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June 27, 2005

NAVFAC Atlantic  
North Carolina/Caribbean IPT  
Environmental Business Line  
Code: OPACEV4DC  
Attn: David T. Cleland, P. G.  
6506 Hampton Blvd.  
Building C. Room 314  
Norfolk, VA 23508-1278

**Re: FINAL Comprehensive Site Assessment  
2004 Helicopter Release**  
Marine Corps Air Station  
New River, North Carolina  
Navy Contract No. N62470-01-D-3009  
Delivery Order No. 0136  
CATLIN Project No. 204-047

Dear Mr. Cleland:

CATLIN Engineers and Scientists (CATLIN) is pleased to submit the FINAL Comprehensive Site Assessment (CSA) for the above referenced site. We have reviewed the comments to the DRAFT report, made the appropriate changes to the final report and offer the following responses to the comments/concerns offered by Ms. Nikki Hall and Mr. David Cleland.

**From Ms. Hall:**

Looks good upon my quick review - i may have missed it but make a figure that points out the area to be excavated. Red areas on last figs I assume is the area of concern.

**Figure 10 has been added to show the proposed excavation area.**

**From Mr. Cleland:**

I have no comments on the subject CSA. Can you verify that we are recommending excavating approx 8000 cu yds?

**We estimate an area 20' X 20' X 3' deep will require excavation for a total of approximately 45 cubic yards. The text has been revised accordingly in the Executive Summary and the Conclusions/Recommendations.**

CATLIN appreciates the opportunity to continue to provide services to NAVFAC Atlantic and the Marine Corps Base Camp Lejeune on your environmental projects.

Sincerely,



Michael E. Mason, P.E.  
CATLIN Program Manager



Stephan A. Tyler  
Project Geologist

Attachments: DRAFT Comprehensive Site Assessment

cc: Ms. Kathy Gillespie– Contracts, correspondence only  
Commanding General, Attn: Director I&E/EMD/EQB (w/ two attachments)

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**COMPREHENSIVE SITE ASSESSMENT**

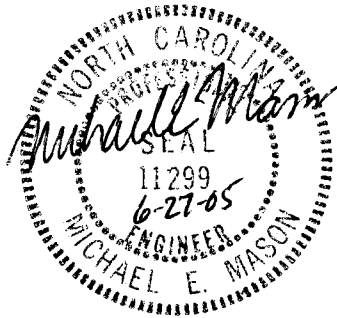
**2004 HELICOPTER RELEASE  
ABOVEGROUND STORAGE TANK JP-5 FUEL RELEASE**

**MARINE CORPS AIR STATION  
NEW RIVER, NORTH CAROLINA**

**June 27, 2005**

SITE INFORMATION		RELEASE INFORMATION	
NCDENR Groundwater Incident No.	PENDING	Facility Identification No.	N/A
Product Released	JP-5	Date Discovered	Confirmed April of 2000
Estimated Quantity	± 700 gallons	Source of Release	Helicopter Fuel Storage Tank

**CONTRACT NO. N62470-01-D-3009  
DELIVERY ORDER NO. 0136  
CATLIN PROJECT NO. 204-047**



**Prepared by:**

**CATLIN ENGINEERS AND SCIENTISTS  
220 OLD DAIRY ROAD  
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**Prepared for:**

**COMMANDING GENERAL  
MCB, CAMP LEJEUNE  
ATTN: I&E/EMD/EQB  
MCB, PSC BOX 20004  
CAMP LEJEUNE, NC 28542  
(910) 451-5068**

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## LIST OF ACRONYMS

2000 Guidelines	Groundwater Section Guidelines for Investigation and Remediation of Soil and Groundwater.
2001 Guidelines	Guidelines for Assessment and Corrective Action, North Carolina Underground Storage Tank Section (Effective July 1, 2001)
2L GWQS	NCAC T15A:02L Groundwater Quality Standards
ARO	Asheville Regional Office
AS	Air Sparge
AST	Aboveground Storage Tank
BDL	Below Detection Limit
BN	Base/Neutral (extractables)
BNA	Base/Neutral/Acid (extractables)
BQL	Below Quantitation Limit
BLS	Below Land Surface
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes
CAP	Corrective Action Plan
CATLIN	CATLIN Engineers and Scientists (Formerly RC&A)
CFR	Code of Federal Regulations
Cr	Chromium
CSA	Comprehensive Site Assessment
CNP	Carbon Nitrogen Phosphorous
CPT	Cone Penetrometer Test
DEM	Division of Environmental Management
DIPE	Diisopropyl Ether
DO	Dissolved Oxygen
DOD	Department of Defense
DPT	Direct Push Technology
DWQ	Division of Water Quality
DWM	Division of Waste Management
DTW	Depth to Water
EAD	Environmental Affairs Department
EDB	Ethylene di-bromide
EMD	Environmental Management Division
EPA	Environmental Protection Agency
EPH	Extractable Petroleum Hydrocarbons
EQB	Environmental Quality Branch
Fe	Iron
FID	Flame Ionization Detector
FOD	Foreign Object Debris
FRO	Fayetteville Regional Office
FT	Feet

GCL	Gross Contaminant Level
GIS	Geographic Information System
GPS	Global Positioning System
Guidelines Vol. I	Groundwater Section Guidelines for Investigation and Remediation of Soil and Groundwater, Volume I, Sources Other Than Petroleum Underground Storage Tanks (May 1998)
Guidelines Vol. II	Groundwater Section Guidelines for Investigation and Remediation of Soil and Groundwater, Volume II, Petroleum Underground Storage Tanks (January 2, 1998)
HDPE	High Density Polyethylene
I/C	Industrial/Commercial
ID	Identification
I&E	Installations and Environment Department
IGWQS	Interim Groundwater Quality Standards
IPE	Isopropyl Ether
LANTDIV	Atlantic Division
LSA	Limited Site Assessment
LUST	Leaking Underground Storage Tank
m-	meta
m	meter
MADEP	Massachusetts Department of Environmental Protection
MCALF	Marine Corps Auxiliary Landing Field
MCAS	Marine Corps Air Station
MCB	Marine Corps Base
MCOLF	Marine Corps Outlying Landing Field
MDL	Method Detection Limit
mg/Kg	Milligrams per Kilogram
mg/L	Milligrams per Litre
MRO	Mooresville Regional Office
MSSC	Maximum Soil Contaminant Concentration
MSL	Mean Sea Level
MTBE	Methyl tertiary butyl ether
µg/Kg	Micrograms per Kilogram
µg/L	Micrograms per Litre
NA	Not Analyzed
N/A	Not Applicable
NC	North Carolina
NCAC	North Carolina Administrative Code
NCDENR	North Carolina Department of Environment and Natural Resources
NCDOC	North Carolina Department of Corrections
NCDOT	North Carolina Department of Transportation
NCSP	North Carolina State Plane
NCSPA	North Carolina State Ports Authority
NE	None Established
NM	Not Measured
NMT	No Measurable Thickness
NS	Not Sampled

o-	ortho
OVA	Organic Vapor Analyzer
p-	para
PAH	Polynuclear Aromatic Hydrocarbons
Pb	Lead
PPB	Parts Per Billion
PPM	Parts Per Million
PID	Photo Ionization Detector
PQL	Practical Quantitation Limit
PVC	Polyvinyl chloride
RBCA	Risk-Based Corrective Action
RCRA	Resource Conservation and Recovery Act
Res	Residential
ROI	Radius of Influence
RRO	Raleigh Regional Office
SOW	Scope of Work
STGW	Soil-to-Groundwater
SVE	Soil Vapor Extraction
SVOC	Semi Volatile Organic Compound
TDHF	Toxicologically Defined Hydrocarbons Fractions
TCLP	Toxicity Characteristic Leaching Procedure
TIC	Tentatively Identified Compound
TKN	Total Kjeldahl Nitrogen
TOC	Top of Casing
TPH	Total Petroleum Hydrocarbons
US	United States
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UST	Underground Storage Tank
VOC	Volatile Organic Compounds
VPH	Volatile Petroleum Hydrocarbons
WaRO	Washington Regional Office
WiRO	Wilmington Regional Office
WSRO	Winston-Salem Regional Office

**2004 HELICOPTER RELEASE  
ABOVEGROUND STORAGE TANK JP-5 FUEL RELEASE**

**MARINE CORPS AIR STATION  
NEW RIVER, NORTH CAROLINA**

**June 27, 2005**

**EXECUTIVE SUMMARY**

The purpose of this Comprehensive Site Assessment (CSA) was to further define the extent of site soils impacted with jet fuel (JP-5) and assess potential dissolved surficial groundwater contamination and free product accumulation just south of the Delta Taxiway aboard Marine Corps Air Station (MCAS), New River, North Carolina. On February 25, 2004 approximately 700 gallons of JP-5 was accidentally released from a helicopter fuel tank onto the flight line and then flowed southward onto the adjacent grass area. Subsequent to the release, initial abatement activities included Air Station crews excavating impacted soils from the release area on two separate occasions. CATLIN Engineers and Scientists (CATLIN) personnel obtained seventeen (17) soil samples (HA-1 through HA-17) from the excavation boundaries for analysis per EPA Methods 8015/5030 and 8015/3550 for Total Petroleum Hydrocarbons (TPH) as Gasoline Range Organics (GRO) and Diesel Range Organics (DRO), respectively. While impacted soils in the vicinity of soil sample HA-04 (DRO) were abated, laboratory analyses revealed a remnant area of concern, or TPH concentrations in excess of applicable NCDENR Action Levels, in the vicinity of site soil samples HA-06 (DRO and GRO), HA-16 (DRO and GRO) and HA-17 (DRO and GRO). In an e-mail dated May 27, 2004, NCDENR personnel recommended a CSA be completed prior to any additional remediation efforts. CATLIN was authorized to perform a CSA, by the LANTDIV NAVFACENGCOM in accordance with the Order of Supplies Contract Number N62470-01-D-3009, Delivery Order Number 0136.

**General Site Conditions**

- No potential receptors including any human, plant, animal, utilities, structures or surface waters were identified that could be adversely affected as a result of this JP-5 release.
- In accordance with the NCDENR "Geologic Map of North Carolina 1985", the subject site is located within the Coastal Plain physiographic region.
- The area within 1,500 feet of the subject site is still within the MCAS. Access to this area is restricted.

**Site Soil Analysis**

- EPA Method 8015/5035 analysis of all site CSA soil samples revealed TPH-GRO concentrations that were either BQL or below the applicable NCDENR Action Level of 10 mg/Kg.
- EPA Method 8015/3550 analysis of all site CSA soil samples revealed TPH-DRO concentrations that were either BQL or below the applicable NCDENR Action Level of 40 mg/Kg.
- The area of concern remains the subsurface soils around site soil samples HA-06, HA-16 and HA-17.

**Site Groundwater Analysis**

- Laboratory analysis of all site groundwater samples revealed BQL for all EPA Method 602 + MTBE + Xylenes parameters.

- Laboratory analysis of all site groundwater samples revealed BQL for all EPA Method 625 analysis parameters. In addition no TICs were detected in the site groundwater samples.
- The apparent surficial *groundwater flow direction*, within the area of interest, is generally to the northwest.

### **Site Free-Phase Product Data**

During the initial abatement activities and CSA field investigation no free-phase product (>0.01') was detected at the subject site.

### **Conclusions**

- Based on the Initial Abatement and CSA investigation findings, the source area at the subject site has been delineated. The area of concern remains the subsurface soils around site soil samples HA-04 (TPH-DRO), HA-06 (TPH-DRO and -GRO), HA-16 (TPH-DRO and -GRO) and HA-17 (TPH-DRO and -GRO).

### **Recommendations**

- Excavate the area around soil sample locations HA-06, HA-16 and HA-17 from the land surface to the apparent water table. The area proposed for excavation is approximately 20 feet long by 20 feet wide by 3 feet deep, or approximately 45 cubic yards of impacted soils.
- Obtain excavation boundary samples for TPH-GRO and DRO analysis.
- Once post excavation samples indicate that soil quality is within applicable NCDENR Action Level concentrations propose that NCDENR WiRO personnel evaluate this incident for "Site Closure".

A copy of this report should be forwarded to the NCDENR WiRO at the following address:

North Carolina Department of Environment and Natural Resources  
Division of Water Quality  
Groundwater Section  
Attention: Dr. Charles F. Stehman, Ph.D., P.G.  
127 Cardinal Drive Extension  
Wilmington, North Carolina 28405

**2004 HELICOPTER RELEASE  
ABOVEGROUND STORAGE TANK JP-5 FUEL RELEASE**

**MARINE CORPS AIR STATION  
NEW RIVER, NORTH CAROLINA**

**1.0 TITLE PAGE**

Date Of Report: DRAFT  
Facility ID: N/A Groundwater Incident Number Pending  
Site Name: 2004 Helicopter Release  
Site Location: Marine Corps Air Station, New River  
Nearest City/Town: Jacksonville County: Onslow  
Risk Classification: Pending Land Use Classification: Military  
  
AST Owner: Commanding General – MCB Camp Lejeune  
Attn: Director I&E/EMD/EQB  
Address: PSC 20004  
MCB Camp Lejeune, NC 28542-0004 Phone: (910) 451-5068  
  
AST Operator: Same as above  
Address: Same as above Phone: Same as above  
  
Property Owner: Same as above  
Address: Same as above Phone: Same as above  
  
Property Occupant: Marine Corps personnel  
Address: Marine Corps Air Station, New River Phone: Unknown  
  
Consultant/Contractor: CATLIN Engineers and Scientists  
Address: 220 Old Dairy Road, Wilmington, North Carolina 28405 Phone: (910) 452-5861

**Release Information**

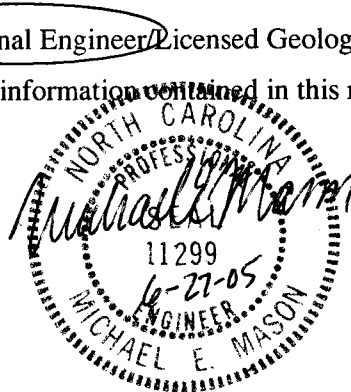
Date Discovered: JP-5 Fuel – April, 2000;  
Longitude: N 77° 26' 30.4" Latitude: W 34° 42' 31.6"  
Estimated Quantity of Release: + 700 Gallons  
Cause of Release: Accidental release from a helicopter fuel tank.  
Source of Release (e.g. Piping/UST):  
Helicopter fuel tank – Aboveground Storage Tank

**Sizes and contents of AST system from which the release occurred:**

+ 1,000 gallon Helicopter fuel tank.

I, Michael E. Mason & Professional Engineer Licensed Geologist (circle one) for CATLIN Engineers and Scientists, do certify that the information contained in this report is correct and accurate to the best of my knowledge.

(Please Affix Seal and Signature)



## 2.0 SITE HISTORY AND SOURCE CHARACTERIZATION

The release impacted the grass area just south of the Delta Taxiway flight line aboard the Marine Corps Air Station (MCAS) at New River, North Carolina (see Figure 1). Site AST owner/operator information has been listed on Table 1.

### 2.1 SITE HISTORY

Land use in the vicinity of the subject site is a military airplane flight line to facilitate the training and support of Marine Corps aircraft. Other than aircraft on the flight line, there are no other potential petroleum sources (aboveground storage tanks, underground storage tanks, pipelines, ex.) within 500 feet of the subject site. On February 25, 2004, approximately 700 gallons of JP-5 fuel was accidentally released from a helicopter fuel tank onto the flight line and then flowed southward onto the adjacent grass area. This is the first petroleum release to occur at the subject site. Subsequent to the release, Air Station crews conducted initial abatement measures, which included excavation of apparently impacted soils at the release area. Laboratory analysis of post excavation soil samples revealed areas of remnant soil contamination remained at the site. In an e-mail dated May 27, 2004, NCDENR personnel recommended a CSA be completed prior to any additional remediation efforts.

CATLIN was authorized to perform this CSA, by the NAVFAC ATLANTIC in accordance with the Order of Supplies Contract Number N62470-01-D-3009, Delivery Order Number 0136.

### 2.2 SOURCE CHARACTERIZATION

#### *Source*

As previously discussed, on February 25, 2004 approximately 700 gallons of jet fuel (JP-5) was incidentally released from a helicopter fuel tank onto the flight line and then flowed southward onto the adjacent grass area. JP-5 (CAS 8008-20-6), or Navy jet fuel, is predominantly kerosene ( $\pm 100\%$  by weight) and naphthalene ( $\pm 0.04\%$  by weight). In the groundwater environment JP-5 has negligible solubility in water and a specific gravity of approximately 0.81 (A Hess, 1999).

#### *Initial Abatement and Assessment Activities*

Subsequent to the release, Air Station crews excavated impacted soil from the release area and CATLIN personnel obtained twelve confirmatory soil samples (identified as HA-01 through HA-12) from the base of the excavation on March 8, 2004. Confirmatory soil samples were analyzed per EPA Methods 8015/5030 and 8015/3550 for TPH concentrations of Gasoline Range Organics (GRO) and Diesel Range Organics (DRO) respectively. For regulatory compliance laboratory analysis results were compared to the NCDENR Action Levels for TPH-GRO (10 mg/Kg) and TPH-DRO (40 mg/Kg) as listed in the *2000 Guidelines*. Laboratory analyses revealed TPH

concentrations in excess of applicable NCDENR Action Levels in two soil samples, HA-04 (DRO) and HA-06 (DRO and GRO).

Based on the initial soil sample results, additional excavation activities were initiated in the area around soil sample locations HA-04 and HA-06. Following the excavation, CATLIN personnel again obtained confirmatory soil samples for laboratory analysis on April 19, 2004. Three soil samples, HA-13, HA-14, and HA-15, were collected by hand auger from the base of the additional excavation at HA-04 and two confirmatory soil samples, HA-16 and HA-17 were collected from the additional excavation at HA-06. These samples were also analyzed for TPH-GRO and TPH-DRO. Laboratory analysis of post excavation soil samples from the HA-04 area revealed TPH-GRO and TPH-DRO concentrations compliant with applicable NCDENR Action Levels. However, analyses of soil samples HA-15 and HA-16 exhibited TPH-GRO and TPH-DRO concentrations in excess of applicable NCDENR Action Levels. As stated previously, site conditions warranted additional site soil and initial site groundwater assessment.

#### ***Site Geographical Setting and Surrounding Land Use***

The subject site is located within the coastal plain of North Carolina just off the New River. The area is former woodland that has been cut and graded for the construction of the MCAS flight line and surrounding support structures. The surrounding land surface is relatively flat with a topography elevation ranging from approximately 23 to 25 foot above MSL. Aside from the adjacent paved flight line the local area is covered with grass.

As stated previously, the subject site is adjacent to the Delta Taxiway flight line aboard MCAS New River. MCAS New River consists of approximately 2,600 acres of land utilized for various military and civil service purposes. This site is currently utilized to train and support Marine Corps aircraft and will likely remain so for the foreseeable future.

### **3.0 SITE RECEPTOR INFORMATION**

As defined by NCDENR in NCAC 15A 02L .0102(19) "receptors" include any human, plant, animal or structure with the potential to be adversely affected by the release or migration of contaminants. Guidance documents issued by the regulatory agency indicate that structures may include items such as utility lines, basements, and elevator shafts. Although not specifically included in Section .0102 of 2L GWQS, regulatory officials typically consider potential receptors to include environmental resources such as water supply wells, surface waters, drinking water supplies, and "regions of groundwater that have been identified for planned resource development." Receptors noted during the March 15, 2005 area reconnaissance can be summarized as follows:

Adjoining Property Owners within 1,500 feet of the Source Area

Not applicable. The area within a 1,500 feet radius of the source area is still well within the MCAS property boundary.

Potable or Non-potable Water Wells within 1,500 feet of Source Area

- No potable or non-potable water wells are located within 1,500 feet of the subject site,
- The MCAS, New River water system supplies public water to the site. The water well nearest to the subject site is MCAS potable water well PSWAS-4150 located approximately 4,200 feet west of the source area.

Wellhead Protection Areas

- Camp Lejeune has identified proposed wellhead protection areas on the MCAS. According to available information (Wellhead Protection Plan – 2002 Update, August 2002), the subject site is not located within a proposed wellhead protection area.

Surface Water Bodies within 1,500 feet of Source Area

- +80 feet south – Manmade drainage ditch,
- No surface water is located within 1,500 feet of the subject site,
- The nearest natural surface water is New River located approximately 4,300 feet northeast of the potential source area,
- A man-made storm water retention pond is located approximately 1,000 feet south of the potential source area.

Buildings within 1,500 feet of Source Area

- +500 feet southeast – AS3000 – slab on grade construction,
- +560 feet southeast – AS3003 – slab on grade construction,
- +900 feet south – AS3525 - slab on grade construction.

Underground Utilities within 1,500 feet of the Source Area

- +0 feet - Electrical conduit for the Delta Taxiway runway lights are located approximately 2 feet below grade and run parallel to the runway through the soil excavation limits,
- Remaining underground communications and telephone lines are located greater than 400 feet from the source area and are generally installed at a depth of less than three feet BLS; however, their exact locations are not known. Secure communication lines are also located on site, but their exact locations and installation depths are not available for public record.

Public Access within 1,500 feet of the Source Area

- The area within 1,500 feet of the source is still within the MCAS. Access to this area is restricted.
- No areas of general public assembly (schools, churches, shops, playgrounds, etc.) currently exist within 1,500 feet of the source area.

## 4.0 REGIONAL GEOLOGY AND HYDROLOGY

### 4.1 REGIONAL GEOLOGY

In accordance with the NCDENR “Geologic Map of North Carolina 1985”, the subject site is located within the Coastal Plain physiographic region (see Figure 2). According to Horton and Zullo in *The Geology of the Carolinas* (1991), the Coastal Plain is comprised of a seaward thickening wedge of post-Triassic, primarily unconsolidated, siliclastic sediments (silts, sands and clays) and carbonate rocks that extend from the Fall Line to the continental shelf break.

### 4.2 REGIONAL HYDROLOGY

To determine the Regional Hydrogeology below the subject site, the site location was profiled in the NCDENR Division of Water Resources website “Visual Hydrogeologic Framework”. Boreholes located within two and a half miles of the subject site and to depths of less than 400 feet BLS were evaluated to determine the local hydrogeology framework. The following subsurface hydrologic sequence is based on the findings of the borehole data for U.S. Marine Corps Test Well No. 12 (1.58 miles away and 360 feet BLS), Alliance Environmental (1.61 miles away and 341 feet BLS) and Carl Beacham (2.20 miles away and 138 feet BLS):

Formation Name	Approximate Depth BLS (feet)	Approximate Thickness (feet)
Surficial	0 to 20	20
Upper Tertiary Aquifer Confining Unit	20 to 25	5
Upper Tertiary Aquifer	25 to 52	27
Castle Hayne Confining Unit	52 to 96	44
Castle Hayne Aquifer	96 to 306	210
Confining Unit	306 to >350	>44

A copy of the “Visual Hydrogeology Framework “ search results for the subject site has been provided in Appendix A.

## 5.0 SITE GEOLOGY AND HYDROLOGY

During this CSA investigation three soil borings (ASTDELAT-SB01 through ASTDELAT-SB03) were advanced three to four feet BLS utilizing conventional hand auger techniques. In addition five soil borings were advanced utilizing conventional hollow stem auguring techniques to facilitate the construction of four fifteen feet BLS shallow (Type

II) groundwater monitoring wells (ASTDELATAT-MW01 through ASTDELATAT-MW04) and one forty feet BLS deep (Type III) groundwater monitoring wells. (ASTDELATAT-MW05). All borings were advanced and sampled in general accordance with the attached CATLIN Standard Procedures (Appendix B).

During installation of Type III groundwater monitoring well ASTDELATAT-MW05 borehole soil samples were obtained continuously until the drilling was terminated at 40 feet BLS. During installation of the Type II monitoring well boreholes continuous samples were collected until the apparent surficial water table was encountered. Soil samples were then obtained at the 8-10 and 13-15 feet BLS intervals. At the hand auger borehole locations soil samples were obtained continuously until the apparent surficial water table was encountered. The CSA Soil boring and groundwater monitoring well locations, in relation to the site plan, have been illustrated on Figure 3. Copies of the groundwater monitoring well construction records and boring logs have been provided in Appendix C.

### **5.1 SITE GEOLOGY**

Soil samples obtained during the site borehole installation were visually classified in accordance with the USCS. The resulting information was evaluated to define the subsurface geology at the subject site, ascertain the vertical extent of soil vadose zone contamination and potential dissolved-phase groundwater contamination.

A plan view of the site geologic cross section location has been illustrated in Figure 4A. The site subsurface geology, based on the site borehole cuttings, have been illustrated in cross sections A-A' and B-B' in Figures 4B and 4C, respectively. As depicted in the Fence Diagrams presented on Figures 4B and 4C, the surficial materials from ground surface to approximately 1 to 3 feet BLS consisted of olive/black organic silty fine grained sands (SM). Below this layer a mottled, highly, plastic clay (OH) was encountered to approximately 4 to 8.5 feet BLS. Below this clay layer, olive fine to medium grained sand with few fines (SM) were encountered to approximately 8.5 to 13.5 feet BLS. Below this, fine to medium grained sands, a dark olive; silt (OL) was encountered to depths ranging from approximately 11.5 to 15 feet BLS. Below 15 feet BLS soil description is based on cuttings obtained from Type III well ASTDELATAT-MW05. A dark olive organic rich silt or peat (PT) was encountered down from 15 to 17.5 feet BLS. From 17.5 to 29 feet BLS an olive silty fine to medium grained sand (SM) was encountered. From 29 to 30.5 feet BLS, olive sandy clay (SC) was encountered. From 30.5 until the borehole was terminated (40 feet BLS) a light grey fine to coarse sand (SP) with lime fines and limestone fragments (gravel) were encountered.

The soils described above are consistent with undivided surficial deposits typically encountered in the Coastal Plain physiographic province. During borehole installation the apparent surficial water table was encountered approximately 2.5 to 3 feet BLS

## 5.2 *SITE HYDROLOGY*

As previously discussed, below the surficial water table there appears to be no consistent clay layer or geologic feature that could prevent the vertical migration of fluids between the Type II and III monitoring well screen intervals. Therefore, it is assumed that the site Type II and III groundwater monitoring well screens intercept the same un- or semi-confined surficial groundwater aquifer. Site Type II and III monitoring well construction details have been summarized in Table 2.

### *Surficial Groundwater Flow Direction*

All site groundwater monitoring well top of casing (TOC) elevations have been surveyed in relation to an assumed elevation of 100.00 feet. During a March 15, 2005 site visit, CATLIN personnel gauged all site groundwater monitoring wells for depth to water table and potential free-phase product data. The March 15, 2005 surficial water table data has been summarized on Table 2. This depth to groundwater table data has been subtracted from the TOC elevation data to determine the site surficial groundwater table elevations. The March 15, 2005 groundwater elevation data was entered into a contouring software program (AutoCAD Land Development) to generate the surficial groundwater table contours illustrated on Figure 5.

A review of Figure 5 illustrates a relatively flat groundwater table. The apparent surficial groundwater flow direction, within the area of interest, is generally to the northwest.

### *Horizontal and Vertical Hydraulic Gradient*

#### *Horizontal Hydraulic Gradient*

To determine the site surficial groundwater horizontal Hydraulic Gradient the difference in the March 15, 2005 water table elevations and distance between monitoring wells ASTDELTAT-MW01 and ASTDELTAT-MW04 were evaluated. The difference in the March 15, 2005 groundwater elevations (95.95 – 95.26) was 0.69 feet. The distance between ASTDELTAT-MW01 and ASTDELTAT-MW04 is approximately 275 feet. The difference in water table elevation divided by the distance is 0.002 or a horizontal Hydraulic Gradient approximately 0.2 % to the northwest.

#### *Vertical Hydraulic Gradient*

To determine the site surficial groundwater vertical hydraulic gradient the well construction and March 15, 2005 water table depth data between Type II monitoring well ASTDELTAT-MW03 and Type III monitoring well ASTDELTAT-MW05 was evaluated. A positive gradient indicates the potential for downward migration of groundwater from the shallow to the deeper aquifer zone. On March 15, 2005 data, the calculated vertical hydraulic gradient at site monitoring wells ASTDELTAT-MW03 and ASTDELTAT-MW05 was 0.04. A summary of the vertical hydraulic gradient evaluation is listed on Table 3.

### ***Hydraulic Conductivity***

The following hydraulic conductivity data is based on hydraulic testing conducted on the local surficial aquifer at a site approximately 1,000 feet northwest of the subject site. Testing data, calculations, and results are included in a report entitled *Leaking Underground Storage Tank Comprehensive Site Assessment Rapid Refueler* (dated November 1, 1994) on file at the NCDENR WiRO. Three slug tests were conducted during the 1994 CSA on monitoring wells identified as RR-4, RR-11, and RR-12 resulting in hydraulic conductivity values of 18 ft/day, 15 ft/day and 20 ft/day, respectively. In addition to the slug testing, grain size analysis was performed on two soil samples collected during the 1994 CSA investigation. Grain size distribution testing was performed on soil samples collected from RR-4 (five to seven feet BLS) and RR-15 (five to seven feet BLS). Comparison of the laboratory results to published information revealed hydraulic conductivity values of 23.78 ft/day for both samples. An eight-hour pumping test was performed on monitoring well RR-15 as part of the 1994 CSA. Hydraulic conductivity values were calculated using the pumping test data in accordance with the Dupuit methods and assumptions resulting with a value of 77.14 feet per day. Based on these hydraulic conductivity calculations, an estimated average hydraulic conductivity value of 31 feet per day was determined for the site.

### ***Groundwater Velocity***

The groundwater velocity (linear flow) was calculated using the following modification of Darcy's Law (Todd, 1980):

$$V_{\text{avg}} = (K_{\text{avg}}/n_e)(dh/dl)$$

Where:

$K_{\text{avg}}$  = Average hydraulic conductivity (feet/day). As previously discussed, an estimated average hydraulic conductivity value of 31 feet per day was determined for the site surficial aquifer.

$dh/dl$  = Hydraulic gradient (feet/feet). As previously discussed, an estimated horizontal hydraulic gradient (from ASTDELTAT-MW01 and ASTDELTAT-MW04) of 0.002 was determined for the site surficial aquifer.

$n_e$  = Effective porosity (unit less). The arithmetic mean for fine sand (0.33) from McWorter and Sunada (1977) is utilized as the effective porosity value for the site surficial aquifer.

Therefore:  $V_{\text{avg}} = (31 \text{ ft/day} / 0.33) (0.002) = 0.187 \text{ ft/day}$

Therefore: Based on the March 15, 2005 field data, the surficial groundwater velocity from site groundwater monitoring wells ASTDELTAT-MW01 to ASTDELTAT-MW04 was determined to be approximately 0.187 feet per day.

Note: Groundwater travel time or average groundwater linear flow velocity serves as a conservative estimate for the rate for potential surficial groundwater contaminant migration across the subject site. This figure would represent a conservative value since actual groundwater velocity rates should include several additional factors such as molecular diffusion, mechanical mixing, sorption-desorption, ion exchange, hydrolysis, and biodegradation.

## **6.0 SITE SOIL SAMPLING**

As previously discussed in Section 2.2, during initial site abatement activities seventeen soil samples (HA-1 through HA-17) were obtained from hand auger boring locations. Initial abatement soil samples were analyzed per EPA Methods 8015/5030 and 8015/3550 for TPH-GRO and TPH-DRO, respectively. Laboratory analyses revealed an area of concern, or TPH concentrations in excess of applicable NCDENR Action Levels, in site soil samples HA-06, HA-16 and HA-17. To further delineate the site soil DRO and GRO area of concern, additional soil samples were obtained at three soil borehole locations (ASTDELTA-T-SB01, SB02 and SB03) and at five groundwater monitoring well locations (ASTDELTA-T-MW01 through MW05).

### **6.1 SOIL SAMPLE SCREENING AND ANALYSIS METHODS**

To assess for potential petroleum contamination the following screening and sample preparation methods were conducted. During the CSA field assessment phase, CATLIN personnel obtained continuous soil samples, at 1-foot intervals, until the apparent surficial water table was encountered at each of the hand auger and monitoring well boreholes. As each borehole was advanced, the soil samples from the apparent unsaturated subsurface soils were set aside for screening. To assess for potential petroleum contamination the headspace of each soil sample was screened with an FID. The unsaturated soil sample from each hand auger and monitoring well borehole with the highest FID reading was prepared for laboratory analysis. Soil sample identification, depth of interval and FID results have been listed in Table 4.

Soil samples, intended for laboratory analysis, were placed in laboratory glassware, labeled with the applicable borehole ID, sample depth, sample date, site name, sampler, and placed in an iced cooler. The samples were then delivered to Paradigm Analytical Laboratories, Inc. (North Carolina Certification #481) in Wilmington, North Carolina. In accordance with Table 1 of the *2000 Guidelines*, selected soil samples were analyzed for suspected jet fuels contamination per EPA Methods 5030 and 3550 (8015 preparation). For regulatory compliance all site soil sample laboratory analysis results were compared to the NCDENR TPH-GRO Action Level of 10 mg/Kg and NCDENR TPH-DRO Action Level of 40 mg/Kg in accordance with the *2000 Guidelines*.

## **6.2 SOIL ANALYSES - EPA METHOD 8015/5030**

Laboratory analysis of the site CSA soil samples, per EPA Method 8260B/5035, revealed that all samples exhibited either BQL or TPH-GRO concentrations below the applicable Action Level of 10 mg/Kg. TPH-GRO and results from initial site abatement and CSA phases have been summarized in Table 5. The estimated horizontal extent of site soils with TPH-GRO concentrations in excess of 10 mg/Kg has been illustrated on Figure 6A. The estimated vertical extent of site soils with TPH-GRO concentrations in excess of 10 mg/Kg has been illustrated in Figures 6B.

## **6.3 SOIL ANALYSES - EPA METHOD 8015/3550**

Laboratory analysis of the site CSA soil samples, per EPA Method 8015/3550, revealed that all samples exhibited either BQL or TPH-DRO concentrations below the applicable Action Level of 40 mg/Kg. TPH-DRO results from initial site abatement and CSA phases have also been summarized in Table 5. The estimated horizontal extent of site soils with TPH-DRO concentrations in excess of 40 mg/Kg has been illustrated on Figure 7A. The estimated vertical extent of site soils with TPH-DRO concentrations in excess of 40 mg/Kg has been illustrated on Figures 7B.

A copy of the Paradigm laboratory analysis report and Chain-Of-Custody (C-O-C) records, concerning the CSA site soil sample analysis, has been provided in Appendix D.

## **7.0 SITE GROUNDWATER SAMPLING AND ANALYSIS METHODS**

On March 15, 2005 CATLIN personnel obtained representative groundwater samples from all five site groundwater monitoring wells. In order to obtain representative groundwater samples each monitoring well was purged a minimum of three volumes. A copy of the March 15, 2005 monitoring well groundwater sampling field data worksheet has been provided in Appendix E.

Once the appropriate volume of groundwater was pumped from each monitoring well a groundwater sample was placed in laboratory glassware. All groundwater samples were labeled with the applicable monitoring well ID, sample date, site name, sampler, placed in an iced cooler and transported with the appropriate C-O-C to Paradigm Analytical Laboratories in Wilmington, North Carolina. In accordance with Table 5 of the *2000 Guidelines*, site groundwater samples were analyzed for suspected jet fuel contamination per EPA Methods 602 + MTBE + xylenes and 625 + TICs. For regulatory compliance results for all analysis parameters were compared to applicable 2L GWQS listed in the *2000 Guidelines*.

### **7.1 GROUNDWATER ANALYSES – EPA METHOD 602 + MTBE + XYLENES**

Laboratory analysis of the March 15, 2005 samples revealed BQL for all EPA Method 602 + MTBE + Xylenes analysis parameters in all site groundwater monitoring well samples. Site groundwater sample EPA Method 602 analysis results have been summarized in Table 7. The locations of the site groundwater sample locations and EPA Method 602 analysis results, in relation to the site plan, have been illustrated on Figure 8.

### **7.2 GROUNDWATER ANALYSES – EPA METHOD 625 + TICS**

Laboratory analysis of the March 15, 2005 samples revealed BQL for all EPA Method 625 analysis parameters in all site groundwater monitoring well samples. Site groundwater sample EPA Method 625 analysis results have been summarized in Table 8. Location of the groundwater sample locations and EPA Method 625 analysis results, in relation to the site plan, has been illustrated in Figure 9.

#### **TICS - Ten (10) Largest (peak area) Non-Target Compounds**

In accordance with the *2000 Guidelines* EPA Method 625 sample(s) are also analyzed for TICS (the ten largest (peak area) non-target compounds). TICs refer to compounds that have been detected by the EPA Method 625 analysis, but are not present in the standard EPA Method 625 list of analysis compounds. Laboratory analysis of the March 15, 2005 samples revealed no TICs were detected in any of the site groundwater monitoring well samples.

A Copy of the Paradigm laboratory analysis report and C-O-C concerning the March 15, 2005 site groundwater sample event has been provided in Appendix D.

## **8.0 GROUNDWATER MODELING RESULTS**

With no apparent groundwater contamination groundwater modeling was not conducted as part of this CSA investigation.

## **9.0 SITE FREE-PHASE PRODUCT**

During the initial abatement activities and CSA field investigation, no free-phase product (>0.01') was detected at the subject site.

## 10.0 CONCLUSIONS/RECOMMENDATIONS

### Conclusions

#### *General Site Conditions*

- No potential receptors including any human, plant, animal, utilities, structures or surface waters were identified that could be adversely affected as a result of this JP-5 release.
- In accordance with the NCDENR “Geologic Map of North Carolina 1985”, the subject site is located within the Coastal Plain physiographic region.
- The area within 1,500 feet of the subject site is still within the MCAS. Access to this area is restricted.

#### *Site Soil Analysis*

- EPA Method 8015/5035 analysis of all site CSA soil samples revealed TPH-GRO concentrations that were either BQL or below the applicable NCDENR Action Level of 10 mg/Kg.
- EPA Method 8015/3550 analysis of all site CSA soil samples revealed TPH-DRO concentrations that were either BQL or below the applicable NCDENR Action Level of 40 mg/Kg.
- The area of concern remains the subsurface soils around site soil samples HA-06, HA-16 and HA-17.

#### *Site Groundwater Analysis*

- Laboratory analysis of all site groundwater samples revealed BQL for all EPA Method 602 + MTBE + Xylenes parameters.
- Laboratory analysis of all site groundwater samples revealed BQL for all EPA Method 625 analysis parameters. In addition no TICs were detected in the site groundwater samples.

#### *Site Free-Phase Product Data*

During the initial abatement activities and CSA field investigation no free-phase product (>0.01') was detected at the subject site.

### Recommendations

- Excavate and properly dispose of remnant JP-5 impacted soils in the vicinity of soil sample locations HA-06, HA-16 and HA-17 from the land surface to the apparent water table. The area proposed for excavation is approximately 20 feet long by 20 feet wide by 3 feet deep, or approximately 45 cubic yards of impacted soils. Figure 10 illustrates the location of the area proposed for excavation in relation to the subject site.

- Obtain soil samples along the resulting north and west excavation boundary for TPH-GRO and DRO analysis.
- Once post excavation samples indicate that soil quality is within applicable NCDENR Action Level concentrations propose that NCDENR WiRO personnel evaluate this incident for “Site Closure”.

A copy of this report should be forwarded to the NCDENR WiRO at the following address:

North Carolina Department of Environment and Natural Resources  
Division of Water Quality  
Groundwater Section  
Attention: Dr. Charles F. Stehman, Ph.D., P.G.  
127 Cardinal Drive Extension  
Wilmington, North Carolina 28405

## **11.0 LIMITATIONS**

The field, soil, and groundwater data evaluated as part of this CSA investigation only provides isolated data points and may not represent conditions at every location in the project area. Analyses and conclusions of this report, being based on interpolation between data points at the project area, may not be completely representative of all site conditions. Conclusions and recommendations of this investigation and report are based on the best available data in an effort to comply with current regulatory requirements.

## 12.0 REFERENCES

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- North Carolina Department of Environment and Natural Resources (NCDENR), Groundwater Section. *Groundwater Section Guidelines for Investigation and Remediation of Soil and Groundwater, Volume I Sources other than Petroleum Underground Storage Tanks*. Effective July 1, 2000.
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- Todd, David Keith, 1980, *Groundwater Hydrology. Second Edition*. John Wiley and Sons, Inc. New York, New York. p. 535
- U.S. Geological Survey. Jacksonville South, North Carolina Topographic Quadrangle. Dated 1952.
- McWorter, D. B. and Sunada, D.K., *Groundwater Hydrology and Hydraulics*, Ft Collins, 5<sup>th</sup> printing, 1997, p. 230

## **TABLES**

**TABLE 1**

**AST OWNER/OPERATOR INFORMATION**

Date: Apr-05 Incident No. and Name: Pending / 2004 Helicopter Release Facility ID#: N/A

<b>Tax Parcel Number/Map ID</b>	<b>Owner/Occupant Name (Last, First MI)</b>	<b>Address</b>
N/A	Owner: Commanding General ATTN: I&E/EMD/EQB	PSC Box 20004 Marine Corps Base, Camp Lejeune, NC 28542-0004

**TABLE 2**  
**GROUNDWATER MONITORING WELL CONSTRUCTION AND WATER TABLE GAUGING DATA**  
**AS OF MARCH 15, 2005**

**2004 HELICOPTER RELEASE**  
**MARINE CORPS AIR STATION**  
**NEW RIVER, NORTH CAROLINA**

WELL NO.	WELL TYPE	SCREEN INTERVAL	TOTAL DEPTH (FT)	TOP OF CASING ELEVATION* (FT)	DEPTH TO GROUND WATER (FT)	DATE MEASURED	WATER TABLE ELEVATION (FT)
ASTDELTAT-MW01	II	2.5-12.5	12.5	100.0	4.05	3/15/05	95.95
ASTDELTAT-MW02	II	2.5-12.5	12.5	97.72	1.93	3/15/05	95.79
ASTDELTAT-MW03	II	2.5-12.5	12.5	99.58	3.90	3/15/05	95.68
ASTDELTAT-MW04	II	2.5-12.5	12.5	99.02	3.76	3/15/05	95.26
ASTDELTAT-MW05	III	35-40	40	99.95	5.42	3/15/05	94.53

(FT) - feet

**TABLE 3**  
**SUMMARY OF VERTICAL HYDRAULIC**  
**GRADIENT ESTIMATES AS OF April 15, 2005**

**2004 HELICOPTER RELEASE**

**Marine Corps Air Station**  
**New River, North Carolina**

	WELL PAIR	
	TYPE II	TYPE III
	ASTDEL TAT MW03	ASTDEL TAT MW05
TOCE (ft.)	99.58	99.95
DTW (ft.)	3.90	5.42
Approx. Mid-Screen Depth (ft.)	10.0	37.5
Approx. Mid-Screen Elevation (ft.)	89.6	62.5
SWLE (ft)	95.68	94.53
Difference in SWLE (ft.)	1.15	
Difference in Mid-Screen Elevation (ft.)	27.13	
Vertical Gradient	0.04	

## NOTES:

DTW = Depth to Water

TOCE = Top of Casing Elevation

SWLE = Static Water Level Elevation

**POSITIVE GRADIENT INDICATES POTENTIAL "DOWNWARD"  
GROUNDWATER MIGRATION**

**TABLE 4**

**Summary of Soil Sample Headspace Screening**

**Date: Apr-05**

**Incident No. Pending  
Name: 2004 Helicopter Release**

**Facility ID#: N/A**

<b>Sample ID</b>	<b>Sample Depth in Feet BLS</b>	<b>FID Reading (ppm)</b>	<b>Sample Interval Selected for Laboratory Analysis</b>
ASTDELTAT-MW01	0-1'	0.0	
ASTDELTAT-MW01	1-2'	532.0	
ASTDELTAT-MW01	2-3'	1619.0	
ASTDELTAT-MW01	3-4'	3485.0	ASTDELTAT-MW01 3-4'
ASTDELTAT-MW02	0-1'	0.0	
ASTDELTAT-MW02	1-2'	0.8	ASTDELTAT-MW02 1-2'
ASTDELTAT-MW02	2-3'	0.6	
ASTDELTAT-MW02	3-4'	0.0	
ASTDELTAT-MW03	0-1'	9.0	
ASTDELTAT-MW03	1-2'	1189.0	ASTDELTAT-MW03 (1-2')
ASTDELTAT-MW03	2-3'	739.0	
ASTDELTAT-MW03	3-4'	60.3	
ASTDELTAT-MW04	0-1'	0.0	
ASTDELTAT-MW04	1-2'	0.6	ASTDELTAT-MW04 1-2'
ASTDELTAT-MW04	2-3'	0.0	
ASTDELTAT-MW04	3-4'	0.2	
ASTDELTAT-MW05	0-2'	234.5	ASTDELTAT-MW05 (0-2')
ASTDELTAT-MW05	2-4'	136.4	
ASTDELTAT-SB01	0-1'	1.7	
ASTDELTAT-SB01	1-2'	3.8	ASTDELTAT-SB01 1-2'
ASTDELTAT-SB01	2-3'	0.0	
ASTDELTAT-SB01	3-4'	0.8	
ASTDELTAT-SB02	0-1'	2.0	
ASTDELTAT-SB02	1-2'	2.6	ASTDELTAT-SB02 1-2'
ASTDELTAT-SB02	2-3'	0.0	
ASTDELTAT-SB03	0-1'	0.8	ASTDELTAT-SB03 0-1'
ASTDELTAT-SB03	1-2'	0.6	
ASTDELTAT-SB03	2-3'	0.0	

BLS - Below Land Surface

FID - Flame Ionization Detector

ppm - part per million

( ) - Depth of soil sample

**TABLE 5 SUMMARY OF SOIL LABORATORY RESULTS**

Date: April 2005

Incident Number and Name: Pending/2004 Helicopter Release

Facility ID#: N/A

**Analytical Method: EPA Methods 3550/8015 and 5030/8015**

Sample ID	Contaminant of Concern →		EPA Method 5030 Gasoline Range Organics	EPA Method 3550 Diesel Range Organics
	Date Collected	Sample Depth (ft. BLS)		
<b>CSA Monitoring Well and Soil Boring Soil Samples</b>				
ASTDELTAT-MW01	3/10/2005	3-4'	<7.02	14.3
ASTDELTAT-MW02	3/10/2005	1-2'	<7.3	12
ASTDELTAT-MW03	3/10/2005	1-2'	<6.86	18.4
ASTDELTAT-MW04	3/10/2005	1-2'	<6.83	8.15
ASTDELTAT-MW05	3/9/2005	0-2'	<6.99	14.7
ASTDELTAT-SB01	3/9/2005	1-2'	<7.08	8.51
ASTDELTAT-SB02	3/9/2005	1-2'	<7.16	<6.88
ASTDELTAT-SB03	3/9/2005	0-1'	<6.97	<7.45
ASTDELTAT-MW03 Duplicate	3/10/2005	1-2'	<7.04	26.9
<b>Initial Abatement Excavation Soil Samples</b>				
HA-01	3/8/2004	0-1'	<6.87	<6.97
HA-02	3/8/2004	0-1'	<6.86	<7.08
HA-03	3/8/2004	0-1'	<6.95	13.7
HA-04	3/8/2004	0-1'	<7.3	<b>201</b>
HA-05	3/8/2004	0-1'	<6.58	<6.78
HA-06	3/8/2004	0-1'	<b>10.6</b>	<b>3520</b>
HA-07	3/8/2004	0-1'	<7.06	27.5
HA-08	3/8/2004	0-1'	<6.77	10.5
HA-09	3/8/2004	0-1'	<7.4	8.36
HA-10	3/8/2004	0-1'	<7.31	8.08
HA-11	3/8/2004	0-1'	<7.15	15.4
HA-12	3/8/2004	0-1'	<7.17	13.6
HA-13	4/19/2004	0-1'	<7.24	18.6
HA-14	4/19/2004	0-1'	<6.27	<7.04
HA-15	4/19/2004	0-1'	<7.85	21.5
HA-16	4/19/2004	0-1'	<b>167</b>	<b>1,330</b>
HA-17	4/19/2004	0-1'	<b>1,170</b>	<b>11,500</b>
<b>Action Level</b>			10	40

All results in milligrams per kilogram - mg/kg.

ft. BLS = feet below land surface

Bold figure indicates concentration exceeds applicable NCDENR Action Level

**TABLE 6A SUMMARY OF GROUNDWATER LABORATORY RESULTS**

Date: April 2005

Incident Number and Name: Pending/2004 Helicopter Release

Facility ID#: N/A

**Analytical Method: EPA Method 602 + MTBE + Xylenes**

Well ID	Contaminant of Concern →		Benzene	Ethylbenzene	MTBE - Methyl-tert-butyl ether	Toluene	Total (m/p/o) Xylenes
	Sample ID	Date Collected					
GCL (µg/L)			5,000	29,000	200,000	257,500	87,500
2L GWQS (µg/L)			1	29	200	1,000	530
ASTDELTAT-MW01	ASTDELTAT-MW01	3/15/2005	<1.00	<1.00	<2.00	<1.00	<4.00
ASTDELTAT-MW02	ASTDELTAT-MW02	3/15/2005	<1.00	<1.00	<2.00	<1.00	<4.00
ASTDELTAT-MW03	ASTDELTAT-MW03	3/15/2005	<1.00	<1.00	<2.00	<1.00	<4.00
ASTDELTAT-MW04	ASTDELTAT-MW04	3/15/2005	<1.00	<1.00	<2.00	<1.00	<4.00
ASTDELTAT-MW05	ASTDELTAT-MW05	3/15/2005	<1.00	<1.00	<2.00	<1.00	<4.00
ASTDELTAT-MW03 Duplicate	ASTDELTAT-MW03 Duplicate	3/15/2005	<1.00	<1.00	<2.00	<1.00	<4.00

All results in micrograms per liter - µg/L

m/p/o - total of meta, para and ortho isomers

**TABLE 6B SUMMARY OF GROUNDWATER LABORATORY RESULTS**

Date: April 2005

Incident Number and Name: Pending/2004 Helicopter Release

Facility ID#: N/A

**Analytical Method: EPA Method 625 + TICs**

Well ID	Contaminant of Concern →		Naphthalene	Remaining EPA Method 625 Analytes	EPA Method TICs
	Sample ID	Date Collected			
	GCL (µg/L) 2L GWQS (µg/L)		15,500 21	Varies Varies	NE
ASTDELTAT-MW01	ASTDELTAT-MW01	3/15/2005	<10	BQL	None
ASTDELTAT-MW02	ASTDELTAT-MW02	3/15/2005	<10	BQL	None
ASTDELTAT-MW03	ASTDELTAT-MW03	3/15/2005	<10	BQL	None
ASTDELTAT-MW04	ASTDELTAT-MW04	3/15/2005	<10	BQL	None
ASTDELTAT-MW05	ASTDELTAT-MW05	3/15/2005	<10	BQL	None
ASTDELTAT-MW03 Duplicate	ASTDELTAT-MW03 Duplicate	3/15/2005	<10	BQL	None

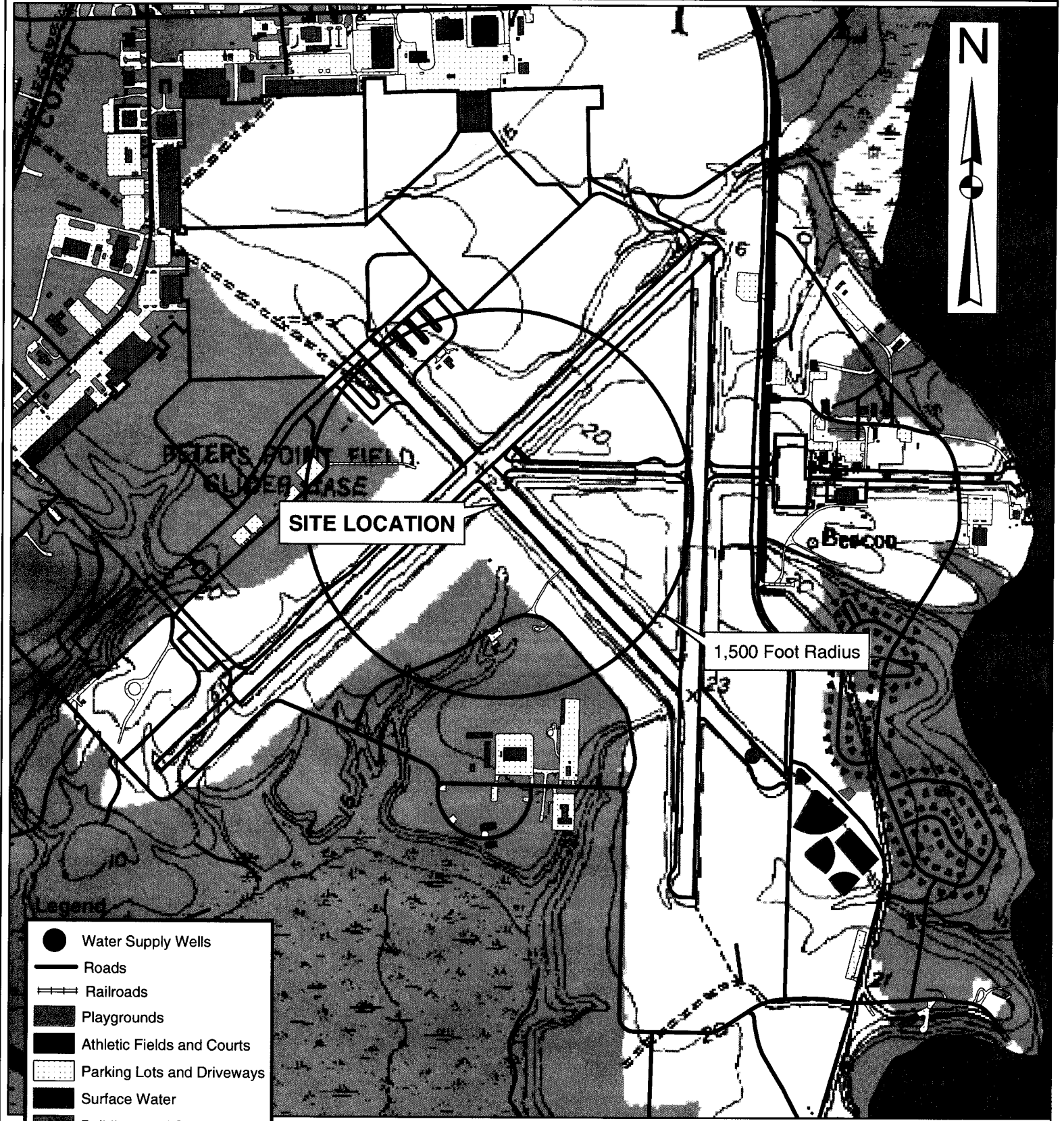
All results in micrograms per liter - µg/L

TICs - Tentatively Identified Compounds

NE - None established

BQL - Below Quantitation Limit


## **FIGURES**



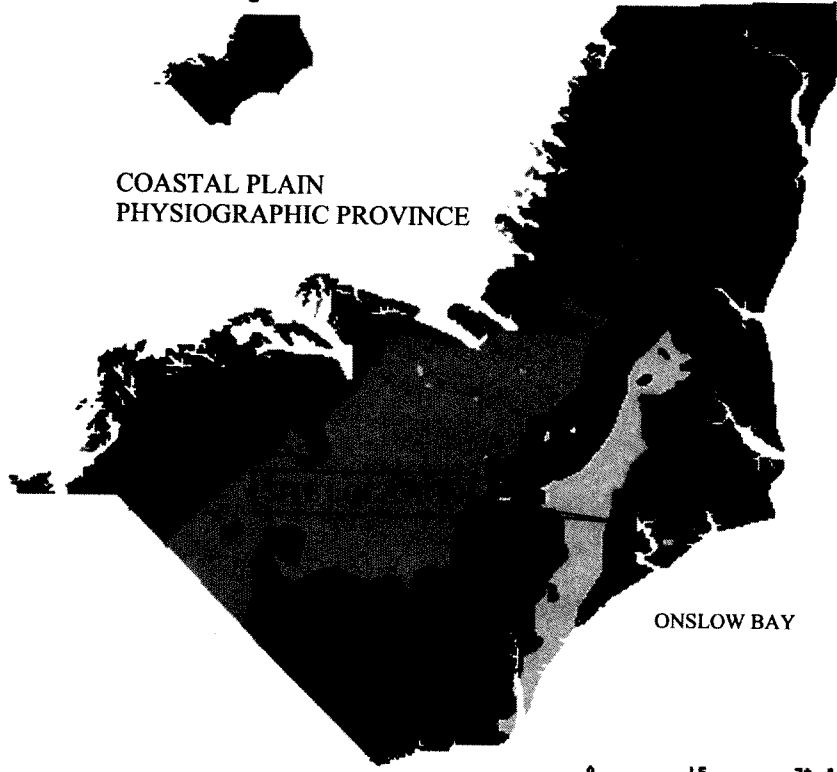
- Legend**
- Water Supply Wells
  - Roads
  - ≡ Railroads
  - Playgrounds
  - Athletic Fields and Courts
  - ▨ Parking Lots and Driveways
  - Surface Water
  - Buildings and Structures
  - Airfield

970 485 0 970 Feet  
**SCALE**

Data Sources: Data Layers provided by MCB Camp Lejeune GIS Office.

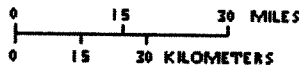
 WILMINGTON, NORTH CAROLINA	PROJECT 2004 HELICOPTER RELEASE MARINE CORPS AIR STATION NEW RIVER, NC	TITLE GENERAL LOCATION USGS TOPOGRAPHIC QUADRANGLE		<b>FIGURE</b>  <b>1</b>
	JOB NO. 204-047	DATE APR 2005	SCALE AS SHOWN	

**Index Map**



COASTAL PLAIN  
PHYSIOGRAPHIC PROVINCE

ONSLow BAY



**Quaternary**

□ Qp

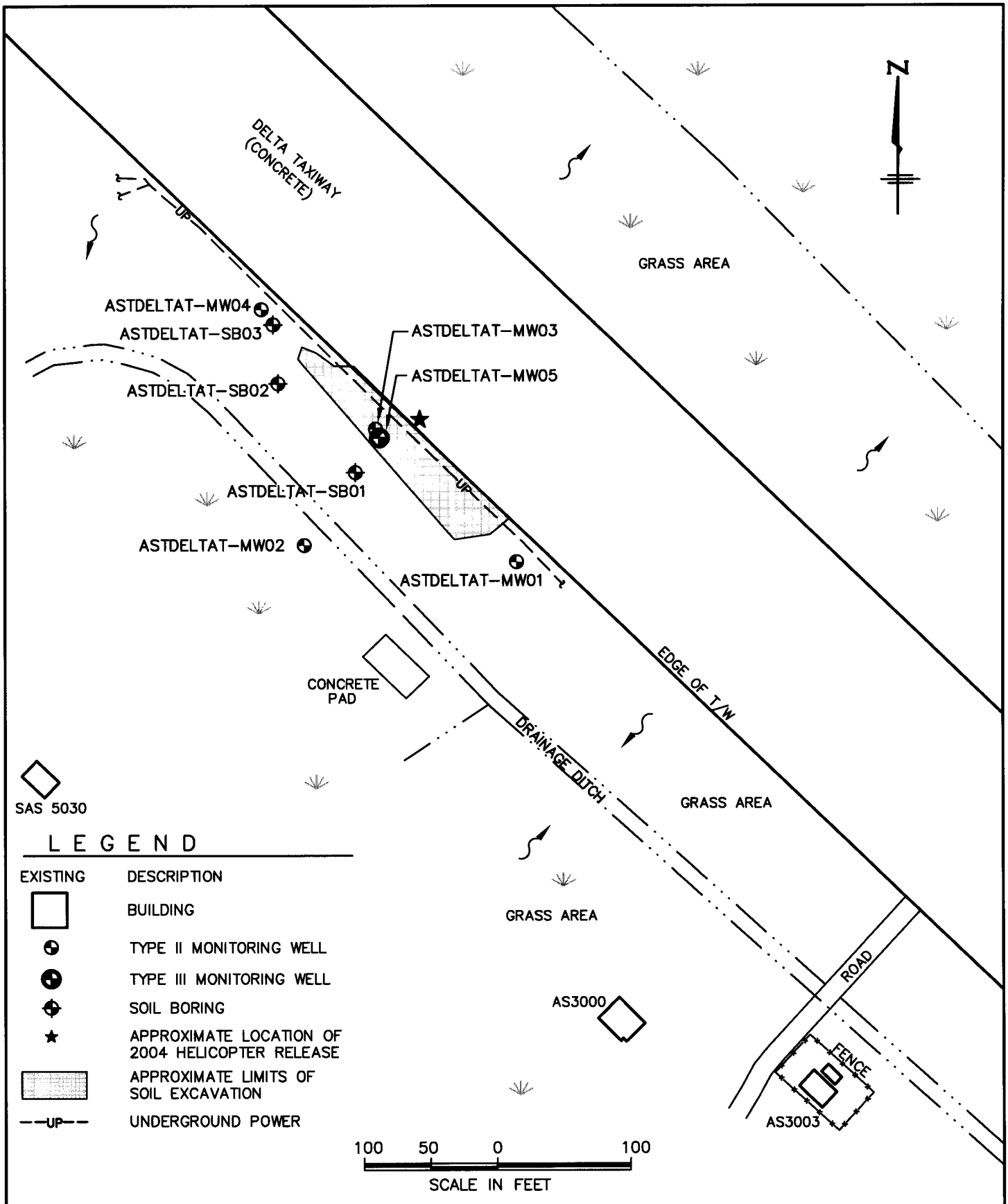
**Tertiary**

- Tp    ■ Tec
- It    ■ Tpa
- Tpyw
- Tpy
- Tob (BELGRADE)
- Tor
- Tecs

**Cretaceous**

- Kp
- Kb
- Km
- Kc

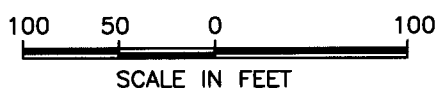
<p>WILMINGTON, NORTH CAROLINA</p>	<p>PROJECT</p> <p>2004 HELICOPTER RELEASE MARINE CORPS AIR STATION NEW RIVER, N.C.</p>	<p>TITLE</p> <p>COASTAL PLAIN PHYSIOGRAPHIC REGION</p>			<p>FIGURE</p>
	<p>JOB NO: 204-047</p>	<p>DATE: APR 2005</p>	<p>SCALE: AS SHOWN</p>	<p>DRAWN BY: HCS</p>	<p>CHECKED BY: SAT</p>



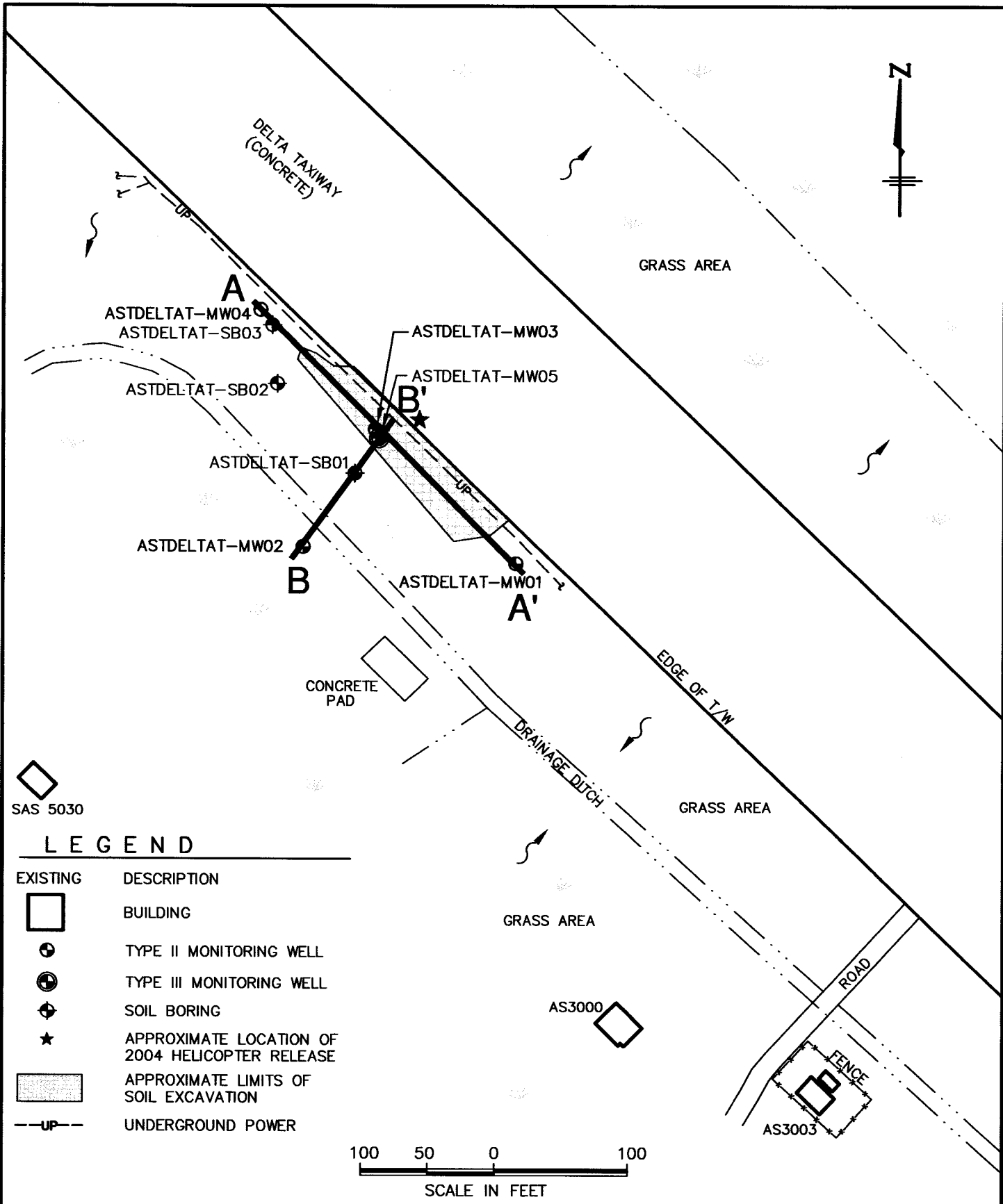
SAS 5030

**LEGEND**

- | EXISTING | DESCRIPTION                                     |
|----------|---|
|          | BUILDING  |
|          | TYPE II MONITORING WELL                         |
|          | TYPE III MONITORING WELL                        |
|          | SOIL BORING                                     |
|          | APPROXIMATE LOCATION OF 2004 HELICOPTER RELEASE |
|          | APPROXIMATE LIMITS OF SOIL EXCAVATION           |
|          | UNDERGROUND POWER                               |










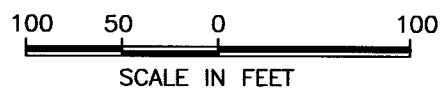
<p><b>ENGINEERS and SCIENTISTS</b> WILMINGTON, NORTH CAROLINA</p>	<p>PROJECT 2004 HELICOPTER RELEASE MARINE CORPS AIR STATION NEW RIVER, N.C.</p>	<p>TITLE SITE MAP WITH SOIL BORING AND MONITORING WELL LOCATIONS</p>	<p>FIGURE <b>3</b></p>
	<p>JOB NO: 204-047    DATE: APR 2005</p>	<p>SCALE: 1"=100'</p>	<p>DRAWN BY: HCS    CHECKED BY: SAT</p>




  
 SAS 5030

**LEGEND**

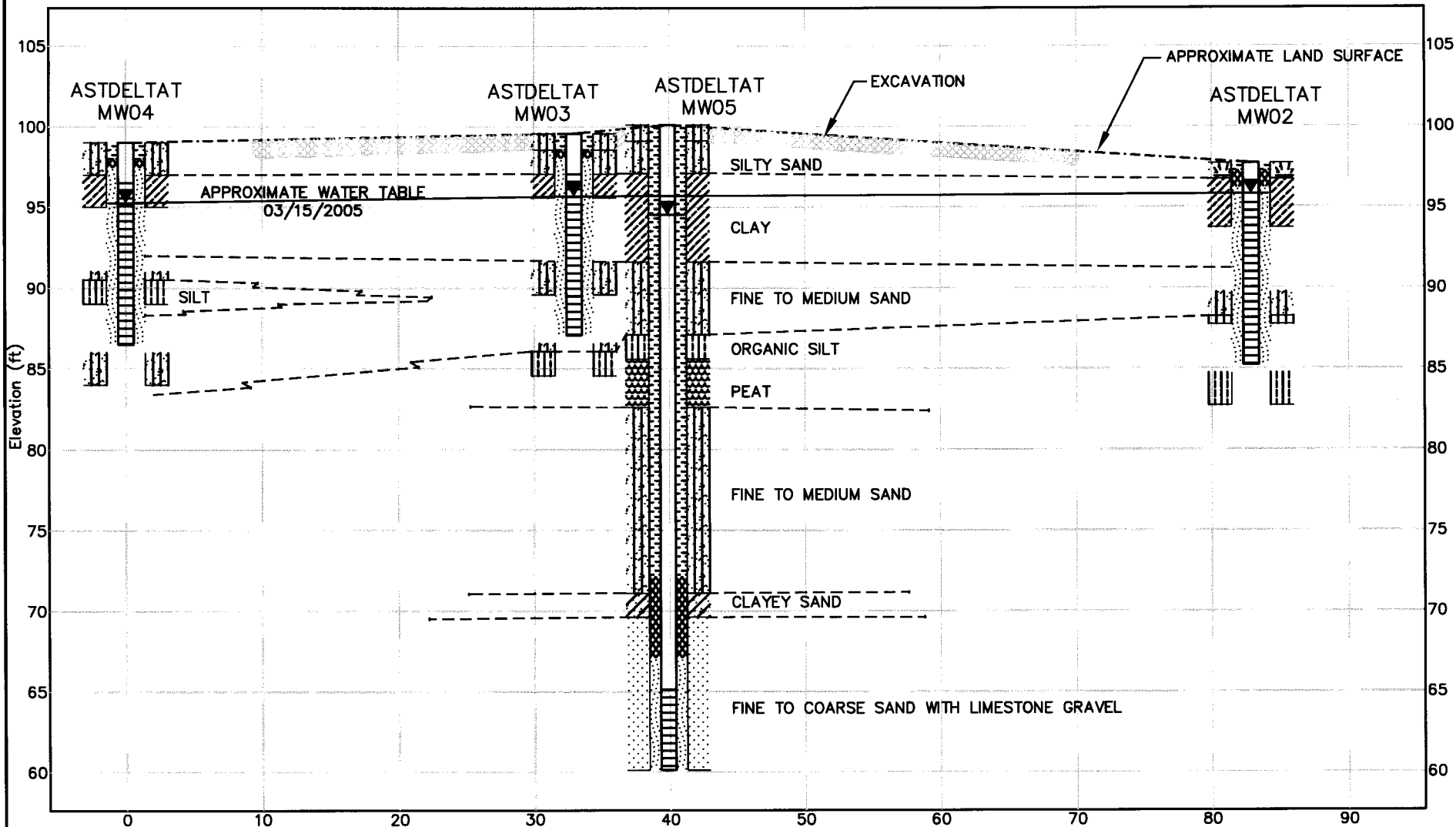
EXISTING	DESCRIPTION
	BUILDING
	TYPE II MONITORING WELL
	TYPE III MONITORING WELL
	SOIL BORING
	APPROXIMATE LOCATION OF 2004 HELICOPTER RELEASE
	APPROXIMATE LIMITS OF SOIL EXCAVATION
	UNDERGROUND POWER



 WILMINGTON, NORTH CAROLINA	PROJECT <b>2004 HELICOPTER RELEASE          MARINE CORPS AIR STATION          NEW RIVER, N.C.</b>	TITLE <b>SITE MAP WITH          GEOLOGIC CROSS SECTION LOCATIONS</b>	FIGURE <b>4A</b>
	JOB NO: 204-047    DATE: APR 2005	SCALE: 1"=100'	DRAWN BY: HCS    CHECKED BY: SAT

A

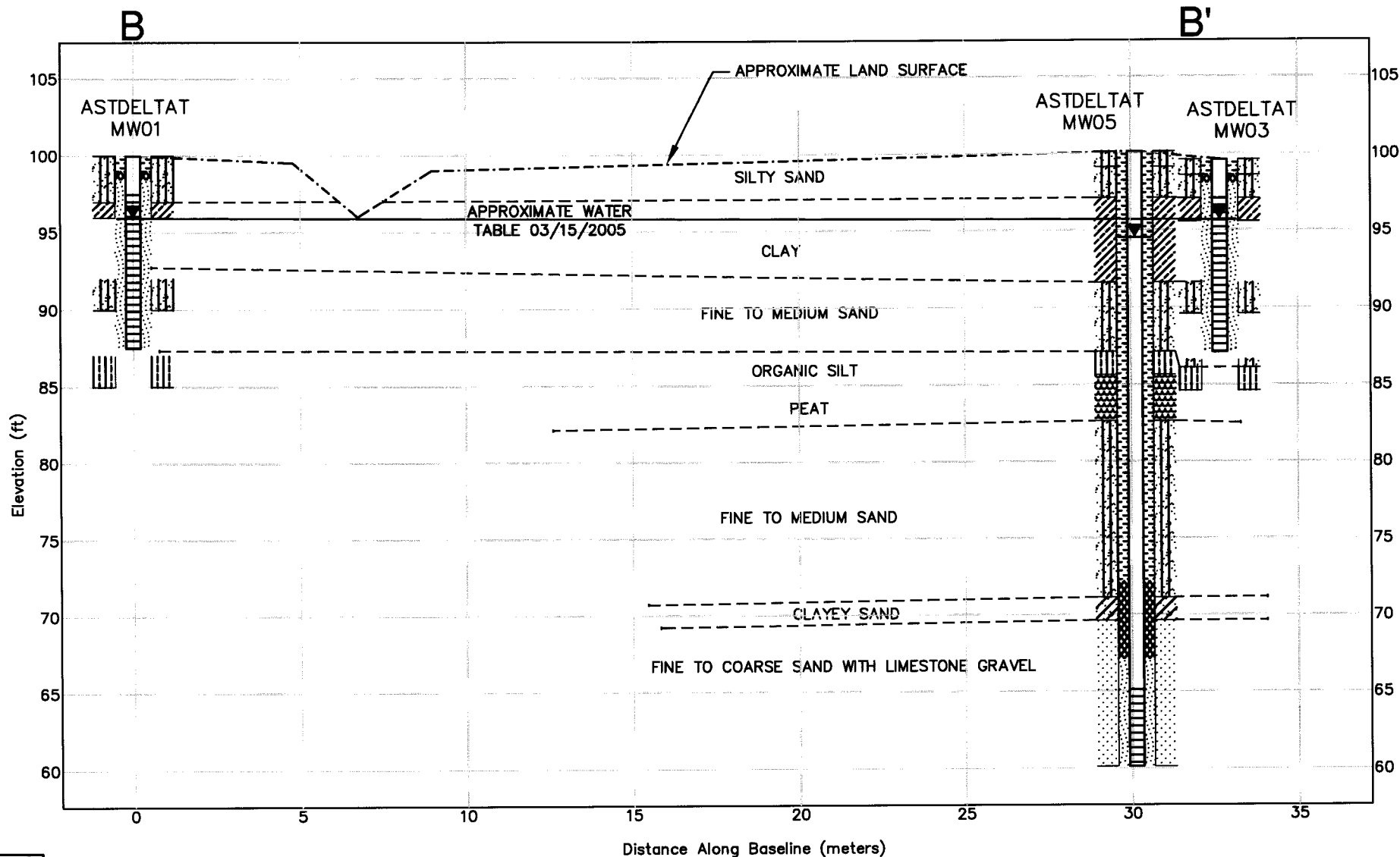
A'



- |  |   |  |  |
|--|---|--|--|
|  | Portland Cement                           |  | #2 Medium Sand                           |
|  | Bentonite Pellets                         |  | (ML) Inorganic Silt and v.f. Sands       |
|  | Topsoil                                   |  | (OL) Low Plasticity Organic Silt or Clay |
|  | (OH) High Plasticity Organic Silt or Clay |  | (PT) Peat or Highly Organic Soils        |
|  | (SM) Silty Sand                           |  |  |

**CAELIN**  
**ENGINEERS and SCIENTISTS**  
 WILMINGTON, NORTH CAROLINA

<b>PROJECT</b> 2004 HELICOPTER RELEASE MARINE CORPS AIR STATION NEW RIVER, N.C.		<b>TITLE</b> CROSS SECTION A-A'		<b>FIGURE</b> <h1>4B</h1>
<b>JOB NO:</b> 204-047	<b>DATE:</b> APR 2005	<b>SCALE:</b> AS SHOWN	<b>DRAWN BY:</b> SVH <b>CHECKED BY:</b> SAT	

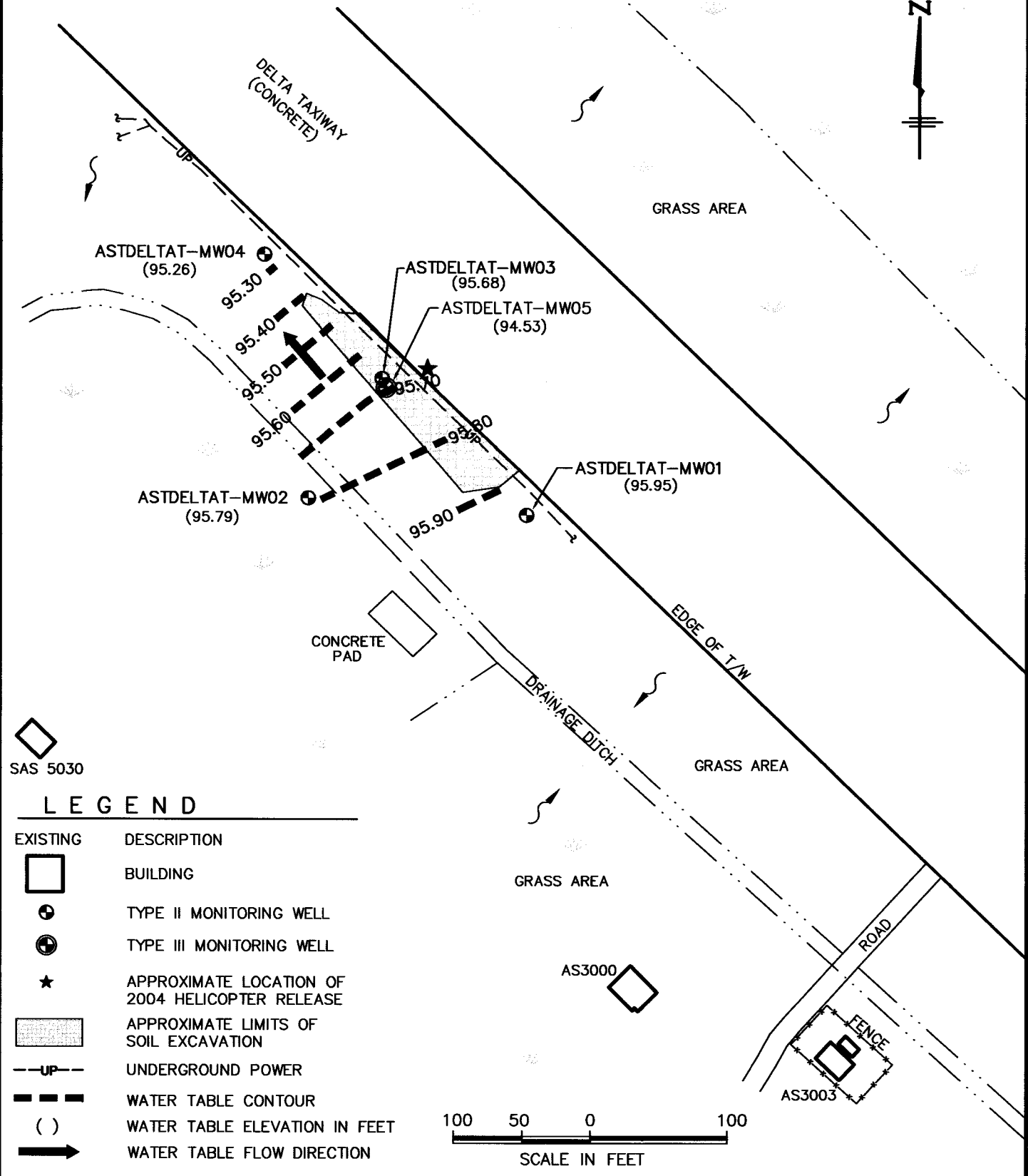


- |  |   |  |  |
|--|---|--|--|
|  | Portland Cement                           |  | (OL) Low Plasticity Organic Silt or Clay |
|  | Bentonite Pellets                         |  | (PT) Peat or Highly Organic Soils        |
|  | #2 Medium Sand                            |  | (SC) Clayey Sand                         |
|  | (OH) High Plasticity Organic Silt or Clay |  | (SP) Poorly-graded Sand                  |
|  | (SM) Silty Sand                           |  |  |

 WILMINGTON, NORTH CAROLINA	PROJECT 2004 HELICOPTER RELEASE MARINE CORPS AIR STATION NEW RIVER, N.C.	TITLE CROSS SECTION B-B'		FIGURE 4C
	JOB NO: 204-047	DATE: APR 2005	SCALE: AS SHOWN	DRAWN BY: SVH CHECKED BY: SAT

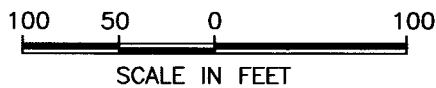
NOTE:

1. CONTOUR INTERVAL = 0.10 FOOT.
2. TYPE III WELL OMITTED FROM CONTOURING.



**LEGEND**

EXISTING	DESCRIPTION
	BUILDING
	TYPE II MONITORING WELL
	TYPE III MONITORING WELL
	APPROXIMATE LOCATION OF 2004 HELICOPTER RELEASE
	APPROXIMATE LIMITS OF SOIL EXCAVATION
	UNDERGROUND POWER
	WATER TABLE CONTOUR
	WATER TABLE ELEVATION IN FEET
	WATER TABLE FLOW DIRECTION



 WILMINGTON, NORTH CAROLINA	PROJECT 2004 HELICOPTER RELEASE MARINE CORPS AIR STATION NEW RIVER, N.C.	TITLE SURFICIAL GROUNDWATER TABLE CONTOURS AS OF MARCH 15, 2005	FIGURE 5
	JOB NO: 204-047    DATE: APR 2005	SCALE: 1"=100'	DRAWN BY: HCS    CHECKED BY: SAT

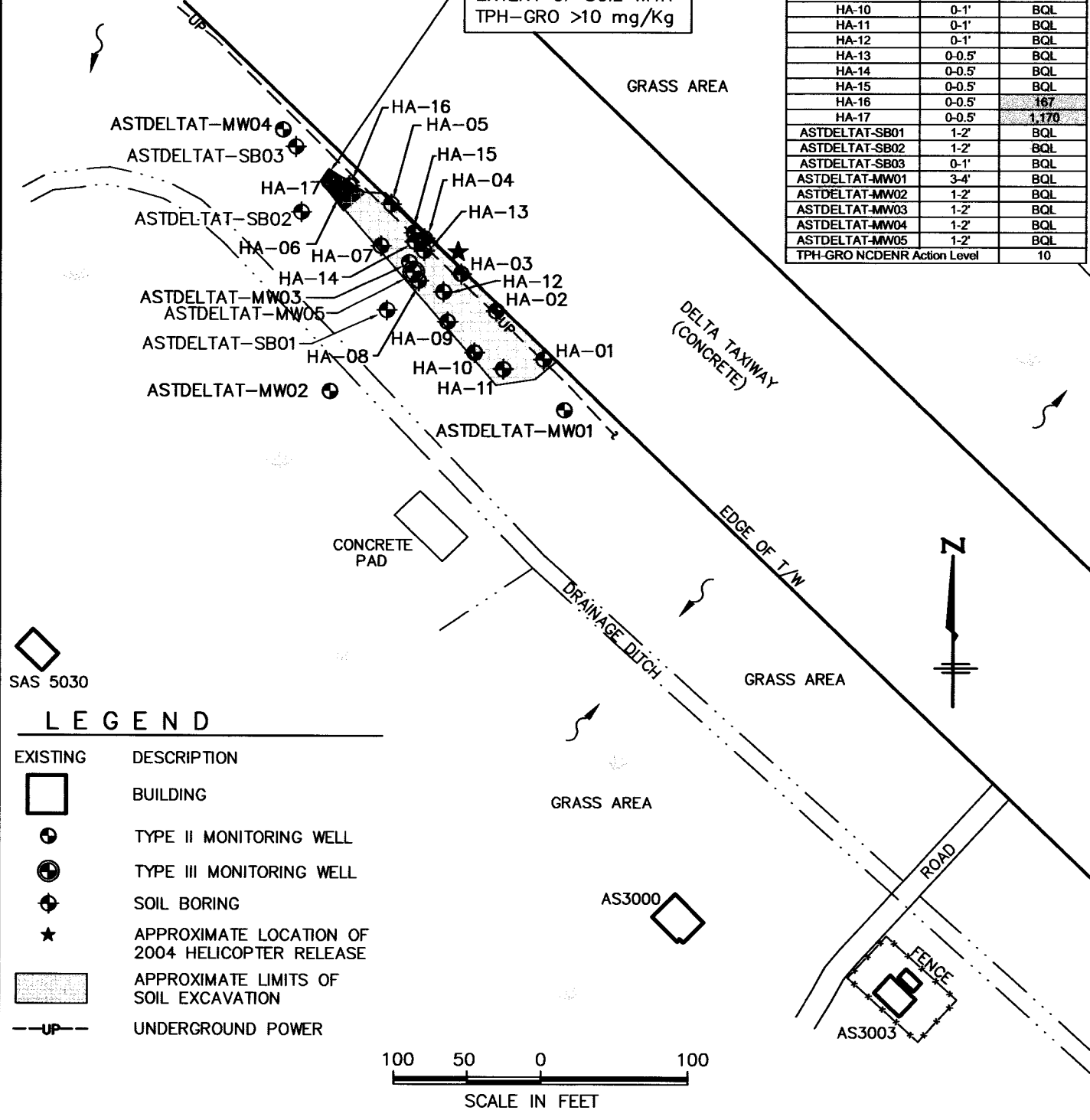
**NOTE:**

1. BOLD FIGURE INDICATES CONCENTRATION EXCEEDS NCDENR ACTION LEVEL.
2. BQL = BELOW QUANTITATION LIMITS.
3. TPH-GRO = TOTAL PETROLEUM HYDROCARBONS GASOLINE RANGE ORGANICS.
4. ALL RESULTS IN mg/Kg
5. mg/Kg = MILLIGRAMS PER LITER.
6. BLS = BELOW LAND SURFACE.
7. SHADED CONTAMINANTS EXCEED NCDENR ACTION LEVEL.

Analytical Method: EPA Method 8015/5030

Sample ID	Sample Depth feet BLS	EPA Method 5030 TPH-GRO
HA-01	0-1'	BQL
HA-02	0-1'	BQL
HA-03	0-1'	BQL
HA-04	0-1'	BQL
HA-05	0-1'	BQL
HA-06	0-1'	10.6
HA-07	0-1'	BQL
HA-08	0-1'	BQL
HA-09	0-1'	BQL
HA-10	0-1'	BQL
HA-11	0-1'	BQL
HA-12	0-1'	BQL
HA-13	0-0.5'	BQL
HA-14	0-0.5'	BQL
HA-15	0-0.5'	BQL
HA-16	0-0.5'	167
HA-17	0-0.5'	1,170
ASTDELTAT-SB01	1-2'	BQL
ASTDELTAT-SB02	1-2'	BQL
ASTDELTAT-SB03	0-1'	BQL
ASTDELTAT-MW01	3-4'	BQL
ASTDELTAT-MW02	1-2'	BQL
ASTDELTAT-MW03	1-2'	BQL
ASTDELTAT-MW04	1-2'	BQL
ASTDELTAT-MW05	1-2'	BQL
TPH-GRO NCDENR Action Level		10

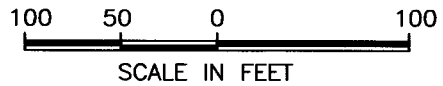
ESTIMATED HORIZONTAL EXTENT OF SOIL WITH TPH-GRO >10 mg/Kg



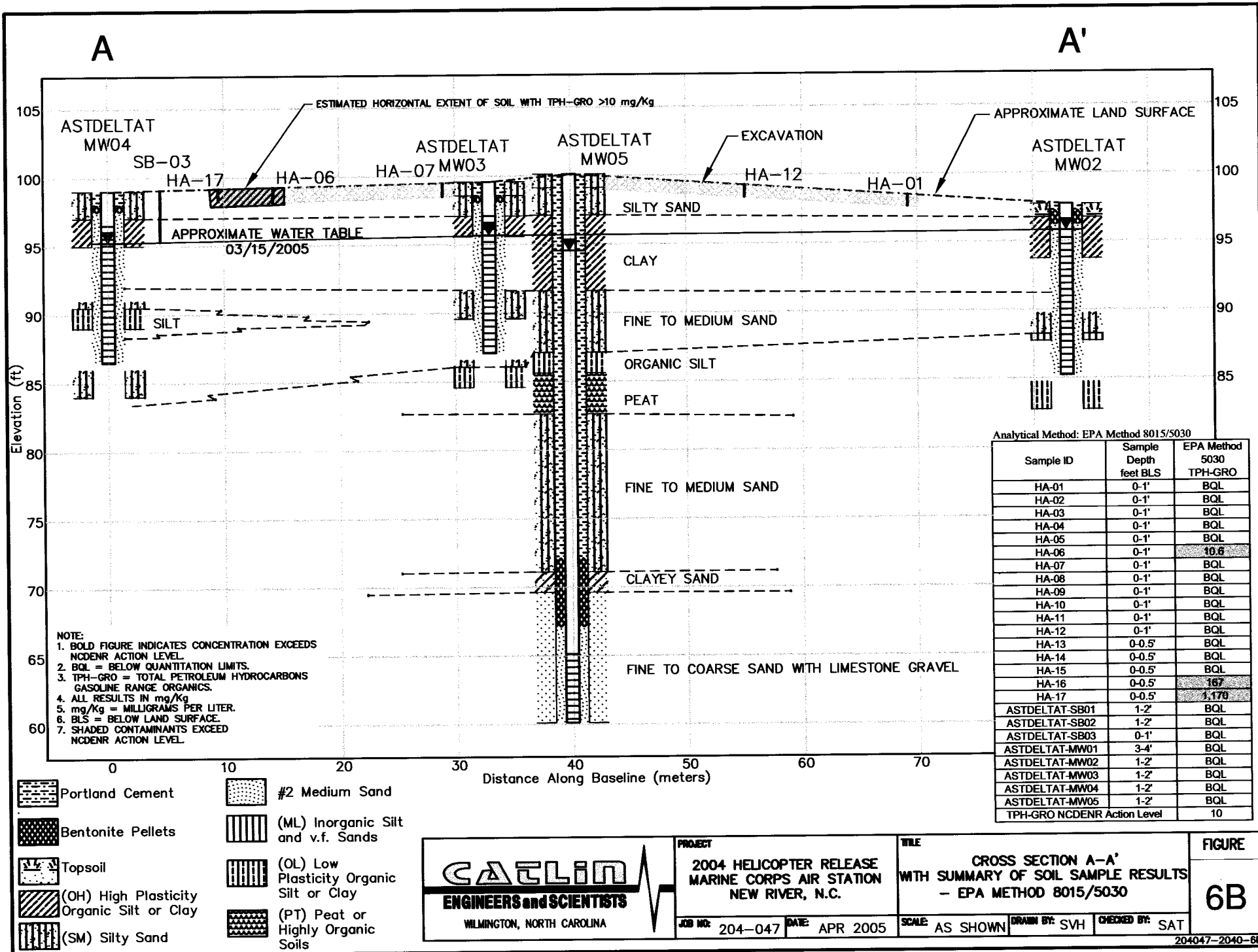
SAS 5030

**LEGEND**

- |          |   |
|----------|---|
| EXISTING | DESCRIPTION                                     |
|          | BUILDING  |
|          | TYPE II MONITORING WELL                         |
|          | TYPE III MONITORING WELL                        |
|          | SOIL BORING                                     |
|          | APPROXIMATE LOCATION OF 2004 HELICOPTER RELEASE |
|          | APPROXIMATE LIMITS OF SOIL EXCAVATION           |
|          | UNDERGROUND POWER                               |



<p>WILMINGTON, NORTH CAROLINA</p>	<p>PROJECT</p> <p>2004 HELICOPTER RELEASE MARINE CORPS AIR STATION NEW RIVER, N.C.</p>	<p>TITLE</p> <p>SUMMARY OF SOIL SAMPLE RESULTS - EPA METHOD 8015/5030</p>	<p>FIGURE</p> <p>6A</p>
	<p>JOB NO: 204-047</p> <p>DATE: APR 2005</p>	<p>SCALE: 1"=100'</p> <p>DRAWN BY: HCS</p>	<p>CHECKED BY: SAT</p>



- NOTE:
1. BOLD FIGURE INDICATES CONCENTRATION EXCEEDS NCDENR ACTION LEVEL.
  2. BQL = BELOW QUANTITATION LIMITS.
  3. TPH-GRO = TOTAL PETROLEUM HYDROCARBONS GASOLINE RANGE ORGANICS.
  4. ALL RESULTS IN mg/Kg
  5. mg/Kg = MILLIGRAMS PER LITER.
  6. BLS = BELOW LAND SURFACE.
  7. SHADED CONTAMINANTS EXCEED NCDENR ACTION LEVEL.

Analytical Method: EPA Method 8015/5030

Sample ID	Sample Depth feet BLS	EPA Method 5030 TPH-GRO
HA-01	0-1'	BQL
HA-02	0-1'	BQL
HA-03	0-1'	BQL
HA-04	0-1'	BQL
HA-05	0-1'	BQL
HA-06	0-1'	<b>10.6</b>
HA-07	0-1'	BQL
HA-08	0-1'	BQL
HA-09	0-1'	BQL
HA-10	0-1'	BQL
HA-11	0-1'	BQL
HA-12	0-1'	BQL
HA-13	0-0.5'	BQL
HA-14	0-0.5'	BQL
HA-15	0-0.5'	BQL
HA-16	0-0.5'	<b>167</b>
HA-17	0-0.5'	<b>1,170</b>
ASTDELTA-SB01	1-2'	BQL
ASTDELTA-SB02	1-2'	BQL
ASTDELTA-SB03	0-1'	BQL
ASTDELTA-MW01	3-4'	BQL
ASTDELTA-MW02	1-2'	BQL
ASTDELTA-MW03	1-2'	BQL
ASTDELTA-MW04	1-2'	BQL
ASTDELTA-MW05	1-2'	BQL
TPH-GRO NCDENR Action Level		10

- Portland Cement
- Bentonite Pellets
- Topsoil
- (OH) High Plasticity Organic Silt or Clay
- (SM) Silty Sand
- #2 Medium Sand
- (ML) Inorganic Silt and v.f. Sands
- (OL) Low Plasticity Organic Silt or Clay
- (PT) Peat or Highly Organic Soils

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ENGINEERS and SCIENTISTS  
WILMINGTON, NORTH CAROLINA

PROJECT  
2004 HELICOPTER RELEASE  
MARINE CORPS AIR STATION  
NEW RIVER, N.C.

JOB NO: 204-047 DATE: APR 2005

TITLE  
CROSS SECTION A-A'  
WITH SUMMARY OF SOIL SAMPLE RESULTS  
- EPA METHOD 8015/5030

SCALE: AS SHOWN DRAWN BY: SVH CHECKED BY: SAT

FIGURE  
**6B**

204047-2040-6B

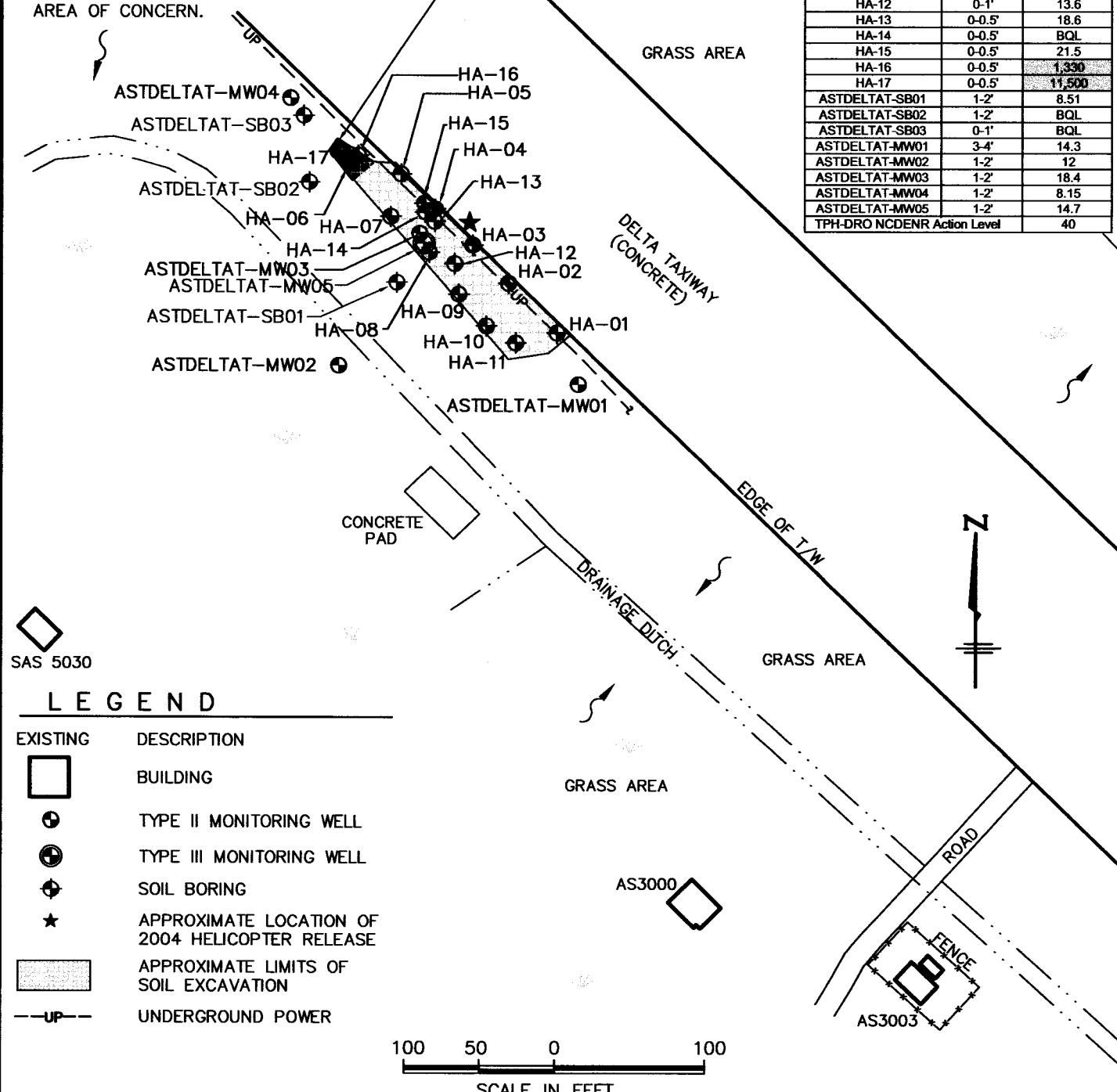
**NOTE:**

1. BOLD FIGURE INDICATES CONCENTRATION EXCEEDS NCDENR ACTION LEVEL.
2. BQL = BELOW QUANTITATION LIMITS.
3. TPH-GRO = TOTAL PETROLEUM HYDROCARBONS DIESEL RANGE ORGANICS.
4. ALL RESULTS IN mg/Kg
5. mg/Kg = MILLIGRAMS PER LITER.
6. BLS = BELOW LAND SURFACE.
7. SHADED CONTAMINANTS EXCEED NCDENR ACTION LEVEL.
8. SOILS AROUND THE HA-04 LOCATION WAS EXCAVATED AGAIN - REMEDIATING THIS AREA OF CONCERN.

Analytical Method: EPA Method 8015/3550

Sample ID	Sample Depth feet BLS	EPA Method 3550 TPH-DRO
HA-01	0-1'	BQL
HA-02	0-1'	22.8
HA-03	0-1'	13.7
HA-04	0-1'	<b>201</b>
HA-05	0-1'	BQL
HA-06	0-1'	<b>3,520</b>
HA-07	0-1'	27.5
HA-08	0-1'	10.5
HA-09	0-1'	8.36
HA-10	0-1'	8.08
HA-11	0-1'	15.4
HA-12	0-1'	13.6
HA-13	0-0.5'	18.6
HA-14	0-0.5'	BQL
HA-15	0-0.5'	21.5
HA-16	0-0.5'	<b>1,330</b>
HA-17	0-0.5'	<b>11,500</b>
ASTDELTAT-SB01	1-2'	8.51
ASTDELTAT-SB02	1-2'	BQL
ASTDELTAT-SB03	0-1'	BQL
ASTDELTAT-MW01	3-4'	14.3
ASTDELTAT-MW02	1-2'	12
ASTDELTAT-MW03	1-2'	18.4
ASTDELTAT-MW04	1-2'	8.15
ASTDELTAT-MW05	1-2'	14.7
TPH-DRO NCDENR Action Level		40

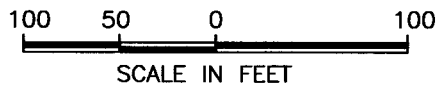
ESTIMATED HORIZONTAL EXTENT OF SOIL WITH TPH-DRO >40 mg/Kg



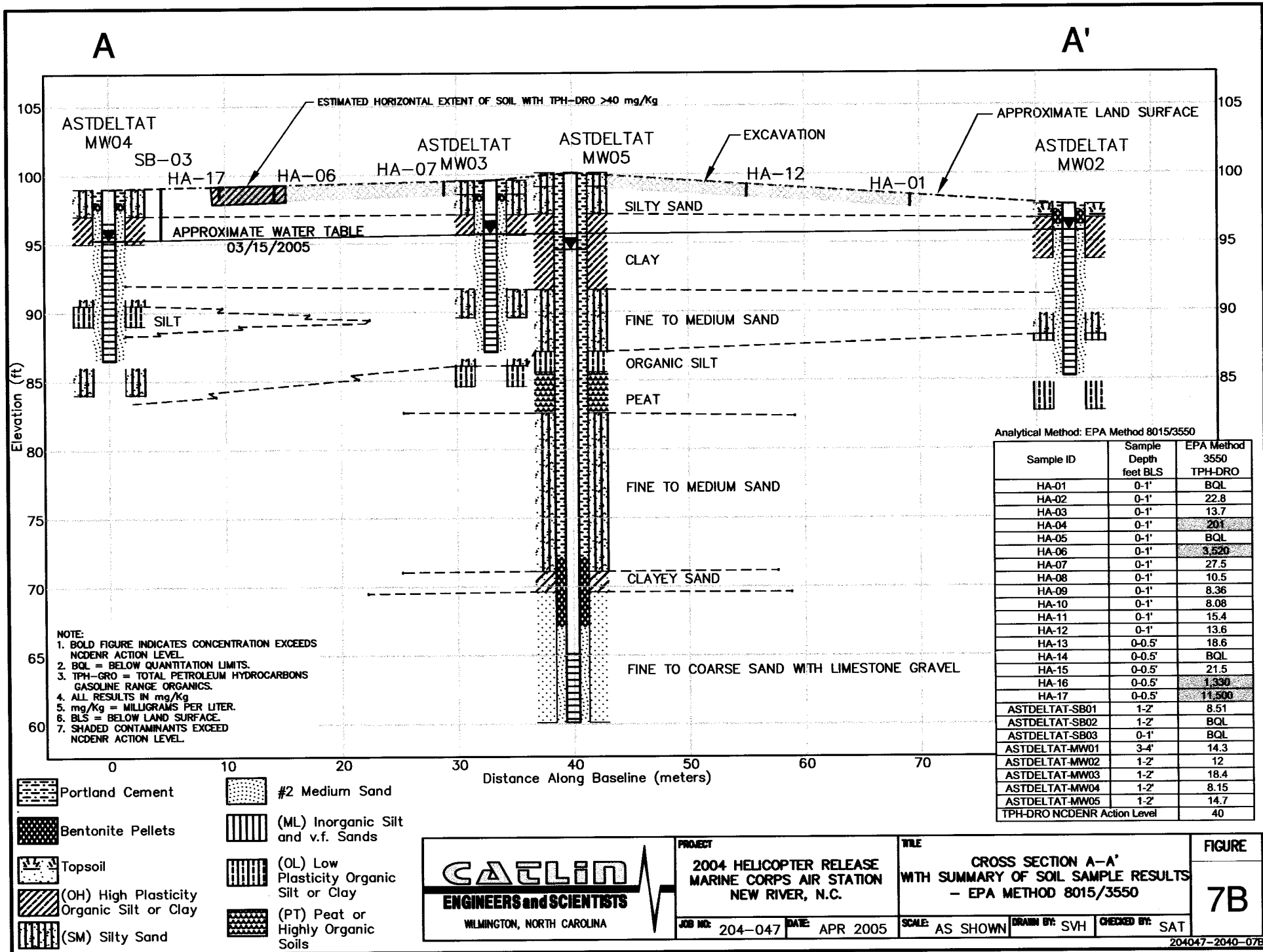
SAS 5030

**LEGEND**

- |          |   |
|----------|---|
| EXISTING | DESCRIPTION                                     |
|          | BUILDING  |
|          | TYPE II MONITORING WELL                         |
|          | TYPE III MONITORING WELL                        |
|          | SOIL BORING                                     |
|          | APPROXIMATE LOCATION OF 2004 HELICOPTER RELEASE |
|          | APPROXIMATE LIMITS OF SOIL EXCAVATION           |
|          | UNDERGROUND POWER                               |



 WILMINGTON, NORTH CAROLINA	<b>PROJECT</b> 2004 HELICOPTER RELEASE MARINE CORPS AIR STATION NEW RIVER, N.C.	<b>TITLE</b> SUMMARY OF SOIL SAMPLE RESULTS - EPA METHOD 8015/3550	<b>FIGURE</b>  <span style="font-size: 2em;">7A</span>
	<b>JOB NO:</b> 204-047 <b>DATE:</b> APR 2005	<b>SCALE:</b> 1"=100'	<b>DRAWN BY:</b> HCS <b>CHECKED BY:</b> SAT



ASTDELTA MW04 SB-03 HA-17 HA-06 HA-07 MW03 ASTDELTA MW05 EXCAVATION HA-12 HA-01 ASTDELTA MW02

ESTIMATED HORIZONTAL EXTENT OF SOIL WITH TPH-DRO >40 mg/Kg

APPROXIMATE WATER TABLE 03/15/2005

APPROXIMATE LAND SURFACE

SILTY SAND

CLAY

FINE TO MEDIUM SAND

ORGANIC SILT

PEAT

FINE TO MEDIUM SAND

CLAYEY SAND

FINE TO COARSE SAND WITH LIMESTONE GRAVEL

- NOTE:
1. BOLD FIGURE INDICATES CONCENTRATION EXCEEDS NCDENR ACTION LEVEL.
  2. BQL = BELOW QUANTITATION LIMITS.
  3. TPH-GRO = TOTAL PETROLEUM HYDROCARBONS GASOLINE RANGE ORGANICS.
  4. ALL RESULTS IN mg/Kg
  5. mg/Kg = MILLIGRAMS PER LITER.
  6. BLS = BELOW LAND SURFACE.
  7. SHADED CONTAMINANTS EXCEED NCDENR ACTION LEVEL.

Analytical Method: EPA Method 8015/3550

Sample ID	Sample Depth feet BLS	EPA Method 3550 TPH-DRO
HA-01	0-1'	BQL
HA-02	0-1'	22.8
HA-03	0-1'	13.7
HA-04	0-1'	<b>201</b>
HA-05	0-1'	BQL
HA-06	0-1'	<b>3,520</b>
HA-07	0-1'	27.5
HA-08	0-1'	10.5
HA-09	0-1'	8.36
HA-10	0-1'	8.08
HA-11	0-1'	15.4
HA-12	0-1'	13.6
HA-13	0-0.5'	18.6
HA-14	0-0.5'	BQL
HA-15	0-0.5'	21.5
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HA-17	0-0.5'	<b>11,500</b>
ASTDELTA-SB01	1-2'	8.51
ASTDELTA-SB02	1-2'	BQL
ASTDELTA-SB03	0-1'	BQL
ASTDELTA-MW01	3-4'	14.3
ASTDELTA-MW02	1-2'	12
ASTDELTA-MW03	1-2'	18.4
ASTDELTA-MW04	1-2'	8.15
ASTDELTA-MW05	1-2'	14.7
TPH-DRO NCDENR Action Level		40

- Portland Cement
- Bentonite Pellets
- Topsoil
- (OH) High Plasticity Organic Silt or Clay
- (SM) Silty Sand
- #2 Medium Sand
- (ML) Inorganic Silt and v.f. Sands
- (OL) Low Plasticity Organic Silt or Clay
- (PT) Peat or Highly Organic Soils

**CAELIN**  
ENGINEERS and SCIENTISTS  
WILMINGTON, NORTH CAROLINA

PROJECT  
2004 HELICOPTER RELEASE  
MARINE CORPS AIR STATION  
NEW RIVER, N.C.

JOB NO: 204-047 DATE: APR 2005

TITLE  
CROSS SECTION A-A'  
WITH SUMMARY OF SOIL SAMPLE RESULTS  
- EPA METHOD 8015/3550

SCALE: AS SHOWN DRAWN BY: SVH CHECKED BY: SAT

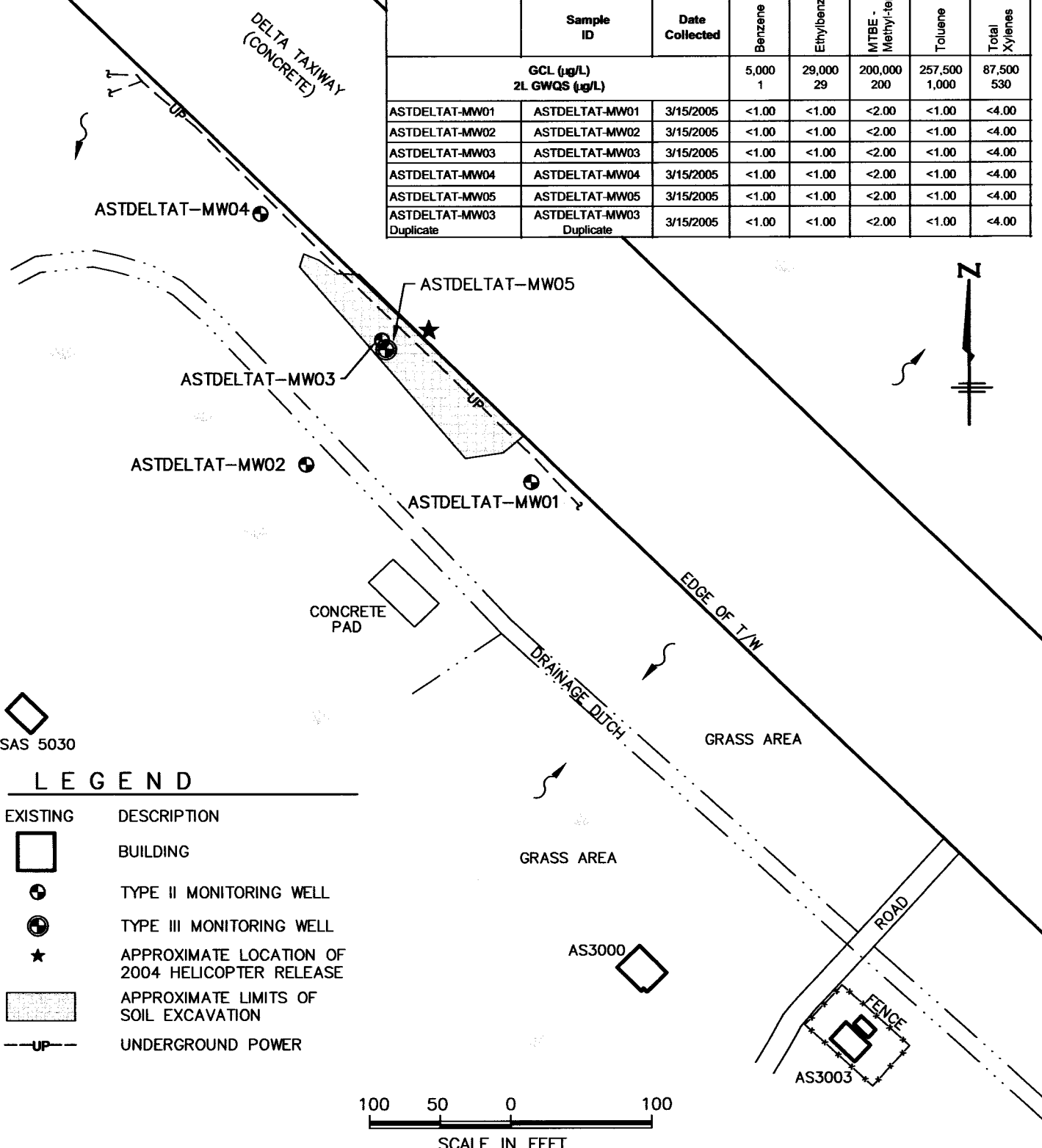
FIGURE  
**7B**  
204047-2040-07B

**NOTE:**

1. ALL RESULTS IN  $\mu\text{g/L}$ .
2.  $\mu\text{g/L}$  = MICROGRAMS PER LITER.

**Analytical Method: EPA Method 602 + MTBE + Xylenes**

Well ID	Contaminant of Concern		Benzene	Ethylbenzene	MTBE - Methyl-tert-butyl ether	Toluene	Total Xylenes
	Sample ID	Date Collected					
GCL ( $\mu\text{g/L}$ )			5,000	29,000	200,000	257,500	87,500
2L GWQS ( $\mu\text{g/L}$ )			1	29	200	1,000	530
ASTDELTAT-MW01	ASTDELTAT-MW01	3/15/2005	<1.00	<1.00	<2.00	<1.00	<4.00
ASTDELTAT-MW02	ASTDELTAT-MW02	3/15/2005	<1.00	<1.00	<2.00	<1.00	<4.00
ASTDELTAT-MW03	ASTDELTAT-MW03	3/15/2005	<1.00	<1.00	<2.00	<1.00	<4.00
ASTDELTAT-MW04	ASTDELTAT-MW04	3/15/2005	<1.00	<1.00	<2.00	<1.00	<4.00
ASTDELTAT-MW05	ASTDELTAT-MW05	3/15/2005	<1.00	<1.00	<2.00	<1.00	<4.00
ASTDELTAT-MW03 Duplicate	ASTDELTAT-MW03 Duplicate	3/15/2005	<1.00	<1.00	<2.00	<1.00	<4.00



SAS 5030

### LEGEND

EXISTING	DESCRIPTION
	BUILDING
	TYPE II MONITORING WELL
	TYPE III MONITORING WELL
	APPROXIMATE LOCATION OF 2004 HELICOPTER RELEASE
	APPROXIMATE LIMITS OF SOIL EXCAVATION
	UNDERGROUND POWER

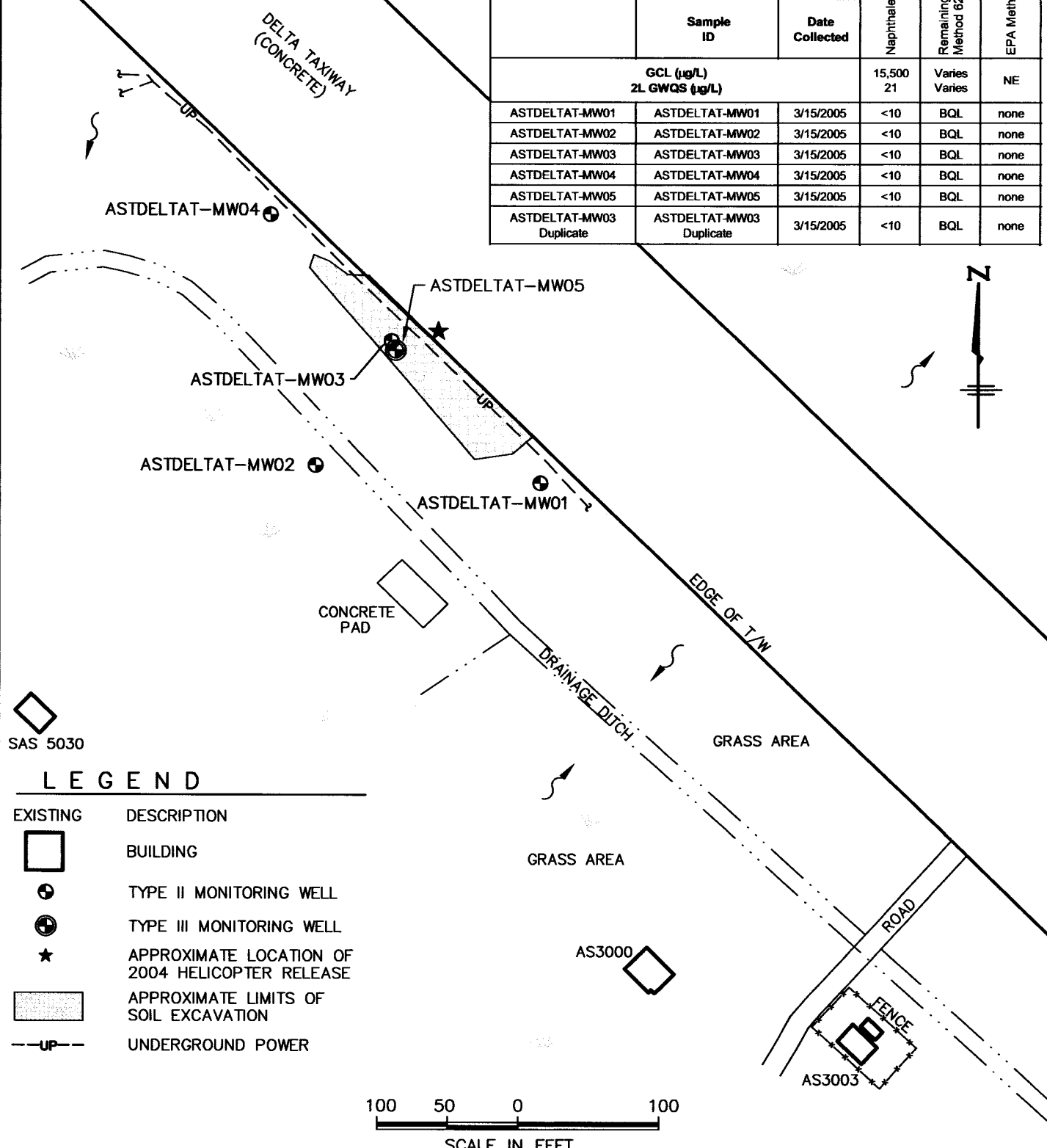
<p>WILMINGTON, NORTH CAROLINA</p>	<p><b>PROJECT</b></p> <p>2004 HELICOPTER RELEASE MARINE CORPS AIR STATION NEW RIVER, N.C.</p>	<p><b>TITLE</b></p> <p>SUMMARY OF GROUNDWATER SAMPLE RESULTS - EPA METHOD 602+MTBE+XYLENES</p>	<p><b>FIGURE</b></p> <p>8</p>
	<p><b>JOB NO:</b> 204-047</p>	<p><b>DATE:</b> APR 2005</p>	<p><b>SCALE:</b> 1"=100'</p>

**NOTE:**

1. ALL RESULTS IN  $\mu\text{g/L}$ .
2.  $\mu\text{g/L}$  = MICROGRAMS PER LITER
3. NE = NONE ESTABLISHED

**Analytical Method: EPA Method 625 + TICs**

Well ID	Contaminant of Concern		Naphthalene	Remaining EPA Method 625 Analytes	EPA Method TICs
	Sample ID	Date Collected			
GCL ( $\mu\text{g/L}$ )			15,500	Varies	NE
2L GWQS ( $\mu\text{g/L}$ )			21	Varies	NE
ASTDELTAT-MW01	ASTDELTAT-MW01	3/15/2005	<10	BQL	none
ASTDELTAT-MW02	ASTDELTAT-MW02	3/15/2005	<10	BQL	none
ASTDELTAT-MW03	ASTDELTAT-MW03	3/15/2005	<10	BQL	none
ASTDELTAT-MW04	ASTDELTAT-MW04	3/15/2005	<10	BQL	none
ASTDELTAT-MW05	ASTDELTAT-MW05	3/15/2005	<10	BQL	none
ASTDELTAT-MW03 Duplicate	ASTDELTAT-MW03 Duplicate	3/15/2005	<10	BQL	none



**LEGEND**

EXISTING	DESCRIPTION
	BUILDING
	TYPE II MONITORING WELL
	TYPE III MONITORING WELL
	APPROXIMATE LOCATION OF 2004 HELICOPTER RELEASE
	APPROXIMATE LIMITS OF SOIL EXCAVATION
	UNDERGROUND POWER

**CATLIN**  
**ENGINEERS and SCIENTISTS**  
 WILMINGTON, NORTH CAROLINA

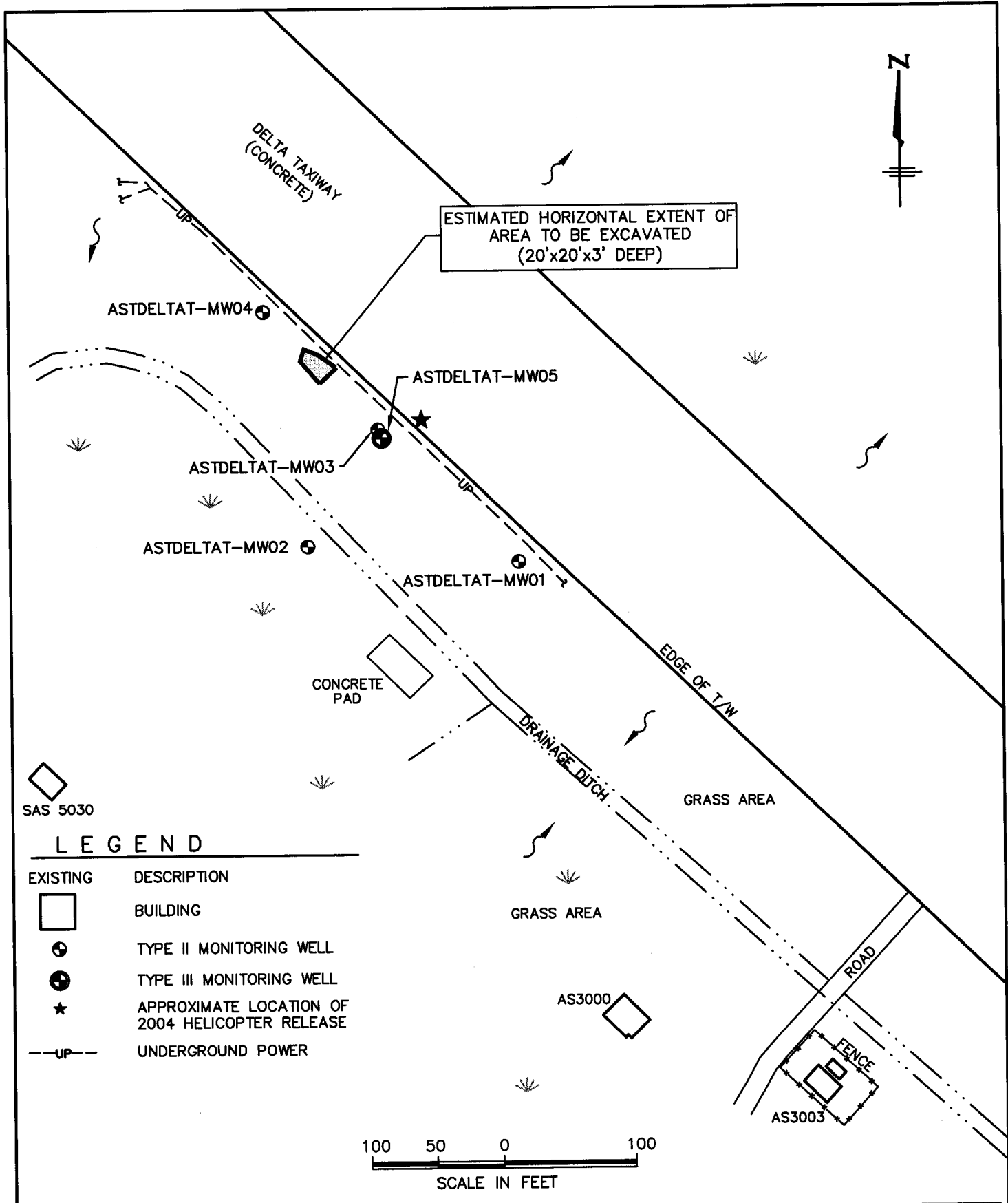
**PROJECT**  
 2004 HELICOPTER RELEASE  
 MARINE CORPS AIR STATION  
 NEW RIVER, N.C.

**JOB NO:** 204-047 **DATE:** APR 2005

**TITLE**  
 SUMMARY OF GROUNDWATER  
 SAMPLE RESULTS  
 - EPA METHOD 625 + TICs

**SCALE:** 1"=100' **DRAWN BY:** HCS **CHECKED BY:** SAT

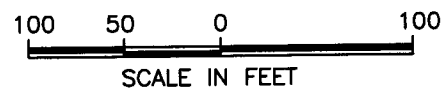
**FIGURE**  
 9



SAS 5030

**LEGEND**

EXISTING	DESCRIPTION
	BUILDING
	TYPE II MONITORING WELL
	TYPE III MONITORING WELL
	APPROXIMATE LOCATION OF 2004 HELICOPTER RELEASE
	UNDERGROUND POWER



 WILMINGTON, NORTH CAROLINA	<b>PROJECT</b> 2004 HELICOPTER RELEASE MARINE CORPS AIR STATION NEW RIVER, N.C.	<b>TITLE</b> SITE MAP WITH PROPOSED HORIZONTAL AREA OF SOILS TO BE EXCAVATED	<b>FIGURE</b> 10
	<b>JOB NO:</b> 204-047 <b>DATE:</b> JUNE 2005	<b>SCALE:</b> 1"=100'	<b>DRAWN BY:</b> HCS <b>CHECKED BY:</b> SAT

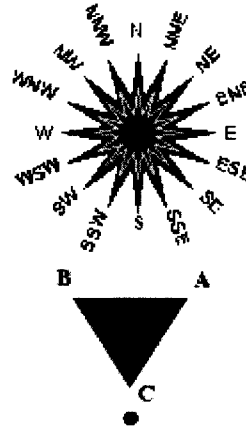
## APPENDICES

**APPENDIX A**  
**VISUAL HYDROLOGY FRAMEWORK**

# Division of Water Resources

## FrameWork Query Results

- Scroll to bottom half of page for cross-section.
- Framework Map with borehole locations may be viewed in a separate window.
- The triangle to the right shows the relative position of the three boreholes to one another and the beginning (left) and ending (right) sides of the cross-section line.
- The dot indicates the location of the viewer of the cross-section.



Cross-section line is oriented approximately:  
**WSW-ENE** (75.67)

### Well of Interest

**Location:** 34.708787, -77.441781; **Well Depth:** 30 feet; **Screen Depth:** 20 feet; **Land Surface (estimated):** 14 feet; **Show Map**

Approximate depths to hydrogeological units (feet):

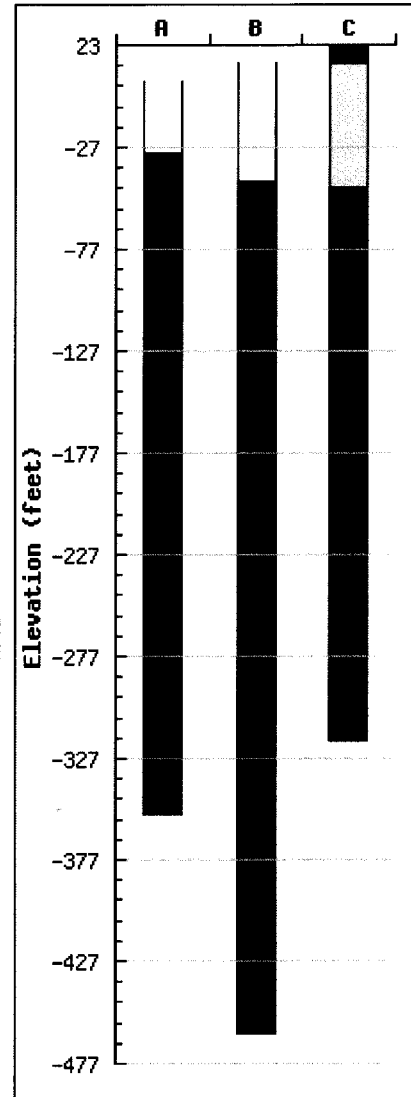
SURFICIAL 0	UTERCONF 21	UTER 25
----------------	----------------	------------

- Hydrogeologic unit top depths estimated to well depth.
- If estimated land surface elevation is higher than actual then subtract the difference from the estimated depths of units.
- If estimated land surface elevation is lower than actual then add the difference to the estimated depths of units.

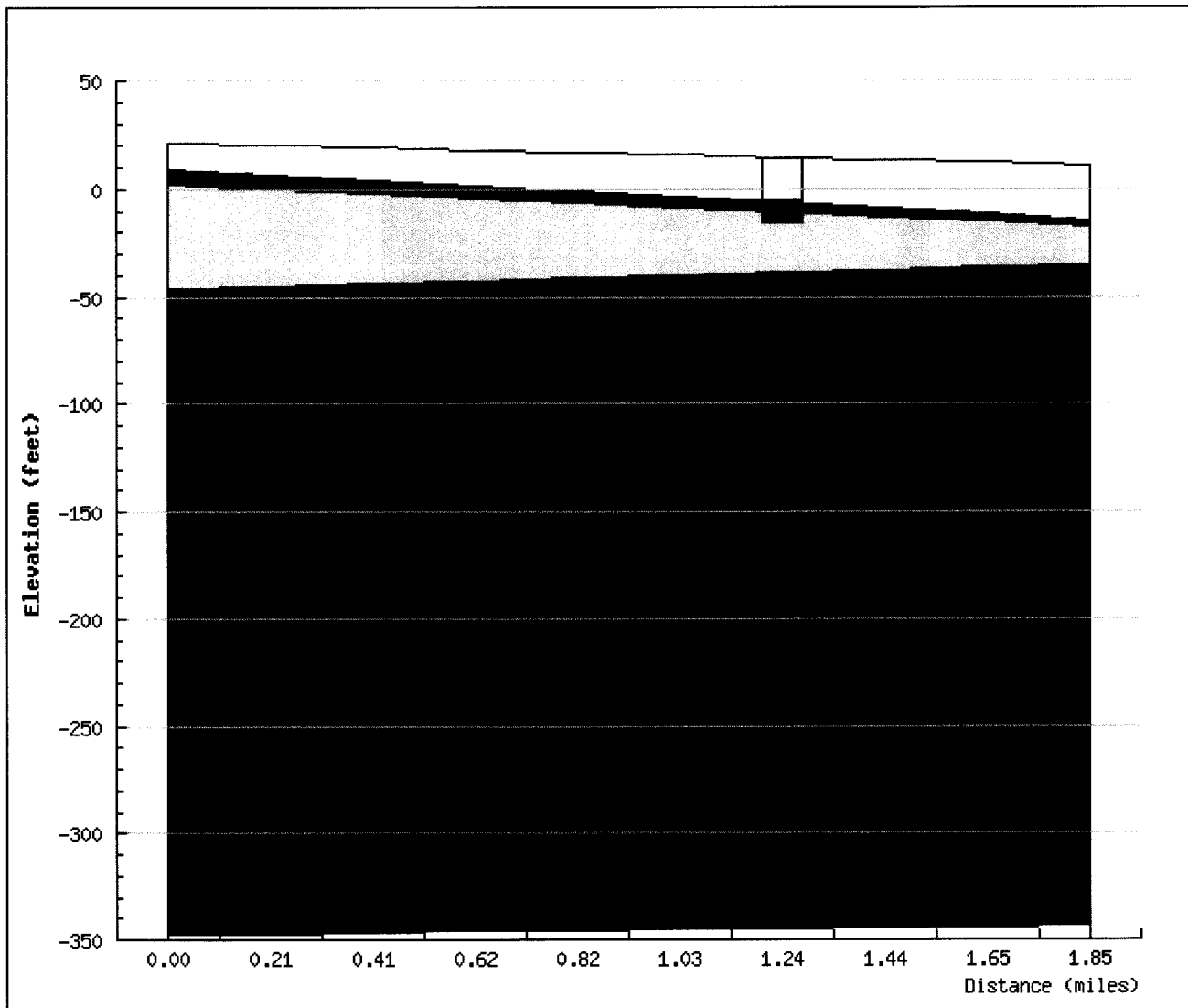
### Boreholes

- A:** U.S. Marine Corps Test Well No. 12, X 24F; **Land Surface:** 6 feet; **Location:** 34.7175, -77.416111; Hydrogeologic Units
- B:** USMC Camp Lejeune T-15, X 25C; **Land Surface:** 15 feet; **Location:** 34.740278, -77.451944; Hydrogeologic Units
- C:** Alliance Environmental, X 25R; **Land Surface:** 23 feet; **Location:** 34.695555, -77.465; Geophysical Logs, Hydrogeologic Units

## Borehole Hydroge



## Calculated Cross-Section



NC Division of Water Resources, DENR - 1611 Mail Service Center - Raleigh, NC  
27699-1611  
Phone: (919)733-4064 - Fax: (919)733-3558

Last Modified:  
07.08.2004

## Structure for Hydrogeologic Framework

Field	Field Name	Type	Width	Decimal Places	Comment
1	LAT	Numeric	10	6	latitude
2	LON	Numeric	11	6	longitude
3	LOCACC	Character	1		GPS accuracy?
4	QUAD	Character	8		one-minute quad identifier
5	WELL_NAME	Character	40		
6	COUNTY	Character	12		
7	DEPTH	Numeric	7	2	depth of borehole (feet)
8	LAND_SURFA	Numeric	6	2	land surface elevation (feet)
9	UTERCONF	Numeric	6		elevation of top of Upper Tertiary confining unit (feet)
10	UTER	Numeric	6		elevation of top of Upper Tertiary aquifer (feet)
11	YKNCONF	Numeric	6		elevation of top of Yorktown confining unit (feet)
12	YKN	Numeric	6		elevation of top of Yorktown aquifer (feet)
13	PGRCONF	Numeric	6		elevation of top of Pungo River confining unit (feet)
14	PGR	Numeric	6		elevation of top of Pungo River aquifer (feet)
15	CLHCONF	Numeric	6		elevation of top of Castle Hayne confining unit (feet)
16	CLH	Numeric	6		elevation of top of Castle Hayne aquifer (feet)
17	BFRTCONF	Numeric	6		elevation of top of Beaufort confining unit (feet)
18	BFRT	Numeric	6		elevation of top of Beaufort aquifer (feet)
19	PDCONF	Numeric	6		elevation of top of Peedee confining unit (feet)
20	PD	Numeric	6		elevation of top of Peedee aquifer (feet)
21	BCCCONF	Numeric	6		elevation of top of Black Creek confining unit (feet)
22	BC	Numeric	6		elevation of top of Black Creek aquifer (feet)
23	UCFCONF	Numeric	6		elevation of top of upper Cape Fear confining unit (feet)
24	UCF	Numeric	6		elevation of top of upper Cape Fear aquifer (feet)
25	LCFCONF	Numeric	6		elevation of top of lower Cape Fear confining unit (feet)
26	LCF	Numeric	6		elevation of top of lower Cape Fear aquifer (feet)
27	LCRTCONF	Numeric	6		elevation of top of lower Cretaceous confining unit (feet)
28	LCRT	Numeric	6		elevation of top of lower Cretaceous aquifer (feet)
29	BSMNT	Numeric	6		elevation of top of basement (feet)

\* Elevation of 10,001 indicates unit does not exist. Elevation of 10,000 indicates unit was not penetrated.

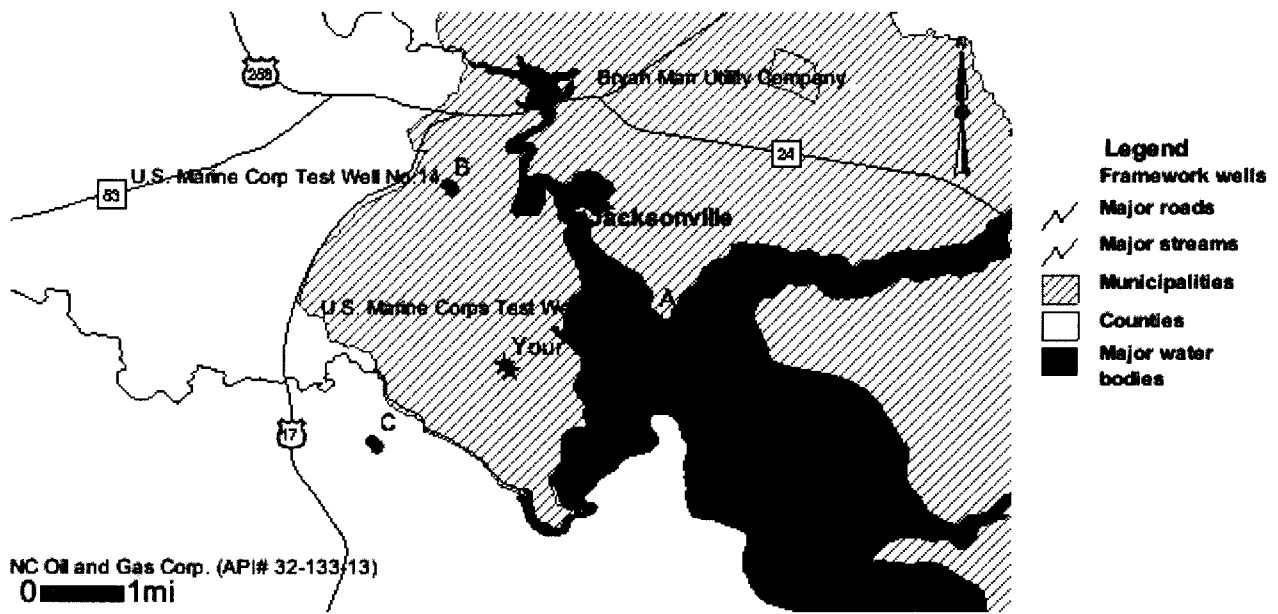
## Framework Boreholes Within 10 Miles

County	Quad	Name	Depth	Miles Away
Onslow	X 24F	U.S. Marine Corps Test Well No. 12	360	1.58
Onslow	X 25R	Alliance Environmental	341	1.61
Onslow	X 25G	Carl Beacham	138	2.20
Onslow	X 25C	USMC Camp Lejeune T-15	477	2.25
Onslow	X 25W	USGS Test Well No.4	233	2.47
Onslow	X 25O	USMC Camp Lejeune T-14	200	2.66
Onslow	X 24M	USMC ON-T-2-87	260	3.65
Onslow	X 24D	USMC Camp Lejeune T-11	202	3.93
Onslow	Y 25D	NC Oil and Gas Corp. (API# 32-133-9)	1,400	3.97
Onslow	X 24C	USMC Camp Lejeune	238	4.10
Onslow	X 26U	NC Oil and Gas Corp. Baucom No. 1	1,414	4.42
Onslow	W 24W	Bryan Marr Utility Company	241	4.81
Onslow	X 26S	NC Oil and Gas Corp. (API# 32-133-8)	1,254	5.25
Onslow	X 24S	Hadnot Point Station	1,526	5.26
Onslow	W 25O	City of Jacksonville Hwy 158, Well No. 2	737	6.89
Onslow	Y 25Q	Dixon Tower Station	1,355	7.11
Onslow	Y 23E	U.S. Marine Corps Test Well No. 8	500	7.22
Onslow	W 25F	Jacksonville 258 Well Field Station	1,226	7.47
Onslow	W 26R	Onslow County Water System #8	668	7.50
Onslow	Y 25W	U.S. Marine Corps Test Well No. 18	300	7.98
Onslow	V 25X	Onslow County Water System #9	660	9.78
Onslow	W 26G	Onslow County Water System #3	650	9.97

22 Boreholes

NC Division of Water Resources, DENR - 1611 Mail Service Center - Raleigh, NC  
 27699-1611  
 Phone: (919)733-4064 - Fax: (919)733-3558

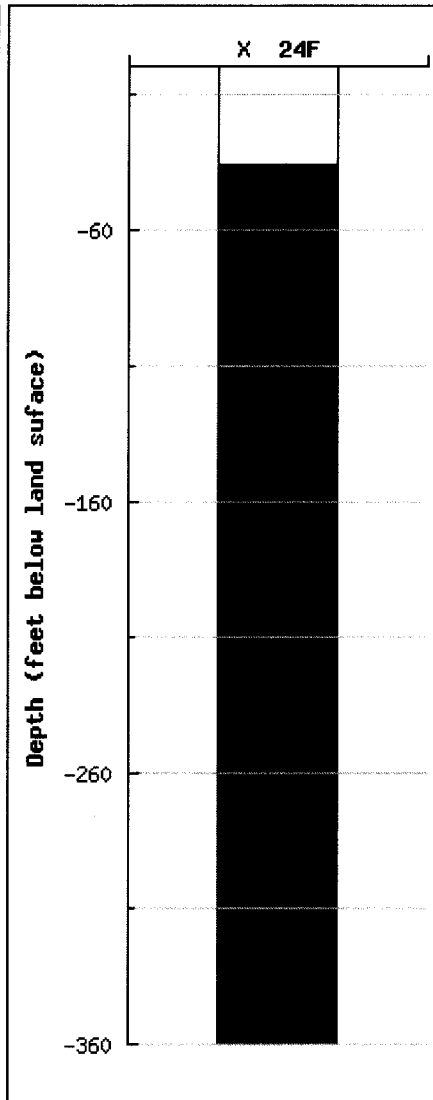
Last Modified:  
 12.30.2004



**DWR Hydrogeologic Framework Detail for X 24F**

Field	Data
County	Onslow
Latitude	34.717500
Longitude	-77.416111
<b>Show Map</b>	
Location Accuracy	Map
Quad	X 24F
Name	U.S. Marine Corps Test Well No. 12
Depth	360.00
Land Surface	6.00
Upper Tertiary CU	10001
Upper Tertiary	10001
Yorktown CU	10001
Yorktown	10001
Pungo River CU	10001
Pungo River	10001
Castle Hayne CU	-30
Castle Hayne	-46
Beaufort CU	10001
Beaufort	10001
Peedee CU	-324
Peedee	10000
Black Creek CU	10000
Black Creek	10000
Upper Cape Fear CU	10000
Upper Cape Fear	10000
Lower Cape Fear CU	10000
Lower Cape Fear	10000
Lower Cretaceous CU	10000
Lower Cretaceous	10000
Basement	10000

Unit top elevations are shown in table,  
depths are shown in plot



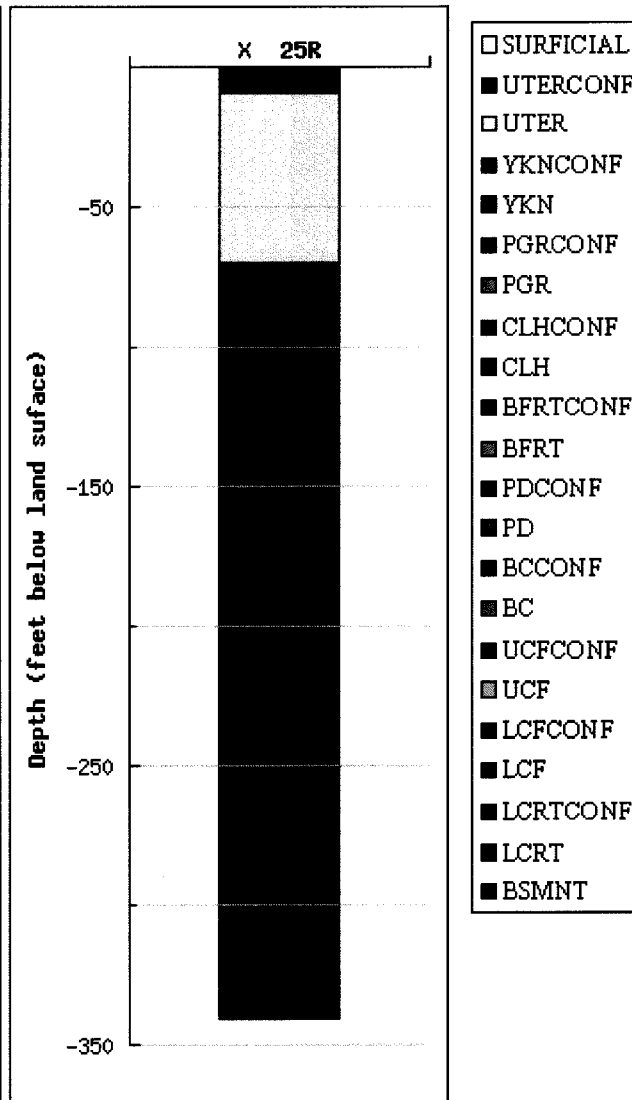
- SURFICIAL
- UTERCONF
- UTER
- YKNCONF
- YKN
- PGRCONF
- PGR
- CLHCONF
- CLH
- BFRTCONF
- BFRT
- PDCONF
- PD
- BCCCONF
- BC
- UCFCCONF
- UCF
- LCFCCONF
- LCF
- LCRTCONF
- LCRT
- BSMNT

Units with 10001 foot elevations do not exist  
and units with 10000 foot elevations  
are not penetrated.

**DWR Hydrogeologic Framework Detail for X 25R**

Field	Data
County	Onslow
Latitude	34.695555
Longitude	-77.465000
<b>Show Map</b>	
Location Accuracy	Map
Quad	X 25R
Name (link to logs)	Alliance Environmental
Depth	341.00
Land Surface	23.00
Upper Tertiary CU	23
Upper Tertiary	14
Yorktown CU	10001
Yorktown	10001
Pungo River CU	10001
Pungo River	10001
Castle Hayne CU	-47
Castle Hayne	-121
Beaufort CU	10001
Beaufort	10001
Peedee CU	-277
Peedee	10000
Black Creek CU	10000
Black Creek	10000
Upper Cape Fear CU	10000
Upper Cape Fear	10000
Lower Cape Fear CU	10000
Lower Cape Fear	10000
Lower Cretaceous CU	10000
Lower Cretaceous	10000
Basement	10000

Unit top elevations are shown in table, depths are shown in plot

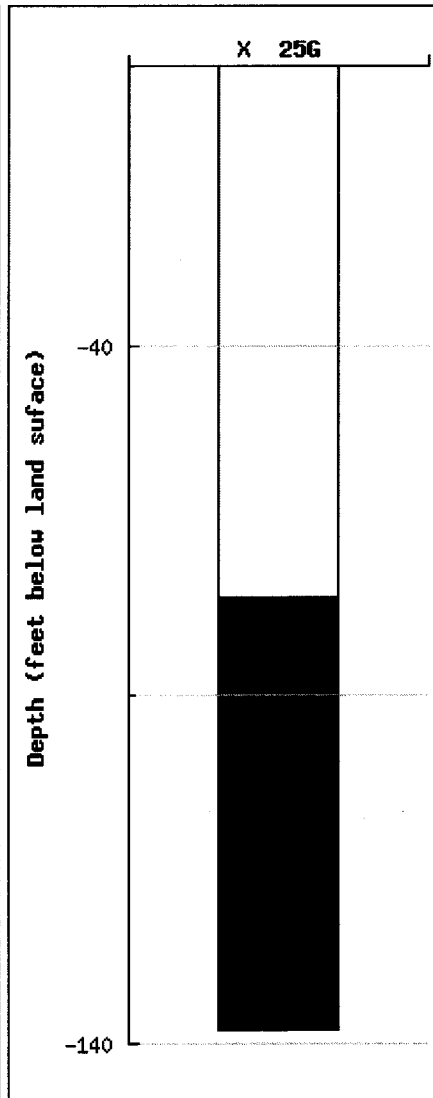


Units with 10001 foot elevations do not exist and units with 10000 foot elevations are not penetrated.

**DWR Hydrogeologic Framework Detail for X 25G**

Field	Data
County	Onslow
Latitude	34.725000
Longitude	-77.475000
<b>Show Map</b>	
Location Accuracy	Map
Quad	X 25G
Name (link to logs)	Carl Beacham
Depth	138.00
Land Surface	27.00
Upper Tertiary CU	10001
Upper Tertiary	10001
Yorktown CU	10001
Yorktown	10001
Pungo River CU	10001
Pungo River	10001
Castle Hayne CU	-49
Castle Hayne	-59
Beaufort CU	10000
Beaufort	10000
Peedee CU	10000
Peedee	10000
Black Creek CU	10000
Black Creek	10000
Upper Cape Fear CU	10000
Upper Cape Fear	10000
Lower Cape Fear CU	10000
Lower Cape Fear	10000
Lower Cretaceous CU	10000
Lower Cretaceous	10000
Basement	10000

Unit top elevations are shown in table, depths are shown in plot



- SURFICIAL
- UTERCONF
- UTER
- YKNCONF
- YKN
- PGRCONF
- PGR
- CLHCONF
- CLH
- BFRTCONF
- BFRT
- PDCONF
- PD
- BCCONF
- BC
- UCFCONF
- UCF
- LCFCONF
- LCF
- LCRTCONF
- LCRT
- BSMNT

Units with 10001 foot elevations do not exist and units with 10000 foot elevations are not penetrated.

**APPENDIX B**

**CATLIN STANDARD METHODS OF INVESTIGATION**

# CATLIN STANDARD METHODS OF INVESTIGATION

(REVISED APRIL 2002)

## 1.0 DATA COLLECTION

### 1.1 BACKGROUND DATA

Background data and history information relevant to the site investigation is generated through numerous sources. These sources may include, but are not limited to, the following:

- Conversations with the client and regulatory officials involved with the incident.
- Review of pertinent regulatory correspondence.
- Review of previous and existing reports and other technical data.
- Review of available historical records.

### 1.2 SURVEYS AND POTENTIAL RECEPTOR DATA

Physical survey and potential receptor data are collected in accordance with the intended level of investigation. In general, the purpose is to collect sufficient information for site assessment and corrective action planning.

Individual receptors are identified and evaluated in the context of their potential for contaminant impact. Potential receptors of contamination can include surface water bodies, groundwater supply wells, wellhead protection areas, and subsurface building structures.

#### 1.2.1 Horizontal Survey

Horizontal survey data are generated using either accepted general field surveying techniques, or existing survey maps; or by using a combination of existing data and field generated information. The survey area generally extends to a point at least 50 feet beyond suspected plume boundaries. A receptor scale survey of a larger area surrounding a site will be made if appropriate and necessary.

#### 1.2.2 Vertical Survey

A vertical survey is conducted at the site typically within an accuracy of 0.01 foot. The datum plane is generally assumed unless otherwise noted. Assumed temporary benchmarks (TBM) are selected near ground level. The vertical survey includes such points as top of all well casings, selected ground shots, important utility inverts, utility fluid levels, important surface water levels, and other items determined to be significant.

### **1.3 DRILLING AND MONITORING WELL/PIEZOMETER INSTALLATION**

Necessary permits are applied for and obtained in accordance with federal, state, and local requirements prior to drilling or well construction activities. Additionally, the well locations are scanned for underground utilities prior to conducting intrusive subsurface activities. Wells are installed under applicable licensing requirements, and are designed and constructed in accordance with accepted standards and practices. Any wells purposely installed at off-site locations are permitted through appropriate right-of-entry agreements with all necessary property owners and/or their agents.

#### **1.3.1 Drilling Methods and Subsurface Data Collection**

Drilling is accomplished utilizing one or more of the following methods:

##### ***Auger Drilling***

Auger drilling is the preferred, most often used method of subsurface investigation and is accomplished using a vehicle or trailer mounted drill rig. Continuous flight auger types used vary upon the site and situation; ranging from the 4-inch outside diameter solid stem to the 12-inch outside diameter hollow stem. Auger type is selected based upon appropriateness and/or site-specific requirements.

##### ***Hand Augering***

Hand augering is utilized when economically and scientifically feasible, or when no other method is suitable. Hand augers typically produce three-inch diameter holes and are generally limited to depths of less than 15 feet.

##### ***Direct Push***

Direct push methods of subsurface investigation are used generally for soil screening purposes or collection of groundwater samples where permanent wells are not viable.

##### ***Other Methods***

Other drilling methods, such as mud and air rotary, rock coring, cable tool, and large bucket augering are used when site conditions or project requirements dictate.

Regardless of the drilling method used, the drill rig(s) and all drilling tools are thoroughly cleaned between boreholes to prevent cross introduction of contaminants. Split spoon samples are collected and field-described at intervals of five feet or less, and cuttings are continuously monitored for organic vapors. Drill cuttings are containerized for off-site disposal or are spread on the ground surface in proximity to the well or boring in accordance with North Carolina Department of Environment and Natural Resources (NCDENR) requirements. A geologist or engineer, trained in using visual/manual techniques, is always present during drilling and is responsible for subsurface contaminant and geologic data collection. Soils are classified in general agreement with the Unified Soils Classification System (USCS).

### **1.3.2 Hydropunch Installation**

Hydropunch penetrometers (Hydropunches) are used to delineate the spatial extent of dissolved and free phase plumes. Soil borings are advanced to the appropriate depth and then the Hydropunch is advanced through the soil boring into undisturbed material. Groundwater samples are collected by pulling back on the body of the Hydropunch and allowing the groundwater to enter the screened portion of the sample chamber. Samples are retrieved using a decontaminated Teflon bailer or peristaltic pump.

### **1.3.3 Well Installation**

Wells are typically constructed of threaded PVC casing and screen. No glues or cements are used in joining PVC components. Well diameter, slot sizes, and protective covers vary depending upon site-specific conditions or situation-specific requirements.

### **1.3.4 Well Development**

Wells are developed by over-pumping or surging using appropriate pumps, blocks, or bailers. Through development, unwanted fine materials are removed from the natural formation surrounding the well. Well development will be performed no sooner than 24-hours after grouting is completed for the Type III wells. Water generated during development is containerized and properly disposed or is discharged onto the ground in proximity of the well in accordance with NCDENR requirements.

## **1.4 HYDROGEOLOGIC DATA COLLECTION**

Data used to help characterize hydrogeologic conditions at a site are obtained through various procedures including, but not necessarily limited to, those described below:

#### **1.4.1 Regional Geology**

Information pertaining to the regional geologic framework is compiled from existing publications, maps, and scientific papers.

#### **1.4.2 Site Geology**

Shallow site geology is generally determined from field descriptions and borehole samples. Interpretations with regard to hydrogeologically important contacts, zones, fractures, faults, cleavage, and facies changes are made when possible.

#### **1.4.3 Groundwater Occurrence and Characteristics**

Groundwater data is obtained utilizing a number of methods and procedures, not limited to the general list below:

##### ***Well Water Levels***

After well development, wells are allowed to stabilize for a minimum of 24 hours prior to measuring. Water level and free product thickness (where applicable) measurements are performed using an electronic interface probe or steel tape with water/product finding pastes.

The specific gravity of any accumulated product is determined and used to calculate true hydraulic grade from measured water levels. This information is combined with vertical survey data to determine relative potentiometric surface elevations for all wells.

##### ***Aquifer Testing***

Various aquifer tests may be used to make determinations of hydraulic conductivity. Slug or pumping tests are often used to characterize site hydrogeologic conditions and to develop remedial action alternatives utilizing appropriate pumping technologies.

##### ***Other Methods***

Other methods may be deemed appropriate for determining various groundwater characteristics. These other methods may include nested well configurations and/or clustered piezometer installations; sieve or pipette analysis; fracture trace analysis; computer modeling; and geophysical logging.

## **1.5 PETROLEUM HYDROCARBON DATA COLLECTION**

### **1.5.1 Collection Methods**

Petroleum hydrocarbon data is obtained through various methods including, but not limited to, the following:

#### ***Field Analysis***

- Direct thickness measurement of phase separated components using tapes and/or probes.
- Manual vapor analysis using a photoionization detector (PID) or flame ionization detector (FIS).
- Detectable odor and visual observation.

#### ***Laboratory Analysis***

- Laboratory analysis of phase-separated products.
- Laboratory vapor, soil, and groundwater analysis using appropriate EPA Methods.

### **1.5.2 Field Sampling**

Field sampling procedures are performed in accordance with recommended protocol, accepted industry standards, and under appropriate chain-of-custody procedures. Generally, sampling procedures are as follows:

#### ***Product Samples***

Product samples are obtained using clean equipment and containers. Each is shipped to the analytical laboratory in protective containers.

#### ***Vapor Samples***

PID/FID readings are measured from soil sample headspace using containerized samples that have been brought to ambient temperature.

Carbon tubes are utilized in conjunction with a laboratory-calibrated vacuum pump to obtain vapor samples. The carbon tubes are sealed and refrigerated for shipment to the analytical laboratory (This method is known as the Carbon Adsorption Method).

### *Soil Samples*

Soil samples are immediately packed into clean containers, and refrigerated for shipment to the analytical laboratory.

### *Groundwater Samples*

Groundwater samples are collected in accordance with the following procedures:

- Creeks/Lakes/Etc.

Grab samples are obtained.

- Domestic Wells

Wells are pumped for a time sufficient to completely purge the well and any pressure or holding tanks prior to sampling.

- Monitoring Wells

Water level measurements are made and well volumes calculated for each well.

Three well volumes are removed from each well using a thoroughly cleaned Teflon bailer or appropriate purging pump. If it is not possible to remove three volumes, due to very low yields, a minimum of one volume is removed prior to obtaining a sample.

Where analysis for metals is required, wells are typically sampled utilizing low flow techniques, which reduce turbidity and the potential for matrix interference.

Samples are collected and containerized in a manner that minimizes agitation and contact with the air.

Sampling records are field prepared.

Samples are labeled and proper chain of custody documents are maintained.

Samples are promptly protectively packed, refrigerated, and shipped to the analytical laboratory for analysis.

## 2.0 DATA EVALUATION

Data obtained as a result of the site investigation is compiled and evaluated and a report is prepared for client review and distribution to the appropriate agencies. Generally, specific data are evaluated as follows:

- Background data are evaluated in context with the suspected or confirmed problem.
- Survey data are utilized to develop site maps and to evaluate contaminant receptors.
- Well construction records are compiled and presented as part of the report. As-built information is used in combination with other data to evaluate subsurface conditions and monitoring well screen settings as they relate to the investigation.
- Subsurface drilling logs are used to develop geologic cross-sections, fence diagrams, isopachs, structure contours, or other constructions. Regional geologic data are used to obtain an overall framework.
- Hydrogeologic data are used to develop contour maps, flow nets and other constructions. The data is also used to calculate various hydrogeologic parameters that describe aquifer characteristics.
- Hydrocarbon data are utilized to develop various plume geometry and isoconcentration maps.
- All data are compiled and utilized for making specific recommendations with regard to remedial action alternatives.

**APPENDIX C**  
**WELL CONSTRUCTION RECORDS AND**  
**BORING LOGS**

# WELL CONSTRUCTION RECORD

North Carolina - Department of Environment and Natural Resources - Division of Water Quality - Groundwater Section

WELL CONTRACTOR (INDIVIDUAL) NAME (print) Bobbie Fowler CERTIFICATION # 2869  
WELL CONTRACTOR COMPANY NAME CATLIN Engineers & Scientists PHONE # (910) 452-5861  
STATE WELL CONSTRUCTION PERMIT # \_\_\_\_\_ ASSOCIATED WO PERMIT # N/A  
(if applicable) (if applicable)

## ASTDELTAT - MW01

1. WELL USE (Check Applicable Box): Residential  Municipal/Public  Industrial  Agricultural   
Monitoring  Recovery  Heat Pump Water Injection  Other  If Other, List Use \_\_\_\_\_

2. WELL LOCATION: (Show sketch of the location below)  
Nearest Town: Jacksonville County: Onslow

New River Air Station  
(Road Name and Numbers, Community, Subdivision, Lot No., Zip Code)

3. OWNER: Commanding General MCB  
Address: Attn: I&E/ EMD/ EQB/ PSC Box 20004  
(Street or Route No.)

Camp Lejeune NC 28542-0004  
City or Town State Zip Code

Area code - Phone number

4. DATE DRILLED: 3/10/2005

5. TOTAL DEPTH: 12.5

6. DOES WELL REPLACE EXISTING WELL? YES  NO

7. STATIC WATER LEVEL Below Top of Casing 4.05 FT.  
(Use "+" if Above Top of Casing)

8. TOP OF CASING IS 0 FT. Above Land Surface\*

\* Top of casing terminated at/or below land surface requires a variance in accordance with 15A NCAC 2C.0118

9. YIELD (gpm): N/A METHOD OF TEST N/A

10. WATER ZONES (depth): Surficial Aquifer

12. DISINFECTION: Type N/A Amount N/A

13. CASING:

Depth	Diameter	Wall Thickness or Weight/Ft.	Material
From <u>0</u> To <u>2.5</u> ft.	<u>2</u> in.	<u>Sch. 40</u>	<u>PVC</u>
From _____ To _____ ft.	_____ in.	_____	_____
From _____ To _____ ft.	_____ in.	_____	_____

14. GROUT:

Depth	Material	Method
From <u>0</u> To <u>1</u> ft.	<u>Portland Cement</u>	<u>Surface Pour</u>
From <u>1</u> To <u>1.5</u> ft.	<u>Bent. Pellets</u>	<u>Surface Pour</u>

15. SCREEN:

Depth	Diameter	Slot Size	Material
From <u>2.5</u> To <u>12.5</u> ft.	<u>2</u> in.	<u>Slot .010 in.</u>	<u>PVC</u>
From _____ To _____ ft.	_____ in.	_____ in.	_____

16. SAND/GRAVEL PACK:

Depth	Size	Material
From <u>1.5</u> To <u>12.5</u> ft.	<u>#2 Medium</u>	<u>Torpedo Sand</u>
From _____ To _____ ft.	_____	_____

17. REMARKS: \_\_\_\_\_

Topographic/Land Setting  
 Ridge  Slope  Valley  Flat  
(check appropriate box)

Northing/Easting of well location  
3843410.106/276389.222

NCSP NAD 83 (m)

Latitude/longitude source:  GPS  Topo. map  
(check box)

DEPTH  
From To

DRILLING LOG  
Formation Description

SEE  
ATTACHED

### LOCATION SKETCH

Show direction and distance in miles from at least two State Roads or County Roads. Include road numbers and common road names.

SEE  
ATTACHED

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.

Bobbie Fowler  
SIGNATURE OF PERSON CONSTRUCTING THE WELL

3-29-05  
DATE

Submit original to Division of Water Quality, Groundwater Section, 1636 Mail Service Center - Raleigh, NC 27699-1636 Phone No. (919) 733-3221, within 30 days.

Modified from: GW-1 REV.07/2001

# WELL LOG

**CATLIN**

ENGINEERS and SCIENTISTS  
204-047  
Wilmington, North Carolina

SHEET 1 OF 1

PROJECT NO.: 204-047	STATE: NC	COUNTY: Onslow	LOCATION: Jacksonville
PROJECT NAME: 2004 Helicopter Release		LOGGED BY: Steve Tyler	WELL ID: ASTDELTAT - MW01
NORTHING: 3,843,410.1		EASTING: 276,389.2	CREW: Tom Stetler
SYSTEM: NCSP NAD 83 (m)		BORING LOCATION: SW side of Delta Taxiway	
DRILL MACHINE: Diedrich D-50		METHOD: HSA	0 HOUR DTW: NM
START DATE: 03/10/05		FINISH DATE: 03/10/05	24 HOUR DTW: 4.1
			BORING DEPTH: 15.0
			WELL DEPTH: 12.5

DEPTH	BLOW COUNT				OVA (ppm)	LAB.	U S C S	L O G	SOIL AND ROCK DESCRIPTION	ELEVATION	WELL DETAIL
	6in	6in	6in	6in							
0.0									0.0	100.0	0.0
1.0	2	3			0						
2.0			3	4	532			SM	Black, silty SAND. Organic-rich.		
3.0	4	4			1619					97.0	
4.0			4	5	3485	AST DELTAT -MW01 (3-4)		OH	Olive fat CLAY. High plasticity. No hydrocarbon odor.		
8.0										92.0	
10.0	1	1	5	6				SM	Olive, cse. to f. SAND. Few fines. Wet. No hydrocarbon odor.		
13.0										87.0	
15.0	0	3	6	7				OL	Dark olive SILT. Light green, silty f. SAND at base of spoon.		
									Boring Terminated at Elevation 85.0 ft		

CATLIN BORING LOG 204-047 2004 HELICOPTER RELEASE G.P.L. TEST.GDT. 03/28/05

 Portland Cement
  Bentonite Pellets
  #2 Medium Sand

# WELL CONSTRUCTION RECORD

North Carolina - Department of Environment and Natural Resources - Division of Water Quality - Groundwater Section

WELL CONTRACTOR (INDIVIDUAL) NAME (print) Bobbie Fowler CERTIFICATION # 2869

WELL CONTRACTOR COMPANY NAME CATLIN Engineers & Scientists PHONE # (910) 452-5861

STATE WELL CONSTRUCTION PERMIT # \_\_\_\_\_ ASSOCIATED WO PERMIT # N/A  
(if applicable) (if applicable)

## ASTDELTA - MW02

1. WELL USE (Check Applicable Box): Residential  Municipal/Public  Industrial  Agricultural   
Monitoring  Recovery  Heat Pump Water Injection  Other  If Other, List Use \_\_\_\_\_

2. WELL LOCATION: (Show sketch of the location below)  
Nearest Town: Jacksonville County: Onslow

New River Air Station  
(Road Name and Numbers, Community, Subdivision, Lot No., Zip Code)

3. OWNER: Commanding General MCB

Address: Attn: I&E/ EMD/ EQB/ PSC Box 20004  
(Street or Route No.)

Camp Lejeune NC 28542-0004  
City or Town State Zip Code

Area code - Phone number

4. DATE DRILLED: 3/10/2005

5. TOTAL DEPTH: 12.5

6. DOES WELL REPLACE EXISTING WELL? YES  NO

7. STATIC WATER LEVEL Below Top of Casing 1.93 FT.  
(Use "+" if Above Top of Casing)

8. TOP OF CASING IS 0 FT. Above Land Surface\*

\* Top of casing terminated at/or below land surface requires a variance in accordance with 15A NCAC 2C.0118

9. YIELD (gpm): N/A METHOD OF TEST N/A

10. WATER ZONES (depth): Surficial Aquifer

12. DISINFECTION: Type N/A Amount N/A

13. CASING:

Depth	Diameter	Wall Thickness or Weight/Ft.	Material
From <u>0</u> To <u>2.5</u> ft.	<u>2</u> in.	<u>Sch. 40</u>	<u>PVC</u>
From _____ To _____ ft.	_____ in.	_____	_____
From _____ To _____ ft.	_____ in.	_____	_____

14. GROUT:

Depth	Material	Method
From <u>0</u> To <u>0.5</u> ft.	<u>Portland Cement</u>	<u>Surface Pour</u>
From <u>0.5</u> To <u>1.5</u> ft.	<u>Bent. Pellets</u>	<u>Surface Pour</u>

15. SCREEN:

Depth	Diameter	Slot Size	Material
From <u>2.5</u> To <u>12.5</u> ft.	<u>2</u> in.	<u>Slot .010</u> in.	<u>PVC</u>
From _____ To _____ ft.	_____ in.	_____ in.	_____

16. SAND/GRAVEL PACK:

Depth	Size	Material
From <u>1.5</u> To <u>12.5</u> ft.	<u>#2 Medium</u>	<u>Torpedo Sand</u>
From _____ To _____ ft.	_____	_____

17. REMARKS: \_\_\_\_\_

Topographic/Land Setting  
 Ridge  Slope  Valley  Flat  
(check appropriate box)

Northing/Easting of well location  
3843404.094/276438.745

NCSP NAD 83 (m)

Latitude/longitude source:  GPS  Topo. map  
(check box)

DEPTH  
From To

DRILLING LOG  
Formation Description

SEE  
ATTACHED

### LOCATION SKETCH

Show direction and distance in miles from at least two State Roads or County Roads. Include road numbers and common road names.

SEE  
ATTACHED

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.

Bobbie Fowler  
SIGNATURE OF PERSON CONSTRUCTING THE WELL

3-29-05  
DATE

Submit original to Division of Water Quality, Groundwater Section, 1636 Mail Service Center - Raleigh, NC 27699-1636 Phone No. (919) 733-3221, within 30 days.

Modified from:  
GW-1 REV.07/2001

# WELL LOG

**CATLIN**

ENGINEERS and SCIENTISTS  
204-047  
Wilmington, North Carolina

SHEET 1 OF 1

PROJECT NO.: 204-047	STATE: NC	COUNTY: Onslow	LOCATION: Jacksonville
PROJECT NAME: 2004 Helicopter Release		LOGGED BY: Steve Tyler	WELL ID: ASTDELTAT - MW02
NORTHING: 3,843,404.1	EASTING: 276,438.7	DRILLER: Bobbie Fowler	
SYSTEM: NCSP NAD 83 (m)		CREW: Tom Stetler	T.O.C. ELEV.: 97.72
DRILL MACHINE: Diedrich D-50	METHOD: HSA	0 HOUR DTW: NM	BORING DEPTH: 15.0
START DATE: 03/10/05	FINISH DATE: 03/10/05	24 HOUR DTW: 1.9	WELL DEPTH: 12.5

DEPTH	BLOW COUNT				OVA (ppm)	LAB.	USCS	LOG	DEPTH	SOIL AND ROCK DESCRIPTION	ELEVATION	WELL DETAIL
	6in	6in	6in	6in								
0.0								0.0	LAND SURFACE	97.7	0.0	
1.0	1	3			0			1.0	TOPSOIL. Black, silty SAND. Organic-rich.	96.7	0.5	
2.0			3	5	.8	AST DELTAT -MW02 (1-2)			Gray, fat CLAY. Mottled yellow to red. High plasticity.	93.7	1.5	
3.0	6	5			.6	OH						
4.0			4	6	0			4.0			2.5	
8.0								8.0		89.7		
9.5	1	2	1	1				9.5	Med. to f. SAND. Few fines.	88.2		
10.0								10.0	Olive, sandy SILT. Soft. Wet.	87.7		
13.0								13.0		84.7		
15.0	2	1	1	2				15.0	Dark olive SILT.	82.7		
									Boring Terminated at Elevation 82.7 ft			

CATLIN BORING LOG 204-047 2004 HELICOPTER RELEASE G.P.L. TEST.GDT 03/28/05

 Portland Cement
  Bentonite Pellets
  #2 Medium Sand

# WELL CONSTRUCTION RECORD

North Carolina - Department of Environment and Natural Resources - Division of Water Quality - Groundwater Section

WELL CONTRACTOR (INDIVIDUAL) NAME (print) Bobbie Fowler CERTIFICATION # 2869

WELL CONTRACTOR COMPANY NAME CATLIN Engineers & Scientists PHONE # (910) 452-5861

STATE WELL CONSTRUCTION PERMIT # \_\_\_\_\_ ASSOCIATED WQ PERMIT # N/A  
(if applicable) (if applicable)

## ASTDELTA - MW03

1. WELL USE (Check Applicable Box): Residential  Municipal/Public  Industrial  Agricultural   
Monitoring  Recovery  Heat Pump Water Injection  Other  If Other, List Use \_\_\_\_\_

2. WELL LOCATION: (Show sketch of the location below)  
Nearest Town: Jacksonville County: Onslow  
New River Air Station  
(Road Name and Numbers, Community, Subdivision, Lot No., Zip Code)

Topographic/Land Setting  
 Ridge  Slope  Valley  Flat  
(check appropriate box)

Northing/Easting of well location  
3843435.732/276407.004

3. OWNER: Commanding General MCB  
Address: Attn: I&E/ EMD/ EQB/ PSC Box 20004  
(Street or Route No.)

Latitude/longitude source:  GPS  Topo. map  
(check box)

Camp Lejeune NC 28542-0004  
City or Town State Zip Code

DEPTH DRILLING LOG  
From To Formation Description

Area code - Phone number

4. DATE DRILLED: 3/10/2005/10/2005

5. TOTAL DEPTH: 12.5

6. DOES WELL REPLACE EXISTING WELL? YES  NO

7. STATIC WATER LEVEL Below Top of Casing 3.9 FT.  
(Use "+" if Above Top of Casing)

8. TOP OF CASING IS 0 FT. Above Land Surface\*

\* Top of casing terminated at/or below land surface requires a variance in accordance with 15A NCAC 2C.0118

SEE  
ATTACHED

9. YIELD (gpm): N/A METHOD OF TEST N/A

10. WATER ZONES (depth): Surficial Aquifer

12. DISINFECTION: Type N/A Amount N/A

13. CASING: 

Depth	Diameter	Wall Thickness or Weight/Ft.	Material
From <u>0</u> To <u>2.5</u> ft.	<u>2</u> in.	<u>Sch. 40</u>	<u>PVC</u>
From _____ To _____ ft.	_____ in.	_____	_____
From _____ To _____ ft.	_____ in.	_____	_____

14. GROUT: 

Depth	Material	Method
From <u>0</u> To <u>1</u> ft.	<u>Portland Cement</u>	<u>Surface Pour</u>
From <u>1</u> To <u>1.5</u> ft.	<u>Bent. Pellets</u>	<u>Surface Pour</u>

LOCATION SKETCH  
Show direction and distance in miles from at least two State Roads or County Roads. Include road numbers and common road names.

15. SCREEN: 

Depth	Diameter	Slot Size	Material
From <u>2.5</u> To <u>12.5</u> ft.	<u>2</u> in.	<u>Slot .010 in.</u>	<u>PVC</u>
From _____ To _____ ft.	_____ in.	_____ in.	_____

16. SAND/GRAVEL PACK: 

Depth	Size	Material
From <u>1.5</u> To <u>12.5</u> ft.	<u>#2 Medium</u>	<u>Torpedo Sand</u>
From _____ To _____ ft.	_____	_____

SEE  
ATTACHED

17. REMARKS: \_\_\_\_\_

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.

Bobbie Fowler  
SIGNATURE OF PERSON CONSTRUCTING THE WELL

3-29-05  
DATE

Submit original to Division of Water Quality, Groundwater Section, 1636 Mail Service Center - Raleigh, NC 27699-1636 Phone No. (919) 733-3221, within 30 days.

Modified from:  
GW-1 REV.07/2001

# WELL LOG

**CATLIN**




ENGINEERS and SCIENTISTS  
204-047  
Wilmington, North Carolina

SHEET 1 OF 1

PROJECT NO.: 204-047	STATE: NC	COUNTY: Onslow	LOCATION: Jacksonville
PROJECT NAME: 2004 Helicopter Release		LOGGED BY: Steve Tyler	WELL ID: ASTDELTAT - MW03
NORTHING: 3,843,435.7		EASTING: 276,407.0	CREW: Tom Stetler
SYSTEM: NCSP NAD 83 (m)		BORING LOCATION: SW side of Delta Taxiway	T.O.C. ELEV.: 99.58
DRILL MACHINE: Diedrich D-50		METHOD: HSA	0 HOUR DTW: NM
START DATE: 03/10/05		FINISH DATE: 03/10/05	24 HOUR DTW: 3.9
			BORING DEPTH: 15.0
			WELL DEPTH: 12.5

DEPTH	BLOW COUNT				OVA (ppm)	LAB.	USCS	LOG	DEPTH	SOIL AND ROCK DESCRIPTION	ELEVATION	WELL DETAIL
	6in	6in	6in	6in								
0.0								0.0	LAND SURFACE	99.6		
1.0	4	4			9		SM	1.0	Olive, f. SAND. Few fines.	98.6	0.0	
2.0			4	5	1189	AST DELTAT - MW03 (1-2)	SM	2.5	Black, silty SAND. Organic-rich. No hydrocarbon odor.	97.1	2.5	
3.0	4	4			739		OH	4.0	Red to yellow CLAY. High plasticity. Mottled. No hydrocarbon odor.	95.6		
8.0								8.0				
10.0	2	3	3	5			SM	10.0	Cse. to f. SAND. Few fines. Wet. No hydrocarbon odor.	89.6		
13.0								13.0				
	0	0	1	1			SM	13.5	Olive, silty SAND.	86.1		
							OL	15.0	Dark olive, organic SILT. Wet. No hydrocarbon odor.	84.6		
									Boring Terminated at Elevation 84.6 ft			

CATLIN BORING LOG - 204-047 2004 HELICOPTER RELEASE G.P.L. TEST.GDI 03/29/05

 Portland Cement
  Bentonite Pellets
  #2 Medium Sand

# WELL CONSTRUCTION RECORD

North Carolina - Department of Environment and Natural Resources - Division of Water Quality - Groundwater Section

WELL CONTRACTOR (INDIVIDUAL) NAME (print) Bobbie Fowler CERTIFICATION # 2869  
WELL CONTRACTOR COMPANY NAME CATLIN Engineers & Scientists PHONE # (910) 452-5861  
STATE WELL CONSTRUCTION PERMIT # \_\_\_\_\_ ASSOCIATED WO PERMIT # N/A  
(if applicable) (if applicable)

## ASTDELTA - MW04

1. WELL USE (Check Applicable Box): Residential  Municipal/Public  Industrial  Agricultural   
Monitoring  Recovery  Heat Pump Water Injection  Other  If Other, List Use \_\_\_\_\_

2. WELL LOCATION: (Show sketch of the location below)

Nearest Town: Jacksonville County: Onslow

New River Air Station

(Road Name and Numbers, Community, Subdivision, Lot No., Zip Code)

3. OWNER: Commanding General MCB

Address: Attn: I&E/ EMD/ EQB/ PSC Box 20004  
(Street or Route No.)

Camp Lejeune NC 28542-0004  
City or Town State Zip Code

Area code - Phone number

4. DATE DRILLED: 3/10/2005

5. TOTAL DEPTH: 12.5

6. DOES WELL REPLACE EXISTING WELL? YES  NO

7. STATIC WATER LEVEL Below Top of Casing 3.76 FT.  
(Use "+" if Above Top of Casing)

8. TOP OF CASING IS 0 FT. Above Land Surface\*

\* Top of casing terminated at/or below land surface requires a variance in accordance with 15A NCAC 2C.0118

9. YIELD (gpm): N/A METHOD OF TEST N/A

10. WATER ZONES (depth): Surficial Aquifer

12. DISINFECTION: Type N/A Amount N/A

13. CASING:

Depth	Diameter	Wall Thickness or Weight/Ft.	Material
From <u>0</u> To <u>2.5</u> ft.	<u>2</u> in.	<u>Sch. 40</u>	<u>PVC</u>
From _____ To _____ ft.	_____ in.	_____	_____
From _____ To _____ ft.	_____ in.	_____	_____

14. GROUT:

Depth	Material	Method
From <u>0</u> To <u>1</u> ft.	<u>Portland Cement</u>	<u>Surface Pour</u>
From <u>1</u> To <u>1.5</u> ft.	<u>Bent. Pellets</u>	<u>Surface Pour</u>

15. SCREEN:

Depth	Diameter	Slot Size	Material
From <u>2.5</u> To <u>12.5</u> ft.	<u>2</u> in.	<u>Slot .010</u> in.	<u>PVC</u>
From _____ To _____ ft.	_____ in.	_____ in.	_____

16. SAND/GRAVEL PACK:

Depth	Size	Material
From <u>1.5</u> To <u>12.5</u> ft.	<u>#2 Medium</u>	<u>Torpedo Sand</u>
From _____ To _____ ft.	_____	_____

17. REMARKS: \_\_\_\_\_

Topographic/Land Setting  
 Ridge  Slope  Valley  Flat  
(check appropriate box)

Northing/Easting of well location

3843464.389/276381.882

NCSP NAD 83 (m)

Latitude/longitude source:  GPS  Topo. map  
(check box)

DEPTH  
From To

DRILLING LOG  
Formation Description

SEE  
ATTACHED

### LOCATION SKETCH

Show direction and distance in miles from at least two State Roads or County Roads. Include road numbers and common road names.

SEE  
ATTACHED

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.

Bobbie Fowler  
SIGNATURE OF PERSON CONSTRUCTING THE WELL

3-29-05  
DATE

Submit original to Division of Water Quality, Groundwater Section, 1636 Mail Service Center - Raleigh, NC 27699-1636 Phone No. (919) 733-3221, within 30 days.

Modified from:  
GW-1 REV.07/2001

# WELL LOG

**CATLIN**

ENGINEERS and SCIENTISTS  
204-047  
Wilmington, North Carolina

SHEET 1 OF 1

PROJECT NO.: 204-047	STATE: NC	COUNTY: Onslow	LOCATION: Jacksonville
PROJECT NAME: 2004 Helicopter Release		LOGGED BY: Steve Tyler	WELL ID: ASTDELTAT - MW04
NORTHING: 3,843,464.4	EASTING: 276,381.9	DRILLER: Bobbie Fowler	
SYSTEM: NCSP NAD 83 (m)		CREW: Tom Stetler	
BORING LOCATION: SW side of Delta Taxiway		T.O.C. ELEV.: 99.02	
DRILL MACHINE: Diedrich D-50	METHOD: HSA	0 HOUR DTW: NM	BORING DEPTH: 15.0
START DATE: 03/10/05	FINISH DATE: 03/10/05	24 HOUR DTW: 3.8	WELL DEPTH: 12.5

DEPTH	BLOW COUNT				OVA (ppm)	LAB.	U S C S	L O G	DEPTH	SOIL AND ROCK DESCRIPTION	ELEVATION	WELL DETAIL
	6in	6in	6in	6in								
0.0									0.0	LAND SURFACE	99.0	0.0
1.0	1	5			0							
2.0			4	5	.6	AST DELTAT -MW04 (1-2)	SM		2.0	Olive to black, silty SAND. Dry.	97.0	1.0 1.5
3.0	3	5			0		OH					
			5	6	.2				4.0	Olive CLAY. High plasticity.	95.0	2.5
8.0									8.0		91.0	
							SM		8.5	Olive, silty SAND. Wet.	90.5	
	2	1	1	4			OL		10.0	Olive SILT. Mod. to low plasticity. Wet.	89.0	
13.0									13.0		86.0	12.5
	2	5	6	6			SM		15.0	Light green, silty SAND. Wet. No hydrocarbon odor.	84.0	12.5
										Boring Terminated at Elevation 84.0 ft		

CATLIN BORING LOG - 204-047 2004 HELICOPTER RELEASE G.P.L. TEST G.D.I. 03/26/05

 Portland Cement
  Bentonite Pellets
  #2 Medium Sand

# WELL CONSTRUCTION RECORD

North Carolina - Department of Environment and Natural Resources - Division of Water Quality - Groundwater Section

WELL CONTRACTOR (INDIVIDUAL) NAME (print) Bobbie Fowler CERTIFICATION # 2869

WELL CONTRACTOR COMPANY NAME CATLIN Engineers & Scientists PHONE # (910) 452-5861

STATE WELL CONSTRUCTION PERMIT # \_\_\_\_\_ ASSOCIATED WQ PERMIT # N/A  
(if applicable) (if applicable)

## ASTDELTA - MW05

1. WELL USE (Check Applicable Box): Residential  Municipal/Public  Industrial  Agricultural   
Monitoring  Recovery  Heat Pump Water Injection  Other  If Other, List Use \_\_\_\_\_

2. WELL LOCATION: (Show sketch of the location below)  
Nearest Town: Jacksonville County: Onslow

New River Air Station  
(Road Name and Numbers, Community, Subdivision, Lot No., Zip Code)

3. OWNER: Commanding General MCB

Address: Attn: I&E/ EMD/ EQB/ PSC Box 20004  
(Street or Route No.)

Camp Lejeune NC 28542-0004  
City or Town State Zip Code

Area code - Phone number

4. DATE DRILLED: 3/10/2005

5. TOTAL DEPTH: 40

6. DOES WELL REPLACE EXISTING WELL? YES  NO

7. STATIC WATER LEVEL Below Top of Casing 5.59 FT.  
(Use "+" if Above Top of Casing)

8. TOP OF CASING IS 0 FT. Above Land Surface\*

\* Top of casing terminated at/or below land surface requires a variance in accordance with 15A NCAC 2C.0118

9. YIELD (gpm): N/A METHOD OF TEST N/A

10. WATER ZONES (depth): Surficial Aquifer

12. DISINFECTION: Type N/A Amount N/A

13. CASING:

Depth	Diameter	Wall Thickness or Weight/Ft.	Material
From <u>0</u> To <u>35</u> ft.	<u>2</u> in.	<u>Sch. 40</u>	<u>PVC</u>
From <u>0</u> To <u>30</u> ft.	<u>6</u> in.	<u>Sch. 40</u>	<u>PVC</u>
From _____ To _____ ft.	_____ in.	_____	_____

14. GROUT:

Depth	Material	Method
From <u>0</u> To <u>28</u> ft.	<u>Portland Cement</u>	<u>Tremie</u>
From <u>28</u> To <u>33</u> ft.	<u>Bent. Pellets</u>	<u>Surface Pour</u>

15. SCREEN:

Depth	Diameter	Slot Size	Material
From <u>35</u> To <u>40</u> ft.	<u>2</u> in.	<u>Slot .010 in.</u>	<u>PVC</u>
From _____ To _____ ft.	_____ in.	_____ in.	_____

16. SAND/GRAVEL PACK:

Depth	Size	Material
From <u>33</u> To <u>40</u> ft.	<u>#2 Medium</u>	<u>Torpedo Sand</u>
From _____ To _____ ft.	_____	_____

17. REMARKS: \_\_\_\_\_

Topographic/Land Setting  
 Ridge  Slope  Valley  Flat  
(check appropriate box)

Northing/Easting of well location

3843433.937/276407.69

NCSP NAD 83 (m)

Latitude/longitude source:  GPS  Topo. map  
(check box)

DEPTH  
From To

DRILLING LOG  
Formation Description

SEE  
ATTACHED

### LOCATION SKETCH

Show direction and distance in miles from at least two State Roads or County Roads. Include road numbers and common road names.

SEE  
ATTACHED

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.

Bobbie Fowler  
SIGNATURE OF PERSON CONSTRUCTING THE WELL

3-29-05  
DATE

Submit original to Division of Water Quality, Groundwater Section, 1636 Mail Service Center - Raleigh, NC 27699-1636 Phone No. (919) 733-3221, within 30 days.

Modified from:  
GW-1 REV.07/2001

# WELL LOG

**CATLIN**

ENGINEERS and SCIENTISTS  
204-047  
Wilmington, North Carolina

SHEET 1 OF 2

PROJECT NO.: 204-047	STATE: NC	COUNTY: Onslow	LOCATION: Jacksonville
PROJECT NAME: 2004 Helicopter Release		LOGGED BY: Steve Tyler	WELL ID: ASTDELTAT
		DRILLER: Bobbie Fowler	- MW05
NORTHING: 3,843,433.9	EASTING: 276,407.7	CREW: Tom Stetler	
SYSTEM: NCSP NAD 83 (m)	BORING LOCATION: SW side of Delta Taxiway		T.O.C. ELEV.: 100.12
DRILL MACHINE: Diedrich D-50	METHOD: HSA	0 HOUR DTW: NM	BORING DEPTH: 40.0
START DATE: 03/09/05	FINISH DATE: 03/10/05	24 HOUR DTW: 5.6	WELL DEPTH: 40.0

DEPTH	BLOW COUNT				OVA (ppm)	LAB.	U S C S	L O G	DEPTH	SOIL AND ROCK DESCRIPTION	ELEVATION	WELL DETAIL
	6in	6in	6in	6in								
0.0								0.0	LAND SURFACE	100.1	0.0	
	3	3	3	4	234.5	AST DELTAT -MW05 (1-2)	SM	1.0	Olive, silty, f. SAND. Possibly fill.	99.1		
2.0							SM	3.0	Black, organic-rich, silty SAND. Trace CLAY.	97.1		
	4	3	3	2	136.4							
4.0							OH		Yellow to olive CLAY. High plasticity. Wet. Silty layering up to 4" in thickness at approximately 6.5' BLS.			
	1	2	1	2								
6.0												
	0	0	1	2								
8.0								8.5		91.6		
	2	4	7	8			SM		Light gray, f. to med. SAND. Few fines. Wet. Slight sulfur-like odor.			
10.0												
	3	3	2	1								
12.0												
	0	0	0	0				13.0		87.1		
14.0							OL		Olive sandy SILT. Wet.			
	0	5	4	3				14.5		85.6		
16.0							PT		Dark olive, organic-rich SILT with high wood content. Almost a Peat. Wet.			
	2	12	10	13				17.5		82.6		
18.0												
	2	10	17	27			SM		Olive, silty, f. to med. SAND. Cse. grained at approximately 18.5' BLS, w/ few silts. Greenish, glauconitic sands between 22 to 24' BLS. Trace wood fragments. Wet.			
20.0												
	9	13	14	15								

CATLIN BORING LOG - 204-047 2004 HELICOPTER RELEASE G.P.I. TEST GDT 03/28/05

 Portland Cement
  Bentonite Pellets
  #2 Medium Sand

# WELL LOG

**CATLIN**  
ENGINEERS and SCIENTISTS  
204-047  
Wilmington, North Carolina

SHEET 2 OF 2

PROJECT NO.: 204-047	STATE: NC	COUNTY: Onslow	LOCATION: Jacksonville
PROJECT NAME: 2004 Helicopter Release		LOGGED BY: Steve Tyler	WELL ID: ASTDELTAT - MW05
DRILLER: Bobbie Fowler		CREW: Tom Stetler	
NORTHING: 3,843,433.9	EASTING: 276,407.7	CREW: Tom Stetler	
SYSTEM: NCSP NAD 83 (m)	BORING LOCATION: SW side of Delta Taxiway		T.O.C. ELEV.: 100.12
DRILL MACHINE: Diedrich D-50	METHOD: HSA	0 HOUR DTW: NM	BORING DEPTH: 40.0
START DATE: 03/09/05	FINISH DATE: 03/10/05	24 HOUR DTW: 5.6	WELL DEPTH: 40.0

DEPTH	BLOW COUNT				OVA (ppm)	LAB.	U S C S	L O G	SOIL AND ROCK DESCRIPTION		WELL DETAIL
	6in	6in	6in	6in					DEPTH	ELEVATION	
24.0	6	10	10	11				SM	Olive, silty, f. to med. SAND. Cse. grained at approximately 18.5' BLS, w/ few silts. Greenish, glauconitic sands between 22 to 24' BLS. Trace wood fragments. Wet. (continued)	71.1	28.0
26.0	9	5	6	7							
28.0	2	2	4	1				SC	Same as above, but high CLAY content. Olive, clayey, f. to med. SAND. Wet.	69.6	30.0
30.0	5	7	14	17							
32.0	0	0	0	4				SP	Light gray, f. to cse. SAND w/ limey fines. Limestone fragments. Wet.	35.0	33.0
34.0	6	7	6	8							
36.0	3	5	11	11							
38.0	6	8	7	11							
40.0										60.1	40.0
Boring Terminated at Elevation 60.1 ft											

CATLIN BORING LOG - 204-047 2004 HELICOPTER RELEASE G.P.I. TEST G.D.I. 03/29/05

 Portland Cement
  Bentonite Pellets
  #2 Medium Sand

**APPENDIX D**

**LABORATORY ANALYTICAL REPORTS**  
**AND**  
**CHAIN-OF-CUSTODY RECORDS**

**FILE COPY**

**PARADIGM ANALYTICAL LABORATORIES, INC.**

5500 Business Drive  
Wilmington, North Carolina 28405  
(910) 350-1903  
Fax (910) 350-1557

Mr. Mike E. Mason  
Richard Catlin & Associates  
P.O. Box 10279  
Wilmington NC 28404-0279

Report Number: G128-1271

Client Project: Helicopter Release

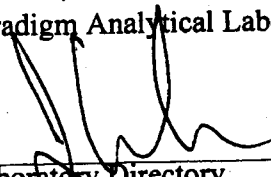
Dear Mr. Mason:

Enclosed are the results of the analytical services performed under the referenced project. The samples are certified to meet the requirements of the National Environmental Laboratory Accreditation Conference Standards. Copies of this report and supporting data will be retained in our files for a period of five years in the event they are required for future reference. Any samples submitted to our laboratory will be retained for a maximum of thirty (30) days from the date of this report unless other arrangements are requested.

If there are any questions about the report or the services performed during this project, please call Paradigm at (910) 350-1903. We will be happy to answer any questions or concerns which you may have.

Thank you for using Paradigm Analytical Labs for your analytical services. We look forward to working with you again on any additional analytical needs which you may have.

Sincerely,  
Paradigm Analytical Laboratories, Inc.

  
\_\_\_\_\_  
Laboratory Director  
J. Patrick Weaver

3/12/04  
\_\_\_\_\_  
Date

**Results for Total Petroleum Hydrocarbons  
by GC/FID**

Client Sample ID: HA-01 (0-1)  
Client Project ID: Helicopter Release  
Lab Sample ID: G128-1271-1  
Lab Project ID: G128-1271  
Report Basis: Dry Weight

Analyzed By: CLP  
Date Collected: 03/08/04  
Date Received: 03/08/04  
Matrix: Soil

Analyte	Result MG/KG	Report Limit MG/KG	Method	Dilution Factor	Date Analyzed
Gasoline Range Organics	BQL	6.87	5030	1	03/11/04
Diesel Range Organics	BQL	7.08	3550	1	03/10/04

Reviewed By: 


PARADIGM ANALYTICAL LABORATORIES, INC.

**Results for Total Petroleum Hydrocarbons  
by GC/FID**

Client Sample ID: HA-02 (0-1)  
Client Project ID: Helicopter Release  
Lab Sample ID: G128-1271-2  
Lab Project ID: G128-1271  
Report Basis: Dry Weight

Analyzed By: CLP  
Date Collected: 03/08/04  
Date Received: 03/08/04  
Matrix: Soil

Analyte	Result MG/KG	Report Limit MG/KG	Method	Dilution Factor	Date Analyzed
Gasoline Range Organics	BQL	6.86	5030	1	03/11/04
Diesel Range Organics	22.8	6.97	3550	1	03/10/04

Reviewed By: 

PARADIGM ANALYTICAL LABORATORIES, INC.

**Results for Total Petroleum Hydrocarbons  
by GC/FID**

Client Sample ID: HA-03 (0-1)  
Client Project ID: Helicopter Release  
Lab Sample ID: G128-1271-3  
Lab Project ID: G128-1271  
Report Basis: Dry Weight

Analyzed By: CLP  
Date Collected: 03/08/04  
Date Received: 03/08/04  
Matrix: Soil

Analyte	Result MG/KG	Report Limit MG/KG	Method	Dilution Factor	Date Analyzed
Gasoline Range Organics	BQL	6.95	5030	1	03/11/04
Diesel Range Organics	13.7	7	3550	1	03/10/04

Reviewed By: 

**Results for Total Petroleum Hydrocarbons  
by GC/FID**

Client Sample ID: HA-04 (0-1)  
Client Project ID: Helicopter Release  
Lab Sample ID: G128-1271-4  
Lab Project ID: G128-1271  
Report Basis: Dry Weight

Analyzed By: CLP  
Date Collected: 03/08/04  
Date Received: 03/08/04  
Matrix: Soil

Analyte	Result MG/KG	Report Limit MG/KG	Method	Dilution Factor	Date Analyzed
Gasoline Range Organics	BQL	7.3	5030	1	03/11/04
Diesel Range Organics	201	7.35	3550	1	03/10/04

Reviewed By: 

**Results for Total Petroleum Hydrocarbons  
by GC/FID**

Client Sample ID: HA-05 (0-1)  
Client Project ID: Helicopter Release  
Lab Sample ID: G128-1271-5  
Lab Project ID: G128-1271  
Report Basis: Dry Weight

Analyzed By: CLP  
Date Collected: 03/08/04  
Date Received: 03/08/04  
Matrix: Soil

Analyte	Result MG/KG	Report Limit MG/KG	Method	Dilution Factor	Date Analyzed
Gasoline Range Organics	BQL	6.58	5030	1	03/11/04
Diesel Range Organics	BQL	6.78	3550	1	03/10/04

Reviewed By: 

**Results for Total Petroleum Hydrocarbons**  
by GC/FID

Client Sample ID: HA-06 (0-1)  
Client Project ID: Helicopter Release  
Lab Sample ID: G128-1271-6  
Lab Project ID: G128-1271  
Report Basis: Dry Weight

Analyzed By: DCS  
Date Collected: 03/08/04  
Date Received: 03/08/04  
Matrix: Soil

Analyte	Result MG/KG	Report Limit MG/KG	Method	Dilution Factor	Date Analyzed
Gasoline Range Organics	10.6	6.8	5030	1	03/11/04
Diesel Range Organics	3520	347	3550	50	03/11/04

Reviewed By: 

**Results for Total Petroleum Hydrocarbons**  
by GC/FID

Client Sample ID: HA-07 (0-1)  
Client Project ID: Helicopter Release  
Lab Sample ID: G128-1271-7  
Lab Project ID: G128-1271  
Report Basis: Dry Weight

Analyzed By: CLP  
Date Collected: 03/08/04  
Date Received: 03/08/04  
Matrix: Soil

Analyte	Result MG/KG	Report Limit MG/KG	Method	Dilution Factor	Date Analyzed
Gasoline Range Organics	BQL	7.06	5030	1	03/11/04
Diesel Range Organics	27.5	7.39	3550	1	03/10/04

Reviewed By: 

**Results for Total Petroleum Hydrocarbons**  
by GC/FID

Client Sample ID: HA-08 (0-1)

Analyzed By: CLP

Client Project ID: Helicopter Release

Date Collected: 03/08/04

Lab Sample ID: G128-1271-8

Date Received: 03/08/04

Lab Project ID: G128-1271

Matrix: Soil

Report Basis: Dry Weight

Analyte	Result MG/KG	Report Limit MG/KG	Method	Dilution Factor	Date Analyzed
Gasoline Range Organics	BQL	6.77	5030	1	03/11/04
Diesel Range Organics	10.5	6.74	3550	1	03/10/04

Reviewed By: 

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Total Petroleum Hydrocarbons  
by GC/FID

Client Sample ID: HA-09 (0-1)  
Client Project ID: Helicopter Release  
Lab Sample ID: G128-1271-9  
Lab Project ID: G128-1271  
Report Basis: Dry Weight

Analyzed By: CLP  
Date Collected: 03/08/04  
Date Received: 03/08/04  
Matrix: Soil

Analyte	Result MG/KG	Report Limit MG/KG	Method	Dilution Factor	Date Analyzed
Gasoline Range Organics	BQL	7.4	5030	1	03/11/04
Diesel Range Organics	8.36	7.46	3550	1	03/10/04

Reviewed By: 

PARADIGM ANALYTICAL LABORATORIES, INC.

**Results for Total Petroleum Hydrocarbons**  
by GC/FID

Client Sample ID: HA-10 (0-1)  
Client Project ID: Helicopter Release  
Lab Sample ID: G128-1271-10  
Lab Project ID: G128-1271  
Report Basis: Dry Weight

Analyzed By: CLP  
Date Collected: 03/08/04  
Date Received: 03/08/04  
Matrix: Soil

Analyte	Result MG/KG	Report Limit MG/KG	Method	Dilution Factor	Date Analyzed
Gasoline Range Organics	BQL	7.31	5030	1	03/11/04
Diesel Range Organics	8.08	7.49	3550	1	03/10/04

Reviewed By: 

PARADIGM ANALYTICAL LABORATORIES, INC.

**Results for Total Petroleum Hydrocarbons**  
by GC/FID

Client Sample ID: HA-11 (0-1)  
Client Project ID: Helicopter Release  
Lab Sample ID: G128-1271-11  
Lab Project ID: G128-1271  
Report Basis: Dry Weight

Analyzed By: CLP  
Date Collected: 03/08/04  
Date Received: 03/08/04  
Matrix: Soil

Analyte	Result MG/KG	Report Limit MG/KG	Method	Dilution Factor	Date Analyzed
Gasoline Range Organics	BQL	7.15	5030	1	03/11/04
Diesel Range Organics	15.4	7.43	3550	1	03/10/04

Reviewed By: 

**Results for Total Petroleum Hydrocarbons**  
by GC/FID

Client Sample ID: HA-12 (0-1)  
Client Project ID: Helicopter Release  
Lab Sample ID: G128-1271-12  
Lab Project ID: G128-1271  
Report Basis: Dry Weight

Analyzed By: CLP  
Date Collected: 03/08/04  
Date Received: 03/08/04  
Matrix: Soil

Analyte	Result MG/KG	Report Limit MG/KG	Method	Dilution Factor	Date Analyzed
Gasoline Range Organics	BQL	7.17	5030	1	03/11/04
Diesel Range Organics	13.6	7.22	3550	1	03/10/04

Reviewed By: 

List of Reporting Abbreviations  
and Data Qualifiers

B = Compound also detected in batch blank

BQL = Below Quantitation Limit

DF = Dilution Factor

Dup = Duplicate

E = Estimated concentration, exceeds calibration range.

J = Estimated concentration, below calibration range and above MDL

LCS(D) = Laboratory Control Spike (Duplicate)

MDL = Method Detection Limit

MS(D) = Matrix Spike (Duplicate)

PQL = Practical Quantitation Limit

RL = Reporting Limit

RPD = Relative Percent Difference

mg/kg = milligram per kilogram, ppm, parts per million

ug/kg = micrograms per kilogram, ppb, parts per billion

mg/L = milligram per liter, ppm, parts per million

ug/L = micrograms per liter, ppb, parts per billion

% Rec = Percent Recovery

% solids = Percent Solids

Special Notes:

1) Metals and mercury samples are digested with a hot block, see the standard operating procedure document for details.

2) Uncertainty for all reported data is less than or equal to 30 percent.

MI34.011404.1





Mr. Mike E. Mason  
Richard Catlin & Associates  
P.O. Box 10279  
Wilmington NC 28404-0279

Report Number: G128-1478

Client Project: 04 Heli. Rel.

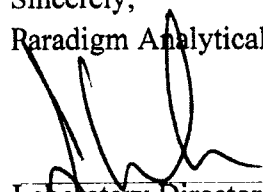
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Sincerely,  
Paradigm Analytical Laboratories, Inc.

  
Laboratory Director  
J. Patrick Weaver

3/30/05  
Date

**Results for Semivolatiles  
by GCMS 625**

Client Sample ID: ASTDELTAT-MW01

Client Project ID: 04 Heli. Rel.

Lab Sample ID: G128-1478-1E

Lab Project ID: G128-1478

Analyzed By: MRC

Date Collected: 3/15/2005 10:20

Date Received: 3/16/2005

Date Extracted: 3/21/2005

Matrix: Water

Compound	Result ug/L	Quantitation Limit ug/L	MDL ug/L	Dilution Factor	Date Analyzed	Flag
Acenaphthene	BQL	10.0	1.22	1	3/22/2005	
Acenaphthylene	BQL	10.0	1.12	1	3/22/2005	
Anthracene	BQL	10.0	1.75	1	3/22/2005	
Benzo[a]anthracene	BQL	10.0	1.36	1	3/22/2005	
Benzo[a]pyrene	BQL	10.0	1.27	1	3/22/2005	
Benzo[b]fluoranthene	BQL	10.0	1.43	1	3/22/2005	
Benzo[g,h,i]perylene	BQL	10.0	4.57	1	3/22/2005	
Benzo[k]fluoranthene	BQL	10.0	1.09	1	3/22/2005	
Bis(2-chloroethoxy)methane	BQL	10.0	1.11	1	3/22/2005	
Bis(2-chloroethyl)ether	BQL	10.0	1.09	1	3/22/2005	
Bis(2-chloroisopropyl)ether	BQL	10.0	1.57	1	3/22/2005	
Bis(2-ethylhexyl)phthalate	BQL	10.0	1.33	1	3/22/2005	
4-bromophenyl phenyl ether	BQL	10.0	1.99	1	3/22/2005	
Butylbenzylphthalate	BQL	10.0	1.53	1	3/22/2005	
2-Chloronaphthalene	BQL	10.0	1.25	1	3/22/2005	
2-Chlorophenol	BQL	10.0	4.22	1	3/22/2005	
4-Chloro-3-methylphenol	BQL	10.0	3.26	1	3/22/2005	
4-Chlorophenyl phenyl ether	BQL	10.0	1.42	1	3/22/2005	
Chrysene	BQL	10.0	1.11	1	3/22/2005	
Dibenzo[a,h]anthracene	BQL	10.0	4.87	1	3/22/2005	
Di-n-Butylphthalate	BQL	10.0	1.65	1	3/22/2005	
1,2-Dichlorobenzene	BQL	10.0	1.25	1	3/22/2005	
1,3-Dichlorobenzene	BQL	10.0	1.24	1	3/22/2005	
1,4-Dichlorobenzene	BQL	10.0	1.20	1	3/22/2005	
3,3'-Dichlorobenzidine	BQL	20.0	4.10	1	3/22/2005	
2,4-Dichlorophenol	BQL	10.0	3.75	1	3/22/2005	
Diethylphthalate	BQL	10.0	1.48	1	3/22/2005	
Dimethylphthalate	BQL	10.0	1.04	1	3/22/2005	
2,4-Dimethylphenol	BQL	10.0	9.25	1	3/22/2005	
Di-n-octylphthalate	BQL	10.0	1.16	1	3/22/2005	
4,6-Dinitro-2-methylphenol	BQL	50.0	3.71	1	3/22/2005	
2,4-Dinitrophenol	BQL	50.0	4.20	1	3/22/2005	
2,4-Dinitrotoluene	BQL	10.0	1.52	1	3/22/2005	
2,6-Dinitrotoluene	BQL	10.0	1.41	1	3/22/2005	
Fluoranthene	BQL	10.0	1.41	1	3/22/2005	
Fluorene	BQL	10.0	1.22	1	3/22/2005	
Hexachlorobenzene	BQL	10.0	1.22	1	3/22/2005	
Hexachlorobutadiene	BQL	10.0	1.58	1	3/22/2005	
Hexachlorocyclopentadiene	BQL	20.0	20.0	1	3/22/2005	
Hexachloroethane	BQL	10.0	1.58	1	3/22/2005	
Indeno(1,2,3-c,d)pyrene	BQL	10.0	4.57	1	3/22/2005	
Isophorone	BQL	10.0	1.27	1	3/22/2005	

**Results for Semivolatiles  
by GCMS 625**

Client Sample ID: ASTDELTAT-MW01  
 Client Project ID: 04 Heli. Rel.  
 Lab Sample ID: G128-1478-1E  
 Lab Project ID: G128-1478

Analyzed By: MRC  
 Date Collected: 3/15/2005 10:20  
 Date Received: 3/16/2005  
 Date Extracted: 3/21/2005  
 Matrix: Water

Compound	Result ug/L	Quantitation Limit ug/L	MDL ug/L	Dilution Factor	Date Analyzed	Flag
Naphthalene	BQL	10.0	1.08	1	3/22/2005	
Nitrobenzene	BQL	10.0	1.32	1	3/22/2005	
2-Nitrophenol	BQL	10.0	3.52	1	3/22/2005	
4-Nitrophenol	BQL	50.0	3.17	1	3/22/2005	
N-Nitrosodi-n-propylamine	BQL	10.0	1.87	1	3/22/2005	
N-Nitrosodiphenylamine	BQL	10.0	1.53	1	3/22/2005	
Pentachlorophenol	BQL	50.0	2.83	1	3/22/2005	
Phenanthrene	BQL	10.0	1.38	1	3/22/2005	
Phenol	BQL	10.0	3.38	1	3/22/2005	
Pyrene	BQL	10.0	2.08	1	3/22/2005	
1,2,4-Trichlorobenzene	BQL	10.0	1.33	1	3/22/2005	
2,4,6-Trichlorophenol	BQL	10.0	2.92	1	3/22/2005	

	Spike Added	Spike Result	Percent Recovered
2-Fluorobiphenyl	10	8.1	81
2-Fluorophenol	10	7.5	75
Nitrobenzene-d5	10	8.2	82
Phenol-d6	10	7.3	73
2,4,6-Tribromophenol	5	3.8	76
4-Terphenyl-d14	10	10	100

**Comments:**

**Flags:**

BQL = Below Quantitation Limits.  
 J = Detected below the quantitation limit.

Reviewed By: MF

**Results of Library Search for Semivolatile Compounds**  
by GCMS

Client Sample ID: ASTDELTAT-MW01  
 Client Project ID: 04 Heii. Rel.  
 Lab Sample ID: G128-1478-1E  
 Lab Project ID: G128-1478  
 Sample Wt/Vol: 500 ML  
 Dilution: 1

Analyzed By: MRC  
 Date Collected: 3/15/2005 10:20  
 Date Received: 3/16/2005  
 Date Analyzed: 3/22/2005  
 Date Extracted: 3/21/2005  
 Matrix: Water

No.	Compound	Retention Time	CAS#	Match Probability	Result (ug/L)
1	No library search compounds detected.				
2					
3					
4					
5					
6					
7					
8					
9					
10					

**Comment:**

Tentatively Identified Compound (TIC) refers to substances which are not present in the list of target compounds. Therefore, not all TICs are identified and quantitated using individual standards. TIC listings are prepared utilizing a computerized library search of electron impact mass spectral data and evaluation of the relevant data by a mass spectral data specialist.

Quantitation is accomplished by relative peak area of the compound compared to that of the nearest internal standard from the total ion chromatogram. TICs are identified and quantitated only if the peak area is equal to or greater than 10% of that of the nearest internal standard. Quantitation provided is an estimate.

Reviewed by: BF

**Results for Semivolatiles  
by GCMS 625**

Client Sample ID: ASTDELTAT-MW02  
Client Project ID: 04 Heli. Rel.  
Lab Sample ID: G128-1478-2E  
Lab Project ID: G128-1478

Analyzed By: MRC  
Date Collected: 3/15/2005 9:45  
Date Received: 3/16/2005  
Date Extracted: 3/21/2005  
Matrix: Water

Compound	Result ug/L	Quantitation Limit ug/L	MDL ug/L	Dilution Factor	Date Analyzed	Flag
Acenaphthene	BQL	10.0	1.22	1	3/22/2005	
Acenaphthylene	BQL	10.0	1.12	1	3/22/2005	
Anthracene	BQL	10.0	1.75	1	3/22/2005	
Benzo[a]anthracene	BQL	10.0	1.36	1	3/22/2005	
Benzo[a]pyrene	BQL	10.0	1.27	1	3/22/2005	
Benzo[b]fluoranthene	BQL	10.0	1.43	1	3/22/2005	
Benzo[g,h,i]perylene	BQL	10.0	4.57	1	3/22/2005	
Benzo[k]fluoranthene	BQL	10.0	1.09	1	3/22/2005	
Bis(2-chloroethoxy)methane	BQL	10.0	1.11	1	3/22/2005	
Bis(2-chloroethyl)ether	BQL	10.0	1.09	1	3/22/2005	
Bis(2-chloroisopropyl)ether	BQL	10.0	1.57	1	3/22/2005	
Bis(2-ethylhexyl)phthalate	BQL	10.0	1.33	1	3/22/2005	
4-bromophenyl phenyl ether	BQL	10.0	1.99	1	3/22/2005	
Butylbenzylphthalate	BQL	10.0	1.53	1	3/22/2005	
2-Chloronaphthalene	BQL	10.0	1.25	1	3/22/2005	
2-Chlorophenol	BQL	10.0	4.22	1	3/22/2005	
4-Chloro-3-methylphenol	BQL	10.0	3.26	1	3/22/2005	
4-Chlorophenyl phenyl ether	BQL	10.0	1.42	1	3/22/2005	
Chrysene	BQL	10.0	1.11	1	3/22/2005	
Dibenzo[a,h]anthracene	BQL	10.0	4.87	1	3/22/2005	
Di-n-Butylphthalate	BQL	10.0	1.65	1	3/22/2005	
1,2-Dichlorobenzene	BQL	10.0	1.25	1	3/22/2005	
1,3-Dichlorobenzene	BQL	10.0	1.24	1	3/22/2005	
1,4-Dichlorobenzene	BQL	10.0	1.20	1	3/22/2005	
3,3'-Dichlorobenzidine	BQL	20.0	4.10	1	3/22/2005	
2,4-Dichlorophenol	BQL	10.0	3.75	1	3/22/2005	
Diethylphthalate	BQL	10.0	1.48	1	3/22/2005	
Dimethylphthalate	BQL	10.0	1.04	1	3/22/2005	
2,4-Dimethylphenol	BQL	10.0	9.25	1	3/22/2005	
Di-n-octylphthalate	BQL	10.0	1.16	1	3/22/2005	
4,6-Dinitro-2-methylphenol	BQL	50.0	3.71	1	3/22/2005	
2,4-Dinitrophenol	BQL	50.0	4.20	1	3/22/2005	
2,4-Dinitrotoluene	BQL	10.0	1.52	1	3/22/2005	
2,6-Dinitrotoluene	BQL	10.0	1.41	1	3/22/2005	
Fluoranthene	BQL	10.0	1.41	1	3/22/2005	
Fluorene	BQL	10.0	1.22	1	3/22/2005	
Hexachlorobenzene	BQL	10.0	1.22	1	3/22/2005	
Hexachlorobutadiene	BQL	10.0	1.58	1	3/22/2005	
Hexachlorocyclopentadiene	BQL	20.0	20.0	1	3/22/2005	
Hexachloroethane	BQL	10.0	1.58	1	3/22/2005	
Indeno(1,2,3-c,d)pyrene	BQL	10.0	4.57	1	3/22/2005	
Isophorone	BQL	10.0	1.27	1	3/22/2005	

**Results for Semivolatiles  
by GCMS 625**

Client Sample ID: ASTDELTAT-MW02  
 Client Project ID: 04 Heli. Rel.  
 Lab Sample ID: G128-1478-2E  
 Lab Project ID: G128-1478

Analyzed By: MRC  
 Date Collected: 3/15/2005 9:45  
 Date Received: 3/16/2005  
 Date Extracted: 3/21/2005  
 Matrix: Water

Compound	Result ug/L	Quantitation Limit ug/L	MDL ug/L	Dilution Factor	Date Analyzed	Flag
Naphthalene	BQL	10.0	1.08	1	3/22/2005	
Nitrobenzene	BQL	10.0	1.32	1	3/22/2005	
2-Nitrophenol	BQL	10.0	3.52	1	3/22/2005	
4-Nitrophenol	BQL	50.0	3.17	1	3/22/2005	
N-Nitrosodi-n-propylamine	BQL	10.0	1.87	1	3/22/2005	
N-Nitrosodiphenylamine	BQL	10.0	1.53	1	3/22/2005	
Pentachlorophenol	BQL	50.0	2.83	1	3/22/2005	
Phenanthrene	BQL	10.0	1.38	1	3/22/2005	
Phenol	BQL	10.0	3.38	1	3/22/2005	
Pyrene	BQL	10.0	2.08	1	3/22/2005	
1,2,4-Trichlorobenzene	BQL	10.0	1.33	1	3/22/2005	
2,4,6-Trichlorophenol	BQL	10.0	2.92	1	3/22/2005	

	Spike Added	Spike Result	Percent Recovered
2-Fluorobiphenyl	10	7.7	77
2-Fluorophenol	10	7	70
Nitrobenzene-d5	10	7.5	75
Phenol-d6	10	6.9	69
2,4,6-Tribromophenol	5	3.5	70
4-Terphenyl-d14	10	10.3	103

**Comments:**

**Flags:**

BQL = Below Quantitation Limits.  
 J = Detected below the quantitation limit.

Reviewed By: AF

**Results of Library Search for Semivolatile Compounds**  
by GCMS

Client Sample ID: ASTDELTAT-MW02  
 Client Project ID: 04 Heli. Rel.  
 Lab Sample ID: G128-1478-2E  
 Lab Project ID: G128-1478  
 Sample Wt/Vol: 500 ML  
 Dilution: 1

Analyzed By: MRC  
 Date Collected: 3/15/2005 9:45  
 Date Received: 3/16/2005  
 Date Analyzed: 3/22/2005  
 Date Extracted: 3/21/2005  
 Matrix: Water

No.	Compound	Retention Time	CAS#	Match Probability	Result (ug/L)
1	No library search compounds detected.				
2					
3					
4					
5					
6					
7					
8					
9					
10					

**Comment:**

Tentatively Identified Compound (TIC) refers to substances which are not present in the list of target compounds. Therefore, not all TICs are identified and quantitated using individual standards. TIC listings are prepared utilizing a computerized library search of electron impact mass spectral data and evaluation of the relevant data by a mass spectral data specialist.

Quantitation is accomplished by relative peak area of the compound compared to that of the nearest internal standard from the total ion chromatogram. TICs are identified and quantitated only if the peak area is equal to or greater than 10% of that of the nearest internal standard. Quantitation provided is an estimate.

Reviewed by: AF

**Results for Semivolatiles  
by GCMS 625**

Client Sample ID: ASTDELTAT-MW03

Client Project ID: 04 Heli. Rel.

Lab Sample ID: G128-1478-3E

Lab Project ID: G128-1478

Analyzed By: MRC

Date Collected: 3/15/2005 11:15

Date Received: 3/16/2005

Date Extracted: 3/21/2005

Matrix: Water

Compound	Result ug/L	Quantitation Limit ug/L	MDL ug/L	Dilution Factor	Date Analyzed	Flag
Acenaphthene	BQL	10.0	1.22	1	3/22/2005	
Acenaphthylene	BQL	10.0	1.12	1	3/22/2005	
Anthracene	BQL	10.0	1.75	1	3/22/2005	
Benzo[a]anthracene	BQL	10.0	1.36	1	3/22/2005	
Benzo[a]pyrene	BQL	10.0	1.27	1	3/22/2005	
Benzo[b]fluoranthene	BQL	10.0	1.43	1	3/22/2005	
Benzo[g,h,i]perylene	BQL	10.0	4.57	1	3/22/2005	
Benzo[k]fluoranthene	BQL	10.0	1.09	1	3/22/2005	
Bis(2-chloroethoxy)methane	BQL	10.0	1.11	1	3/22/2005	
Bis(2-chloroethyl)ether	BQL	10.0	1.09	1	3/22/2005	
Bis(2-chloroisopropyl)ether	BQL	10.0	1.57	1	3/22/2005	
Bis(2-ethylhexyl)phthalate	BQL	10.0	1.33	1	3/22/2005	
4-bromophenyl phenyl ether	BQL	10.0	1.99	1	3/22/2005	
Butylbenzylphthalate	BQL	10.0	1.53	1	3/22/2005	
2-Chloronaphthalene	BQL	10.0	1.25	1	3/22/2005	
2-Chlorophenol	BQL	10.0	4.22	1	3/22/2005	
4-Chloro-3-methylphenol	BQL	10.0	3.26	1	3/22/2005	
4-Chlorophenyl phenyl ether	BQL	10.0	1.42	1	3/22/2005	
Chrysene	BQL	10.0	1.11	1	3/22/2005	
Dibenzo[a,h]anthracene	BQL	10.0	4.87	1	3/22/2005	
Di-n-Butylphthalate	BQL	10.0	1.65	1	3/22/2005	
1,2-Dichlorobenzene	BQL	10.0	1.25	1	3/22/2005	
1,3-Dichlorobenzene	BQL	10.0	1.24	1	3/22/2005	
1,4-Dichlorobenzene	BQL	10.0	1.20	1	3/22/2005	
3,3'-Dichlorobenzidine	BQL	20.0	4.10	1	3/22/2005	
2,4-Dichlorophenol	BQL	10.0	3.75	1	3/22/2005	
Diethylphthalate	BQL	10.0	1.48	1	3/22/2005	
Dimethylphthalate	BQL	10.0	1.04	1	3/22/2005	
2,4-Dimethylphenol	BQL	10.0	9.25	1	3/22/2005	
Di-n-octylphthalate	BQL	10.0	1.16	1	3/22/2005	
4,6-Dinitro-2-methylphenol	BQL	50.0	3.71	1	3/22/2005	
2,4-Dinitrophenol	BQL	50.0	4.20	1	3/22/2005	
2,4-Dinitrotoluene	BQL	10.0	1.52	1	3/22/2005	
2,6-Dinitrotoluene	BQL	10.0	1.41	1	3/22/2005	
Fluoranthene	BQL	10.0	1.41	1	3/22/2005	
Fluorene	BQL	10.0	1.22	1	3/22/2005	
Hexachlorobenzene	BQL	10.0	1.22	1	3/22/2005	
Hexachlorobutadiene	BQL	10.0	1.58	1	3/22/2005	
Hexachlorocyclopentadiene	BQL	20.0	20.0	1	3/22/2005	
Hexachloroethane	BQL	10.0	1.58	1	3/22/2005	
Indeno(1,2,3-c,d)pyrene	BQL	10.0	4.57	1	3/22/2005	
Isophorone	BQL	10.0	1.27	1	3/22/2005	

**Results for Semivolatiles  
by GCMS 625**

Client Sample ID: ASTDELTAT-MW03  
 Client Project ID: 04 Heli. Rel.  
 Lab Sample ID: G128-1478-3E  
 Lab Project ID: G128-1478

Analyzed By: MRC  
 Date Collected: 3/15/2005 11:15  
 Date Received: 3/16/2005  
 Date Extracted: 3/21/2005  
 Matrix: Water

Compound	Result ug/L	Quantitation Limit ug/L	MDL ug/L	Dilution Factor	Date Analyzed	Flag
Naphthalene	BQL	10.0	1.08	1	3/22/2005	
Nitrobenzene	BQL	10.0	1.32	1	3/22/2005	
2-Nitrophenol	BQL	10.0	3.52	1	3/22/2005	
4-Nitrophenol	BQL	50.0	3.17	1	3/22/2005	
N-Nitrosodi-n-propylamine	BQL	10.0	1.87	1	3/22/2005	
N-Nitrosodiphenylamine	BQL	10.0	1.53	1	3/22/2005	
Pentachlorophenol	BQL	50.0	2.83	1	3/22/2005	
Phenanthrene	BQL	10.0	1.38	1	3/22/2005	
Phenol	BQL	10.0	3.38	1	3/22/2005	
Pyrene	BQL	10.0	2.08	1	3/22/2005	
1,2,4-Trichlorobenzene	BQL	10.0	1.33	1	3/22/2005	
2,4,6-Trichlorophenol	BQL	10.0	2.92	1	3/22/2005	

	Spike Added	Spike Result	Percent Recovered
2-Fluorobiphenyl	10	7.3	73
2-Fluorophenol	10	6.6	66
Nitrobenzene-d5	10	7.3	73
Phenol-d6	10	6.7	67
2,4,6-Tribromophenol	5	3.6	72
4-Terphenyl-d14	10	9.8	98

**Comments:**

**Flags:**

BQL = Below Quantitation Limits.  
 J = Detected below the quantitation limit.

Reviewed By:    *AF*

**Results of Library Search for Semivolatile Compounds**  
by GCMS

Client Sample ID: ASTDELTAT-MW03  
 Client Project ID: 04 Heli. Rel.  
 Lab Sample ID: G128-1478-3E  
 Lab Project ID: G128-1478  
 Sample Wt/Vol: 500 ML  
 Dilution: 1

Analyzed By: MRC  
 Date Collected: 3/15/2005 11:15  
 Date Received: 3/16/2005  
 Date Analyzed: 3/22/2005  
 Date Extracted: 3/21/2005  
 Matrix: Water

No.	Compound	Retention Time	CAS#	Match Probability	Result (ug/L)
1	No library search compounds detected.				
2					
3					
4					
5					
6					
7					
8					
9					
10					

**Comment:**

Tentatively Identified Compound (TIC) refers to substances which are not present in the list of target compounds. Therefore, not all TICs are identified and quantitated using individual standards. TIC listings are prepared utilizing a computerized library search of electron impact mass spectral data and evaluation of the relevant data by a mass spectral data specialist.

Quantitation is accomplished by relative peak area of the compound compared to that of the nearest internal standard from the total ion chromatogram. TICs are identified and quantitated only if the peak area is equal to or greater than 10% of that of the nearest internal standard. Quantitation provided is an estimate.

Reviewed by: AT

**Results for Semivolatiles  
by GCMS 625**

Client Sample ID: ASTDELTAT-MW04

Client Project ID: 04 Heli. Rel.

Lab Sample ID: G128-1478-5E

Lab Project ID: G128-1478

Analyzed By: MRC

Date Collected: 3/15/2005 10:40

Date Received: 3/16/2005

Date Extracted: 3/21/2005

Matrix: Water

Compound	Result ug/L	Quantitation Limit ug/L	MDL ug/L	Dilution Factor	Date Analyzed	Flag
Acenaphthene	BQL	10.0	1.22	1	3/22/2005	
Acenaphthylene	BQL	10.0	1.12	1	3/22/2005	
Anthracene	BQL	10.0	1.75	1	3/22/2005	
Benzo[a]anthracene	BQL	10.0	1.36	1	3/22/2005	
Benzo[a]pyrene	BQL	10.0	1.27	1	3/22/2005	
Benzo[b]fluoranthene	BQL	10.0	1.43	1	3/22/2005	
Benzo[g,h,i]perylene	BQL	10.0	4.57	1	3/22/2005	
Benzo[k]fluoranthene	BQL	10.0	1.09	1	3/22/2005	
Bis(2-chloroethoxy)methane	BQL	10.0	1.11	1	3/22/2005	
Bis(2-chloroethyl)ether	BQL	10.0	1.09	1	3/22/2005	
Bis(2-chloroisopropyl)ether	BQL	10.0	1.57	1	3/22/2005	
Bis(2-ethylhexyl)phthalate	BQL	10.0	1.33	1	3/22/2005	
4-bromophenyl phenyl ether	BQL	10.0	1.99	1	3/22/2005	
Butylbenzylphthalate	BQL	10.0	1.53	1	3/22/2005	
2-Chloronaphthalene	BQL	10.0	1.25	1	3/22/2005	
2-Chlorophenol	BQL	10.0	4.22	1	3/22/2005	
4-Chloro-3-methylphenol	BQL	10.0	3.26	1	3/22/2005	
4-Chlorophenyl phenyl ether	BQL	10.0	1.42	1	3/22/2005	
Chrysene	BQL	10.0	1.11	1	3/22/2005	
Dibenzo[a,h]anthracene	BQL	10.0	4.87	1	3/22/2005	
Di-n-Butylphthalate	BQL	10.0	1.65	1	3/22/2005	
1,2-Dichlorobenzene	BQL	10.0	1.25	1	3/22/2005	
1,3-Dichlorobenzene	BQL	10.0	1.24	1	3/22/2005	
1,4-Dichlorobenzene	BQL	10.0	1.20	1	3/22/2005	
3,3'-Dichlorobenzidine	BQL	20.0	4.10	1	3/22/2005	
2,4-Dichlorophenol	BQL	10.0	3.75	1	3/22/2005	
Diethylphthalate	BQL	10.0	1.48	1	3/22/2005	
Dimethylphthalate	BQL	10.0	1.04	1	3/22/2005	
2,4-Dimethylphenol	BQL	10.0	9.25	1	3/22/2005	
Di-n-octylphthalate	BQL	10.0	1.16	1	3/22/2005	
4,6-Dinitro-2-methylphenol	BQL	50.0	3.71	1	3/22/2005	
2,4-Dinitrophenol	BQL	50.0	4.20	1	3/22/2005	
2,4-Dinitrotoluene	BQL	10.0	1.52	1	3/22/2005	
2,6-Dinitrotoluene	BQL	10.0	1.41	1	3/22/2005	
Fluoranthene	BQL	10.0	1.41	1	3/22/2005	
Fluorene	BQL	10.0	1.22	1	3/22/2005	
Hexachlorobenzene	BQL	10.0	1.22	1	3/22/2005	
Hexachlorobutadiene	BQL	10.0	1.58	1	3/22/2005	
Hexachlorocyclopentadiene	BQL	20.0	20.0	1	3/22/2005	
Hexachloroethane	BQL	10.0	1.58	1	3/22/2005	
Indeno(1,2,3-c,d)pyrene	BQL	10.0	4.57	1	3/22/2005	
Isophorone	BQL	10.0	1.27	1	3/22/2005	

**Results for Semivolatiles  
by GCMS 625**

Client Sample ID: ASTDELTAT-MW04  
 Client Project ID: 04 Heli. Rel.  
 Lab Sample ID: G128-1478-5E  
 Lab Project ID: G128-1478

Analyzed By: MRC  
 Date Collected: 3/15/2005 10:40  
 Date Received: 3/16/2005  
 Date Extracted: 3/21/2005  
 Matrix: Water

Compound	Result ug/L	Quantitation Limit ug/L	MDL ug/L	Dilution Factor	Date Analyzed	Flag
Naphthalene	BQL	10.0	1.08	1	3/22/2005	
Nitrobenzene	BQL	10.0	1.32	1	3/22/2005	
2-Nitrophenol	BQL	10.0	3.52	1	3/22/2005	
4-Nitrophenol	BQL	50.0	3.17	1	3/22/2005	
N-Nitrosodi-n-propylamine	BQL	10.0	1.87	1	3/22/2005	
N-Nitrosodiphenylamine	BQL	10.0	1.53	1	3/22/2005	
Pentachlorophenol	BQL	50.0	2.83	1	3/22/2005	
Phenanthrene	BQL	10.0	1.38	1	3/22/2005	
Phenol	BQL	10.0	3.38	1	3/22/2005	
Pyrene	BQL	10.0	2.08	1	3/22/2005	
1,2,4-Trichlorobenzene	BQL	10.0	1.33	1	3/22/2005	
2,4,6-Trichlorophenol	BQL	10.0	2.92	1	3/22/2005	

	Spike Added	Spike Result	Percent Recovered
2-Fluorobiphenyl	10	6.8	68
2-Fluorophenol	10	6.4	64
Nitrobenzene-d5	10	6.8	68
Phenol-d6	10	6.3	63
2,4,6-Tribromophenol	5	3.1	61
4-Terphenyl-d14	10	9.5	95

**Comments:**

**Flags:**

BQL = Below Quantitation Limits.  
 J = Detected below the quantitation limit.

Reviewed By: AF

**Results of Library Search for Semivolatile Compounds**  
by GCMS

Client Sample ID: ASTDELTAT-MW04  
 Client Project ID: 04 Heli. Rel.  
 Lab Sample ID: G128-1478-5E  
 Lab Project ID: G128-1478  
 Sample Wt/Vol: 500 ML  
 Dilution: 1

Analyzed By: MRC  
 Date Collected: 3/15/2005 10:40  
 Date Received: 3/16/2005  
 Date Analyzed: 3/22/2005  
 Date Extracted: 3/21/2005  
 Matrix: Water

No.	Compound	Retention Time	CAS#	Match Probability	Result (ug/L)
1	No library search compounds detected.				
2					
3					
4					
5					
6					
7					
8					
9					
10					

**Comment:**

Tentatively Identified Compound (TIC) refers to substances which are not present in the list of target compounds. Therefore, not all TICs are identified and quantitated using individual standards. TIC listings are prepared utilizing a computerized library search of electron impact mass spectral data and evaluation of the relevant data by a mass spectral data specialist.

Quantitation is accomplished by relative peak area of the compound compared to that of the nearest internal standard from the total ion chromatogram. TICs are identified and quantitated only if the peak area is equal to or greater than 10% of that of the nearest internal standard. Quantitation provided is an estimate.

Reviewed by: AF

**Results for Semivolatiles  
by GCMS 625**

Client Sample ID: ASTDELTAT-MW05  
Client Project ID: 04 Heli. Rel.  
Lab Sample ID: G128-1478-6E  
Lab Project ID: G128-1478

Analyzed By: MRC  
Date Collected: 3/15/2005 11:00  
Date Received: 3/16/2005  
Date Extracted: 3/21/2005  
Matrix: Water

Compound	Result ug/L	Quantitation Limit ug/L	MDL ug/L	Dilution Factor	Date Analyzed	Flag
Acenaphthene	BQL	10.0	1.22	1	3/22/2005	
Acenaphthylene	BQL	10.0	1.12	1	3/22/2005	
Anthracene	BQL	10.0	1.75	1	3/22/2005	
Benzo[a]anthracene	BQL	10.0	1.36	1	3/22/2005	
Benzo[a]pyrene	BQL	10.0	1.27	1	3/22/2005	
Benzo[b]fluoranthene	BQL	10.0	1.43	1	3/22/2005	
Benzo[g,h,i]perylene	BQL	10.0	4.57	1	3/22/2005	
Benzo[k]fluoranthene	BQL	10.0	1.09	1	3/22/2005	
Bis(2-chloroethoxy)methane	BQL	10.0	1.11	1	3/22/2005	
Bis(2-chloroethyl)ether	BQL	10.0	1.09	1	3/22/2005	
Bis(2-chloroisopropyl)ether	BQL	10.0	1.57	1	3/22/2005	
Bis(2-ethylhexyl)phthalate	BQL	10.0	1.33	1	3/22/2005	
4-bromophenyl phenyl ether	BQL	10.0	1.99	1	3/22/2005	
Butylbenzylphthalate	BQL	10.0	1.53	1	3/22/2005	
2-Chloronaphthalene	BQL	10.0	1.25	1	3/22/2005	
2-Chlorophenol	BQL	10.0	4.22	1	3/22/2005	
4-Chloro-3-methylphenol	BQL	10.0	3.26	1	3/22/2005	
4-Chlorophenyl phenyl ether	BQL	10.0	1.42	1	3/22/2005	
Chrysene	BQL	10.0	1.11	1	3/22/2005	
Dibenzo[a,h]anthracene	BQL	10.0	4.87	1	3/22/2005	
Di-n-Butylphthalate	BQL	10.0	1.65	1	3/22/2005	
1,2-Dichlorobenzene	BQL	10.0	1.25	1	3/22/2005	
1,3-Dichlorobenzene	BQL	10.0	1.24	1	3/22/2005	
1,4-Dichlorobenzene	BQL	10.0	1.20	1	3/22/2005	
3,3'-Dichlorobenzidine	BQL	20.0	4.10	1	3/22/2005	
2,4-Dichlorophenol	BQL	10.0	3.75	1	3/22/2005	
Diethylphthalate	BQL	10.0	1.48	1	3/22/2005	
Dimethylphthalate	BQL	10.0	1.04	1	3/22/2005	
2,4-Dimethylphenol	BQL	10.0	9.25	1	3/22/2005	
Di-n-octylphthalate	BQL	10.0	1.16	1	3/22/2005	
4,6-Dinitro-2-methylphenol	BQL	50.0	3.71	1	3/22/2005	
2,4-Dinitrophenol	BQL	50.0	4.20	1	3/22/2005	
2,4-Dinitrotoluene	BQL	10.0	1.52	1	3/22/2005	
2,6-Dinitrotoluene	BQL	10.0	1.41	1	3/22/2005	
Fluoranthene	BQL	10.0	1.41	1	3/22/2005	
Fluorene	BQL	10.0	1.22	1	3/22/2005	
Hexachlorobenzene	BQL	10.0	1.22	1	3/22/2005	
Hexachlorobutadiene	BQL	10.0	1.58	1	3/22/2005	
Hexachlorocyclopentadiene	BQL	20.0	20.0	1	3/22/2005	
Hexachloroethane	BQL	10.0	1.58	1	3/22/2005	
Indeno(1,2,3-c,d)pyrene	BQL	10.0	4.57	1	3/22/2005	
Isophorone	BQL	10.0	1.27	1	3/22/2005	

**Results for Semivolatiles  
by GCMS 625**

Client Sample ID: ASTDELTAT-MW05  
 Client Project ID: 04 Heli. Rel.  
 Lab Sample ID: G128-1478-6E  
 Lab Project ID: G128-1478

Analyzed By: MRC  
 Date Collected: 3/15/2005 11:00  
 Date Received: 3/16/2005  
 Date Extracted: 3/21/2005  
 Matrix: Water

Compound	Result ug/L	Quantitation Limit ug/L	MDL ug/L	Dilution Factor	Date Analyzed	Flag
Naphthalene	BQL	10.0	1.08	1	3/22/2005	
Nitrobenzene	BQL	10.0	1.32	1	3/22/2005	
2-Nitrophenol	BQL	10.0	3.52	1	3/22/2005	
4-Nitrophenol	BQL	50.0	3.17	1	3/22/2005	
N-Nitrosodi-n-propylamine	BQL	10.0	1.87	1	3/22/2005	
N-Nitrosodiphenylamine	BQL	10.0	1.53	1	3/22/2005	
Pentachlorophenol	BQL	50.0	2.83	1	3/22/2005	
Phenanthrene	BQL	10.0	1.38	1	3/22/2005	
Phenol	BQL	10.0	3.38	1	3/22/2005	
Pyrene	BQL	10.0	2.08	1	3/22/2005	
1,2,4-Trichlorobenzene	BQL	10.0	1.33	1	3/22/2005	
2,4,6-Trichlorophenol	BQL	10.0	2.92	1	3/22/2005	

	Spike Added	Spike Result	Percent Recovered
2-Fluorobiphenyl	10	7.7	78
2-Fluorophenol	10	7.5	75
Nitrobenzene-d5	10	7.7	77
Phenol-d6	10	7.2	72
2,4,6-Tribromophenol	5	3.4	68
4-Terphenyl-d14	10	10.6	106

**Comments:**

**Flags:**

BQL = Below Quantitation Limits.  
 J = Detected below the quantitation limit.

Reviewed By: MF

**Results of Library Search for Semivolatile Compounds**  
by GCMS

Client Sample ID: ASTDELTAT-MW05  
Client Project ID: 04 Heli. Rel.  
Lab Sample ID: G128-1478-6E  
Lab Project ID: G128-1478  
Sample Wt/Vol: 500 ML  
Dilution: 1

Analyzed By: MRC  
Date Collected: 3/15/2005 11:00  
Date Received: 3/16/2005  
Date Analyzed: 3/22/2005  
Date Extracted: 3/21/2005  
Matrix: Water

No.	Compound	Retention Time	CAS#	Match Probability	Result (ug/L)
1	No library search compounds detected.				
2					
3					
4					
5					
6					
7					
8					
9					
10					

**Comment:**

Tentatively Identified Compound (TIC) refers to substances which are not present in the list of target compounds. Therefore, not all TICs are identified and quantitated using individual standards. TIC listings are prepared utilizing a computerized library search of electron impact mass spectral data and evaluation of the relevant data by a mass spectral data specialist.

Quantitation is accomplished by relative peak area of the compound compared to that of the nearest internal standard from the total ion chromatogram. TICs are identified and quantitated only if the peak area is equal to or greater than 10% of that of the nearest internal standard. Quantitation provided is an estimate.

Reviewed by: 

**Results for Volatiles**  
by GC 602

Client Sample ID: ASTDELTAT-MW01  
 Client Project ID: 04 Hell. Rel.  
 Lab Sample ID: G128-1478-1A  
 Lab Project ID: G128-1478

Analyzed By: DCS  
 Date Collected: 3/15/2005 10:20  
 Date Received: 3/16/2005  
 Matrix: Water

Analyte	Result ug/L	RL ug/L	Dilution Factor	Date Analyzed
Benzene	BQL	1.00	1	3/22/2005
Ethylbenzene	BQL	1.00	1	3/22/2005
Methyl-tert butyl ether (MTBE)	BQL	2.00	1	3/22/2005
Toluene	BQL	1.00	1	3/22/2005
m/p-Xylene	BQL	2.00	1	3/22/2005
o-Xylene	BQL	2.00	1	3/22/2005

Surrogate Spike Recoveries	Spike Added	Spike Result	Percent Recovery
Trifluorotoluene	40	37.0	92.6

**Comments:**  
 All values corrected for dilution.  
 BQL = Below quantitation limit.

**Results for Volatiles**  
by GC 602

Client Sample ID: ASTDEL/TAT-MW02  
 Client Project ID: 04 Heli. Rel.  
 Lab Sample ID: G128-1478-2A  
 Lab Project ID: G128-1478

Analyzed By: DCS  
 Date Collected: 3/15/2005 9:45  
 Date Received: 3/16/2005  
 Matrix: Water

Analyte	Result ug/L	RL ug/L	Dilution Factor	Date Analyzed
Benzene	BQL	1.00	1	3/22/2005
Ethylbenzene	BQL	1.00	1	3/22/2005
Methyl-tert butyl ether (MTBE)	BQL	2.00	1	3/22/2005
Toluene	BQL	1.00	1	3/22/2005
m/p-Xylene	BQL	2.00	1	3/22/2005
o-Xylene	BQL	2.00	1	3/22/2005

**Surrogate Spike Recoveries**

	Spike Added	Spike Result	Percent Recovery
Trifluorotoluene	40	38.0	95

**Comments:**

All values corrected for dilution.  
 BQL = Below quantitation limit.

**Results for Volatiles**  
by GC 602

Client Sample ID: ASTDEL/TAT-MW03  
 Client Project ID: 04 Heli. Rel.  
 Lab Sample ID: G128-1478-3A  
 Lab Project ID: G128-1478

Analyzed By: DCS  
 Date Collected: 3/15/2005 11:15  
 Date Received: 3/16/2005  
 Matrix: Water

Analyte	Result ug/L	RL ug/L	Dilution Factor	Date Analyzed
Benzene	BQL	1.00	1	3/22/2005
Ethylbenzene	BQL	1.00	1	3/22/2005
Methyl-tert butyl ether (MTBE)	BQL	2.00	1	3/22/2005
Toluene	BQL	1.00	1	3/22/2005
m/p-Xylene	BQL	2.00	1	3/22/2005
o-Xylene	BQL	2.00	1	3/22/2005
<b>Surrogate Spike Recoveries</b>		<b>Spike Added</b>	<b>Spike Result</b>	<b>Percent Recovery</b>
Trifluorotoluene		40	38.0	95

**Comments:**  
 All values corrected for dilution.  
 BQL = Below quantitation limit.

**Results for Volatiles**

by GC 602

Client Sample ID: ASTDELTAT-MW03 Duplicate

Analyzed By: DCS

Client Project ID: 04 Heli. Rel.

Date Collected: 3/15/2005 11:15

Lab Sample ID: G128-1478-4A

Date Received: 3/16/2005

Lab Project ID: G128-1478

Matrix: Water

Analyte	Result ug/L	RL ug/L	Dilution Factor	Date Analyzed
Benzene	BQL	1.00	1	3/22/2005
Ethylbenzene	BQL	1.00	1	3/22/2005
Methyl-tert butyl ether (MTBE)	BQL	2.00	1	3/22/2005
Toluene	BQL	1.00	1	3/22/2005
m/p-Xylene	BQL	2.00	1	3/22/2005
o-Xylene	BQL	2.00	1	3/22/2005
<b>Surrogate Spike Recoveries</b>		<b>Spike Added</b>	<b>Spike Result</b>	<b>Percent Recovery</b>
Trifluorotoluene		40	36.9	92.3

**Comments:**

All values corrected for dilution.

BQL = Below quantitation limit.

**Results for Volatiles**  
by GC 602

Client Sample ID: ASTDEL/TAT-MW04  
 Client Project ID: 04 Heli. Rel.  
 Lab Sample ID: G128-1478-5A  
 Lab Project ID: G128-1478

Analyzed By: DCS  
 Date Collected: 3/15/2005 10:40  
 Date Received: 3/16/2005  
 Matrix: Water

Analyte	Result ug/L	RL ug/L	Dilution Factor	Date Analyzed
Benzene	BQL	1.00	1	3/22/2005
Ethylbenzene	BQL	1.00	1	3/22/2005
Methyl-tert butyl ether (MTBE)	BQL	2.00	1	3/22/2005
Toluene	BQL	1.00	1	3/22/2005
m/p-Xylene	BQL	2.00	1	3/22/2005
o-Xylene	BQL	2.00	1	3/22/2005
<b>Surrogate Spike Recoveries</b>		<b>Spike Added</b>	<b>Spike Result</b>	<b>Percent Recovery</b>
Trifluorotoluene		40	37.8	94.6

**Comments:**  
 All values corrected for dilution.  
 BQL = Below quantitation limit.

**Results for Volatiles**  
by GC 602

Client Sample ID: ASTDELTAT-MW05  
 Client Project ID: 04 Heli. Rel.  
 Lab Sample ID: G128-1478-6A  
 Lab Project ID: G128-1478

Analyzed By: DCS  
 Date Collected: 3/15/2005 11:00  
 Date Received: 3/16/2005  
 Matrix: Water

Analyte	Result ug/L	RL ug/L	Dilution Factor	Date Analyzed
Benzene	BQL	1.00	1	3/22/2005
Ethylbenzene	BQL	1.00	1	3/22/2005
Methyl-tert butyl ether (MTBE)	BQL	2.00	1	3/22/2005
Toluene	BQL	1.00	1	3/22/2005
m/p-Xylene	BQL	2.00	1	3/22/2005
o-Xylene	BQL	2.00	1	3/22/2005
<b>Surrogate Spike Recoveries</b>		<b>Spike Added</b>	<b>Spike Result</b>	<b>Percent Recovery</b>
Trifluorotoluene		40	38.0	94.9

**Comments:**

All values corrected for dilution.  
 BQL = Below quantitation limit.

List of Reporting Abbreviations  
and Data Qualifiers

B = Compound also detected in batch blank

BQL = Below Quantitation Limit

DF = Dilution Factor

Dup = Duplicate

E = Estimated concentration, exceeds calibration range.

J = Estimated concentration, below calibration range and above MDL

LCS(D) = Laboratory Control Spike (Duplicate)

MDL = Method Detection Limit

MS(D) = Matrix Spike (Duplicate)

PQL = Practical Quantitation Limit

RL = Reporting Limit

RPD = Relative Percent Difference

mg/kg = milligram per kilogram, ppm, parts per million

ug/kg = micrograms per kilogram, ppb, parts per billion

mg/L = milligram per liter, ppm, parts per million

ug/L = micrograms per liter, ppb, parts per billion

% Rec = Percent Recovery

% solids = Percent Solids

Special Notes:

1) Metals and mercury samples are digested with a hot block, see the standard operating procedure document for details.

2) Uncertainty for all reported data is less than or equal to 30 percent.



**PARADIGM ANALYTICAL LABORATORIES, INC.**

5500 Business Drive  
Wilmington, North Carolina 28405  
(910) 350-1903  
Fax (910) 350-1557

Mr. Mike E. Mason  
Richard Catlin & Associates  
P.O. Box 10279  
Wilmington NC 28404-0279

Report Number: G128-1271

Client Project: Helicopter Release

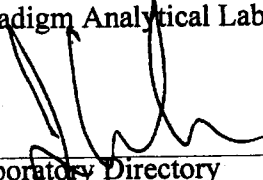
Dear Mr. Mason:

Enclosed are the results of the analytical services performed under the referenced project. The samples are certified to meet the requirements of the National Environmental Laboratory Accreditation Conference Standards. Copies of this report and supporting data will be retained in our files for a period of five years in the event they are required for future reference. Any samples submitted to our laboratory will be retained for a maximum of thirty (30) days from the date of this report unless other arrangements are requested.

If there are any questions about the report or the services performed during this project, please call Paradigm at (910) 350-1903. We will be happy to answer any questions or concerns which you may have.

Thank you for using Paradigm Analytical Labs for your analytical services. We look forward to working with you again on any additional analytical needs which you may have.

Sincerely,  
Paradigm Analytical Laboratories, Inc.

  
\_\_\_\_\_  
Laboratory Director  
J. Patrick Weaver

3/12/04  
\_\_\_\_\_  
Date

**Results for Total Petroleum Hydrocarbons  
by GC/FID**

Client Sample ID: HA-01 (0-1)  
Client Project ID: Helicopter Release  
Lab Sample ID: G128-1271-1  
Lab Project ID: G128-1271  
Report Basis: Dry Weight

Analyzed By: CLP  
Date Collected: 03/08/04  
Date Received: 03/08/04  
Matrix: Soil

Analyte	Result MG/KG	Report Limit MG/KG	Method	Dilution Factor	Date Analyzed
Gasoline Range Organics	BQL	6.87	5030	1	03/11/04
Diesel Range Organics	BQL	7.08	3550	1	03/10/04

Reviewed By: 

**Results for Total Petroleum Hydrocarbons  
by GC/FID**

Client Sample ID: HA-02 (0-1)  
 Client Project ID: Helicopter Release  
 Lab Sample ID: G128-1271-2  
 Lab Project ID: G128-1271  
 Report Basis: Dry Weight

Analyzed By: CLP  
 Date Collected: 03/08/04  
 Date Received: 03/08/04  
 Matrix: Soil

Analyte	Result MG/KG	Report Limit MG/KG	Method	Dilution Factor	Date Analyzed
Gasoline Range Organics	BQL	6.86	5030	1	03/11/04
Diesel Range Organics	22.8	6.97	3550	1	03/10/04

Reviewed By: 

**Results for Total Petroleum Hydrocarbons  
by GC/FID**

Client Sample ID: HA-03 (0-1)  
Client Project ID: Helicopter Release  
Lab Sample ID: G128-1271-3  
Lab Project ID: G128-1271  
Report Basis: Dry Weight

Analyzed By: CLP  
Date Collected: 03/08/04  
Date Received: 03/08/04  
Matrix: Soil

Analyte	Result MG/KG	Report Limit MG/KG	Method	Dilution Factor	Date Analyzed
Gasoline Range Organics	BQL	6.95	5030	1	03/11/04
Diesel Range Organics	13.7	7	3550	1	03/10/04

Reviewed By: 

**Results for Total Petroleum Hydrocarbons  
by GC/FID**

Client Sample ID: HA-04 (0-1)  
Client Project ID: Helicopter Release  
Lab Sample ID: G128-1271-4  
Lab Project ID: G128-1271  
Report Basis: Dry Weight

Analyzed By: CLP  
Date Collected: 03/08/04  
Date Received: 03/08/04  
Matrix: Soil

Analyte	Result MG/KG	Report Limit MG/KG	Method	Dilution Factor	Date Analyzed
Gasoline Range Organics	BQL	7.3	5030	1	03/11/04
Diesel Range Organics	201	7.35	3550	1	03/10/04

Reviewed By: 

**Results for Total Petroleum Hydrocarbons**  
by GC/FID

Client Sample ID: HA-05 (0-1)

Analyzed By: CLP

Client Project ID: Helicopter Release

Date Collected: 03/08/04

Lab Sample ID: G128-1271-5

Date Received: 03/08/04

Lab Project ID: G128-1271

Matrix: Soil

Report Basis: Dry Weight

Analyte	Result MG/KG	Report Limit MG/KG	Method	Dilution Factor	Date Analyzed
Gasoline Range Organics	BQL	6.58	5030	1	03/11/04
Diesel Range Organics	BQL	6.78	3550	1	03/10/04

Reviewed By: 

**Results for Total Petroleum Hydrocarbons**  
by GC/FID

Client Sample ID: HA-06 (0-1)  
Client Project ID: Helicopter Release  
Lab Sample ID: G128-1271-6  
Lab Project ID: G128-1271  
Report Basis: Dry Weight

Analyzed By: DCS  
Date Collected: 03/08/04  
Date Received: 03/08/04  
Matrix: Soil

Analyte	Result MG/KG	Report Limit MG/KG	Method	Dilution Factor	Date Analyzed
Gasoline Range Organics	10.6	6.8	5030	1	03/11/04
Diesel Range Organics	3520	347	3550	50	03/11/04


Reviewed By: 

**Results for Total Petroleum Hydrocarbons**  
by GC/FID

Client Sample ID: HA-07 (0-1)  
Client Project ID: Helicopter Release  
Lab Sample ID: G128-1271-7  
Lab Project ID: G128-1271  
Report Basis: Dry Weight

Analyzed By: CLP  
Date Collected: 03/08/04  
Date Received: 03/08/04  
Matrix: Soil

Analyte	Result MG/KG	Report Limit MG/KG	Method	Dilution Factor	Date Analyzed
Gasoline Range Organics	BQL	7.06	5030	1	03/11/04
Diesel Range Organics	27.5	7.39	3550	1	03/10/04

Reviewed By: 

**Results for Total Petroleum Hydrocarbons**  
by GC/FID

Client Sample ID: HA-08 (0-1)

Analyzed By: CLP

Client Project ID: Helicopter Release

Date Collected: 03/08/04

Lab Sample ID: G128-1271-8

Date Received: 03/08/04

Lab Project ID: G128-1271

Matrix: Soil

Report Basis: Dry Weight

Analyte	Result MG/KG	Report Limit MG/KG	Method	Dilution Factor	Date Analyzed
Gasoline Range Organics	BQL	6.77	5030	1	03/11/04
Diesel Range Organics	10.5	6.74	3550	1	03/10/04


Reviewed By: 

**Results for Total Petroleum Hydrocarbons**  
by GC/FID

Client Sample ID: HA-09 (0-1)  
Client Project ID: Helicopter Release  
Lab Sample ID: G128-1271-9  
Lab Project ID: G128-1271  
Report Basis: Dry Weight

Analyzed By: CLP  
Date Collected: 03/08/04  
Date Received: 03/08/04  
Matrix: Soil

Analyte	Result MG/KG	Report Limit MG/KG	Method	Dilution Factor	Date Analyzed
Gasoline Range Organics	BQL	7.4	5030	1	03/11/04
Diesel Range Organics	8.36	7.46	3550	1	03/10/04

Reviewed By: 

**Results for Total Petroleum Hydrocarbons**  
by GC/FID

Client Sample ID: HA-10 (0-1)

Analyzed By: CLP

Client Project ID: Helicopter Release

Date Collected: 03/08/04

Lab Sample ID: G128-1271-10

Date Received: 03/08/04

Lab Project ID: G128-1271

Matrix: Soil

Report Basis: Dry Weight

Analyte	Result MG/KG	Report Limit MG/KG	Method	Dilution Factor	Date Analyzed
Gasoline Range Organics	BQL	7.31	5030	1	03/11/04
Diesel Range Organics	8.08	7.49	3550	1	03/10/04

Reviewed By: 

**Results for Total Petroleum Hydrocarbons  
by GC/FID**

Client Sample ID: HA-11 (0-1)

Analyzed By: CLP

Client Project ID: Helicopter Release

Date Collected: 03/08/04

Lab Sample ID: G128-1271-11

Date Received: 03/08/04

Lab Project ID: G128-1271

Matrix: Soil

Report Basis: Dry Weight

Analyte	Result MG/KG	Report Limit MG/KG	Method	Dilution Factor	Date Analyzed
Gasoline Range Organics	BQL	7.15	5030	1	03/11/04
Diesel Range Organics	15.4	7.43	3550	1	03/10/04

Reviewed By: 

PARADIGM ANALYTICAL LABORATORIES, INC.

**Results for Total Petroleum Hydrocarbons**  
by GC/FID

Client Sample ID: HA-12 (0-1)

Analyzed By: CLP

Client Project ID: Helicopter Release

Date Collected: 03/08/04

Lab Sample ID: G128-1271-12

Date Received: 03/08/04

Lab Project ID: G128-1271

Matrix: Soil

Report Basis: Dry Weight

Analyte	Result MG/KG	Report Limit MG/KG	Method	Dilution Factor	Date Analyzed
Gasoline Range Organics	BQL	7.17	5030	1	03/11/04
Diesel Range Organics	13.6	7.22	3550	1	03/10/04

Reviewed By: 

List of Reporting Abbreviations  
and Data Qualifiers

B = Compound also detected in batch blank

BQL = Below Quantitation Limit

DF = Dilution Factor

Dup = Duplicate

E = Estimated concentration, exceeds calibration range.

J = Estimated concentration, below calibration range and above MDL

LCS(D) = Laboratory Control Spike (Duplicate)

MDL = Method Detection Limit

MS(D) = Matrix Spike (Duplicate)

PQL = Practical Quantitation Limit

RL = Reporting Limit

RPD = Relative Percent Difference

mg/kg = milligram per kilogram, ppm, parts per million

ug/kg = micrograms per kilogram, ppb, parts per billion

mg/L = milligram per liter, ppm, parts per million

ug/L = micrograms per liter, ppb, parts per billion

% Rec = Percent Recovery

% solids = Percent Solids

Special Notes:

- 1) Metals and mercury samples are digested with a hot block, see the standard operating procedure document for details.
- 2) Uncertainty for all reported data is less than or equal to 30 percent.

MI34.011404.1

**PARADIGM ANALYTICAL LABORATORIES, INC.**  
 5500 Business Drive, Wilmington, NC 28405  
 Phone: (910)-350-1903 FAX: (910)-350-1557

Chain-of Custody Record & Analytical Request

COC# 41659

Page 1 of 2

Client: Callie Eng 25Cin Project ID: Helicopter Release  
 Address: 200 Old Dixie Rd Contact: Mike E. Mason  
 Address: Wilmington NC 28405 Phone: 452-5861  
 Quote #: DD101 Fax: 452-7563

Date: 3-8-04  
 Turnaround: Std.  
 Job Number: 204-016  
 P.O. Number: 240308-6

Report To: Mike E. Mason  
Charles Ray  
 Invoice To: Wayne Corp  
Stark

Sample ID	Lot	QTY	Container	Matrix	Analysis	Result	Remarks
NA-01 (0-1)	5/8/04	0995	S	MEOH	5550	5050	
NA-02 (0-1)		0930			/	/	
NA-03 (0-1)		0935			/	/	
NA-04 (0-1)		0940			/	/	
NA-05 (0-1)		0945			/	/	
NA-06 (0-1)		0950			/	/	
NA-07 (0-1)		0955			/	/	
NA-08 (0-1)		1000			/	/	
NA-09 (0-1)		1005			/	/	
NA-10 (0-1)		1010			/	/	

G128-1271

- Summary EDD format  
 - Report & Lab Runs

Callie Eng  
 3/8/04 1505  
Judy Johnson

avg  
 5.8°C

NC \_\_\_ SC \_\_\_ Other \_\_\_  
 SEE REVERSE FOR  
 TERMS AND CONDITIONS

ORIGINAL



**PARADIGM ANALYTICAL LABORATORIES, INC.**

5500 Business Drive, Wilmington, NC 28405  
 Phone: (910)-350-1903 FAX: (910)-350-1557

Chain-of Custody Record & Analytical Request

COC# 41659

Page 1 of 2

Client: Collier Eng. LLC Project ID: Metropole Water Date: 3-8-04 Report To: Mike E. Wilson  
 Address: 270 Old Dairy Rd Contact: Mike E. Wilson Turnaround: 5HL Invoice To: Charles Ray  
 Address: Wilmington NC 28405 Phone: 457-5561 Job Number: 204-016  
 Quote #: DOD101 Fax: 252-7583 P.O. Number: 240308-6

Sample ID	Date	Time	Matrix	Preservatives		Analyses						Comments: Please specify any special reporting requirements		
				1	2	1	2	3	4	5	6		7	8
NA-01 (0-1)	3/8/04	0915	S	1	1	1	1	1	1	1	1	1	1	- Summary EDD format
NA-02 (0-1)		0930		1	1	1	1	1	1	1	1	1	1	- Report to Lab Pass
NA-03 (0-1)		0935		1	1	1	1	1	1	1	1	1	1	
NA-04 (0-1)		0940		1	1	1	1	1	1	1	1	1	1	
NA-05 (0-1)		0945		1	1	1	1	1	1	1	1	1	1	
NA-06 (0-1)		0950		1	1	1	1	1	1	1	1	1	1	
NA-07 (0-1)		0955		1	1	1	1	1	1	1	1	1	1	
NA-08 (0-1)		1000		1	1	1	1	1	1	1	1	1	1	
NA-09 (0-1)		1005		1	1	1	1	1	1	1	1	1	1	
NA-10 (0-1)		1010		1	1	1	1	1	1	1	1	1	1	
Relinquished By	Date	Time	Received By	Date	Time	Temperature	State Certification Requested							
<u>Collier Eng</u>	<u>3/8/04</u>	<u>1505</u>	<u>Mike E. Wilson</u>	<u>3/8/04</u>	<u>1505</u>	<u>ambient</u>	NC ___ SC ___ Other ___							
													SEE REVERSE FOR TERMS AND CONDITIONS	

CLIENT COPY



**PARADIGM ANALYTICAL LABORATORIES, INC.**

5500 Business Drive  
Wilmington, North Carolina 28405  
(910) 350-1903  
Fax (910) 350-1557

Mr. Mike E. Mason  
Richard Catlin & Associates  
P.O. Box 10279  
Wilmington NC 28404-0279

Report Number: G128-1296

Client Project: Helicopter Spill

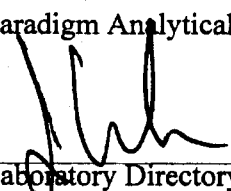
Dear Mr. Mason:

Enclosed are the results of the analytical services performed under the referenced project. The samples are certified to meet the requirements of the National Environmental Laboratory Accreditation Conference Standards. Copies of this report and supporting data will be retained in our files for a period of five years in the event they are required for future reference. Any samples submitted to our laboratory will be retained for a maximum of thirty (30) days from the date of this report unless other arrangements are requested.

If there are any questions about the report or the services performed during this project, please call Paradigm at (910) 350-1903. We will be happy to answer any questions or concerns which you may have.

Thank you for using Paradigm Analytical Labs for your analytical services. We look forward to working with you again on any additional analytical needs which you may have.

Sincerely,  
Paradigm Analytical Laboratories, Inc.

  
\_\_\_\_\_  
Laboratory Directory  
J. Patrick Weaver

4/28/04  
\_\_\_\_\_  
Date

PARADIGM ANALYTICAL LABORATORIES, INC.

**Results for Total Petroleum Hydrocarbons**  
by GC/FID

Client Sample ID: HA-13  
Client Project ID: Helicopter Spill  
Lab Sample ID: G128-1296-1  
Lab Project ID: G128-1296  
Report Basis: Dry Weight

Analyzed By: DCS  
Date Collected: 04/19/2004 14:05  
Date Received: 04/20/2004  
Matrix: Soil

Analyte	Result MG/KG	Report Limit MG/KG	Method	Dilution Factor	Date Analyzed
Gasoline Range Organics	BQL	7.24	5030	1	04/22/04
Diesel Range Organics	18.6	7.62	3550	1	04/26/04

Reviewed By: jsmc

PARADIGM ANALYTICAL LABORATORIES, INC.

**Results for Total Petroleum Hydrocarbons**  
by GC/FID

Client Sample ID: HA-14  
Client Project ID: Helicopter Spill  
Lab Sample ID: G128-1296-2  
Lab Project ID: G128-1296  
Report Basis: Dry Weight

Analyzed By: DCS  
Date Collected: 04/19/2004 14:10  
Date Received: 04/20/2004  
Matrix: Soil

Analyte	Result MG/KG	Report Limit MG/KG	Method	Dilution Factor	Date Analyzed
Gasoline Range Organics	BQL	6.27	5030	1	04/23/04
Diesel Range Organics	BQL	7.04	3550	1	04/26/04

Reviewed By: mmc

**Results for Total Petroleum Hydrocarbons**  
by GC/FID

Client Sample ID: HA-15  
Client Project ID: Helicopter Spill  
Lab Sample ID: G128-1296-3  
Lab Project ID: G128-1296  
Report Basis: Dry Weight

Analyzed By: DCS  
Date Collected: 04/19/2004 14:15  
Date Received: 04/20/2004  
Matrix: Soil

Analyte	Result MG/KG	Report Limit MG/KG	Method	Dilution Factor	Date Analyzed
Gasoline Range Organics	BQL	7.85	5030	1	04/23/04
Diesel Range Organics	21.5	8.09	3550	1	04/26/04

Reviewed By: rwc

**Results for Total Petroleum Hydrocarbons  
by GC/FID**

Client Sample ID: HA-16  
Client Project ID: Helicopter Spill  
Lab Sample ID: G128-1296-4  
Lab Project ID: G128-1296  
Report Basis: Dry Weight

Analyzed By: DCS  
Date Collected: 04/19/2004 14:20  
Date Received: 04/20/2004  
Matrix: Soil

Analyte	Result MG/KG	Report Limit MG/KG	Method	Dilution Factor	Date Analyzed
Gasoline Range Organics	167	27.4	5030	4	04/23/04
Diesel Range Organics	1330	72.3	3550	10	04/28/04

Reviewed By: mc

PARADIGM ANALYTICAL LABORATORIES, INC.

**Results for Total Petroleum Hydrocarbons**  
by GC/FID

Client Sample ID: HA-17  
Client Project ID: Helicopter Spill  
Lab Sample ID: G128-1296-5  
Lab Project ID: G128-1296  
Report Basis: Dry Weight

Analyzed By: DCS  
Date Collected: 04/19/2004 14:25  
Date Received: 04/20/2004  
Matrix: Soil

Analyte	Result MG/KG	Report Limit MG/KG	Method	Dilution Factor	Date Analyzed
Gasoline Range Organics	1170	143	5030	20	04/23/04
Diesel Range Organics	11500	729	3550	100	04/28/04

Reviewed By: 

List of Reporting Abbreviations  
and Data Qualifiers

B = Compound also detected in batch blank  
BQL = Below Quantitation Limit  
DF = Dilution Factor  
Dup = Duplicate  
E = Estimated concentration, exceeds calibration range.  
J = Estimated concentration, below calibration range and above MDL  
LCS(D) = Laboratory Control Spike (Duplicate)  
MDL = Method Detection Limit  
MS(D) = Matrix Spike (Duplicate)  
PQL = Practical Quantitation Limit  
RL = Reporting Limit  
RPD = Relative Percent Difference  
mg/kg = milligram per kilogram, ppm, parts per million  
ug/kg = micrograms per kilogram, ppb, parts per billion  
mg/L = milligram per liter, ppm, parts per million  
ug/L = micrograms per liter, ppb, parts per billion  
% Rec = Percent Recovery  
% solids = Percent Solids

Special Notes:

- 1) Metals and mercury samples are digested with a hot block, see the standard operating procedure document for details.
- 2) Uncertainty for all reported data is less than or equal to 30 percent.



**PARADIGM ANALYTICAL LABORATORIES, INC.**

5500 Business Drive, Wilmington, NC 28405  
 Phone: (910)-350-1903 FAX: (910)-350-1557

Chain-of-Custody Record & Analytical Request

COC# 40234

Page 1 of 1

Client: Cottis Exp. & Sec. Project ID: Helicopters Spill Date: 4-20-04 Report To: Mike G. Moore  
 Address: 220 Old Dairy Rd. Contact: Mike G. Moore Turnaround: Std. Job Number: 204-016  
 Address: Wilmington NC 28405 Phone: 910-5861 P.O. Number: \_\_\_\_\_ Invoice To: Stark  
 Quote #: \_\_\_\_\_ Fax: \_\_\_\_\_

Sample ID	Date	Time	Matrix	Preservatives		Analyses						Comments: Please specify any special reporting requirements			
				1	2	1	2	3	4	5	6		7	8	
HA-13	4/19/04	1405	S	1	1	5878	5550								- Summary EDD Format
HA-14		1410		1	1										- Report for Ross
HA-15		1415		1	1										
HA-16		1420		1	1										
HA-17		1425		1	1										

Relinquished By	Date	Time	Received By	Date	Time	Temperature	State Certification Requested
<u>[Signature]</u>	4/20/04	1810	<u>[Signature]</u>	4/20/04	1110	NC	NC _____ SC _____ Other _____

SEE REVERSE FOR TERMS AND CONDITIONS

CLIENT COPY

**APPENDIX E**  
**SAMPLING FIELD DATA WORKSHEET**

**SAMPLING FIELD DATA WORKSHEET**

**2004 HELICOPTER RELEASE**

**MARINE CORPS AIR STATION  
NEW RIVER, NORTH CAROLINA**

<i>Well No.</i>	<i>Date</i>	<i>Time Sampled</i>	<i>Diameter (in.)</i>	<i>Well Depth (feet)</i>	<i>DTW (feet)</i>	<i>Feet of Water in Well</i>	<i>Gal/Foot</i>	<i>One Volume (gals.)</i>	<i>Three Volumes (gals.)</i>	<i>Volume of Bailer (gals.)</i>	<i>No. Bails Required</i>	<i>No. Bails Taken</i>	<i>Volume Removed (gals.)</i>
ASTDELTAT-MW01	3/15/2005	10:20	2	12.5	4.05	8.45	0.163	1.38	4.13	0.24	17.22	Pumped	12
ASTDELTAT-MW02	3/15/2005	9:45	2	12.5	1.93	10.57	0.163	1.72	5.17	0.24	21.54	Pumped	15
ASTDELTAT-MW03	3/15/2005	11:15	2	12.5	3.9	8.6	0.163	1.40	4.21	0.24	17.52	Pumped	12
ASTDELTAT-MW04	3/15/2005	10:40	2	12.5	3.76	8.74	0.163	1.42	4.27	0.24	17.81	Pumped	12
ASTDELTAT-MW05	3/15/2005	11:00	2	40	5.42	34.58	0.163	5.64	16.91	0.24	70.46	Pumped	25