIVE POST/ABUTMENT	YES ____	NO X	_____
NONPOTABLE LABEL	YES X	NO ____	_____
ID PLATE	YES X	NO ____	_____
WELL INTEGRITY SATISFACTORY	YES ____	NO X	_____

WELL YIELD LOW ____ MODERATE ____ HIGH X COMMENTS _____

FIELD ANALYSES

VOLUME (1/10 GAL.)	0	1.75	4.0	
pH (S.U.)	4.59	4.63	4.65	
SP. COND. (μMHOS/CM)	118	099	097	
WATER TEMP. (°C)	23.1	23.3	23.4	
TURBIDITY*	3	3	2	

*VISUAL DETERMINATION ONLY
(1) CLEAR (2) SLIGHT (3) MODERATE (4) HIGH

DRAFT

LAW ENGINEERING
3301 ATLANTIC AVENUE
RALEIGH, NORTH CAROLINA 27604

MONITORING WELL AND SAMPLING FIELD DATA WORKSHEET

LAW JOB NUMBER 30740-5-0500/0194 MONITORING WELL NUMBER 66GW06

SITE NAME MCAS Cherry Point - PIT 15

DATE (MO/DAY/YR) 10/7/96 TIME (MILITARY) _____

FIELD PERSONNEL J. Tyburski

WEATHER CONDITIONS Overcast - 65-70°F

TOTAL WELL DEPTH (TWD) 15.0 1/10 FT. (DEPTH BELOW MEASURING POINT)

HEIGHT OF MEASURING POINT ABOVE LAND SURFACE -0.7 1/10 FT.

DESCRIPTION OF MEASURING POINT TOC

DEPTH TO GROUNDWATER (DGW) 12.50 1/100 FT. (DEPTH BELOW MEASURING POINT)

LENGTH OF WATER COLUMN (LWC) = TWD - DGW = 3.2 1/100 FT.

ONE STANDING WELL VOLUME (SWV) = LWC X 0.17 = 0.54 1/10 GAL.

THREE STANDING WELL VOLUMES = 3XSWV = 1.62 1/10 GAL = STANDARD EVACUATION VOLUME

METHOD OF WELL EVACUATION TEFLON BAILER _____ OTHER: Disposable bailer

TOTAL VOLUME OF WATER REMOVED 2.0 1/10 GAL. CASING DIAMETER _____ In.

CASING MATERIAL PVC X S.S. _____ TEFLON _____ OTHER _____

SCREENED INTERVAL (FROM ID PLATE) 5.0-15.0 (DEPTHS BELOW LAND SURFACE - FT.)

STEEL GUARD PIPE AROUND CASING	YES ____	NO X	COMMENTS _____
LOCKING CAP	YES X	NO ____	_____
PROTECTIVE POST/ABUTMENT	YES ____	NO X	_____
NONPOTABLE LABEL	YES X	NO ____	_____
ID PLATE	YES X	NO ____	_____
WELL INTEGRITY SATISFACTORY	YES X	NO ____	_____

WELL YIELD LOW ____ MODERATE X HIGH ____ COMMENTS _____

FIELD ANALYSES

VOLUME (1/10 GAL.)	0	1.0	2.0	
pH (S.U.)	6.41	6.47	6.48	
SP. COND. (μMHOS/CM)	573	602	573	
WATER TEMP. (°C)	22.3	22.4	22.3	
TURBIDITY*	4	4	3	

*VISUAL DETERMINATION ONLY
(1) CLEAR (2) SLIGHT (3) MODERATE (4) HIGH

DRAFT

LAW ENGINEERING
3301 ATLANTIC AVENUE
RALEIGH, NORTH CAROLINA 27604

MONITORING WELL AND SAMPLING FIELD DATA WORKSHEET

LAW JOB NUMBER 30740-5-0500/0194 MONITORING WELL NUMBER 66GW41

SITE NAME MCAS Cherry Point - PIT 15

DATE (MO/DAY/YR) 10/7/96 TIME (MILITARY) 14:10

FIELD PERSONNEL J. Tyburski

WEATHER CONDITIONS Overcast - 70°F

TOTAL WELL DEPTH (TWD) 18.5 1/10 FT. (DEPTH BELOW MEASURING POINT)

HEIGHT OF MEASURING POINT ABOVE LAND SURFACE _____ 1/10 FT.

DESCRIPTION OF MEASURING POINT -0.60

DEPTH TO GROUNDWATER (DGW) 11.38 1/100 FT. (DEPTH BELOW MEASURING POINT)

LENGTH OF WATER COLUMN (LWC) = TWD - DGW = 7.72 1/100 FT.

ONE STANDING WELL VOLUME (SWV) = LWC X 0.17 = 1.31 1/10 GAL.

THREE STANDING WELL VOLUMES = 3XSWV = 3.93 1/10 GAL = STANDARD EVACUATION VOLUME

METHOD OF WELL EVACUATION TEFLON BAILER _____ OTHER: Disposable bailer

TOTAL VOLUME OF WATER REMOVED 4.0 1/10 GAL. CASING DIAMETER _____ In.

CASING MATERIAL PVC X S.S. _____ TEFLON _____ OTHER _____

SCREENED INTERVAL (FROM ID PLATE) 8.5-18.5 (DEPTHS BELOW LAND SURFACE - FT.)

STEEL GUARD PIPE AROUND CASING	YES ____	NO X	COMMENTS ____
LOCKING CAP	YES X	NO ____	____
PROTECTIVE POST/ABUTMENT	YES ____	NO X	____
NONPOTABLE LABEL	YES X	NO ____	____
ID PLATE	YES X	NO ____	____
WELL INTEGRITY SATISFACTORY	YES X	NO ____	____
WELL YIELD	LOW ____	MODERATE X	HIGH ____ COMMENTS ____

FIELD ANALYSES

VOLUME (1/10 GAL.)	0	2	4	
pH (S.U.)	6.1	6.43	6.34	
SP. COND. (μMHOS/CM)	640	557	588	
WATER TEMP. (°C)	23.4	23.3	23.2	
TURBIDITY*				

*VISUAL DETERMINATION ONLY
(1) CLEAR (2) SLIGHT (3) MODERATE (4) HIGH

DRAFT

LAW ENGINEERING
3301 ATLANTIC AVENUE
RALEIGH, NORTH CAROLINA 27604

MONITORING WELL AND SAMPLING FIELD DATA WORKSHEET

LAW JOB NUMBER 30740-5-0500/0194 MONITORING WELL NUMBER 66GW55

SITE NAME MCAS Cherry Point - PIT 15

DATE (MO/DAY/YR) 10/7/96 TIME (MILITARY) 16:45

FIELD PERSONNEL J. Tyburski

WEATHER CONDITIONS Rain - 70°F

TOTAL WELL DEPTH (TWD) 19.5 1/10 FT. (DEPTH BELOW MEASURING POINT)

HEIGHT OF MEASURING POINT ABOVE LAND SURFACE 0.0 1/10 FT.

DESCRIPTION OF MEASURING POINT TOC

DEPTH TO GROUNDWATER (DGW) 12.01 1/100 FT. (DEPTH BELOW MEASURING POINT)

LENGTH OF WATER COLUMN (LWC) = TWD - DGW = 7.49 1/100 FT.

ONE STANDING WELL VOLUME (SWV) = LWC X 0.17 = 1.27 1/10 GAL.

THREE STANDING WELL VOLUMES = 3XSWV = 3.81 1/10 GAL = STANDARD EVACUATION VOLUME

METHOD OF WELL EVACUATION TEFLON BAILER _____ OTHER: Disposable bailer

TOTAL VOLUME OF WATER REMOVED 4.0 1/10 GAL. CASING DIAMETER _____ In.

CASING MATERIAL PVC X S.S. _____ TEFLON _____ OTHER _____

SCREENED INTERVAL (FROM ID PLATE) 9.5-19.5 (DEPTHS BELOW LAND SURFACE - FT.)

STEEL GUARD PIPE AROUND CASING	YES ____	NO X	COMMENTS ____
LOCKING CAP	YES X	NO ____	____
PROTECTIVE POST/ABUTMENT	YES ____	NO X	____
NONPOTABLE LABEL	YES X	NO ____	____
ID PLATE	YES X	NO ____	____
WELL INTEGRITY SATISFACTORY	YES X	NO ____	____

WELL YIELD LOW ____ MODERATE X HIGH ____ COMMENTS ____

FIELD ANALYSES

VOLUME (1/10 GAL.)	0	2	4	
pH (S.U.)	5.29	4.04	5.18	
SP. COND. (μMHOS/CM)	200	189	183	
WATER TEMP. (°C)	21.6	21.9	22.0	
TURBIDITY*	3	3	2	

*VISUAL DETERMINATION ONLY
(1) CLEAR (2) SLIGHT (3) MODERATE (4) HIGH

DRAFT

LAW ENGINEERING
3301 ATLANTIC AVENUE
RALEIGH, NORTH CAROLINA 27604

MONITORING WELL AND SAMPLING FIELD DATA WORKSHEET

LAW JOB NUMBER 30740-5-0500/0194 MONITORING WELL NUMBER 66GW58

SITE NAME MCAS Cherry Point - PIT 15

DATE (MO/DAY/YR) 10/7/96 TIME (MILITARY) _____

FIELD PERSONNEL J. Tyburski

WEATHER CONDITIONS Light Rain -- 70°F

TOTAL WELL DEPTH (TWD) 42 1/10 FT. (DEPTH BELOW MEASURING POINT)

HEIGHT OF MEASURING POINT ABOVE LAND SURFACE 0.0 1/10 FT.

DESCRIPTION OF MEASURING POINT TOC

DEPTH TO GROUNDWATER (DGW) 13.17 1/100 FT. (DEPTH BELOW MEASURING POINT)

LENGTH OF WATER COLUMN (LWC) = TWD - DGW = 28.83 1/100 FT.

ONE STANDING WELL VOLUME (SWV) = LWC X 0.17 = 4.9 1/10 GAL.

THREE STANDING WELL VOLUMES = 3XSWV = 14.7 1/10 GAL = STANDARD EVACUATION VOLUME

METHOD OF WELL EVACUATION TEFLON BAILER _____ OTHER: Disposable bailer

TOTAL VOLUME OF WATER REMOVED 15.0 1/10 GAL. CASING DIAMETER _____ In.

CASING MATERIAL PVC X S.S. _____ TEFLON _____ OTHER _____

SCREENED INTERVAL (FROM ID PLATE) 37-42 (DEPTHS BELOW LAND SURFACE - FT.)

STEEL GUARD PIPE AROUND CASING	YES ____	NO X	COMMENTS _____
LOCKING CAP	YES X	NO ____	_____
PROTECTIVE POST/ABUTMENT	YES ____	NO X	_____
NONPOTABLE LABEL	YES X	NO ____	_____
ID PLATE	YES X	NO ____	_____
WELL INTEGRITY SATISFACTORY	YES X	NO ____	_____

WELL YIELD LOW ____ MODERATE X HIGH ____ COMMENTS _____

FIELD ANALYSES

VOLUME (1/10 GAL.)	0	2.5	15	
pH (S.U.)	5.68	6.10	5.74	
SP. COND. (μMHOS/CM)	268	20.9	20.6	
WATER TEMP. (°C)	23.9	470	285	
TURBIDITY*	1	1	1	

*VISUAL DETERMINATION ONLY
(1) CLEAR (2) SLIGHT (3) MODERATE (4) HIGH

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APPENDIX G

SUMMARY OF HYDRAULIC CONDUCTIVITY AND GROUNDWATER VELOCITY ESTIMATIONS

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LAW
ENGINEERING AND ENVIRONMENTAL SERVICES, INC.
3301 ATLANTIC AVENUE
RALEIGH, NC 27604

JOB NO. 30740-5-0500 SHEET 1 OF 1
PHASE 0194 TASK
JOB NAME PIT 15
BY JT DATE 10/28/96
CHECKED BY BJB DATE 12/3/96

Average Hydraulic Conductivity

- From Grain size data:

① 666W57 (18.5-20 ftbls) = 40.5 ft/day

② 666W58 (38.5-40 ftbls) = 38.3 ft/day

- From slug Test (drawdown) data

666W55 (screened int = 9.5'-19.5') = 2.19 ft/day

666W58 (screened int = 37'-42') = 2.39 ft/day

- From Adjacent sites along Runway 14L

③ Bld 130 = 66.0 ft/day (pump Test data)

④ Bld 4075 = 20 ft/day

* Slug Test data is not considered to be representative based upon a comparison of grain size data and data from nearby sites

* Average values ① through ④ to obtain an hydraulic conductivity estimate for PIT 15

① 40.5 ft/day

② 38.3 ft/day

③ 66.0 ft/day

④ 20.0 ft/day

164.80/4 = 41.20 ~ KAvg = 41.0 feet/day ok

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ENGINEERING AND ENVIRONMENTAL SERVICES, INC
3301 ATLANTIC AVENUE
RALEIGH, NC 27604

JOB NO. 30740-5-0500 SHEET 1 OF 1
PHASE 0194 TASK
JOB NAME PIT 15
BY J.T DATE 10/28/96
CHECKED BY B.A.B DATE 12/3/96

Effective Porosity

The effective porosity for the site was determined using the grain size results for samples 666W57 (18.5-20 ft bls) and 666W58 (38.5-40.0 ft bls). These two samples are considered to be representative of the upper and lower portions of the surficial aquifer and are similar in texture. The percentages of sand, silt and clay for each sample were used to determine the specific yield (effective porosity) using the textural classification triangle for unconsolidated materials by A.I. Johnson U.S. Geological Survey water supply paper 1662-D, 1967.

Sample	Specific Yield (Effective Porosity)	
666W57 (18.5-20 ft bls)	(47.1% sand)	42 %
666W58 (38.5-40 ft bls)	(93.5% sand)	38 %
Average Value =		40 %

DRAFT

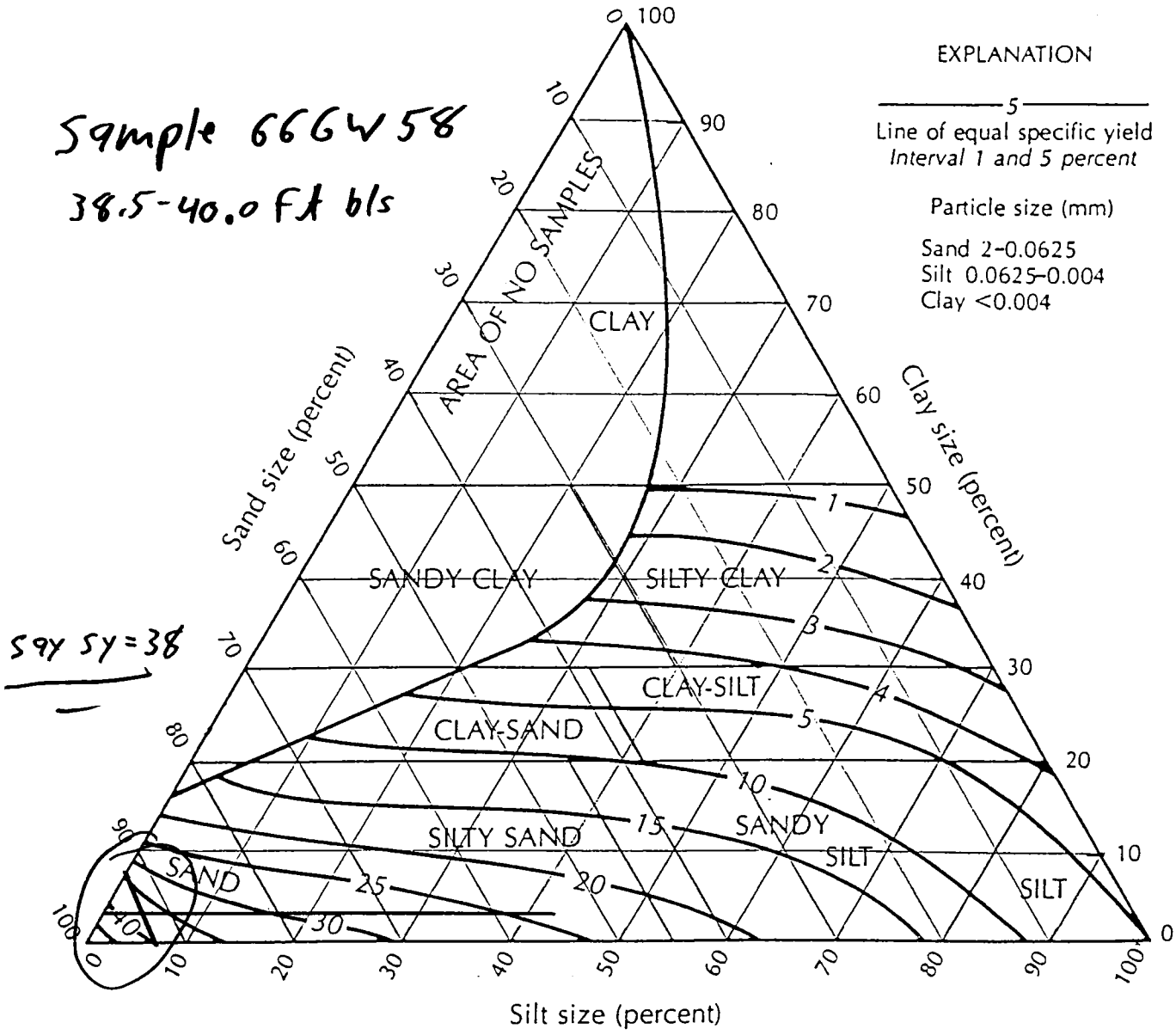


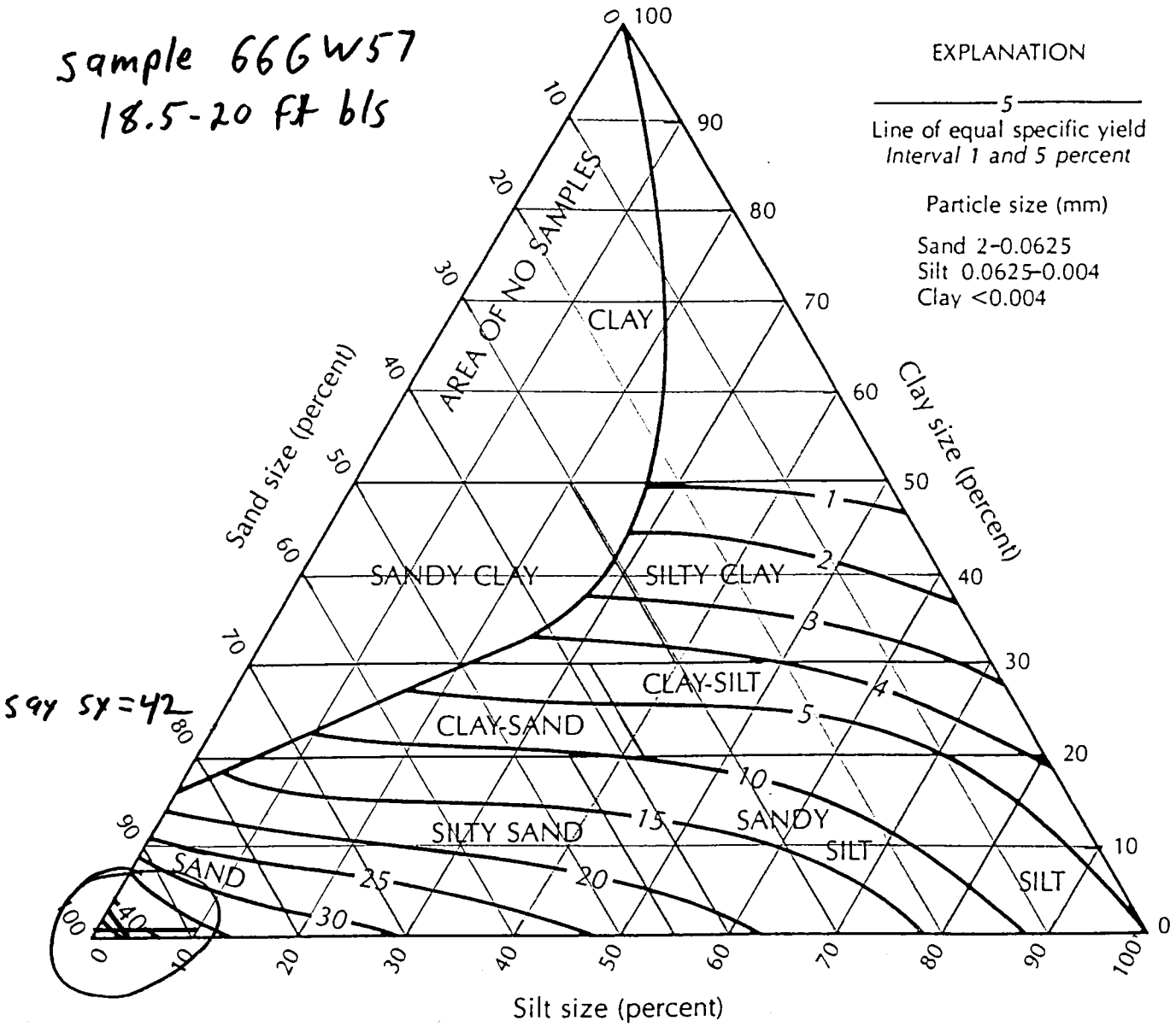
FIGURE 4.8. Textural classification triangle for unconsolidated materials showing the relation between particle size and specific yield. SOURCE: A. I. Johnson, U.S. Geological Survey Water Supply Paper 1662-D, 1967.

JOHNSON, A. I. *Specific Yield—Compilation of Specific Yields for Various Materials.* U.S. Geological Survey Water Supply Paper 1662-D, 1967, 74 pp.

Source: Fetter, C.W., Jr., 1980, Applied Hydrogeology, Charles E. Merril Publishing Company, Columbus Ohio, 488p.

DRAFT

Sample 666W57
18.5-20 ft bls



Say Sy = 42

FIGURE 4.8. Textural classification triangle for unconsolidated materials showing the relation between particle size and specific yield. SOURCE: A. I. Johnson, U.S. Geological Survey Water Supply Paper 1662-D, 1967.

JOHNSON, A. I. *Specific Yield—Compilation of Specific Yields for Various Materials.* U.S. Geological Survey Water Supply Paper 1662-D, 1967, 74 pp.

Source: Fetter, C.W., Jr., 1980, Applied Hydrogeology, Charles E. Merril Publishing Company, Columbus Ohio, 488p.

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ENGINEERING AND ENVIRONMENTAL SERVICES, INC.
3301 ATLANTIC AVENUE
RALEIGH, NC 27604

JOB NO. _____ SHEET _____ OF _____
PHASE _____ TASK _____
JOB NAME PIT 15
BY JT DATE 11/8/96
CHECKED BY BAB DATE 12/3/96

Calculate Groundwater Flow Velocity

$$v = \frac{K\left(\frac{dh}{dl}\right)}{n}$$

$$v = \frac{41.0\ (0.0033)}{0.40} = 0.34 \text{ ft/day} \checkmark$$

From grain size data

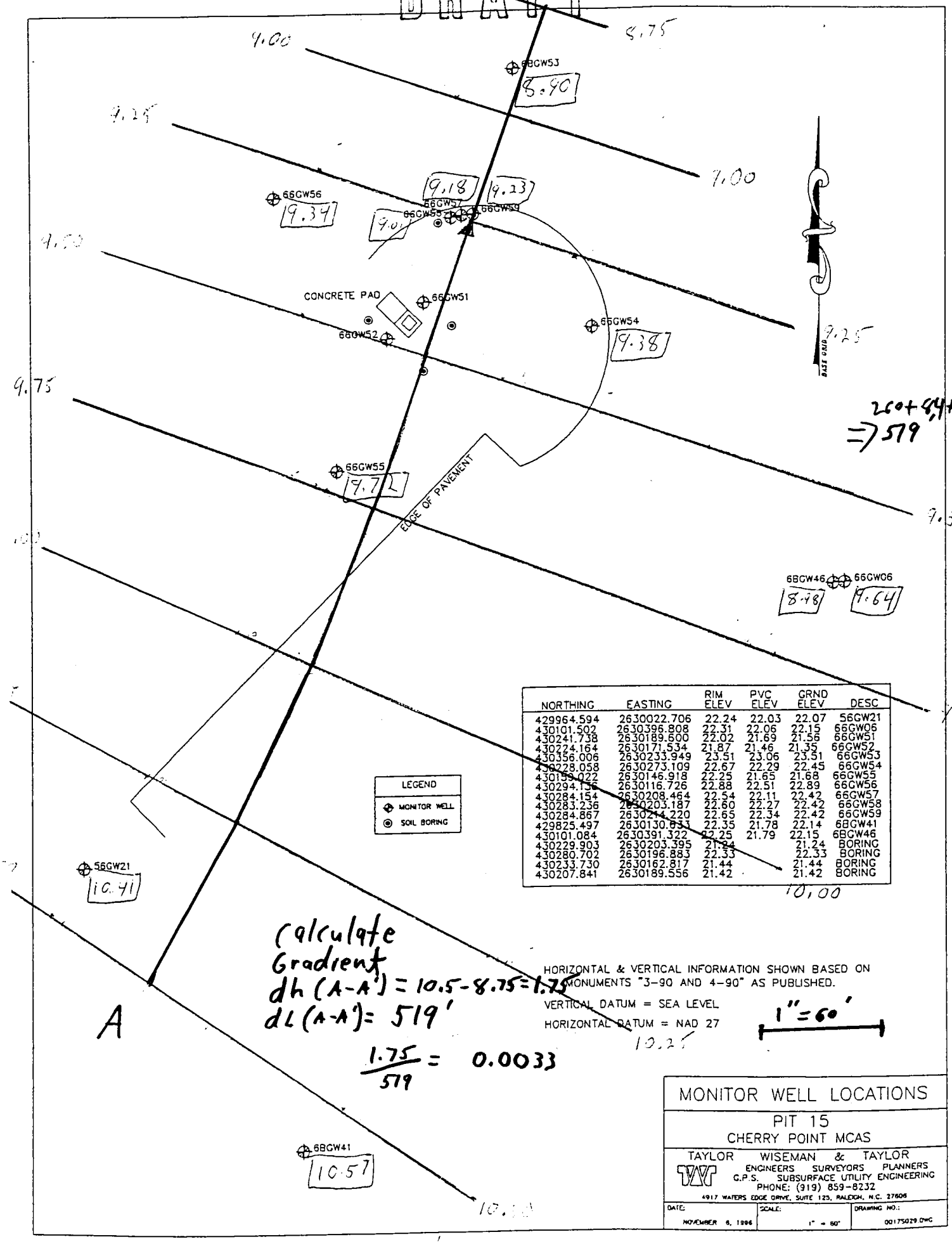
f = mass of silt and clay / mass of sand, silt and clay

sample 666W57 (18.5-20.0) = 2.9/100 = 0.029

sample 666W58 (38.5-40.0) = 6.5/100 = 0.065

f (Average) = 0.047 ✓

DRAFT



NORTHING	EASTING	RIM ELEV	PVC ELEV	GRND ELEV	DESC
429964.594	2630022.706	22.24	22.03	22.07	56GW21
430101.502	2630396.808	22.31	22.06	22.15	66GW06
430241.738	2630189.600	22.02	21.69	21.56	66GW51
430224.164	2630171.534	21.87	21.46	21.35	66GW52
430356.006	2630233.949	23.51	23.06	23.51	66GW53
430228.058	2630273.109	22.67	22.29	22.45	66GW54
430159.022	2630146.918	22.25	21.65	21.68	66GW55
430294.136	2630116.726	22.88	22.51	22.89	66GW56
430284.154	2630208.464	22.54	22.11	22.42	66GW57
430283.236	2630203.187	22.60	22.27	22.42	66GW58
430284.867	2630214.220	22.65	22.34	22.42	66GW59
429825.497	2630130.833	22.35	21.78	22.14	6BGW41
430101.084	2630391.322	22.25	21.79	22.15	6BGW46
430229.903	2630203.395	21.84		21.24	BORING
430280.702	2630196.883	22.33		22.33	BORING
430233.730	2630162.817	21.44		21.44	BORING
430207.841	2630189.556	21.42		21.42	BORING

260+84+85+90
⇒ 519

Calculate Gradient
dh (A-A') = 10.5 - 8.75 = 1.75
dL (A-A') = 519'

$\frac{1.75}{519} = 0.0033$

HORIZONTAL & VERTICAL INFORMATION SHOWN BASED ON MONUMENTS "3-90 AND 4-90" AS PUBLISHED.
VERTICAL DATUM = SEA LEVEL
HORIZONTAL DATUM = NAD 27

1" = 60'

MONITOR WELL LOCATIONS

PIT 15
CHERRY POINT MCAS

TAYLOR WISEMAN & TAYLOR
ENGINEERS SURVEYORS PLANNERS
G.P.S. SUBSURFACE UTILITY ENGINEERING
PHONE: (919) 859-8232
4917 WATERS EDGE DRIVE, SUITE 125, RALEIGH, N.C. 27606

DATE:	SCALE:	DRAWING NO.:
NOVEMBER 6, 1996	1" = 60'	0017S029.DWG

DRAFT

JOB NAME: PIT 15, MCAS CHERRY POINT
JOB NO.: 30740-5-0500/0194
WELL NO.: 66GW58

TEST BY/DATE: Tyburski/10/10/96
ENTERED BY/DATE: Tyburski/10/28/96
CHECKED/DATE: BJB 12/3/96

HYDRAULIC CONDUCTIVITY (K) CALCULATION FROM SLUG OR RECOVERY TEST DATA
USING HVORSLEV'S BASIC TIME-LAG METHOD
FOR WELLS SCREENED ABOVE AND BELOW THE WATER TABLE

INPUT DATA

Top of screen (ft below meas. pt.)	37.0	Static Level (H) = (ft below meas. pt.)	13.26 ft	r =	0.08 ft
				R =	0.24 ft
Bot of screen (ft below meas. pt.)	42.0			L =	8.50 ft
		Initial Reading (Ho) = (ft below meas. pt.)	17.70 ft	H-Ho =	-4.44 ft

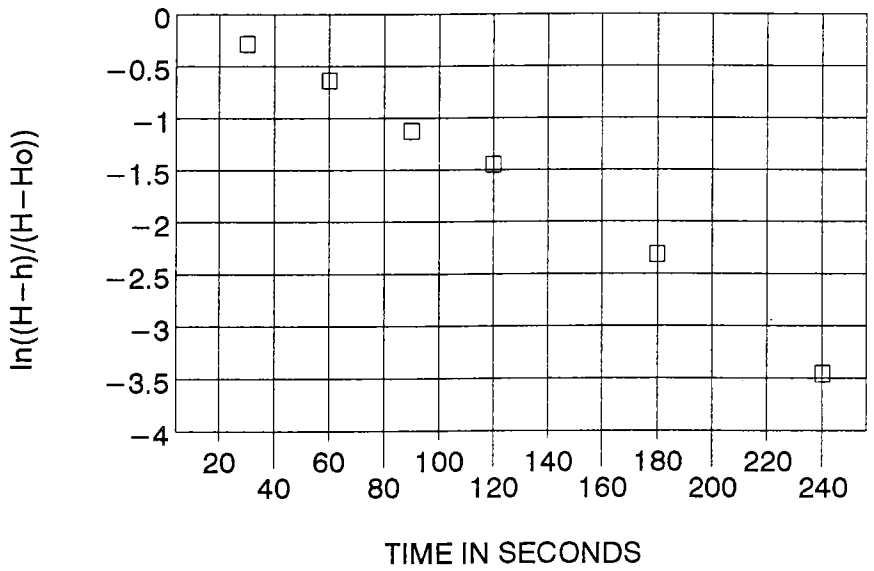
CALCULATION OF HYDRAULIC CONDUCTIVITY (K)

	WATER LEVEL FT BELOW M.P.	L(t) ft	(H-h) ft	(H-h)/ (H-Ho)	LN(1) Y	ELAPSED TIME SEC X
i	17.70	5.00	-4.44	1.00		
i+1	16.60	5.00	-3.34	0.75	-0.28	30
"	15.60	5.00	-2.34	0.53	-0.64	60
"	14.70	5.00	-1.44	0.32	-1.13	90
"	14.30	5.00	-1.04	0.23	-1.45	120
"	13.70	5.00	-0.44	0.10	-2.31	180
"	13.40	5.00	-0.14	0.03	-3.46	240
"						

K=r^2 LN(L(t)/R)/(2L(t)(H-h))*d(H-h)/dt

K (i to i+1)	1.72 f/d	6.1E-04 cm/s
	2.14 f/d	7.5E-04 cm/s
	2.89 f/d	1.0E-03 cm/s
	1.96 f/d	6.9E-04 cm/s
K (i+n to	2.46 f/d	8.7E-04 cm/s
i+(n+1))	3.14 f/d	1.1E-03 cm/s
Kavg	2.39 f/d	8.41E-04 cm/s

RECOVERY VS. TIME, WELL 66GW58 (Type 3)



Spreadsheet designed by Bellis (1988).

DRAFT

JOB NAME: PIT 15, MCAS CHERRY POINT
JOB NO.: 30740-5-0500/0194
WELL NO.: 66GW55

TEST BY/DATE: Tyburski/10/10/96
ENTERED BY/DATE: Tyburski/10/28/96
CHECKED/DATE: BJD 12/3/96

HYDRAULIC CONDUCTIVITY (K) CALCULATION FROM SLUG OR RECOVERY TEST DATA
USING HVORSLEV'S BASIC TIME-LAG METHOD
FOR WELLS SCREENED ABOVE AND BELOW THE WATER TABLE

INPUT DATA

Top of screen (ft below meas. pt.)	9.5	Static Level (H) = (ft below meas. pt.)	11.93 ft	r =	0.08 ft
				R =	0.35 ft
Bot of screen (ft below meas. pt.)	19.5			L =	14.00 ft
		Initial Reading (Ho) = (ft below meas. pt.)	13.00 ft	H-Ho =	-1.07 ft

CALCULATION OF HYDRAULIC CONDUCTIVITY (K)

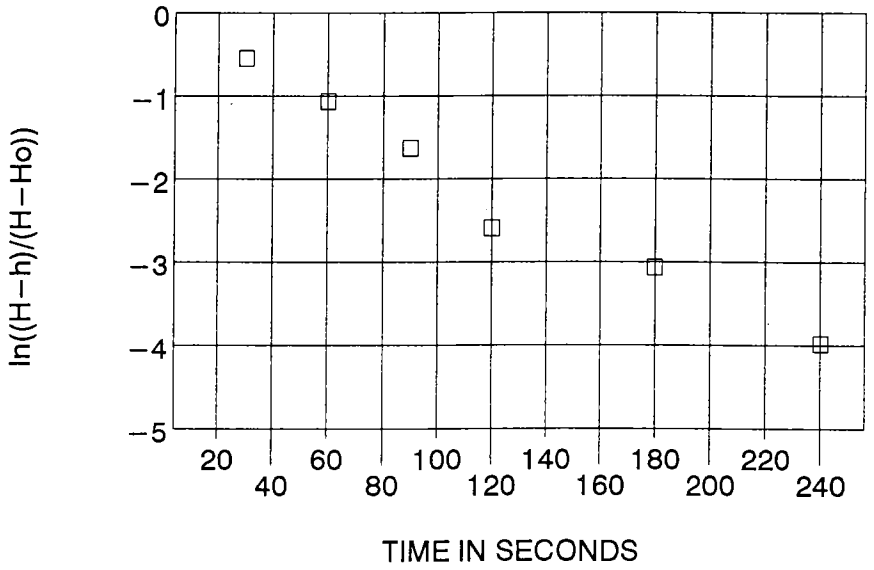
	WATER LEVEL FT BELOW M.P.	L(t) ft	(H-h) ft	(H-h)/ (H-Ho)	LN(1)	ELAPSED TIME SEC
i	13.00	6.50	-1.07	1.00	Y	X
i+1	12.55	6.95	-0.62	0.58	-0.55	30
"	12.30	7.20	-0.37	0.35	-1.06	60
"	12.14	7.36	-0.21	0.20	-1.63	90
"	12.01	7.49	-0.08	0.07	-2.59	120
"	11.98	7.52	-0.05	0.05	-3.06	180
"	11.95	7.55	-0.02	0.02	-3.98	240
"						

K=r ^ 2 LN(L(t)/R)/(2L(t)(H-h))*d(H-h)/dt

K (i to i+1)	2.34 f/d	8.3E-04 cm/s
	2.15 f/d	7.6E-04 cm/s
	2.30 f/d	8.1E-04 cm/s
	3.69 f/d	1.3E-03 cm/s
K (i+n to	0.94 f/d	3.3E-04 cm/s
i+(n+1))	1.75 f/d	6.2E-04 cm/s

Kavg	2.19 f/d	7.74E-04 cm/s

RECOVERY VS. TIME, WELL 66GW55 (Type 2)



Spreadsheet designed by Bellis (1988).

DRAFT

APPENDIX H

CONTAMINANT VELOCITY CALCULAITONS

DRAFT

DETERMINATION OF CONTAMINANT VELOCITY IN GROUNDWATER FOR ORGANIC COMPOUNDS

Project Name:	Pit 15	Prepared By/Date:	Tyburski/12-4-96
Job No.:	30740-5-0500/0194	Checked By/Date:	Bellis/12-4-96

Based on the mathematical relationship between Kow and Rd, the following spreadsheet determines contaminant velocities in groundwater based on the contaminants Kow and the ground-water seepage velocity.

Governing Equations:

$Vc = Vavg/Rd$

Where: Vc = Contaminant Velocity in ground water (ft/d)
Vavg = Average ground-water seepage velocity (ft/d)
and: Rd = Retardation factor (unitless)

$Rd = 1 + (Kd * pb/n)$

Where: Kd = Distribution coefficient (ml/g)
pb = Bulk soil density (g/ml)
and: n = total porosity (unitless)

$Kd = Koc * [0.2(1-f)Xsoc + f*Xfoc]$

Where: f = mass of silt and clay/mass of sand, silt and clay
Xsoc = Organic fraction of sand ($0 < Xsoc < 0.1$)
Xfoc = Organic Fraction of silt and clay ($0 < Xfox < 0.1$)
Kow = Octanol-water partitioning coefficient (unitless)
and: Koc = Organic carbon partitioning coefficient, = 0.63 * Kow (unitless)

Contaminant: Benzene

Variable	Value	Units	Reference
Kow	100	none	WQA/EPA-600/6-85/002a
Koc	63.00	none	Calculated from above equation
f	0.047	none	Grain size data (Conservative) - Average value for samples 66GW57 and 66GW58.
pb	1.62	g/cm^3	Avg of F-M sand mean values, p.314 WQA/EPA-600/6-85/002a Part II, Table VII-2
n	0.4	none	Avg of F-M sand mean values, p.318 WQA/EPA-600/6-85/002a Part II, Table VII-4. Average value from samples 66GW57 and 66
Xsoc	0.025	none	Mean value of suggested ranges, WQA/EPA-600/6-85/002a
Xfoc	0.065	none	Mean value of suggested ranges, WQA/EPA-600/6-85/002a
Kd	0.49	none	Calculated from above equation
Rd	3.00	none	Calculated from above equation
Vavg	0.34	ft/d	Calculated average ground-water seepage velocity (see Appendix G)

Vc = 1.14E-01 ft/d Calculated from above equation

Spreadsheet designed by Bellis (4/94)

DRAFT

DETERMINATION OF CONTAMINANT VELOCITY IN GROUNDWATER FOR ORGANIC COMPOUNDS

Project Name:	Pit 15	Prepared By/Date:	Tyburski/12-4-96
Job No.:	30740-5-0500/0194	Checked By/Date:	Bellis/12-4-96

Based on the mathematical relationship between Kow and Rd, the following spreadsheet determines contaminant velocities in groundwater based on the contaminants Kow and the ground-water seepage velocity.

Governing Equations:

$Vc = Vavg/Rd$

Where: Vc = Contaminant Velocity in ground water (ft/d)
Vavg = Average ground-water seepage velocity (ft/d)
and: Rd = Retardation factor (unitless)

$Rd = 1 + (Kd * pb/n)$

Where: Kd = Distribution coefficient (ml/g)
pb = Bulk soil density (g/ml)
and: n = total porosity (unitless)

$Kd = Koc * [0.2(1-f)Xsoc + f*Xfoc]$

Where: f = mass of silt and clay/mass of sand, silt and clay
Xsoc = Organic fraction of sand ($0 < Xsoc < 0.1$)
Xfoc = Organic Fraction of silt and clay ($0 < Xfox < 0.1$)
Kow = Octanol-water partitioning coefficient (unitless)
and: Koc = Organic carbon partitioning coefficient, = 0.63 * Kow (unitless)

Contaminant: MTBE

Variable	Value	Units	Reference
Kow	17.37	none	WQA/EPA-600/6-85/002a
Koc	10.94	none	Calculated from above equation
f	0.047	none	Grain size data (Conservative) - Average value for samples 66GW57 and 66GW58.
pb	1.62	g/cm^3	Avg of F-M sand mean values, p 314 WQA/EPA-600/6-85/002a Part II, Table VII-2
n	0.4	none	Avg of F-M sand mean values, p.318 WQA/EPA-600/6-85/002a Part II, Table VII-4. Average value.
Xsoc	0.025	none	Mean value of suggested ranges, WQA/EPA-600/6-85/002a
Xfoc	0.065	none	Mean value of suggested ranges, WQA/EPA-600/6-85/002a
Kd	0.09	none	Calculated from above equation
Rd	1.35	none	Calculated from above equation
Vavg	0.34	ft/d	Calculated average ground-water seepage velocity (Appendix G)

Vc = 2.52E-01 ft/d Calculated from above equation

Spreadsheet designed by Bellis (4/94)

DRAFT

DETERMINATION OF CONTAMINANT VELOCITY IN GROUNDWATER FOR ORGANIC COMPOUNDS

Project Name:	Pit 15	Prepared By/Date:	Tyburski/12-4-96
Job No.:	30740-5-0500/0194	Checked By/Date:	Bellis/12-4-96

Based on the mathematical relationship between Kow and Rd, the following spreadsheet determines contaminant velocities in groundwater based on the contaminants Kow and the ground-water seepage velocity.

Governing Equations:

$Vc = Vavg/Rd$

Where: Vc = Contaminant Velocity in ground water (ft/d)
Vavg = Average ground-water seepage velocity (ft/d)
and: Rd = Retardation factor (unitless)

$Rd = 1 + (Kd * pb/n)$

Where: Kd = Distribution coefficient (ml/g)
pb = Bulk soil density (g/ml)
and: n = total porosity (unitless)

$Kd = Koc * [0.2(1-f)Xsoc + f*Xfoc]$

Where: f = mass of silt and clay/mass of sand, silt and clay
Xsoc = Organic fraction of sand ($0 < Xsoc < 0.1$)
Xfoc = Organic Fraction of silt and clay ($0 < Xfox < 0.1$)
Kow = Octanol-water partitioning coefficient (unitless)
and: Koc = Organic carbon partitioning coefficient, = 0.63 * Kow (unitless)

Contaminant: Naphthalene

Variable	Value	Units	Reference
Kow	2300	none	WQA/EPA-600/6-85/002a
Koc	1449.00	none	Calculated from above equation
f	0.047	none	Grain size data (Conservative) - Average value for samples 66GW57 and 66GW58.
pb	1.62	g/cm^3	Avg of F-M sand mean values, p.314 WQA/EPA-600/6-85/002a Part II, Table VII-2
n	0.4	none	Avg of F-M sand mean values, p.318 WQA/EPA-600/6-85/002a Part II, Table VII-4. Average value.
Xsoc	0.025	none	Mean value of suggested ranges, WQA/EPA-600/6-85/002a
Xfoc	0.065	none	Mean value of suggested ranges, WQA/EPA-600/6-85/002a
Kd	11.33	none	Calculated from above equation
Rd	46.89	none	Calculated from above equation
Vavg	0.34	ft/d	Calculated average ground-water seepage velocity (see Appendix G)

Vc = 7.25E-03 ft/d Calculated from above equation

Spreadsheet designed by Bellis (4/94)

DRAFT

APPENDIX I

LABORATORY ANALYTICAL TEST RESULTS/ CHAIN OF CUSTODY RECORDS

LAW
ENGINEERING AND ENVIRONMENTAL SERVICES
3355 McLemore Drive
Pensacola, Florida 32514
(904) 857-0606

October 17, 1996

Mr. Jeff Tyburski
Law Eng. & Env. Svcs., Inc.
3301 Atlantic Avenue
Raleigh, NC 27604

Subject: Chemical Analysis of Samples Received on 10/09/96
Project Number: 30740-5-0500-0194

Dear Mr. Tyburski:

Law Eng. & Env. National Laboratories has completed its analysis of your samples and reports the results on the following pages. These results relate only to the contents of the samples as submitted.

If further assistance is needed, please feel free to contact Kelli Silvia or myself at (904) 857-0606.

Sincerely,

LAW ENG. & ENV. SVCS. NATIONAL LABORATORIES

James M.G. Tucci
Laboratory Manager

JMGT/kas

Enclosures: Data Report
Invoice

LAW ENVIRONMENTAL NATIONAL LABORATORIES

TEST DATA REPORT

10/17/96

--- Project Information ---

Mr. Jeff Tyburski
Law Eng & Envir Services, Inc.
3301 Atlantic Avenue
Raleigh, NC 27604

Project Name: PIT
Pit 15 Proj. #30740-0500-0194

--- Sample Information ---

Station ID: 66GW55
Lab ID: AB01814
Collector: J TYBURSKI

Date Sampled: 10/07/96
Time Sampled: 17:10
Log In Date: 10/09/96
Log In Time: 16:17

--- Test Information ---

Parameter	Units	Method	Det Lim	Result	Analysis Date	Tech
622-602 VOA by GC ug/L	ug/L	EPA 602		_TITLE_	10/17/96	WM
Benzene	ug/L	EPA 602	5.00	45.4	10/17/96	WM
Chlorobenzene	ug/L	EPA 602	5.00	Not Det	10/17/96	WM
1,2-Dichlorobenzene	ug/L	EPA 602	5.00	13.8	10/17/96	WM
1,3-Dichlorobenzene	ug/L	EPA 602	5.00	Not Det	10/17/96	WM
1,4-Dichlorobenzene	ug/L	EPA 602	5.00	Not Det	10/17/96	WM
Ethylbenzene	ug/L	EPA 602	5.00	78.5	10/17/96	WM
Toluene	ug/L	EPA 602	5.00	120	10/17/96	WM
Xylenes (total)	ug/L	EPA 602	5.00	580	10/17/96	WM
Methyl tert-butyl ether	ug/L	EPA 602	5.00	Not Det	10/17/96	WM
sur-Fluorobenzene %R 62-116	ug/L	EPA 602	0	94	10/17/96	WM
622-625 Semi-VOA ug/L	ug/L	EPA 625		_TITLE_	10/10/96	DH
Acenaphthene	ug/L	EPA 625	4.92	Not Det	10/10/96	DH
Acenaphthylene	ug/L	EPA 625	3.81	Not Det	10/10/96	DH
Anthracene	ug/L	EPA 625	11.7	Not Det	10/10/96	DH
Benzo(a)anthracene	ug/L	EPA 625	13.5	Not Det	10/10/96	DH
Benzidine	ug/L	EPA 625	60.3	Not Det	10/10/96	DH
Benzo(b)fluoranthene	ug/L	EPA 625	8.86	Not Det	10/10/96	DH
Benzo(k)fluoranthene	ug/L	EPA 625	10.7	Not Det	10/10/96	DH
Benzo(g,h,i)perylene	ug/L	EPA 625	36.9	Not Det	10/10/96	DH
Benzo(a)pyrene	ug/L	EPA 625	8.61	Not Det	10/10/96	DH
bis(2-Chloroethoxy)methane	ug/L	EPA 625	12.3	Not Det	10/10/96	DH
bis(2-Chloroethyl)ether	ug/L	EPA 625	25.8	Not Det	10/10/96	DH
bis(2-Chloroisopropyl)ether	ug/L	EPA 625	27.1	Not Det	10/10/96	DH
bis(2-Ethylhexyl)phthalate	ug/L	EPA 625	41.8	69.6	10/10/96	DH
4-Bromophenyl phenyl ether	ug/L	EPA 625	13.5	Not Det	10/10/96	DH
Butylbenzylphthalate	ug/L	EPA 625	10.1	Not Det	10/10/96	DH
2-Chloronaphthalene	ug/L	EPA 625	17.2	Not Det	10/10/96	DH
4-Chlorophenyl phenyl ether	ug/L	EPA 625	17.2	Not Det	10/10/96	DH
Chrysene	ug/L	EPA 625	4.18	Not Det	10/10/96	DH
Dibenz(a,h)anthracene	ug/L	EPA 625	10.8	Not Det	10/10/96	DH
Di-n-butylphthalate	ug/L	EPA 625	6.40	Not Det	10/10/96	DH
1,2-Dichlorobenzene	ug/L	EPA 625	12.3	Not Det	10/10/96	DH
1,3-Dichlorobenzene	ug/L	EPA 625	27.1	Not Det	10/10/96	DH
1,4-Dichlorobenzene	ug/L	EPA 625	19.7	Not Det	10/10/96	DH

LAW ENVIRONMENTAL NATIONAL LABORATORIES

TEST DATA REPORT

10/17/96

--- Project Information ---

Mr. Jeff Tyburski
Law Eng & Envir Services, Inc.
3301 Atlantic Avenue
Raleigh, NC 27604

Project Name: PIT
Pit 15 Proj. #30740-0500-0194

--- Sample Information ---

Station ID: 66GW55
Lab ID: AB01814
Collector: J TYBURSKI

Date Sampled: 10/07/96
Time Sampled: 17:10
Log In Date: 10/09/96
Log In Time: 16:17

--- Test Information ---

Parameter	Units	Method	Det Lim	Result	Analysis Date	Tech
3,3'-Dichlorobenzidine	ug/L	EPA 625	89.8	Not Det	10/10/96	DH
Diethylphthalate	ug/L	EPA 625	14.8	Not Det	10/10/96	DH
Dimethylphthalate	ug/L	EPA 625	11.7	Not Det	10/10/96	DH
2,4-Dinitrotoluene	ug/L	EPA 625	23.4	Not Det	10/10/96	DH
2,6-Dinitrotoluene	ug/L	EPA 625	23.4	Not Det	10/10/96	DH
Dinoctylphthalate	ug/L	EPA 625	8.49	Not Det	10/10/96	DH
Fluoranthene	ug/L	EPA 625	3.08	Not Det	10/10/96	DH
Fluorene	ug/L	EPA 625	2.58	Not Det	10/10/96	DH
Hexachlorobenzene	ug/L	EPA 625	25.8	Not Det	10/10/96	DH
Hexachlorobutadiene	ug/L	EPA 625	36.9	Not Det	10/10/96	DH
Hexachlorocyclopentadiene	ug/L	EPA 625	123	Not Det	10/10/96	DH
Hexachloroethane	ug/L	EPA 625	28.3	Not Det	10/10/96	DH
Indeno(1,2,3-cd)pyrene	ug/L	EPA 625	16.0	Not Det	10/10/96	DH
Isophorone	ug/L	EPA 625	14.8	Not Det	10/10/96	DH
Naphthalene	ug/L	EPA 625	4.55	398	10/10/96	DH
Nitrobenzene	ug/L	EPA 625	19.7	Not Det	10/10/96	DH
n-Nitrosodimethylamine	ug/L	EPA 625	92.2	Not Det	10/10/96	DH
n-Nitrosodiphenylamine	ug/L	EPA 625	34.4	Not Det	10/10/96	DH
n-Nitrosodi-n-propylamine	ug/L	EPA 625	33.2	Not Det	10/10/96	DH
Phenanthrene	ug/L	EPA 625	7.26	Not Det	10/10/96	DH
Pyrene	ug/L	EPA 625	6.52	Not Det	10/10/96	DH
1,2,4-Trichlorobenzene	ug/L	EPA 625	23.4	Not Det	10/10/96	DH
sur-Nitrobenzene-d5 %R 35-114	ug/L	EPA 625	0	79	10/10/96	DH
sur-Fluorobiphenyl %R 43-116	ug/L	EPA 625	0	87	10/10/96	DH
sur-Terphenyl-d14 %R 38-141	ug/L	EPA 625	0	83	10/10/96	DH
610-3030C Furnace Digest W		3030C		Done	10/10/96	JE
610-239.2 Lead ug/L	ug/L	EPA 239.2	25.0	1760	10/11/96	JM
623-3520 Cont. Liq/Liq Ext. B/N		SW3520		Done	10/09/96	SB

Remarks:

Signed: _____

James M.G. Tucci
Laboratory Manager

LAW ENVIRONMENTAL NATIONAL LABORATORIES

TEST DATA REPORT

10/17/96

--- Project Information ---

Mr. Jeff Tyburski

Law Eng & Envir Services, Inc.

3301 Atlantic Avenue

Raleigh, NC 27604

Project Name: PIT

Pit 15 Proj. #30740-0500-0194

--- Sample Information ---

Station ID: 66GW105

Lab ID: AB01815

Collector: J TYBURSKI

Date Sampled: 10/07/96

Time Sampled: 18:10

Log In Date: 10/09/96

Log In Time: 16:17

--- Test Information ---

Parameter	Units	Method	Det Lim	Result	Analysis Date	Tech
622-602 VOA by GC ug/L	ug/L	EPA 602		_TITLE_	10/17/96	WM
Benzene	ug/L	EPA 602	5.00	41.0	10/17/96	WM
Chlorobenzene	ug/L	EPA 602	5.00	Not Det	10/17/96	WM
1,2-Dichlorobenzene	ug/L	EPA 602	5.00	13.1	10/17/96	WM
1,3-Dichlorobenzene	ug/L	EPA 602	5.00	Not Det	10/17/96	WM
1,4-Dichlorobenzene	ug/L	EPA 602	5.00	Not Det	10/17/96	WM
Ethylbenzene	ug/L	EPA 602	5.00	71.4	10/17/96	WM
Toluene	ug/L	EPA 602	5.00	112	10/17/96	WM
Xylenes (total)	ug/L	EPA 602	5.00	54.0	10/17/96	WM
Methyl tert-butyl ether	ug/L	EPA 602	5.00	Not Det	10/17/96	WM
sur-Fluorobenzene %R 62-116	ug/L	EPA 602	0	94	10/17/96	WM
622-625 Semi-VOA ug/L	ug/L	EPA 625		_TITLE_	10/11/96	DH
Acenaphthene	ug/L	EPA 625	4.48	Not Det	10/11/96	DH
Acenaphthylene	ug/L	EPA 625	3.47	Not Det	10/11/96	DH
Anthracene	ug/L	EPA 625	10.6	Not Det	10/11/96	DH
Benzo(a)anthracene	ug/L	EPA 625	12.3	Not Det	10/11/96	DH
Benzidine	ug/L	EPA 625	54.9	Not Det	10/11/96	DH
Benzo(b)fluoranthene	ug/L	EPA 625	8.06	Not Det	10/11/96	DH
Benzo(k)fluoranthene	ug/L	EPA 625	9.74	Not Det	10/11/96	DH
Benzo(g,h,i)perylene	ug/L	EPA 625	33.6	Not Det	10/11/96	DH
Benzo(a)pyrene	ug/L	EPA 625	7.84	Not Det	10/11/96	DH
bis(2-Chloroethoxy)methane	ug/L	EPA 625	11.2	Not Det	10/11/96	DH
bis(2-Chloroethyl)ether	ug/L	EPA 625	23.5	Not Det	10/11/96	DH
bis(2-Chloroisopropyl)ether	ug/L	EPA 625	24.6	Not Det	10/11/96	DH
bis(2-Ethylhexyl)phthalate	ug/L	EPA 625	38.1	Not Det	10/11/96	DH
4-Bromophenyl phenyl ether	ug/L	EPA 625	12.3	Not Det	10/11/96	DH
Butylbenzylphthalate	ug/L	EPA 625	9.18	Not Det	10/11/96	DH
2-Chloronaphthalene	ug/L	EPA 625	15.7	Not Det	10/11/96	DH
4-Chlorophenyl phenyl ether	ug/L	EPA 625	15.7	Not Det	10/11/96	DH
Chrysene	ug/L	EPA 625	3.81	Not Det	10/11/96	DH
Dibenz(a,h)anthracene	ug/L	EPA 625	9.86	Not Det	10/11/96	DH
Di-n-butylphthalate	ug/L	EPA 625	5.82	Not Det	10/11/96	DH
1,2-Dichlorobenzene	ug/L	EPA 625	11.2	Not Det	10/11/96	DH
1,3-Dichlorobenzene	ug/L	EPA 625	24.6	Not Det	10/11/96	DH
1,4-Dichlorobenzene	ug/L	EPA 625	17.9	Not Det	10/11/96	DH

LAW ENVIRONMENTAL NATIONAL LABORATORIES

TEST DATA REPORT

10/17/96

--- Project Information ---

Mr. Jeff Tyburski

Law Eng & Envir Services, Inc.

3301 Atlantic Avenue

Raleigh, NC 27604

Project Name: PIT

Pit 15 Proj. #30740-0500-0194

--- Sample Information ---

Station ID: 66GW105

Lab ID: AB01815

Collector: J TYBURSKI

Date Sampled: 10/07/96

Time Sampled: 18:10

Log In Date: 10/09/96

Log In Time: 16:17

--- Test Information ---

Parameter	Units	Method	Det Lim	Result	Analysis Date	Tech
3,3'-Dichlorobenzidine	ug/L	EPA 625	81.8	Not Det	10/11/96	DH
Diethylphthalate	ug/L	EPA 625	13.4	Not Det	10/11/96	DH
Dimethylphthalate	ug/L	EPA 625	10.6	Not Det	10/11/96	DH
2,4-Dinitrotoluene	ug/L	EPA 625	21.3	Not Det	10/11/96	DH
2,6-Dinitrotoluene	ug/L	EPA 625	21.3	Not Det	10/11/96	DH
Dinoctylphthalate	ug/L	EPA 625	7.73	Not Det	10/11/96	DH
Fluoranthene	ug/L	EPA 625	2.80	Not Det	10/11/96	DH
Fluorene	ug/L	EPA 625	2.35	Not Det	10/11/96	DH
Hexachlorobenzene	ug/L	EPA 625	23.5	Not Det	10/11/96	DH
Hexachlorobutadiene	ug/L	EPA 625	33.6	Not Det	10/11/96	DH
Hexachlorocyclopentadiene	ug/L	EPA 625	112	Not Det	10/11/96	DH
Hexachloroethane	ug/L	EPA 625	25.8	Not Det	10/11/96	DH
Indeno(1,2,3-cd)pyrene	ug/L	EPA 625	14.6	Not Det	10/11/96	DH
Isophorone	ug/L	EPA 625	13.4	Not Det	10/11/96	DH
Naphthalene	ug/L	EPA 625	4.14	353	10/11/96	DH
Nitrobenzene	ug/L	EPA 625	17.9	Not Det	10/11/96	DH
n-Nitrosodimethylamine	ug/L	EPA 625	84.0	Not Det	10/11/96	DH
n-Nitrosodiphenylamine	ug/L	EPA 625	31.4	Not Det	10/11/96	DH
n-Nitrosodi-n-propylamine	ug/L	EPA 625	30.2	Not Det	10/11/96	DH
Phenanthrene	ug/L	EPA 625	6.61	Not Det	10/11/96	DH
Pyrene	ug/L	EPA 625	5.94	Not Det	10/11/96	DH
1,2,4-Trichlorobenzene	ug/L	EPA 625	21.3	Not Det	10/11/96	DH
sur-Nitrobenzene-d5 %R 35-114	ug/L	EPA 625	0	67	10/11/96	DH
sur-Fluorobiphenyl %R 43-116	ug/L	EPA 625	0	70	10/11/96	DH
sur-Terphenyl-d14 %R 38-141	ug/L	EPA 625	0	61	10/11/96	DH
610-3030C Furnace Digest W		3030C		Done	10/10/96	JE
610-239.2 Lead ug/L	ug/L	EPA 239.2	5.00	174	10/11/96	JM
623-3520 Cont. Liq/Liq Ext. B/N		SW3520		Done	10/09/96	SB

Remarks:

Signed: _____

James M.G. Tucci
Laboratory Manager

LAW ENVIRONMENTAL NATIONAL LABORATORIES

TEST DATA REPORT

10/17/96

--- Project Information ---

Mr. Jeff Tyburski

Law Eng & Envir Services, Inc.

3301 Atlantic Avenue

Raleigh, NC 27604

Project Name: PIT

Pit 15 Proj. #30740-0500-0194

--- Sample Information ---

Station ID: 66GW58

Lab ID: AB01816

Collector: J TYBURSKI

Date Sampled: 10/07/96

Time Sampled: 16:00

Log In Date: 10/09/96

Log In Time: 16:17

--- Test Information ---

Parameter	Units	Method	Det Lim	Result	Analysis Date	Tech
622-602 VOA by GC ug/L	ug/L	EPA 602		_TITLE_	10/16/96	WM
Benzene	ug/L	EPA 602	0.500	Not Det	10/16/96	WM
Chlorobenzene	ug/L	EPA 602	0.500	Not Det	10/16/96	WM
1,2-Dichlorobenzene	ug/L	EPA 602	0.500	Not Det	10/16/96	WM
1,3-Dichlorobenzene	ug/L	EPA 602	0.500	Not Det	10/16/96	WM
1,4-Dichlorobenzene	ug/L	EPA 602	0.500	1.63	10/16/96	WM
Ethylbenzene	ug/L	EPA 602	0.500	0.665	10/16/96	WM
Toluene	ug/L	EPA 602	0.500	0.938	10/16/96	WM
Xylenes (total)	ug/L	EPA 602	0.500	4.68	10/16/96	WM
Methyl tert-butyl ether	ug/L	EPA 602	0.500	2.21	10/16/96	WM
sur-Fluorobenzene %R 62-116	ug/L	EPA 602	0	96	10/16/96	WM
622-625 Semi-VOA ug/L	ug/L	EPA 625		_TITLE_	10/10/96	DH
Acenaphthene	ug/L	EPA 625	0.476	Not Det	10/10/96	DH
Acenaphthylene	ug/L	EPA 625	0.369	Not Det	10/10/96	DH
Anthracene	ug/L	EPA 625	1.13	Not Det	10/10/96	DH
Benzo(a)anthracene	ug/L	EPA 625	1.31	Not Det	10/10/96	DH
Benzidine	ug/L	EPA 625	5.83	Not Det	10/10/96	DH
Benzo(b)fluoranthene	ug/L	EPA 625	0.857	Not Det	10/10/96	DH
Benzo(k)fluoranthene	ug/L	EPA 625	1.04	Not Det	10/10/96	DH
Benzo(g,h,i)perylene	ug/L	EPA 625	3.57	Not Det	10/10/96	DH
Benzo(a)pyrene	ug/L	EPA 625	0.833	Not Det	10/10/96	DH
bis(2-Chloroethoxy)methane	ug/L	EPA 625	1.19	Not Det	10/10/96	DH
bis(2-Chloroethyl)ether	ug/L	EPA 625	2.50	Not Det	10/10/96	DH
bis(2-Chloroisopropyl)ether	ug/L	EPA 625	2.62	Not Det	10/10/96	DH
bis(2-Ethylhexyl)phthalate	ug/L	EPA 625	4.05	Not Det	10/10/96	DH
4-Bromophenyl phenyl ether	ug/L	EPA 625	1.31	Not Det	10/10/96	DH
Butylbenzylphthalate	ug/L	EPA 625	0.976	Not Det	10/10/96	DH
2-Chloronaphthalene	ug/L	EPA 625	1.67	Not Det	10/10/96	DH
4-Chlorophenyl phenyl ether	ug/L	EPA 625	1.67	Not Det	10/10/96	DH
Chrysene	ug/L	EPA 625	0.405	Not Det	10/10/96	DH
Dibenz(a,h)anthracene	ug/L	EPA 625	1.05	Not Det	10/10/96	DH
Di-n-butylphthalate	ug/L	EPA 625	0.619	Not Det	10/10/96	DH
1,2-Dichlorobenzene	ug/L	EPA 625	1.19	Not Det	10/10/96	DH
1,3-Dichlorobenzene	ug/L	EPA 625	2.62	Not Det	10/10/96	DH
1,4-Dichlorobenzene	ug/L	EPA 625	1.90	Not Det	10/10/96	DH

LAW ENVIRONMENTAL NATIONAL LABORATORIES

TEST DATA REPORT

10/17/96

--- Project Information ---

Mr. Jeff Tyburski

Law Eng & Envir Services, Inc.

3301 Atlantic Avenue

Raleigh, NC 27604

Project Name: PIT

Pit 15 Proj. #30740-0500-0194

--- Sample Information ---

Station ID: 66GW58

Lab ID: AB01816

Collector: J TYBURSKI

Date Sampled: 10/07/96

Time Sampled: 16:00

Log In Date: 10/09/96

Log In Time: 16:17

--- Test Information ---

Parameter	Units	Method	Det Lim	Result	Analysis Date	Tech
3,3'-Dichlorobenzidine	ug/L	EPA 625	8.69	Not Det	10/10/96	DH
Diethylphthalate	ug/L	EPA 625	1.43	Not Det	10/10/96	DH
Dimethylphthalate	ug/L	EPA 625	1.13	Not Det	10/10/96	DH
2,4-Dinitrotoluene	ug/L	EPA 625	2.26	Not Det	10/10/96	DH
2,6-Dinitrotoluene	ug/L	EPA 625	2.26	Not Det	10/10/96	DH
Dinoctylphthalate	ug/L	EPA 625	0.821	Not Det	10/10/96	DH
Fluoranthene	ug/L	EPA 625	0.298	Not Det	10/10/96	DH
Fluorene	ug/L	EPA 625	0.250	Not Det	10/10/96	DH
Hexachlorobenzene	ug/L	EPA 625	2.50	Not Det	10/10/96	DH
Hexachlorobutadiene	ug/L	EPA 625	3.57	Not Det	10/10/96	DH
Hexachlorocyclopentadiene	ug/L	EPA 625	11.9	Not Det	10/10/96	DH
Hexachloroethane	ug/L	EPA 625	2.74	Not Det	10/10/96	DH
Indeno(1,2,3-cd)pyrene	ug/L	EPA 625	1.55	Not Det	10/10/96	DH
Isophorone	ug/L	EPA 625	1.43	Not Det	10/10/96	DH
Naphthalene	ug/L	EPA 625	0.440	2.36	10/10/96	DH
Nitrobenzene	ug/L	EPA 625	1.90	Not Det	10/10/96	DH
n-Nitrosodimethylamine	ug/L	EPA 625	8.92	Not Det	10/10/96	DH
n-Nitrosodiphenylamine	ug/L	EPA 625	3.33	Not Det	10/10/96	DH
n-Nitrosodi-n-propylamine	ug/L	EPA 625	3.21	Not Det	10/10/96	DH
Phenanthrene	ug/L	EPA 625	0.702	Not Det	10/10/96	DH
Pyrene	ug/L	EPA 625	0.631	Not Det	10/10/96	DH
1,2,4-Trichlorobenzene	ug/L	EPA 625	2.26	Not Det	10/10/96	DH
sur-Nitrobenzene-d5 %R 35-114	ug/L	EPA 625	0	73	10/10/96	DH
sur-Fluorobiphenyl %R 43-116	ug/L	EPA 625	0	79	10/10/96	DH
sur-Terphenyl-d14 %R 38-141	ug/L	EPA 625	0	81	10/10/96	DH
610-3030C Furnace Digest W		3030C		Done	10/10/96	JE
610-239.2 Lead ug/L	ug/L	EPA 239.2	1.00	24.8	10/11/96	JM
623-3520 Cont. Liq/Liq Ext. B/N		SW3520		Done	10/09/96	SB

Remarks:

Signed: _____

James M.G. Tucci
Laboratory Manager

LAW ENVIRONMENTAL NATIONAL LABORATORIES

TEST DATA REPORT

10/17/96

--- Project Information ---

Mr. Jeff Tyburski

Law Eng & Envir Services, Inc.

3301 Atlantic Avenue

Raleigh, NC 27604

Project Name: PIT

Pit 15 Proj. #30740-0500-0194

--- Sample Information ---

Station ID: 66 TRIP BLANK

Lab ID: AB01817

Collector: J TYBURSKI

Date Sampled: 10/07/96

Time Sampled: 00:00

Log In Date: 10/09/96

Log In Time: 16:17

--- Test Information ---

Parameter	Units	Method	Det Lim	Result	Analysis Date	Tech
622-602 VOA by GC ug/L	ug/L	EPA 602		_TITLE_	10/16/96	WM
Benzene	ug/L	EPA 602	0.500	Not Det	10/16/96	WM
Chlorobenzene	ug/L	EPA 602	0.500	Not Det	10/16/96	WM
1,2-Dichlorobenzene	ug/L	EPA 602	0.500	Not Det	10/16/96	WM
1,3-Dichlorobenzene	ug/L	EPA 602	0.500	Not Det	10/16/96	WM
1,4-Dichlorobenzene	ug/L	EPA 602	0.500	Not Det	10/16/96	WM
Ethylbenzene	ug/L	EPA 602	0.500	Not Det	10/16/96	WM
Toluene	ug/L	EPA 602	0.500	Not Det	10/16/96	WM
Xylenes (total)	ug/L	EPA 602	0.500	Not Det	10/16/96	WM
Methyl tert-butyl ether	ug/L	EPA 602	0.500	Not Det	10/16/96	WM
sur-Fluorobenzene %R 62-116	ug/L	EPA 602	0	96	10/16/96	WM

Remarks:

Signed: _____

James M.G. Tucci

Laboratory Manager

LAW ENVIRONMENTAL NATIONAL LABORATORIES

TEST DATA REPORT

10/17/96

--- Project Information ---

Mr. Jeff Tyburski

Law Eng & Envir Services, Inc.

3301 Atlantic Avenue

Raleigh, NC 27604

Project Name: PIT

Pit 15 Proj. #30740-0500-0194

--- Sample Information ---

Station ID: 56GW21

Lab ID: AB01818

Collector: J TYBURSKI

Date Sampled: 10/07/96

Time Sampled: 12:50

Log In Date: 10/09/96

Log In Time: 16:17

--- Test Information ---

Parameter	Units	Method	Det Lim	Result	Analysis Date	Tech
622-602 VOA by GC ug/L	ug/L	EPA 602		_TITLE_	10/16/96	WM
Benzene	ug/L	EPA 602	0.500	Not Det	10/16/96	WM
Chlorobenzene	ug/L	EPA 602	0.500	Not Det	10/16/96	WM
1,2-Dichlorobenzene	ug/L	EPA 602	0.500	Not Det	10/16/96	WM
1,3-Dichlorobenzene	ug/L	EPA 602	0.500	Not Det	10/16/96	WM
1,4-Dichlorobenzene	ug/L	EPA 602	0.500	Not Det	10/16/96	WM
Ethylbenzene	ug/L	EPA 602	0.500	Not Det	10/16/96	WM
Toluene	ug/L	EPA 602	0.500	Not Det	10/16/96	WM
Xylenes (total)	ug/L	EPA 602	0.500	Not Det	10/16/96	WM
Methyl tert-butyl ether	ug/L	EPA 602	0.500	Not Det	10/16/96	WM
sur-Fluorobenzene %R 62-116	ug/L	EPA 602	0	95	10/16/96	WM
622-625 Semi-VOA ug/L	ug/L	EPA 625		_TITLE_	10/10/96	DH
Acenaphthene	ug/L	EPA 625	0.444	Not Det	10/10/96	DH
Acenaphthylene	ug/L	EPA 625	0.344	Not Det	10/10/96	DH
Anthracene	ug/L	EPA 625	1.05	Not Det	10/10/96	DH
Benzo(a)anthracene	ug/L	EPA 625	1.22	Not Det	10/10/96	DH
Benzidine	ug/L	EPA 625	5.44	Not Det	10/10/96	DH
Benzo(b)fluoranthene	ug/L	EPA 625	0.799	Not Det	10/10/96	DH
Benzo(k)fluoranthene	ug/L	EPA 625	0.966	Not Det	10/10/96	DH
Benzo(g,h,i)perylene	ug/L	EPA 625	3.33	Not Det	10/10/96	DH
Benzo(a)pyrene	ug/L	EPA 625	0.777	Not Det	10/10/96	DH
bis(2-Chloroethoxy)methane	ug/L	EPA 625	1.11	Not Det	10/10/96	DH
bis(2-Chloroethyl)ether	ug/L	EPA 625	2.33	Not Det	10/10/96	DH
bis(2-Chloroisopropyl)ether	ug/L	EPA 625	2.44	Not Det	10/10/96	DH
bis(2-Ethylhexyl)phthalate	ug/L	EPA 625	3.77	Not Det	10/10/96	DH
4-Bromophenyl phenyl ether	ug/L	EPA 625	1.22	Not Det	10/10/96	DH
Butylbenzylphthalate	ug/L	EPA 625	0.910	Not Det	10/10/96	DH
2-Chloronaphthalene	ug/L	EPA 625	1.55	Not Det	10/10/96	DH
4-Chlorophenyl phenyl ether	ug/L	EPA 625	1.55	Not Det	10/10/96	DH
Chrysene	ug/L	EPA 625	0.377	Not Det	10/10/96	DH
Dibenz(a,h)anthracene	ug/L	EPA 625	0.977	Not Det	10/10/96	DH
Di-n-butylphthalate	ug/L	EPA 625	0.577	Not Det	10/10/96	DH
1,2-Dichlorobenzene	ug/L	EPA 625	1.11	Not Det	10/10/96	DH
1,3-Dichlorobenzene	ug/L	EPA 625	2.44	Not Det	10/10/96	DH
1,4-Dichlorobenzene	ug/L	EPA 625	1.78	Not Det	10/10/96	DH

LAW ENVIRONMENTAL NATIONAL LABORATORIES

TEST DATA REPORT

10/17/96

--- Project Information ---

Mr. Jeff Tyburski
Law Eng & Envir Services, Inc.
3301 Atlantic Avenue
Raleigh, NC 27604

Project Name: PIT
Pit 15 Proj. #30740-0500-0194

--- Sample Information ---

Station ID: 56GW21
Lab ID: AB01818
Collector: J TYBURSKI

Date Sampled: 10/07/96
Time Sampled: 12:50
Log In Date: 10/09/96
Log In Time: 16:17

--- Test Information ---

Parameter	Units	Method	Det Lim	Result	Analysis Date	Tech
3,3'-Dichlorobenzidine	ug/L	EPA 625	8.10	Not Det	10/10/96	DH
Diethylphthalate	ug/L	EPA 625	1.33	Not Det	10/10/96	DH
Dimethylphthalate	ug/L	EPA 625	1.05	Not Det	10/10/96	DH
2,4-Dinitrotoluene	ug/L	EPA 625	2.11	Not Det	10/10/96	DH
2,6-Dinitrotoluene	ug/L	EPA 625	2.11	Not Det	10/10/96	DH
Dinoctylphthalate	ug/L	EPA 625	0.766	Not Det	10/10/96	DH
Fluoranthene	ug/L	EPA 625	0.278	Not Det	10/10/96	DH
Fluorene	ug/L	EPA 625	0.233	Not Det	10/10/96	DH
Hexachlorobenzene	ug/L	EPA 625	2.33	Not Det	10/10/96	DH
Hexachlorobutadiene	ug/L	EPA 625	3.33	Not Det	10/10/96	DH
Hexachlorocyclopentadiene	ug/L	EPA 625	11.1	Not Det	10/10/96	DH
Hexachloroethane	ug/L	EPA 625	2.55	Not Det	10/10/96	DH
Indeno(1,2,3-cd)pyrene	ug/L	EPA 625	1.44	Not Det	10/10/96	DH
Isophorone	ug/L	EPA 625	1.33	Not Det	10/10/96	DH
Naphthalene	ug/L	EPA 625	0.411	Not Det	10/10/96	DH
Nitrobenzene	ug/L	EPA 625	1.78	Not Det	10/10/96	DH
n-Nitrosodimethylamine	ug/L	EPA 625	8.32	Not Det	10/10/96	DH
n-Nitrosodiphenylamine	ug/L	EPA 625	3.11	Not Det	10/10/96	DH
n-Nitrosodi-n-propylamine	ug/L	EPA 625	3.00	Not Det	10/10/96	DH
Phenanthrene	ug/L	EPA 625	0.655	Not Det	10/10/96	DH
Pyrene	ug/L	EPA 625	0.588	Not Det	10/10/96	DH
1,2,4-Trichlorobenzene	ug/L	EPA 625	2.11	Not Det	10/10/96	DH
sur-Nitrobenzene-d5 %R 35-114	ug/L	EPA 625	0	66	10/10/96	DH
sur-Fluorobiphenyl %R 43-116	ug/L	EPA 625	0	71	10/10/96	DH
sur-Terphenyl-d14 %R 38-141	ug/L	EPA 625	0	64	10/10/96	DH
610-3030C Furnace Digest W		3030C		Done	10/10/96	JE
610-239.2 Lead ug/L	ug/L	EPA 239.2	1.00	29.1	10/11/96	JM
623-3520 Cont. Liq/Liq Ext. B/N		SW3520		Done	10/09/96	SB

Remarks:

Signed: _____

James M.G. Tucci

Laboratory Manager

LAW ENVIRONMENTAL NATIONAL LABORATORIES

TEST DATA REPORT

10/17/96

--- Project Information ---

Mr. Jeff Tyburski

Law Eng & Envir Services, Inc.

3301 Atlantic Avenue

Raleigh, NC 27604

Project Name: PIT

Pit 15 Proj. #30740-0500-0194

--- Sample Information ---

Station ID: 66GW06

Lab ID: AB01819

Collector: J TYBURSKI

Date Sampled: 10/07/96

Time Sampled: 12:00

Log In Date: 10/09/96

Log In Time: 16:17

--- Test Information ---

Parameter	Units	Method	Det Lim	Result	Analysis Date	Tech
622-602 VOA by GC ug/L	ug/L	EPA 602		_TITLE_	10/16/96	WM
Benzene	ug/L	EPA 602	0.500	Not Det	10/16/96	WM
Chlorobenzene	ug/L	EPA 602	0.500	Not Det	10/16/96	WM
1,2-Dichlorobenzene	ug/L	EPA 602	0.500	Not Det	10/16/96	WM
1,3-Dichlorobenzene	ug/L	EPA 602	0.500	Not Det	10/16/96	WM
1,4-Dichlorobenzene	ug/L	EPA 602	0.500	Not Det	10/16/96	WM
Ethylbenzene	ug/L	EPA 602	0.500	Not Det	10/16/96	WM
Toluene	ug/L	EPA 602	0.500	Not Det	10/16/96	WM
Xylenes (total)	ug/L	EPA 602	0.500	Not Det	10/16/96	WM
Methyl tert-butyl ether	ug/L	EPA 602	0.500	Not Det	10/16/96	WM
sur-Fluorobenzene %R 62-116	ug/L	EPA 602	0	95	10/16/96	WM
622-625 Semi-VOA ug/L	ug/L	EPA 625		_TITLE_	10/10/96	DH
Acenaphthene	ug/L	EPA 625	0.500	Not Det	10/10/96	DH
Acenaphthylene	ug/L	EPA 625	0.388	Not Det	10/10/96	DH
Anthracene	ug/L	EPA 625	1.19	Not Det	10/10/96	DH
Benzo(a)anthracene	ug/L	EPA 625	1.38	Not Det	10/10/96	DH
Benzidine	ug/L	EPA 625	6.12	Not Det	10/10/96	DH
Benzo(b)fluoranthene	ug/L	EPA 625	0.900	Not Det	10/10/96	DH
Benzo(k)fluoranthene	ug/L	EPA 625	1.09	Not Det	10/10/96	DH
Benzo(g,h,i)perylene	ug/L	EPA 625	3.75	Not Det	10/10/96	DH
Benzo(a)pyrene	ug/L	EPA 625	0.875	Not Det	10/10/96	DH
bis(2-Chloroethoxy)methane	ug/L	EPA 625	1.25	Not Det	10/10/96	DH
bis(2-Chloroethyl)ether	ug/L	EPA 625	2.62	Not Det	10/10/96	DH
bis(2-Chloroisopropyl)ether	ug/L	EPA 625	2.75	Not Det	10/10/96	DH
bis(2-Ethylhexyl)phthalate	ug/L	EPA 625	4.25	Not Det	10/10/96	DH
4-Bromophenyl phenyl ether	ug/L	EPA 625	1.38	Not Det	10/10/96	DH
Butylbenzylphthalate	ug/L	EPA 625	1.02	Not Det	10/10/96	DH
2-Chloronaphthalene	ug/L	EPA 625	1.75	Not Det	10/10/96	DH
4-Chlorophenyl phenyl ether	ug/L	EPA 625	1.75	Not Det	10/10/96	DH
Chrysene	ug/L	EPA 625	0.425	Not Det	10/10/96	DH
Dibenz(a,h)anthracene	ug/L	EPA 625	1.10	Not Det	10/10/96	DH
Di-n-butylphthalate	ug/L	EPA 625	0.650	Not Det	10/10/96	DH
1,2-Dichlorobenzene	ug/L	EPA 625	1.25	Not Det	10/10/96	DH
1,3-Dichlorobenzene	ug/L	EPA 625	2.75	Not Det	10/10/96	DH
1,4-Dichlorobenzene	ug/L	EPA 625	2.00	Not Det	10/10/96	DH

LAW ENVIRONMENTAL NATIONAL LABORATORIES

TEST DATA REPORT

10/17/96

--- Project Information ---

Mr. Jeff Tyburski

Law Eng & Envir Services, Inc.

3301 Atlantic Avenue

Raleigh, NC 27604

Project Name: PIT

Pit 15 Proj. #30740-0500-0194

--- Sample Information ---

Station ID: 66GW06

Lab ID: AB01819

Collector: J TYBURSKI

Date Sampled: 10/07/96

Time Sampled: 12:00

Log In Date: 10/09/96

Log In Time: 16:17

--- Test Information ---

Parameter	Units	Method	Det Lim	Result	Analysis Date	Tech
3,3'-Dichlorobenzidine	ug/L	EPA 625	9.12	Not Det	10/10/96	DH
Diethylphthalate	ug/L	EPA 625	1.50	Not Det	10/10/96	DH
Dimethylphthalate	ug/L	EPA 625	1.19	Not Det	10/10/96	DH
2,4-Dinitrotoluene	ug/L	EPA 625	2.38	Not Det	10/10/96	DH
2,6-Dinitrotoluene	ug/L	EPA 625	2.38	Not Det	10/10/96	DH
Dinoctylphthalate	ug/L	EPA 625	0.862	Not Det	10/10/96	DH
Fluoranthene	ug/L	EPA 625	0.312	Not Det	10/10/96	DH
Fluorene	ug/L	EPA 625	0.262	Not Det	10/10/96	DH
Hexachlorobenzene	ug/L	EPA 625	2.62	Not Det	10/10/96	DH
Hexachlorobutadiene	ug/L	EPA 625	3.75	Not Det	10/10/96	DH
Hexachlorocyclopentadiene	ug/L	EPA 625	12.5	Not Det	10/10/96	DH
Hexachloroethane	ug/L	EPA 625	2.88	Not Det	10/10/96	DH
Indeno(1,2,3-cd)pyrene	ug/L	EPA 625	1.62	Not Det	10/10/96	DH
Isophorone	ug/L	EPA 625	1.50	Not Det	10/10/96	DH
Naphthalene	ug/L	EPA 625	0.462	Not Det	10/10/96	DH
Nitrobenzene	ug/L	EPA 625	2.00	Not Det	10/10/96	DH
n-Nitrosodimethylamine	ug/L	EPA 625	9.38	Not Det	10/10/96	DH
n-Nitrosodiphenylamine	ug/L	EPA 625	3.50	Not Det	10/10/96	DH
n-Nitrosodi-n-propylamine	ug/L	EPA 625	3.38	Not Det	10/10/96	DH
Phenanthrene	ug/L	EPA 625	0.738	Not Det	10/10/96	DH
Pyrene	ug/L	EPA 625	0.662	Not Det	10/10/96	DH
1,2,4-Trichlorobenzene	ug/L	EPA 625	2.38	Not Det	10/10/96	DH
sur-Nitrobenzene-d5 %R 35-114	ug/L	EPA 625	0	65	10/10/96	DH
sur-Fluorobiphenyl %R 43-116	ug/L	EPA 625	0	70	10/10/96	DH
sur-Terphenyl-d14 %R 38-141	ug/L	EPA 625	0	64	10/10/96	DH
610-3030C Furnace Digest W		3030C		Done	10/10/96	JE
610-239.2 Lead ug/L	ug/L	EPA 239.2	1.00	102	10/11/96	JM
623-3520 Cont. Liq/Liq Ext. B/N		SW3520		Done	10/09/96	SB

Remarks:

Signed: _____

James M.G. Tucci

Laboratory Manager

LAW ENVIRONMENTAL NATIONAL LABORATORIES

TEST DATA REPORT

10/17/96

--- Project Information ---

Mr. Jeff Tyburski

Law Eng & Envir Services, Inc.

3301 Atlantic Avenue

Raleigh, NC 27604

Project Name: PIT

Pit 15 Proj. #30740-0500-0194

--- Sample Information ---

Station ID: 66GW41

Lab ID: AB01820

Collector: J TYBURSKI

Date Sampled: 10/07/96

Time Sampled: 15:20

Log In Date: 10/09/96

Log In Time: 16:17

--- Test Information ---

Parameter	Units	Method	Det Lim	Result	Analysis Date	Tech
622-602 VOA by GC ug/L	ug/L	EPA 602		_TITLE_	10/16/96	WM
Benzene	ug/L	EPA 602	0.500	Not Det	10/16/96	WM
Chlorobenzene	ug/L	EPA 602	0.500	Not Det	10/16/96	WM
1,2-Dichlorobenzene	ug/L	EPA 602	0.500	Not Det	10/16/96	WM
1,3-Dichlorobenzene	ug/L	EPA 602	0.500	Not Det	10/16/96	WM
1,4-Dichlorobenzene	ug/L	EPA 602	0.500	Not Det	10/16/96	WM
Ethylbenzene	ug/L	EPA 602	0.500	Not Det	10/16/96	WM
Toluene	ug/L	EPA 602	0.500	Not Det	10/16/96	WM
Xylenes (total)	ug/L	EPA 602	0.500	Not Det	10/16/96	WM
Methyl tert-butyl ether	ug/L	EPA 602	0.500	Not Det	10/16/96	WM
sur-Fluorobenzene %R 62-116	ug/L	EPA 602	0	92	10/16/96	WM
622-625 Semi-VOA ug/L	ug/L	EPA 625		_TITLE_	10/10/96	DH
Acenaphthene	ug/L	EPA 625	0.480	Not Det	10/10/96	DH
Acenaphthylene	ug/L	EPA 625	0.372	Not Det	10/10/96	DH
Anthracene	ug/L	EPA 625	1.14	Not Det	10/10/96	DH
Benzo(a)anthracene	ug/L	EPA 625	1.32	Not Det	10/10/96	DH
Benzidine	ug/L	EPA 625	5.88	Not Det	10/10/96	DH
Benzo(b)fluoranthene	ug/L	EPA 625	0.864	Not Det	10/10/96	DH
Benzo(k)fluoranthene	ug/L	EPA 625	1.04	Not Det	10/10/96	DH
Benzo(g,h,i)perylene	ug/L	EPA 625	3.60	Not Det	10/10/96	DH
Benzo(a)pyrene	ug/L	EPA 625	0.840	Not Det	10/10/96	DH
bis(2-Chloroethoxy)methane	ug/L	EPA 625	1.20	Not Det	10/10/96	DH
bis(2-Chloroethyl)ether	ug/L	EPA 625	2.52	Not Det	10/10/96	DH
bis(2-Chloroisopropyl)ether	ug/L	EPA 625	2.64	Not Det	10/10/96	DH
bis(2-Ethylhexyl)phthalate	ug/L	EPA 625	4.08	Not Det	10/10/96	DH
4-Bromophenyl phenyl ether	ug/L	EPA 625	1.32	Not Det	10/10/96	DH
Butylbenzylphthalate	ug/L	EPA 625	0.984	Not Det	10/10/96	DH
2-Chloronaphthalene	ug/L	EPA 625	1.68	Not Det	10/10/96	DH
4-Chlorophenyl phenyl ether	ug/L	EPA 625	1.68	Not Det	10/10/96	DH
Chrysene	ug/L	EPA 625	0.408	Not Det	10/10/96	DH
Dibenz(a,h)anthracene	ug/L	EPA 625	1.06	Not Det	10/10/96	DH
Di-n-butylphthalate	ug/L	EPA 625	0.624	Not Det	10/10/96	DH
1,2-Dichlorobenzene	ug/L	EPA 625	1.20	Not Det	10/10/96	DH
1,3-Dichlorobenzene	ug/L	EPA 625	2.64	Not Det	10/10/96	DH
1,4-Dichlorobenzene	ug/L	EPA 625	1.92	Not Det	10/10/96	DH

LAW ENVIRONMENTAL NATIONAL LABORATORIES
TEST DATA REPORT

10/17/96

--- Project Information ---

Mr. Jeff Tyburski

Law Eng & Envir Services, Inc.

3301 Atlantic Avenue

Raleigh, NC 27604

Project Name: PIT

Pit 15 Proj. #30740-0500-0194

--- Sample Information ---

Station ID: 66GW41

Lab ID: AB01820

Collector: J TYBURSKI

Date Sampled: 10/07/96

Time Sampled: 15:20

Log In Date: 10/09/96

Log In Time: 16:17

--- Test Information ---

Parameter	Units	Method	Det Lim	Result	Analysis Date	Tech
3,3'-Dichlorobenzidine	ug/L	EPA 625	8.76	Not Det	10/10/96	DH
Diethylphthalate	ug/L	EPA 625	1.44	Not Det	10/10/96	DH
Dimethylphthalate	ug/L	EPA 625	1.14	Not Det	10/10/96	DH
2,4-Dinitrotoluene	ug/L	EPA 625	2.28	Not Det	10/10/96	DH
2,6-Dinitrotoluene	ug/L	EPA 625	2.28	Not Det	10/10/96	DH
Dinoctylphthalate	ug/L	EPA 625	0.828	Not Det	10/10/96	DH
Fluoranthene	ug/L	EPA 625	0.300	Not Det	10/10/96	DH
Fluorene	ug/L	EPA 625	0.252	Not Det	10/10/96	DH
Hexachlorobenzene	ug/L	EPA 625	2.52	Not Det	10/10/96	DH
Hexachlorobutadiene	ug/L	EPA 625	3.60	Not Det	10/10/96	DH
Hexachlorocyclopentadiene	ug/L	EPA 625	12.0	Not Det	10/10/96	DH
Hexachloroethane	ug/L	EPA 625	2.76	Not Det	10/10/96	DH
Indeno(1,2,3-cd)pyrene	ug/L	EPA 625	1.56	Not Det	10/10/96	DH
Isophorone	ug/L	EPA 625	1.44	Not Det	10/10/96	DH
Naphthalene	ug/L	EPA 625	0.444	Not Det	10/10/96	DH
Nitrobenzene	ug/L	EPA 625	1.92	Not Det	10/10/96	DH
n-Nitrosodimethylamine	ug/L	EPA 625	9.00	Not Det	10/10/96	DH
n-Nitrosodiphenylamine	ug/L	EPA 625	3.36	Not Det	10/10/96	DH
n-Nitrosodi-n-propylamine	ug/L	EPA 625	3.24	Not Det	10/10/96	DH
Phenanthrene	ug/L	EPA 625	0.708	Not Det	10/10/96	DH
Pyrene	ug/L	EPA 625	0.636	Not Det	10/10/96	DH
1,2,4-Trichlorobenzene	ug/L	EPA 625	2.28	Not Det	10/10/96	DH
sur-Nitrobenzene-d5 %R 35-114	ug/L	EPA 625	0	50	10/10/96	DH
sur-Fluorobiphenyl %R 43-116	ug/L	EPA 625	0	54	10/10/96	DH
sur-Terphenyl-d14 %R 38-141	ug/L	EPA 625	0	54	10/10/96	DH
610-3030C Furnace Digest W		3030C		Done	10/10/96	JE
610-239.2 Lead ug/L	ug/L	EPA 239.2	1.00	35.1	10/11/96	JM
623-3520 Cont. Liq/Liq Ext. B/N		SW3520		Done	10/09/96	SB

Remarks:

Signed: _____

James M.G. Tucci

Laboratory Manager

LAW ENVIRONMENTAL NATIONAL LABORATORIES

TEST DATA REPORT

10/17/96

--- Project Information ---

Mr. Jeff Tyburski

Law Eng & Envir Services, Inc.

3301 Atlantic Avenue

Raleigh, NC 27604

Project Name: PIT

Pit 15 Proj. #30740-0500-0194

--- Sample Information ---

Station ID: BAILER RINSE

Lab ID: AB01821

Collector: J TYBURSKI

Date Sampled: 10/07/96

Time Sampled: 15:50

Log In Date: 10/09/96

Log In Time: 16:17

--- Test Information ---

Parameter	Units	Method	Det Lim	Result	Analysis Date	Tech
622-602 VOA by GC ug/L	ug/L	EPA 602		_TITLE_	10/16/96	WM
Benzene	ug/L	EPA 602	0.500	Not Det	10/16/96	WM
Chlorobenzene	ug/L	EPA 602	0.500	Not Det	10/16/96	WM
1,2-Dichlorobenzene	ug/L	EPA 602	0.500	Not Det	10/16/96	WM
1,3-Dichlorobenzene	ug/L	EPA 602	0.500	Not Det	10/16/96	WM
1,4-Dichlorobenzene	ug/L	EPA 602	0.500	Not Det	10/16/96	WM
Ethylbenzene	ug/L	EPA 602	0.500	Not Det	10/16/96	WM
Toluene	ug/L	EPA 602	0.500	Not Det	10/16/96	WM
Xylenes (total)	ug/L	EPA 602	0.500	Not Det	10/16/96	WM
Methyl tert-butyl ether	ug/L	EPA 602	0.500	Not Det	10/16/96	WM
sur-Fluorobenzene %R 62-116	ug/L	EPA 602	0	94	10/16/96	WM

Remarks:

Signed: _____

James M.G. Tucci

Laboratory Manager

Law Engineering &
Environmental Services, Inc.
3355 McLemore Drive
Pensacola, FL 32514
(904) 857-0606

Analytical Request Form

To: LAW-Pensacola Attn: Sample Recieving

From: LAW-Raleigh (Branch/Company Name) Jeff Tyburski (Dept or Name)

COC Number: 13787

Project Name: PIT 15 Project Number: 30740-5-0500/0194

Date Shipped: 10/8/96 Date results requested: std 1 week

Sample ID	Analysis Requested	Detection Limits Req.	Sample Type	Method
		602+625		
* 66GW55	volatiles, semivolatiles, Lead	Less than 1 ppb	Groundwater	625, 602, 239.2 (3030c)
* 66GW105				
~~66 J.T~~				
66GW58				
66 Trip Blank	volatiles only			602
		Lead less than 2 ppb		

Comments: - For EPA Method 625 - Run Base Neutrals only
- For total lead, use 3030c preparation
* sample may be highly contaminated with jet fuel (JP-5)

LAW ENGINEERING &
ENVIRONMENTAL SERVICES, INC.
3355 McLEMORE DRIVE
PENSACOLA, FLORIDA 32514
(904) 857-0606

CHAIN OF CUSTODY RECORD

13787

SAMPLING INFORMATION
NPDES NUMBER
NAME OF FACILITY:
STREET ADDRESS:

PROJECT NAME: PIT 15
JOB NO.: 30740-5-0501694
SAMPLERS (SIGNATURE):
SAMPLING DATE: 10/7/96

TIME	GRAB	COMP.	*SOURCE CODE	SAMPLE STATION DESCRIPTION	TOTAL NO. OF CONTAINERS	40 ml G VOA HCl	1 L G - AMBER	8 oz G, W/M	2 oz. G, W/M	1 L G (H_2SO_4)	500 ml - AMBER	1 L. PL (HNO_3)	1 L. PL (H_2SO_4)	1L. PL (NaOH+Ascorbic Acid)	1 L. PL (Zn Acetate + NaOH)	1 L. PL	4 oz PL W/M	250 ml PL	1 L. TEFLON	LENL LAB NO.
1710	X		MW	66GW55	6	3	2										1			AB01814
1810	X		MW	66GW105	6	3	2										1			AB01815
1600	X		MW	66GW58	6	3	2										1			AB01816
—	X		MW	66TRIP BLANK	2	2														AB01817

RELINQUISHED BY: (SIGNATURE)	DATE / TIME	RECEIVED BY: #894103446 5 Federal Express (SIGNATURE)	DATE / TIME	RELINQUISHED BY: (SIGNATURE)	RECEIVED BY LABORATORY: (SIGNATURE)	DATE / TIME
	10/8 1630					10/9/96 9:45

DISTRIBUTION: ORIGINAL AND YELLOW COPIES ACCOMPANY SAMPLE SHIPMENT TO LABORATORY. PINK COPY RETAINED BY SAMPLERS. YELLOW COPY RETAINED BY LABORATORY.

REMARKS

***SOURCE CODES**

RECOVERY WELL - RW
RCRA MONITORING WELL - MW
SOIL / SEDIMENT - SO
SLUDGE - SL
NPDES DISCHARGE - ND
DRINKING WATER - DW
HAZARDOUS WASTE - HW
SURFACE WATER - SW
NON-AQUEOUS - NA

LAW ENGINEERING &
ENVIRONMENTAL SERVICES, INC.
3355 McLEMORE DRIVE
PENSACOLA, FLORIDA 32514
(904) 857-0606

CHAIN OF CUSTODY RECORD

13786

SAMPLING INFORMATION
NPDES NUMBER
NAME OF FACILITY:
STREET ADDRESS:

PROJECT NAME: PIT 15
JOB NO.: 30140-5-205-0104
SAMPLERS (SIGNATURE):
SAMPLING DATE: 10/7/96

TIME	GRAB	COMP.	*SOURCE CODE	SAMPLE STATION DESCRIPTION	TOTAL NO. OF CONTAINERS	40 ml G VOA HCl	1 L G - AMBER	8 oz G, W/M	2 oz. G, W/M	1 L G (H_2SO_4)	500 ml - AMBER	1 L. PL (HNO_3)	1 L. PL (H_2SO_4)	1L. PL (NaOH+Ascorbic Acid)	1 L. PL (Zn Acetate + NaOH)	1 L. PL	4 oz PL W/M	250 ml PL	1 L. TEFLON	LENL LAB NO.
1250	X		MW	56GW21	6	3	2										1			AB01818
1200	X		MW	66GW06	6	3	2										1			AB01819
1520	X		MW	66GW41	6	3	2										1			AB01820
1550	X		MW	Bailer Rinse	3	3														AB01821

RELINQUISHED BY: (SIGNATURE) — DATE / TIME: 10/8/1620
RECEIVED BY: Federal Express 2694103476 (SIGNATURE) — DATE / TIME:
RELINQUISHED BY: (SIGNATURE)
RECEIVED BY LABORATORY: (SIGNATURE) — DATE / TIME: 10/9/96 9:45

DISTRIBUTION: ORIGINAL AND YELLOW COPIES ACCOMPANY SAMPLE SHIPMENT TO LABORATORY. PINK COPY RETAINED BY SAMPLERS. YELLOW COPY RETAINED BY LABORATORY.

REMARKS

***SOURCE CODES**

- RECOVERY WELL - RW
- RCRA MONITORING WELL - MW
- SOIL / SEDIMENT - SO
- SLUDGE - SL
- NPDES DISCHARGE - ND
- DRINKING WATER - DW
- HAZARDOUS WASTE - HW
- SURFACE WATER - SW
- NON-AQUEOUS - NA

Law Engineering &
Environmental Services, Inc.
3355 McLemore Drive
Pensacola, FL 32514
(904) 857-0606

Analytical Request Form

To: LAW - Pensacola Attn: Sample Receiving

From: LAW - Raleigh (Branch/Company Name) Jeff Tybursk, (Dept or Name)

COC Number: 13786

Project Name: PIT 15 Project Number: 30740-5-0500/0194

Date Shipped: 10/8/96 Date results requested: std 1 week

Sample ID	Analysis Requested	Detection Limits Req.	Sample Type	Method
		602 and 625		
56 GW21	volatiles, semivolatiles Lead	Less Than 1ppb	Groundwater	602, 625 (Base Neutrals only) total Lead 239.2 (3030C)
66 GW06	↓	↓	↓	
66 GW41	↓	↓	↓	
Boiler Rinse	volatiles only	Less than 1ppb	↓	EPA 602
		Lead Less than 2 ppb		

Comments: - For EPA Method 625 - Run Base Neutrals only
- For total Lead, use 3030C preparation method

LAW
ENGINEERING AND ENVIRONMENTAL SERVICES
3355 McLemore Drive
Pensacola, Florida 32514
(904) 857-0606

October 9, 1996

Mr. Jeff Tyburski
Law Eng. & Env. Svcs., Inc.
3301 Atlantic Avenue
Raleigh, NC 27604

Subject: Chemical Analysis of Samples Received on 10/04/96
Project Number: 30740-5-0500-0194-56

Dear Mr. Tyburski:

Law Eng. & Env. National Laboratories has completed its analysis of your samples and reports the results on the following pages. These results relate only to the contents of the samples as submitted.

If further assistance is needed, please feel free to contact Kelli Silvia or myself at (904) 857-0606.

Sincerely,

LAW ENG. & ENV. SVCS. NATIONAL LABORATORIES

James M.G. Tucci
Laboratory Manager

JMGT/kas

Enclosures: Data Report
Invoice

LAW ENVIRONMENTAL NATIONAL LABORATORIES

TEST DATA REPORT

10/09/96

--- Project Information ---

Mr. Jeff Tyburski
Law Eng & Envir Services, Inc.
3301 Atlantic Avenue
Raleigh, NC 27604

Project Name: PIT15
Pit15 Proj#30740-5-0500-0194-56

--- Sample Information ---

Station ID: 66SB22 2-4FT
Lab ID: AB01563
Collector: FISCHER

Date Sampled: 10/01/96
Time Sampled: 16:20
Log In Date: 10/06/96
Log In Time: 16:55

--- Test Information ---

Parameter	Units	Method	Det Lim	Result	Analysis Date	Tech
623-Tot Pet Hydro Prep S		Cal-DHS		Done	10/07/96	LR
621-8015M TPH CalDHS Ext S mg/Kg	mg/Kg	Cal-DHS		_TITLE_	10/07/96	DT
Petroleum Hydrocarbons (Diesel)	mg/Kg	Cal-DHS	7.58	Not Det	10/07/96	DT
sur-O-Terphenyl %R 60-149	mg/Kg	Cal-DHS	0	98	10/07/96	DT
622-8015M TPH Cal-DHS S mg/Kg	mg/Kg	Cal-DHS		_TITLE_	10/07/96	TH
Petroleum Hydrocarbons (Gasoline)	mg/Kg	Cal-DHS	0.110	Not Det	10/07/96	TH
sur-2-Fluorobiphenyl %R 20-180	mg/Kg	Cal-DHS	0	85	10/07/96	TH

Remarks:

Signed: _____

James M.G. Tucci
Laboratory Manager

LAW ENVIRONMENTAL NATIONAL LABORATORIES

TEST DATA REPORT

10/09/96

--- Project Information ---

Mr. Jeff Tyburski

Law Eng & Envir Services, Inc.

3301 Atlantic Avenue

Raleigh, NC 27604

Page 1

Project Name: PIT15

Pit15 Proj#30740-5-0500-0194-56

--- Sample Information ---

Station ID: 66SB22 8-10FT

Lab ID: AB01564

Collector: FISCHER

Date Sampled: 10/01/96

Time Sampled: 16:35

Log In Date: 10/06/96

Log In Time: 16:55

--- Test Information ---

Parameter	Units	Method	Det Lim	Result	Analysis Date	Tech
623-Tot Pet Hydro Prep S		Cal-DHS		Done	10/07/96	LR
621-8015M TPH CalDHS Ext S mg/Kg	mg/Kg	Cal-DHS		_TITLE_	10/07/96	DT
Petroleum Hydrocarbons (Diesel)	mg/Kg	Cal-DHS	7.22	Not Det	10/07/96	DT
sur-O-Terphenyl %R 60-149	mg/Kg	Cal-DHS	0	80	10/07/96	DT
622-8015M TPH Cal-DHS S mg/Kg	mg/Kg	Cal-DHS		_TITLE_	10/07/96	TH
Petroleum Hydrocarbons (Gasoline)	mg/Kg	Cal-DHS	0.110	Not Det	10/07/96	TH
sur-2-Fluorobiphenyl %R 20-180	mg/Kg	Cal-DHS	0	61	10/07/96	TH

Remarks:

Signed: _____

James M.G. Tucci

Laboratory Manager

LAW ENVIRONMENTAL NATIONAL LABORATORIES

TEST DATA REPORT

10/09/96

--- Project Information ---

Mr. Jeff Tyburski

Law Eng & Envir Services, Inc.

3301 Atlantic Avenue

Raleigh, NC 27604

Project Name: PIT15

Pit15 Proj#30740-5-0500-0194-56

--- Sample Information ---

Station ID: 66GW53 6-7.5FT

Lab ID: AB01565

Collector: FISCHER

Date Sampled: 10/02/96

Time Sampled: 08:35

Log In Date: 10/06/96

Log In Time: 16:55

--- Test Information ---

Parameter	Units	Method	Det Lim	Result	Analysis Date	Tech
623-Tot Pet Hydro Prep S		Cal-DHS		Done	10/07/96	LR
621-8015M TPH CalDHS Ext S mg/Kg	mg/Kg	Cal-DHS		_TITLE_	10/07/96	DT
Petroleum Hydrocarbons (Diesel)	mg/Kg	Cal-DHS	7.70	Not Det	10/07/96	DT
sur-O-Terphenyl %R 60-149	mg/Kg	Cal-DHS	0	97	10/07/96	DT
622-8015M TPH Cal-DHS S mg/Kg	mg/Kg	Cal-DHS		_TITLE_	10/07/96	TH
Petroleum Hydrocarbons (Gasoline)	mg/Kg	Cal-DHS	0.100	Not Det	10/07/96	TH
sur-2-Fluorobiphenyl %R 20-180	mg/Kg	Cal-DHS	0	83	10/07/96	TH

Remarks:

Signed: _____

James M.G. Tucci

Laboratory Manager

LAW ENVIRONMENTAL NATIONAL LABORATORIES

TEST DATA REPORT

10/09/96

--- Project Information ---

Mr. Jeff Tyburski

Law Eng & Envir Services, Inc.

3301 Atlantic Avenue

Raleigh, NC 27604

Page 1

Project Name: PIT15

Pit15 Proj#30740-5-0500-0194-56

--- Sample Information ---

Station ID: 66GW53 8.5-10FT

Lab ID: AB01566

Collector: FISCHER

Date Sampled: 10/02/96

Time Sampled: 08:40

Log In Date: 10/06/96

Log In Time: 16:55

--- Test Information ---

Parameter	Units	Method	Det Lim	Result	Analysis Date	Tech
623-Tot Pet Hydro Prep S		Cal-DHS		Done	10/07/96	LR
621-8015M TPH CalDHS Ext S mg/Kg	mg/Kg	Cal-DHS		_TITLE_	10/07/96	DT
Petroleum Hydrocarbons (Diesel)	mg/Kg	Cal-DHS	7.62	Not Det	10/07/96	DT
sur-O-Terphenyl %R 60-149	mg/Kg	Cal-DHS	0	85	10/07/96	DT
622-8015M TPH Cal-DHS S mg/Kg	mg/Kg	Cal-DHS		_TITLE_	10/07/96	TH
Petroleum Hydrocarbons (Gasoline)	mg/Kg	Cal-DHS	0.100	Not Det	10/07/96	TH
sur-2-Fluorobiphenyl %R 20-180	mg/Kg	Cal-DHS	0	88	10/07/96	TH

Remarks:

Signed: _____

James M.G. Tucci

Laboratory Manager

LAW ENVIRONMENTAL NATIONAL LABORATORIES

TEST DATA REPORT

10/09/96

--- Project Information ---

Mr. Jeff Tyburski

Law Eng & Envir Services, Inc.

3301 Atlantic Avenue

Raleigh, NC 27604

Page 1

Project Name: PIT15

Pit15 Proj#30740-5-0500-0194-56

--- Sample Information ---

Station ID: 66GW56 6-7.5FT

Lab ID: AB01567

Collector: FISCHER

Date Sampled: 10/02/96

Time Sampled: 11:15

Log In Date: 10/06/96

Log In Time: 16:55

--- Test Information ---

Parameter	Units	Method	Det Lim	Result	Analysis Date	Tech
623-Tot Pet Hydro Prep S		Cal-DHS		Done	10/07/96	LR
621-8015M TPH CalDHS Ext S mg/Kg	mg/Kg	Cal-DHS		_TITLE_	10/07/96	DT
Petroleum Hydrocarbons (Diesel)	mg/Kg	Cal-DHS	6.90	Not Det	10/07/96	DT
sur-O-Terphenyl %R 60-149	mg/Kg	Cal-DHS	0	78	10/07/96	DT
622-8015M TPH Cal-DHS S mg/Kg	mg/Kg	Cal-DHS		_TITLE_	10/07/96	TH
Petroleum Hydrocarbons (Gasoline)	mg/Kg	Cal-DHS	0.100	Not Det	10/07/96	TH
sur-2-Fluorobiphenyl %R 20-180	mg/Kg	Cal-DHS	0	82	10/07/96	TH

Remarks:

Signed: _____

James M.G. Tucci

Laboratory Manager

LAW ENVIRONMENTAL NATIONAL LABORATORIES

TEST DATA REPORT

10/09/96

--- Project Information ---

Mr. Jeff Tyburski

Law Eng & Envir Services, Inc.

3301 Atlantic Avenue

Raleigh, NC 27604

Page 1

Project Name: PIT15

Pit15 Proj#30740-5-0500-0194-56

--- Sample Information ---

Station ID: 66GW56 8.5-10.0FT

Lab ID: AB01568

Collector: FISCHER

Date Sampled: 10/02/96

Time Sampled: 11:20

Log In Date: 10/06/96

Log In Time: 16:55

--- Test Information ---

Parameter	Units	Method	Det Lim	Result	Analysis Date	Tech
623-Tot Pet Hydro Prep S		Cal-DHS		Done	10/07/96	LR
621-8015M TPH CalDHS Ext S mg/Kg	mg/Kg	Cal-DHS		_TITLE_	10/08/96	DT
Petroleum Hydrocarbons (Diesel)	mg/Kg	Cal-DHS	7.06	Not Det	10/08/96	DT
sur-O-Terphenyl %R 60-149	mg/Kg	Cal-DHS	0	88	10/08/96	DT
622-8015M TPH Cal-DHS S mg/Kg	mg/Kg	Cal-DHS		_TITLE_	10/07/96	TH
Petroleum Hydrocarbons (Gasoline)	mg/Kg	Cal-DHS	0.100	Not Det	10/07/96	TH
sur-2-Fluorobiphenyl %R 20-180	mg/Kg	Cal-DHS	0	77	10/07/96	TH

Remarks:

Signed: _____

James M.G. Tucci

Laboratory Manager

LAW ENVIRONMENTAL NATIONAL LABORATORIES

TEST DATA REPORT

10/09/96

--- Project Information ---

Mr. Jeff Tyburski

Law Eng & Envir Services, Inc.

3301 Atlantic Avenue

Raleigh, NC 27604

Page 1

Project Name: PIT15

Pit15 Proj#30740-5-0500-0194-56

--- Sample Information ---

Station ID: 66GW54 6-7.5FT

Lab ID: AB01569

Collector: FISCHER

Date Sampled: 10/02/96

Time Sampled: 16:10

Log In Date: 10/06/96

Log In Time: 16:55

--- Test Information ---

Parameter	Units	Method	Det Lim	Result	Analysis Date	Tech
623-Tot Pet Hydro Prep S		Cal-DHS		Done	10/07/96	LR
621-8015M TPH CalDHS Ext S mg/Kg	mg/Kg	Cal-DHS		_TITLE_	10/08/96	DT
Petroleum Hydrocarbons (Diesel)	mg/Kg	Cal-DHS	7.38	Not Det	10/08/96	DT
sur-O-Terphenyl %R 60-149	mg/Kg	Cal-DHS	0	81	10/08/96	DT
622-8015M TPH Cal-DHS S mg/Kg	mg/Kg	Cal-DHS		_TITLE_	10/07/96	TH
Petroleum Hydrocarbons (Gasoline)	mg/Kg	Cal-DHS	0.110	Not Det	10/07/96	TH
sur-2-Fluorobiphenyl %R 20-180	mg/Kg	Cal-DHS	0	82	10/07/96	TH

Remarks:

Signed: _____

James M.G. Tucci

Laboratory Manager

LAW ENVIRONMENTAL NATIONAL LABORATORIES

TEST DATA REPORT

10/09/96

--- Project Information ---

Mr. Jeff Tyburski

Law Eng & Envir Services, Inc.

3301 Atlantic Avenue

Raleigh, NC 27604

Page 1

Project Name: PIT15

Pit15 Proj#30740-5-0500-0194-56

--- Sample Information ---

Station ID: 66GW54 8.5-10FT

Lab ID: AB01570

Collector: FISCHER

Date Sampled: 10/02/96

Time Sampled: 16:30

Log In Date: 10/06/96

Log In Time: 16:55

--- Test Information ---

Parameter	Units	Method	Det Lim	Result	Analysis Date	Tech
623-Tot Pet Hydro Prep S		Cal-DHS		Done	10/07/96	LR
621-8015M TPH CalDHS Ext S mg/Kg	mg/Kg	Cal-DHS		_TITLE_	10/08/96	DT
Petroleum Hydrocarbons (Diesel)	mg/Kg	Cal-DHS	7.08	Not Det	10/08/96	DT
sur-O-Terphenyl %R 60-149	mg/Kg	Cal-DHS	0	81	10/08/96	DT
622-8015M TPH Cal-DHS S mg/Kg	mg/Kg	Cal-DHS		_TITLE_	10/07/96	TH
Petroleum Hydrocarbons (Gasoline)	mg/Kg	Cal-DHS	0.100	Not Det	10/07/96	TH
sur-2-Fluorobiphenyl %R 20-180	mg/Kg	Cal-DHS	0	74	10/07/96	TH

Remarks:

Signed: _____

James M.G. Tucci

Laboratory Manager

LAW ENVIRONMENTAL NATIONAL LABORATORIES

TEST DATA REPORT

10/09/96

--- Project Information ---

Mr. Jeff Tyburski

Law Eng & Envir Services, Inc.

3301 Atlantic Avenue

Raleigh, NC 27604

Page 1

Project Name: PIT15

Pit15 Proj#30740-5-0500-0194-56

--- Sample Information ---

Station ID: 66GW57 6-7.5FT

Lab ID: AB01571

Collector: FISCHER

Date Sampled: 10/03/96

Time Sampled: 16:00

Log In Date: 10/06/96

Log In Time: 16:55

--- Test Information ---

Parameter	Units	Method	Det Lim	Result	Analysis Date	Tech
623-Tot Pet Hydro Prep S		Cal-DHS		Done	10/07/96	LR
621-8015M TPH CalDHS Ext S mg/Kg	mg/Kg	Cal-DHS		_TITLE_	10/08/96	DT
Petroleum Hydrocarbons (Diesel)	mg/Kg	Cal-DHS	7.26	Not Det	10/08/96	DT
sur-O-Terphenyl %R 60-149	mg/Kg	Cal-DHS	0	86	10/08/96	DT
622-8015M TPH Cal-DHS S mg/Kg	mg/Kg	Cal-DHS		_TITLE_	10/08/96	TH
Petroleum Hydrocarbons (Gasoline)	mg/Kg	Cal-DHS	0.100	Not Det	10/08/96	TH
sur-2-Fluorobiphenyl %R 20-180	mg/Kg	Cal-DHS	0	72	10/08/96	TH

Remarks:

Signed: _____

James M.G. Tucci

Laboratory Manager

LAW ENVIRONMENTAL NATIONAL LABORATORIES

TEST DATA REPORT

10/09/96

--- Project Information ---

Mr. Jeff Tyburski

Law Eng & Envir Services, Inc.

3301 Atlantic Avenue

Raleigh, NC 27604

Project Name: PIT15

Pit15 Proj#30740-5-0500-0194-56

--- Sample Information ---

Station ID: 66GW57 8.5-10.0FT

Lab ID: AB01572

Collector: FISCHER

Date Sampled: 10/03/96

Time Sampled: 16:05

Log In Date: 10/06/96

Log In Time: 16:55

--- Test Information ---

Parameter	Units	Method	Det Lim	Result	Analysis Date	Tech
623-Tot Pet Hydro Prep S		Cal-DHS		Done	10/07/96	LR
621-8015M TPH CalDHS Ext S mg/Kg	mg/Kg	Cal-DHS		_TITLE_	10/08/96	DT
Petroleum Hydrocarbons (Diesel)	mg/Kg	Cal-DHS	6.94	Not Det	10/08/96	DT
sur-O-Terphenyl %R 60-149	mg/Kg	Cal-DHS	0	92	10/08/96	DT
622-8015M TPH Cal-DHS S mg/Kg	mg/Kg	Cal-DHS		_TITLE_	10/08/96	TH
Petroleum Hydrocarbons (Gasoline)	mg/Kg	Cal-DHS	0.100	Not Det	10/08/96	TH
sur-2-Fluorobiphenyl %R 20-180	mg/Kg	Cal-DHS	0	74	10/08/96	TH

Remarks:

Signed: _____

James M.G. Tucci

Laboratory Manager

LAW ENGINEERING &
ENVIRONMENTAL SERVICES, INC.
3355 McLEMORE DRIVE
PENSACOLA, FLORIDA 32514
(904) 857-0606

CHAIN OF CUSTODY RECORD

13679

SAMPLING INFORMATION
NPDES NUMBER
NAME OF FACILITY:
STREET ADDRESS:

PROJECT NAME: Pit 15 (Clarry Point) JOB NO.: 30-740-5-0506/01946
SAMPLERS (SIGNATURE): Greg A. Fields
SAMPLING DATE: 10/3/96

TIME	GRAB	COMP.	*SOURCE CODE	SAMPLE STATION DESCRIPTION	TOTAL NO. OF CONTAINERS	40 ml G VOA HCl	1 L G - AMBER	8 oz G. W/M	2 oz. G. W/M	1 L G (H_2SO_4)	500 ml - AMBER	1 L. PL (HNO_3)	1 L. PL (H_2SO_4)	1 L. PL (NaOH+Ascorbic Acid)	1 L. PL (Zn Acetate + NaOH)	1 L. PL	4 oz PL W/M	250 ml PL	1 L. TEFLON	LENL LAB NO.
1620	✓		SO.	665B22 (2'-4') 10-1-96	3			1	2											AB01563
1635				665B22 (8'-10') 10-1-96	3			1	2											AB01564
0835				666W53 (6'-7.5') 10-2-96	3			1	2											AB01565
0840				666W53 (8.5'-10') 10-2-96	3			1	2											AB01566
1115				666W56 (6'-7.5') 10-2-96	3			1	2											AB01567
1120				666W56 (8.5'-10.0') 10-2-96	3			1	2											AB01568
1610				666W54 (6'-7.5') 10-2-96	3			1	2											AB01569
1630				666W54 (8.5'-10') 10-2-96	3			1	2											AB01570
1600				666W57 (6'-7.5') 10-3-96	3			1	2											AB01571
1605	✓		✓	666W57 (8.5'-10') 10-3-96	3			1	2											AB01572

RELINQUISHED BY (SIGNATURE)	DATE / TIME	RECEIVED BY (SIGNATURE)	DATE / TIME	RELINQUISHED BY (SIGNATURE)	RECEIVED BY LABORATORY (SIGNATURE)	DATE / TIME
Greg A. Fields	10/3/96 1830					10/4/96 0815

DISTRIBUTION: ORIGINAL AND YELLOW COPIES ACCOMPANY SAMPLE SHIPMENT TO LABORATORY. PINK COPY RETAINED BY SAMPLERS. YELLOW COPY RETAINED BY LABORATORY.

Cooler Temp, 8°

REMARKS

Shipped via Fed Ex.
Airbill #

***SOURCE CODES**

RECOVERY WELL - RW
RCRA MONITORING WELL - MW
SOIL / SEDIMENT - SO
SLUDGE - SL
NPDES DISCHARGE - ND
DRINKING WATER - DW
HAZARDOUS WASTE - HW
SURFACE WATER - SW
NON-AQUEOUS - NA

Law Engineering &
Environmental Services, Inc.
3355 McLemore Drive
Pensacola, FL 32514
(904) 857-0606

6

Analytical Request Form

To: LENC

Attn: Sample Receiving

From: Law / Raleigh
(Branch/Company Name)

30741 / Jeff Tylerski
(Dept or Name)

COC Number: 13679

Project Name: Pit 15 (Cherry Point)

Project Number: 30740-5-0500/0194/5-6

Date Shipped: 10/3/96

Date results requested: 7 day turn.

Sample ID	Analysis Requested	Detection Limits Req.	Sample Type	Method
665B22(2'-4') 10/1/96	Vol.; Semi. Vol.	Std.	Soil TPH	8015 (3550, 5030)
665B22(8'-10') 10/1/96	↓	↓	↓	↓
666w53(6'-7.5') 10/2/96				
666w53(8.5'-10') 10/2/96				
666w56(6'-7.5') 10/2/96				
666w56(8.5'-10') 10/2/96				
666w54(6'-7.5') 10/2/96				
666w54(8.5'-10') 10/2/96				
666w57(6'-7.5') 10/2/96				
666w57(8.5'-10') 10/3/96	✓	✓	✓	✓

Comments:

LAW
ENGINEERING AND ENVIRONMENTAL SERVICES
3355 McLemore Drive
Pensacola, Florida 32514
(904) 857-0606

October 14, 1996

Mr. Jeff Tyburski
Law Eng. & Env. Svcs., Inc.
3301 Atlantic Avenue
Raleigh, NC 27604

Subject: Chemical Analysis of Samples Received on 10/04/96
Purchase Order: 30740-5-0500-0194

Dear Mr. Tyburski:

Law Eng. & Env. National Laboratories has completed its analysis of your samples for volatiles and reports the results on the following pages. These results relate only to the contents of the samples as submitted.

If further assistance is needed, please feel free to contact Carolyn Hooper or myself at (904) 857-0606.

Sincerely,

LAW ENGINEERING & ENVIRONMENTAL SERVICES, INC.

James M.G. Tucci
Laboratory Manager

JMGT/cdh

Enclosures: Data Report
Invoice

LAW ENVIRONMENTAL NATIONAL LABORATORIES

TEST DATA REPORT

10/14/96

--- Project Information ---

Mr. Jeff Tyburski

Law Eng & Envir Services, Inc.

3301 Atlantic Avenue

Raleigh, NC 27604

Page 1

Project Name: 2PIT15

Clt#12024Proj#30740-5-0500-0194

--- Sample Information ---

Station ID: 666W55(3.5-5.0)

Lab ID: AB01718

Collector: JEFF TYBURSKI

Date Sampled: 10/04/96

Time Sampled: 09:50

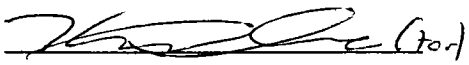
Log In Date: 10/08/96

Log In Time: 11:46

--- Test Information ---

Parameter	Units	Method	Det Lim	Result	Analysis Date	Tech
623-Tot Pet Hydro Prep S		Cal-DHS		Done	10/08/96	LR
621-8015M TPH CalDHS Ext S mg/Kg	mg/Kg	Cal-DHS		_TITLE_	10/09/96	DT
Petroleum Hydrocarbons (Diesel)	mg/Kg	Cal-DHS	7.54	Not Det	10/09/96	DT
sur-O-Terphenyl %R 60-149	mg/Kg	Cal-DHS	0	107	10/09/96	DT
622-8015M TPH CalDHS Vol S mg/Kg	mg/Kg	Cal-DHS		_TITLE_	10/08/96	TH
Petroleum Hydrocarbons (Gasoline)	mg/Kg	Cal-DHS	0.100	Not Det	10/08/96	TH
sur-2-Fluorobiphenyl %R 20-180	mg/Kg	Cal-DHS	0	84	10/08/96	TH

Remarks:

Signed: 

James M.G. Tucci

Laboratory Manager

LAW ENVIRONMENTAL NATIONAL LABORATORIES

TEST DATA REPORT

10/14/96

--- Project Information ---

Mr. Jeff Tyburski

Law Eng & Envir Services, Inc.

3301 Atlantic Avenue

Raleigh, NC 27604

Project Name: 2PIT15

Clt#12024Proj#30740-5-0500-0194

--- Sample Information ---

Station ID: 666W55(8.5-10)

Lab ID: AB01719

Collector: JEFF TYBURSKI

Date Sampled: 10/04/96

Time Sampled: 10:00

Log In Date: 10/08/96

Log In Time: 11:46

--- Test Information ---

Parameter	Units	Method	Det Lim	Result	Analysis Date	Tech
623-Tot Pet Hydro Prep S		Cal-DHS		Done	10/08/96	LR
621-8015M TPH CalDHS Ext S mg/Kg	mg/Kg	Cal-DHS		_TITLE_	10/09/96	DT
Petroleum Hydrocarbons (Diesel)	mg/Kg	Cal-DHS	7.34	Not Det	10/09/96	DT
sur-O-Terphenyl %R 60-149	mg/Kg	Cal-DHS	0	108	10/09/96	DT
622-8015M TPH CalDHS Vol S mg/Kg	mg/Kg	Cal-DHS		_TITLE_	10/08/96	TH
Petroleum Hydrocarbons (Gasoline)	mg/Kg	Cal-DHS	0.100	Not Det	10/08/96	TH
sur-2-Fluorobiphenyl %R 20-180	mg/Kg	Cal-DHS	0	79	10/08/96	TH

Remarks:

Signed: 

James M.G. Tucci

Laboratory Manager

LAW ENVIRONMENTAL NATIONAL LABORATORIES

TEST DATA REPORT

10/14/96

--- Project Information ---

Mr. Jeff Tyburski

Law Eng & Envir Services, Inc.

3301 Atlantic Avenue

Raleigh, NC 27604

Project Name: 2PIT15

Clt#12024Proj#30740-5-0500-0194

--- Sample Information ---

Station ID: 66SB21(4-6)

Lab ID: AB01720

Collector: JEFF TYBURSKI

Date Sampled: 10/04/96

Time Sampled: 11:30

Log In Date: 10/08/96

Log In Time: 11:46

--- Test Information ---

Parameter	Units	Method	Det Lim	Result	Analysis Date	Tech
623-Tot Pet Hydro Prep S		Cal-DHS		Done	10/08/96	LR
621-8015M TPH CalDHS Ext S mg/Kg	mg/Kg	Cal-DHS		_TITLE_	10/10/96	DT
Petroleum Hydrocarbons (Diesel)	mg/Kg	Cal-DHS	7.48	Not Det	10/10/96	DT
sur-O-Terphenyl %R 60-149	mg/Kg	Cal-DHS	0	97	10/10/96	DT
622-8015M TPH CalDHS Vol S mg/Kg	mg/Kg	Cal-DHS		_TITLE_	10/08/96	TH
Petroleum Hydrocarbons (Gasoline)	mg/Kg	Cal-DHS	0.100	Not Det	10/08/96	TH
sur-2-Fluorobiphenyl %R 20-180	mg/Kg	Cal-DHS	0	81	10/08/96	TH

Remarks:

Signed: _____

James M.G. Tucci

Laboratory Manager

LAW ENVIRONMENTAL NATIONAL LABORATORIES

TEST DATA REPORT

10/14/96

--- Project Information ---

Mr. Jeff Tyburski

Law Eng & Envir Services, Inc.

3301 Atlantic Avenue

Raleigh, NC 27604

Page 1

Project Name: 2PIT15

Clt#12024Proj#30740-5-0500-0194

--- Sample Information ---

Station ID: 66SB21(6-8)

Lab ID: AB01721

Collector: JEFF TYBURSKI

Date Sampled: 10/04/96

Time Sampled: 11:35

Log In Date: 10/08/96

Log In Time: 11:46

--- Test Information ---

Parameter	Units	Method	Det Lim	Result	Analysis Date	Tech
623-Tot Pet Hydro Prep S		Cal-DHS		Done	10/08/96	LR
621-8015M TPH CalDHS Ext S mg/Kg	mg/Kg	Cal-DHS		_TITLE_	10/10/96	DT
Petroleum Hydrocarbons (Diesel)	mg/Kg	Cal-DHS	7.06	Not Det	10/10/96	DT
sur-O-Terphenyl %R 60-149	mg/Kg	Cal-DHS	0	107	10/10/96	DT
622-8015M TPH CalDHS Vol S mg/Kg	mg/Kg	Cal-DHS		_TITLE_	10/08/96	TH
Petroleum Hydrocarbons (Gasoline)	mg/Kg	Cal-DHS	0.100	Not Det	10/08/96	TH
sur-2-Fluorobiphenyl %R 20-180	mg/Kg	Cal-DHS	0	81	10/08/96	TH

Remarks:

Signed: 

James M.G. Tucci

Laboratory Manager

LAW ENVIRONMENTAL NATIONAL LABORATORIES

TEST DATA REPORT

10/14/96

--- Project Information ---

Mr. Jeff Tyburski

Law Eng & Envir Services, Inc.

3301 Atlantic Avenue

Raleigh, NC 27604

Project Name: 2PIT15

Clt#12024Proj#30740-5-0500-0194

--- Sample Information ---

Station ID: 66SB20(6-8)

Lab ID: AB01722

Collector: JEFF TYBURSKI

Date Sampled: 10/04/96

Time Sampled: 12:15

Log In Date: 10/08/96

Log In Time: 11:46

--- Test Information ---

Parameter	Units	Method	Det Lim	Result	Analysis Date	Tech
623-Tot Pet Hydro Prep S		Cal-DHS		Done	10/08/96	LR
621-8015M TPH CalDHS Ext S mg/Kg	mg/Kg	Cal-DHS		_TITLE_	10/10/96	DT
Petroleum Hydrocarbons (Diesel)	mg/Kg	Cal-DHS	7.64	Not Det	10/10/96	DT
sur-O-Terphenyl %R 60-149	mg/Kg	Cal-DHS	0	107	10/10/96	DT
622-8015M TPH CalDHS Vol S mg/Kg	mg/Kg	Cal-DHS		_TITLE_	10/08/96	TH
Petroleum Hydrocarbons (Gasoline)	mg/Kg	Cal-DHS	0.100	Not Det	10/08/96	TH
sur-2-Fluorobiphenyl %R 20-180	mg/Kg	Cal-DHS	0	82	10/08/96	TH

Remarks:

Signed: 

James M.G. Tucci

Laboratory Manager

LAW ENVIRONMENTAL NATIONAL LABORATORIES

TEST DATA REPORT

10/14/96

--- Project Information ---

Mr. Jeff Tyburski

Law Eng & Envir Services, Inc.

3301 Atlantic Avenue

Raleigh, NC 27604

Project Name: 2PIT15

Clt#12024Proj#30740-5-0500-0194

--- Sample Information ---

Station ID: 66SB20(8-10)

Lab ID: AB01723

Collector: JEFF TYBURSKI

Date Sampled: 10/04/96

Time Sampled: 12:25

Log In Date: 10/08/96

Log In Time: 11:46

--- Test Information ---

Parameter	Units	Method	Det Lim	Result	Analysis Date	Tech
623-Tot Pet Hydro Prep S		Cal-DHS		Done	10/08/96	LR
621-8015M TPH CalDHS Ext S mg/Kg	mg/Kg	Cal-DHS		_TITLE_	10/10/96	DT
Petroleum Hydrocarbons (Diesel)	mg/Kg	Cal-DHS	7.02	Not Det	10/10/96	DT
sur-O-Terphenyl %R 60-149	mg/Kg	Cal-DHS	0	105	10/10/96	DT
622-8015M TPH CalDHS Vol S mg/Kg	mg/Kg	Cal-DHS		_TITLE_	10/08/96	TH
Petroleum Hydrocarbons (Gasoline)	mg/Kg	Cal-DHS	0.100	Not Det	10/08/96	TH
sur-2-Fluorobiphenyl %R 20-180	mg/Kg	Cal-DHS	0	74	10/08/96	TH

Remarks:

Signed: _____

James M.G. Tucci

Laboratory Manager

LAW ENVIRONMENTAL NATIONAL LABORATORIES

TEST DATA REPORT

10/14/96

--- Project Information ---

Mr. Jeff Tyburski

Law Eng & Envir Services, Inc.

3301 Atlantic Avenue

Raleigh, NC 27604

Project Name: 2PIT15

Clt#12024Proj#30740-5-0500-0194

--- Sample Information ---

Station ID: 66SB19(4-6)

Lab ID: AB01724

Collector: JEFF TYBURSKI

Date Sampled: 10/04/96

Time Sampled: 12:45

Log In Date: 10/08/96

Log In Time: 11:46

--- Test Information ---

Parameter	Units	Method	Det Lim	Result	Analysis Date	Tech
623-Tot Pet Hydro Prep S		Cal-DHS		Done	10/08/96	LR
621-8015M TPH CalDHS Ext S mg/Kg	mg/Kg	Cal-DHS		_TITLE_	10/10/96	DT
Petroleum Hydrocarbons (Diesel)	mg/Kg	Cal-DHS	7.58	Not Det	10/10/96	DT
sur-O-Terphenyl %R 60-149	mg/Kg	Cal-DHS	0	97	10/10/96	DT
622-8015M TPH CalDHS Vol S mg/Kg	mg/Kg	Cal-DHS		_TITLE_	10/08/96	TH
Petroleum Hydrocarbons (Gasoline)	mg/Kg	Cal-DHS	0.100	Not Det	10/08/96	TH
sur-2-Fluorobiphenyl %R 20-180	mg/Kg	Cal-DHS	0	56	10/08/96	TH

Remarks:

Signed: 

James M.G. Tucci

Laboratory Manager

LAW ENVIRONMENTAL NATIONAL LABORATORIES

TEST DATA REPORT

10/14/96

--- Project Information ---

Mr. Jeff Tyburski

Law Eng & Envir Services, Inc.

3301 Atlantic Avenue

Raleigh, NC 27604

Page 1

Project Name: 2PIT15

Clt#12024Proj#30740-5-0500-0194

--- Sample Information ---

Station ID: 66SB19(8-10)

Lab ID: AB01725

Collector: JEFF TYBURSKI

Date Sampled: 10/04/96

Time Sampled: 13:05

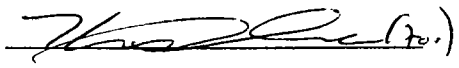
Log In Date: 10/08/96

Log In Time: 11:46

--- Test Information ---

Parameter	Units	Method	Det Lim	Result	Analysis Date	Tech
623-Tot Pet Hydro Prep S		Cal-DHS		Done	10/08/96	LR
621-8015M TPH CalDHS Ext S mg/Kg	mg/Kg	Cal-DHS		_TITLE_	10/10/96	DT
Petroleum Hydrocarbons (Diesel)	mg/Kg	Cal-DHS	8.52	Not Det	10/10/96	DT
sur-O-Terphenyl %R 60-149	mg/Kg	Cal-DHS	0	88	10/10/96	DT
622-8015M TPH CalDHS Vol S mg/Kg	mg/Kg	Cal-DHS		_TITLE_	10/08/96	TH
Petroleum Hydrocarbons (Gasoline)	mg/Kg	Cal-DHS	0.100	Not Det	10/08/96	TH
sur-2-Fluorobiphenyl %R 20-180	mg/Kg	Cal-DHS	0	80	10/08/96	TH

Remarks:

Signed: 

James M.G. Tucci

Laboratory Manager

LAW ENVIRONMENTAL NATIONAL LABORATORIES

TEST DATA REPORT

10/14/96

--- Project Information ---

Mr. Jeff Tyburski

Law Eng & Envir Services, Inc.

3301 Atlantic Avenue

Raleigh, NC 27604

Page 1

Project Name: 2PIT15

Clt#12024Proj#30740-5-0500-0194

--- Sample Information ---

Station ID: 66SB39(8-10)

Lab ID: AB01726

Collector: JEFF TYBURSKI

Date Sampled: 10/04/96

Time Sampled: 14:05

Log In Date: 10/08/96

Log In Time: 11:46

--- Test Information ---

Parameter	Units	Method	Det Lim	Result	Analysis Date	Tech
623-Tot Pet Hydro Prep S		Cal-DHS		Done	10/08/96	LR
621-8015M TPH CalDHS Ext S mg/Kg	mg/Kg	Cal-DHS		_TITLE_	10/10/96	DT
Petroleum Hydrocarbons (Diesel)	mg/Kg	Cal-DHS	7.18	Not Det	10/10/96	DT
sur-O-Terphenyl %R 60-149	mg/Kg	Cal-DHS	0	97	10/10/96	DT
622-8015M TPH CalDHS Vol S mg/Kg	mg/Kg	Cal-DHS		_TITLE_	10/08/96	TH
Petroleum Hydrocarbons (Gasoline)	mg/Kg	Cal-DHS	0.100	Not Det	10/08/96	TH
sur-2-Fluorobiphenyl %R 20-180	mg/Kg	Cal-DHS	0	79	10/08/96	TH

Remarks:

Signed: 

James M.G. Tucci

Laboratory Manager

LAW ENVIRONMENTAL NATIONAL LABORATORIES

TEST DATA REPORT

10/14/96

--- Project Information ---

Mr. Jeff Tyburski

Law Eng & Envir Services, Inc.

3301 Atlantic Avenue

Raleigh, NC 27604

Project Name: 2PIT15

Clt#12024Proj#30740-5-0500-0194

--- Sample Information ---

Station ID: ROLL OFF BOX

Lab ID: AB01727

Collector: JEFF TYBURSKI

Date Sampled: 10/04/96

Time Sampled: 15:00

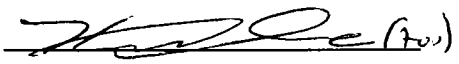
Log In Date: 10/08/96

Log In Time: 11:46

--- Test Information ---

Parameter	Units	Method	Det Lim	Result	Analysis Date	Tech
623-Tot Pet Hydro Prep S		Cal-DHS		Done	10/08/96	LR
621-8015M TPH CalDHS Ext S mg/Kg	mg/Kg	Cal-DHS		_TITLE_	10/11/96	DT
Petroleum Hydrocarbons (Diesel)	mg/Kg	Cal-DHS	430	1990	10/11/96	DT
sur-O-Terphenyl %R 60-149	mg/Kg	Cal-DHS	0	0	10/11/96	DT
622-8015M TPH CalDHS Vol S mg/Kg	mg/Kg	Cal-DHS		_TITLE_	10/09/96	TH
Petroleum Hydrocarbons (Gasoline)	mg/Kg	Cal-DHS	0.310	390	10/09/96	TH
sur-2-Fluorobiphenyl %R 20-180	mg/Kg	Cal-DHS	0	98	10/09/96	TH

Remarks:

Signed: 

James M.G. Tucci

Laboratory Manager

A-E Engineering

GeoChem, Incorporated

Environmental Laboratories

2500 Gate Way Centre Blvd., Suite 300
Morrisville, NC 27560

Report To:
Jeff Tyburski
Raleigh, NC
Raleigh office

Bill To:

Chain of Custody Record

Page 1 of _____

PROJECT SITE NUMBER: 30740-5-0500/0194 | PO#:
SITE NAME: PIT 15
COLLECTED BY (Signature):

GEOCHEM PROJECT #:
DATE DUE:
VERBAL/FAX/HARDCOPY:

FIELD SAMPLE ID	TURNAROUND IN DAYS	SAMPLE MATRIX	DATE AND TIME COLLECTED	NO. OF CONTAINERS PER LOCATION	TPH 3015 (3550)	TPH 8015 (3546)	REMARKS	LAB ID NO. (for lab use only)
666W55 (3.5-5.0)	std	soil	10/4/96 (950)	3	X	X		AB01718
666W55 (8.5-10)	std		10/4/96 (1000)	3	X	X		AB01719
665B21 (4-6)			10/4/96 (1130)	3	X	X		AB01720
665B21 (6-8)			10/4/96 (1135)	3	X	X		AB01721
665B20 (6-8)			10/4/96 (1215)	3	X	X		AB01722
665B20 (8-10)			10/4/96 (1225)	3	X	X		AB01723
665B19 (4-6)			10/4/96 (1245)	3	X	X		AB01724
665B19 (8-10)			10/4/96 (1305)	3	X	X		AB01725
665B39 (8-10)			10/4/96 (1405)	3	X	X		AB01726
Rinsate Blank			10/4/96 (1500)	3	X	X		AB01727
							Sample Highly contaminated with Jet Fuel (JP-5)	

REMARKS

RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME
Federal Express #871403744	10/4/96	1700			

RELINQUISHED BY: _____ DATE 10/4/96 TIME 1700

RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME
Mary Chiminski	10-7-96	0930			

Cooler Temp 15c

This Chain of Custody is considered a written contract to perform the services requested in the analyses section of this document.