Preliminary Site Assessment Report
Fast Fare Markets of NC, Inc. Property

Parcel 205
Durham
Durham County, North Carolina

H&H Job No. ROW-416
State Project U-0071
WBS Element #34745.1.1
August 15, 2013

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Preliminary Site Assessment Report
Fast Fare Markets of NC, Inc. Property Parcel #205
Durham, Durham County, North Carolina
H&H Project ROW-416

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Durham, Durham County, North Carolina
H&H Project ROW-416

1.0 Introduction

Hart & Hickman, PC (H&H) has prepared this Preliminary Site Assessment (PSA) report documenting assessment activities performed at the Fast Fare Markets of NC, Inc. property (Parcel 205) located at 1001 S. Miami Blvd in Durham, Durham County, North Carolina. This assessment was conducted on behalf of the North Carolina Department of Transportation (DOT) in accordance with H&H's May 8, 2013 proposal.

The purpose of this assessment was to collect data to evaluate the potential for underground storage tank (UST) systems and the presence or absence of impacted soil in proposed right-of-way and construction easement areas on the subject property related to the proposed widening of US Highway 70 (State Project U-0071). The Parcel 205 property currently operates as the Han-Dee Hugo's 76 convenience store and gas station. A site location map is included as Figure 1, and a site map is presented as Figure 2. The NC DOT preliminary plan for the proposed road widening near the Parcel 205 property is attached as Appendix A.

H&H reviewed UST incident files for the Parcel 205 property at the NC Department of Environment and Natural Resources (DENR) Raleigh and Central Offices to better target UST system areas and to find locations of previously reported environmental impacts. Based on the ATEC Environmental Consultants (ATEC) report for Crown Central Station NC-567, dated February 7, 1991, two 5,000-gallon gasoline USTs, one 6,000-gallon gasoline UST, and one 8,000-gallon gasoline UST were removed from the Parcel 205 property in January 1991. The four USTs were located outside of the NC DOT proposed right-of-way and construction easement areas near the center of the Parcel 205 property. Low level petroleum constituents were detected above the DENR target screening levels in one soil sample collected beneath the USTs. Impacted soil was excavated to the top of weathered bedrock, approximately 13 ft below ground surface (bgs). In

addition, petroleum sheen was observed on the top of groundwater that was perched in the UST basin.

According to ATEC *Comprehensive Site Assessment (CSA) Report*, dated 1992, four monitoring wells were installed around the USTs in August 1990 (prior to UST closure activities) to determine the potential for a release from the UST system. Groundwater samples collected from the monitoring wells confirmed a petroleum release at the site. As mention above, the UST system was subsequently removed in January 1991. Based on the CSA, assessment activities have included the installation of monitoring wells MW-1 though MW-15 and MW-2A and MW-4A to assess groundwater impacts related to the petroleum release at the site. Free product was initially detected in monitoring well MW-10 in January 1992. According to ATEC CSA addendum, two additional off-site monitoring wells (MW-16 and MW-17) were installed in June 1992 to delineate impacted groundwater to the north of site.

ATEC prepared a Corrective Action Plan (CAP) with recommendations for an active groundwater pump and treat system to address the free product and petroleum impacted groundwater at the site. According to the Excel Civil & Environmental Associates, PLLC (ECEA), *Active Remediation Monitoring Report (ARMR)*, dated January 18, 2013, an active remediation system has been operating at the site since March 2003, with enhancement modifications completed in February 2012. The remediation system utilizes a multiple technology approach including groundwater pump and treat recovery wells (RW-1 and RW-2), air sparging (AS) wells, and soil vapor extraction (SVE) wells. A map depicting the AS wells, SVE wells, and associated trenching was not available for review. Impacted groundwater is located beneath the northern portion of the subject property and extends to the north beyond Pleasant Road. Based on the ARMR, additional monitoring wells (MW-18 through MW-24 and VEW-1) were installed on Parcel 205 and other off-site properties.

Based on Figure 2 from ECEA ARMR, monitoring wells MW-7, MW-10, MW-13, MW-19, MW-20, and recovery well (RW-1) are located within the NC DOT proposed construction easement area on the northern portion of the subject property. H&H observed additional AS and SVE well vaults and associated trenching within the proposed NC DOT construction easement near RW-1. The

remediation system shed is located outside of the NC DOT construction easement area. Off-site monitoring wells MW-11, MW-16R, MW-21, MW-22, and recovery well RW-2 are also located within the NC DOT proposed right-of-way and construction easement areas to the north of the site on Parcels 202, 400 and 402. Pertinent information from the DENR files is included in Appendix B.

The PSA activities conducted by H&H in the NC DOT proposed right-of-way and construction easement areas on the Parcel 205 property are discussed below.

2.0 Site Assessment

Soil Assessment Field Activities

H&H mobilized to the Parcel 205 property on July 9, 2013 and advanced seven soil borings (205-1 through 205-7) by direct push technology (DPT). Prior to advancing the soil borings, H&H reviewed the results of a geophysical survey performed at the subject site by Schnabel Engineering (Schnabel) in May and June 2013. Schnabel utilized electromagnetic (EM) induction technology and ground penetrating radar (GPR) to identify potential geophysical anomalies and potential USTs at the site. The EM results indicated the presence of several metallic objects on the surface (e.g. signs, surface metal, etc.); however, follow up with GPR did not indicate the presence of USTs. Based on the Schnabel EM and GPR results, no potential USTs were identified in the survey area. Schnabel's report, including a site map depicting the results of the EM and GPR survey, is provided in Appendix C.

Prior to advancing the soil borings, utilities were marked by NC One Call and a private utility locator. Borings were also cleared to a five ft depth by hand auger. H&H utilized Probe Technology, Inc. (PTI) of Concord, North Carolina to advance the soil borings (Figure 2). During soil sampling activities, H&H attempted to advance all borings to a total depth of 12 ft bgs. DPT refusal was encountered at depths ranging from 4 ft bgs to 9 ft bgs in soil borings 205-2 through 205-7. To facilitate the selection of soil samples for laboratory analysis, soil from each boring was screened continuously for the presence of volatile organic compounds (VOCs) with an organic vapor analyzer (OVA). Additionally, H&H observed the soil for visual and

olfactory indications of petroleum impacts. During field screening, there were moderate indications of potential impacts in soil boring 205-2 and low level indications of potential impacts in soil boring 205-4. There were no significant field indications of potential impacts in the remaining soil borings. Soil samples were collected at depths ranging from 0 to 1 ft bgs to 7 ft to 8 ft bgs. Soil boring logs are included in Appendix D.

Soil borings 205-1 and 205-2 were advanced north of the former UST basin in the asphalt driveway area in the northeast portion of the site. Soil borings 205-3 through 205-6 were advanced in the asphalt driveway and parking areas in the northern and western portions of the site. Soil boring 205-7 was advanced in the asphalt driveway area downgradient of the active UST system in the southwest portion of the site. GPS coordinate data for soil borings and monitoring wells are included in Table 1.

H&H submitted a total of seven soil samples (205-1 through 205-7) for laboratory analysis. Samples were sent to Pace Analytical Services, Inc. of Huntersville, NC using standard chain-of-custody protocol for analysis of total petroleum hydrocarbons (TPH) as gasoline-range organics (GRO) and diesel-range organics (DRO) by EPA Method 8015. Sample depths and analytical results are summarized in Table 2. Laboratory analytical data sheets for the Parcel 205 soil samples and chain-of-custody documentation are provided in Appendix E. The analytical results are discussed below.

3.0 Analytical Results

Widespread TPH impacts were detected within the proposed right-of-way and construction easement areas of Parcel 205. TPH was detected in five soil samples collected from Parcel 205. Concentrations of TPH DRO (up to 189 mg/kg) were detected in soil samples 205-2 through 205-4, 205-6, and 205-7 above the DENR Action Level of 10 mg/kg. TPH GRO (8.9 mg/kg) was detected in soil sample 205-2 below the DENR Action Level of 10 mg/kg. The TPH DRO reporting limit (290 mg/kg) for soil sample 205-1 was elevated due to non-target analytes and other matrix interference. Based on subsequent laboratory review of the sample chromatograph, the laboratory indicated that there was a potential presence of TPH-DRO; however, the concentration could not be

quantified. Based on the potential presence of TPH DRO and the elevated reporting limit, soil sample 205-1 is also considered to be impacted.

TPH DRO and GRO impacted soil is located beneath the asphalt driveway area to the north of the former UST basin in the northeast portion of the property and TPH DRO impacted soil is located beneath the asphalt driveway and parking areas in the northwest and southwest portions of the property.

- H&H estimates that there are roughly 600 cubic yards (900 tons) of petroleum impacted soil between the surface and 9 ft to the north of the former UST basin near soil borings 205-1 and 205-2 and roughly 300 cubic yards (450 tons) of petroleum impacted soil between the surface and 4 ft beneath the asphalt driveway area near borings 205-3 and 205-4.

- H&H estimates that there are roughly 400 cubic yards (600 tons) of petroleum impacted soil between the surface and 4 ft beneath the asphalt driveway and parking areas near soil borings 205-6 and 205-7.

The estimated depth of impacted soils is based on field screening results. However, field screening and lab results did not provide information that fully defines the impacted soil interval or extent. Therefore, impacts may extend beyond the depths and amounts indicated above. The approximate areas of petroleum impacted soils are shown on Figure 2.

4.0 Summary and Regulatory Considerations

H&H has reviewed DENR incident files, geophysical survey results, and analytical results of soil samples collected at the Parcel 205 property. Review of DENR files indicate that two 5,000-gallon gasoline USTs, one 6,000-gallon gasoline UST, and one 8,000-gallon gasoline UST were removed from Parcel 205 in January 1991. Groundwater impacts and free product were identified in the northern portion of the subject property during previous site assessment activities. Impacted groundwater extends off site to the north beyond Pleasant Road. An active remediation system has been operating at the Parcel 205 property since March 2003. Monitoring wells, remediation system

wells, and/or associated trenching were identified within the NC DOT construction easement on the subject property and adjacent properties to the north. Based on GPR survey, no potential USTs were identified within the proposed NC DOT right of way and construction easement areas on Parcel 205.

Widespread TPH impacts were detected on Parcel 205. Analytical results of soil samples collected by H&H indicate TPH DRO above the DENR Action Level in 5 of 7 soil samples collected on Parcel 205. Elevated reporting limits indicate potential TPH DRO impacts in one other soil sample collected on Parcel 205.

- H&H estimates that there are roughly 600 cubic yards (900 tons) of petroleum impacted soil between the surface and 9 ft to the north of the former UST basin near soil borings 205-1 and 205-2 and roughly 300 cubic yards (450 tons) of petroleum impacted soil between the surface and 4 ft beneath the asphalt driveway area near borings 205-3 and 205-4.

- H&H estimates that there are roughly 400 cubic yards (600 tons) of petroleum impacted soil between the surface and 4 ft beneath the asphalt driveway and parking areas near soil borings 205-6 and 205-7.

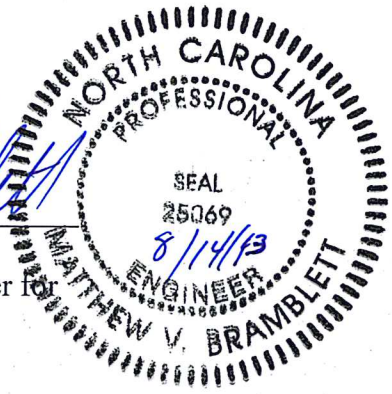
H&H estimates there are a total of 1,300 cubic yards of impacted soil on the Parcel 205 property. NC DOT plans indicate proposed cut and fill in proposed NC DOT work areas. Impacted soil that is removed during road construction activities should be properly managed and disposed at a permitted facility. Remediation system wells, system trenching, and monitoring wells located in NC DOT proposed work areas should be removed and/or properly abandoned prior to road construction activities.

5.0 Signature Page

This report was prepared by:

Jeff Albano
Project Geologist for
Hart and Hickman, PC

This report was reviewed by:



Matt Bramblett, PE
Principal and Project Manager for
Hart and Hickman, PC

Table 1
Soil Boring GPS Coordinate Data
Fast Fare Markets of NC, Inc. Property (Parcel 205)
Durham, Durham County, North Carolina
H&H Job No. ROW-416

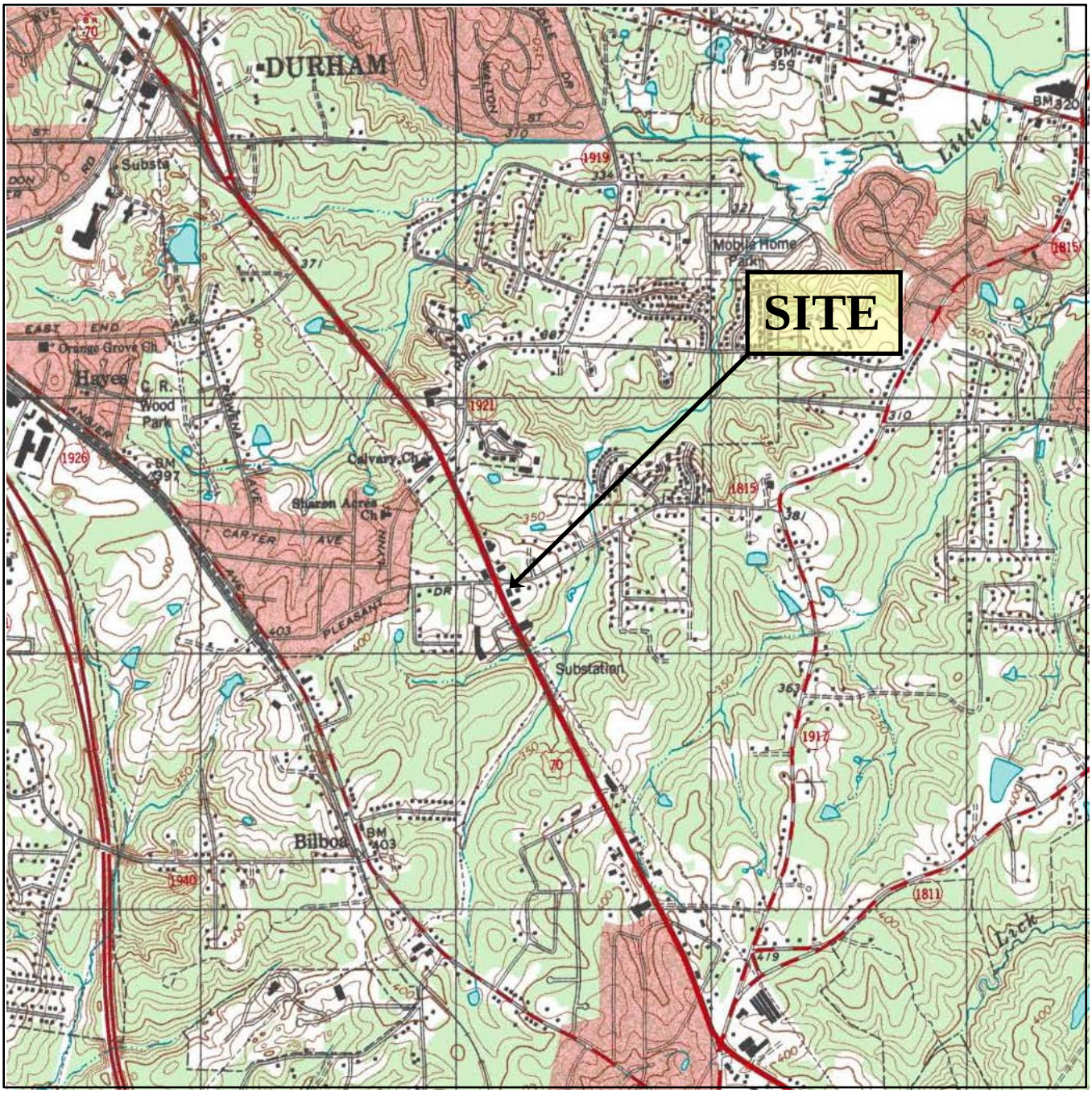
Sample ID	Latitude	Longitude
205-1	35.965538008	-78.846013721
205-2	35.965462760	-78.846122908
205-3	35.965446747	-78.846257617
205-4	35.965431857	-78.846362919
205-5	35.965284031	-78.846448531
205-6	35.965134628	-78.846374836
205-7	35.964974628	-78.846291276

Notes:
GPS coordinate data points collected using a Trimble GeoExplorer 6000 series unit with external satellite for increased accuracy.

Table 2
Soil Analytical Results
Fast Fare Markets of NC, Inc. Property (Parcel 205)
Durham, Durham County, North Carolina
H&H Job No. ROW-416

Sample ID	205-1	205-2	205-3	205-4	205-5	205-6	205-7	**Regulatory Standard**
Sample Depth (ft)	0-1	7-8	0-1	0-1	0-1	0-1	0-1	
Sample Date	7/9/2013	7/9/2013	7/9/2013	7/9/2013	7/9/2013	7/9/2013	7/9/2013	
TPH-DRO/GRO (8015) (mg/kg)								**NCDENR Action Level (mg/kg)**
Diesel-Range Organics (DRO)	<290*	**15**	**68.8**	**65.2**	<5.4	**189**	**58.7**	10
Gasoline-Range Organics (GRO)	<5.7	8.9	<6.0	<6.1	<5.5	<5.4	<5.7	10

Notes:
EPA Method follows parameter in parenthesis
TPH = total petroleum hydrocarbons
Bold indicates above DENR Action Level.
* High laboratory reporting limit due to presence of non-target analytes or other matrix interference.



N

APPROXIMATE

0 2000 4000

SCALE IN FEET

U.S.G.S. QUADRANGLE MAP

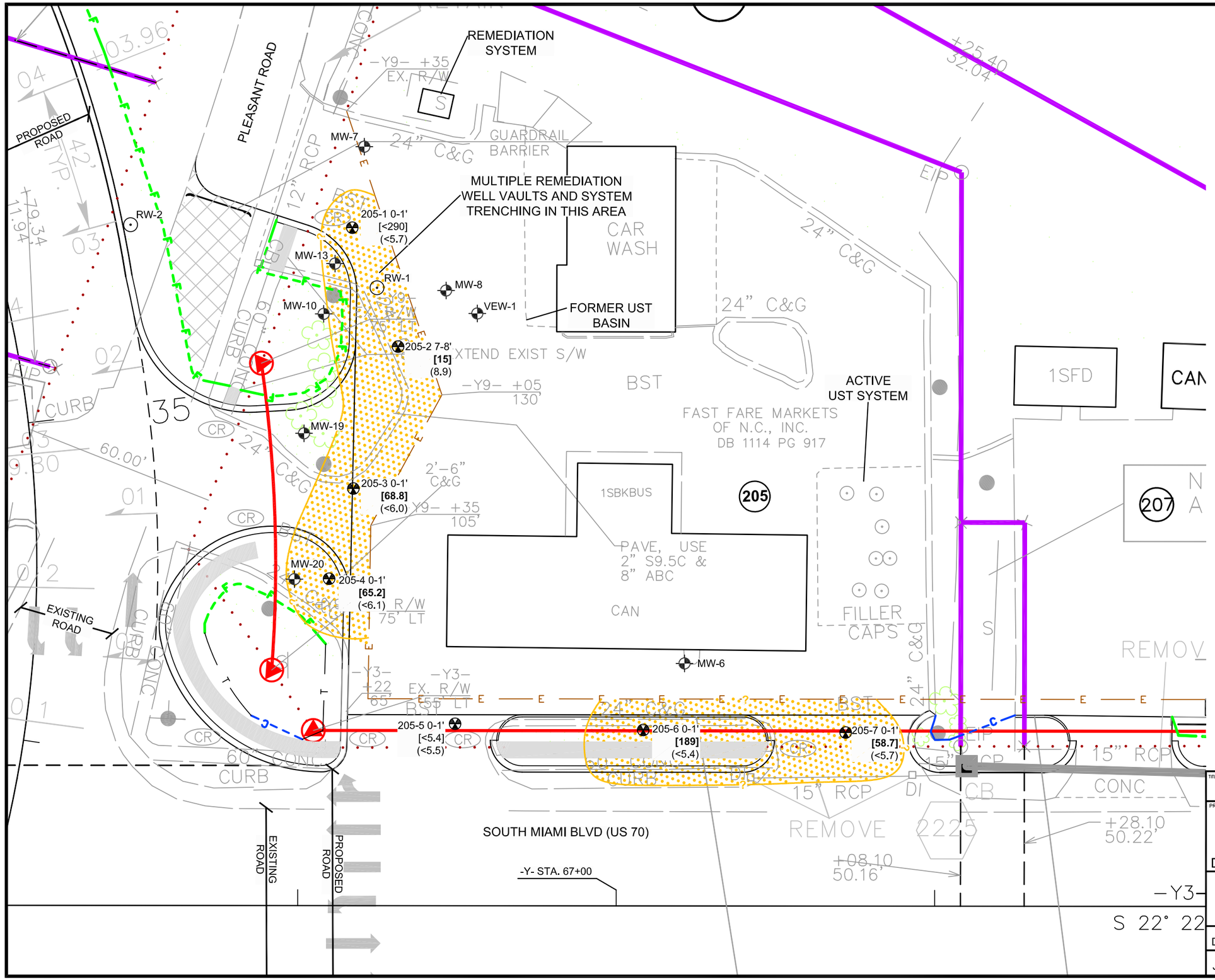
SOUTHEAST DURHAM, NORTH CAROLINA 2002

QUADRANGLE
7.5 MINUTE SERIES (TOPOGRAPHIC)

TITLE	**SITE LOCATION MAP**
PROJECT	FAST FARE MARKETS OF NC, INC. PROPERTY PARCEL 205 1001 S. MIAMI BLVD, DURHAM, NC

hart hickman
SMARTER ENVIRONMENTAL SOLUTIONS
2923 South Tryon Street-Suite 100
Charlotte, North Carolina 28203
704-586-0007 (p) 704-586-0373 (f)

DATE:	7-8-2013	REVISION NO:	0
JOB NO:	ROW-416	FIGURE:	1



TITLE: SITE MAP AND SOIL ANALYTICAL RESULTS

PROJECT: FAST FARE MARKETS OF NC, INC. PROPERTY
PARCEL 205
1001 SOUTH MIAMI BLVD
DURHAM, DURHAM COUNTY, NORTH CAROLINA

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704-586-0007(p) 704-586-0373(f)
License # C-1269 / #C-245 Geology

DATE: 8-8-13 | REVISION NO. 0

JOB NO. ROW-416 | FIGURE NO. 2

Appendix A

NC DOT Preliminary Plan

-Y9- +35
EX. R/W
GUARDRAIL
24" C&G
BARRIER
36'DR.
BST
CR
20'R
(AATFI)
-Y9-
EX. R/W
75' LT
CAR
WASH
24" C&G
EXTEND EXIST S/W
-Y9- +05
130'
BST
FAST FARE MARKETS
OF N.C., INC.
DB 1114 PG 917
2'-6"
C&G
-Y9- +35
105'
ISBKBUS
205
PAVE. USE
2" S9.5C &
8" ABC
CAN
-Y9-
EX. R/W
75' LT
-Y3-
+22
65'
-Y3-
EX. R/W
55' LT
FILLER
CAPS
208
N 00°56'25" W
191.68'
S 67°48" W
286.21'
+25.40
32.04'
N 67°39'05" E
110.00'
ISFD
CAN
S 22°20'55" E
20.00'
207
NAB
ADV
DE
N 67°39'05" E
70.36'
S 67°39'05" W
70.30'
REMOVE
30' DR.
(CONC.)
-Y3-
60'
24" C&G
BST
42'DR.
8'R
8'R CONC
15" RCP
CB
2225
+08.10
50.16'
+28.10
50.22'
-Y3-
S 22° 22' 24.
+79.34
11.94'
42'
TYP.
03
02
16'
35'R
35'
20'R
36'DR.
35'R
20'R
12' 12' 12'
4'
10'R
12"
12" RCP
F
24" C&G
20'R
50'R
C
60" CONC
CURB
6'R
45'DR.
8'R
60" CONC
CURB
8'R
12'
12'
12'
12'
12'
12'
12'
8'R
15" RCP
REMOVE
DI
CB
2225
8'R CONC
15" RCP
8"
+08.10
50.16'
+28.10
50.22'
-Y3-
S 22° 22' 24.
(AATFI)
2'R
Y2-211
'27-A211
END
60.00'
OMH
CURB
CONC
57'
754
SS
W
E

Appendix B

DENR Incident Files

CROWN CENTRAL STATION NC-567
1001 SOUTH MIAMI BOULEVARD
DURHAM, NORTH CAROLINA
ATEC PROJECT NO. 35-08449
FEBRUARY 7, 1991

1.0 INTRODUCTION

1.1 Purpose

The primary objective of this report is to complete an environmental site assessment pertaining to the permanent closure of two (2) 5,000 gallon, one (1) 6,000 gallon and one (1) 8,000 gallon underground storage tank (USTs) at the above referenced facility. All UST's were steel constructed and contained various grades of unleaded gasoline.

1.2 Scope

The scope of studies included but not limited to supervision of UST removal by others, soil screening, photodocumentation, soil sampling and analysis and report preparation. ATEC established and performed a sampling program to determine if there was any petroleum hydrocarbon contamination in the soils within each tank pit. The closure activities were conducted as outlined in Part II 40 CFR, subpart 280.72 and 280.74, Underground Storage Tanks; technical requirements and state of North Carolina Regulations 15A NCAC 2N section .0802, .0803 and .0805.

1.3 Authorization

The investigation was authorized by Mr. Richard Garvine of Crown Central Petroleum Corporation using Crown's P.O. Number 0-384 dated December 18, 1990.

1.4 Background Information

Crown Central Petroleum Corporation (Crown) contacted ATEC Environmental Consultants (ATEC) to supervise the excavation and removal of two 5,000 gallon, one 6,000 and one 8,000 gallon (USTs), at one of its facilities located at 1001 South Miami Boulevard in Durham, North Carolina. A vicinity map and site map of the project site can be found in Appendix A. The UST system was used as a product distribution network for fueling vehicles and for bulk storage. All soil samples were collected in accordance with U.S. Environmental Protection Agency (U.S. EPA) protocols as described in "Test Methods for Evaluations Solid Waste-Physical/Chemical Methods" (SW-846), 3rd Edition.

The following sections describe the work procedures performed on this UST closure project with respect to the removal and excavation of the USTs and the environmental assessment for each tank pit.

2.0 INVESTIGATIVE PROCEDURES

An ATEC representative arrived at the project site on January 17, 1991 to initiate the field activities. Prior to the initiation of the closure procedures all product and sludge in the USTs were removed by Jones and Frank, Inc. of Raleigh, North Carolina. The excavation and removal procedures were performed by Jones & Frank and supervised by ATEC. After removal, the tanks were delivered to the Safeway Disposal facility in Kernersville, NC, where they were decontaminated and destroyed. The paper manifest may be obtained from Safeway Disposal Incorporated (SDI).

Each UST was visually inspected prior to disposal. All tanks were found to be in above average conditions. The USTs were then removed and secured on a flatbed trailer for transport to the disposal facility referenced earlier. The UST identification numbers could not be determined due to rust.

During excavation procedures, samples of the excavated soil were screened intermittently for petroleum vapors. The screening of the soils was based on visual inspection and the emission of petroleum hydrocarbon vapors associated with gasoline fuel. Petroleum vapors were measured with an HNU portable system photoionization detector (PID). Once the USTs were uncovered, the base depths of the USTs were measured which ranged between 8.0 to 10.0 feet below grade. All tanks were removed from the excavation pit and a field screening of the soil beneath each UST was conducted. PID readings indicated the presence of petroleum vapors above the DEM's action level of 10 ppm. During the removal process pooling perched groundwater with a gasoline sheen was noted. Excavation of additional soil was continued to 13.0 feet below grade. It was noted that perched groundwater was confined to the area immediately beneath the USTs. Additional weathered rock encountered at a depth of 13 feet. Excavation of soils were halted at this depth.

3.0 SUBSURFACE SOIL INVESTIGATION

After excavation and tank removal procedures were completed, ten soil samples were collected from the tank pit. Soil sample locations were selected to establish the worst case scenario and can be found in Appendix B. Eight soil samples were collected from the excavation pit, one from each end of each tank. Two additional soil samples were collected each one from the center of each UST which was 20.0 feet or longer (i.e. tanks with capacities of 6,000 and 8,000 gallons). All samples were collected from natural soils from beneath the base of each tank and not from the UST backfill material. Duplicate samples were taken. One sample was immediately screened in the field with the PID and the other was retained in an EPA-approved

container and placed on ice. Field screening results are summarized below in Table 1.

TABLE I
PID SCREENING RESULTS
JANUARY 17, 1991

	SAMPLE I.D.	SAMPLE DEPTH	TPH (PPM)
(TANK #1)	S1	13.0	9.0
	S2A	13.0	8.5
	S2B	13.0	8.0
(TANK #2)	S3	13.0	9.5
	S4	13.0	7.5
(Tank #3)	S5	13.0	8.9
	S6	13.0	8.5
(Tank #4)	S7	13.0	9.7
	S8	13.0	20.8
	S9	13.0	7.8

* PPM = Part Per Million

A total of ten soil samples were shipped to ATEC's analytical laboratories in Georgia. All soil samples were analyzed in the laboratory for the presence of total petroleum hydrocarbons (TPH) by EPA modified method 8015, (Purge and Trap). The analytical results can be found in Appendix C and are also summarized in Table II below:

TABLE II
FEBRUARY 23, 1991

SAMPLE LOCATION	SAMPLE I.D.	TPH (PPM)	RANGE
Tank #1	S#1	ND	Gasoline
	S#2A	ND	Gasoline
	S#2B	ND	Gasoline
Tank #2	S#3	ND	Gasoline
	S#4	ND	Gasoline
Tank #3	S#5	ND	Gasoline
	S#6	ND	Gasoline
Tank #4	S#7	ND	Gasoline
	S#8	14.7	Gasoline
	S#9	ND	Gasoline

ND - NONE DETECTED
Detection Limit 5 ppm

Approximately 200 tons of contaminated soil was stockpiled on site in accordance with DEM guidelines. Composite soil samples were collected from the stockpile and analyzed for volatile organic compounds and PCB's using SW 846 Method 8240 and SW 846 Method 8080 respectively. Laboratory analyses are included in Appendix D.

A site sensitivity evaluation (SSE) was conducted per Crown Central Petroleum's request to determine the sensitivity of groundwater to contamination by the release of petroleum related substance from vadose zone (see Appendix E). The"in-situ" soil clean-up levels, based on total petroleum hydrocarbons (TPH), is determined by the SSE score. Higher SSE score implies Lower cleanup levels of soil and vice versa. However, proposed clean-up levels based on SSE scores must be approved by the DEM office. Remedial activities are not required on soil exhibiting TPH levels of <10 ppm. However, the sensitivity evaluation is applicable only to sites where remaining "in-situ" soils contain between 10 and 85 ppm TPH and meet the following

criteria:

1) Contaminated Soils are located $\geq$ 5 feet from the seasonal high water table or top of bedrock and groundwater is free of contamination.

2) Soil does not create a human exposure pathway via ingestion, absorption or inhalation.

The site sensitivity score is 29, but does not apply to this site since groundwater sample indicated elevated contamination levels which are above the DEM, action levels.

4.0 CONCLUSIONS

Based on the field activities, observations, analytical results and data analysis, ATEC concludes the following.

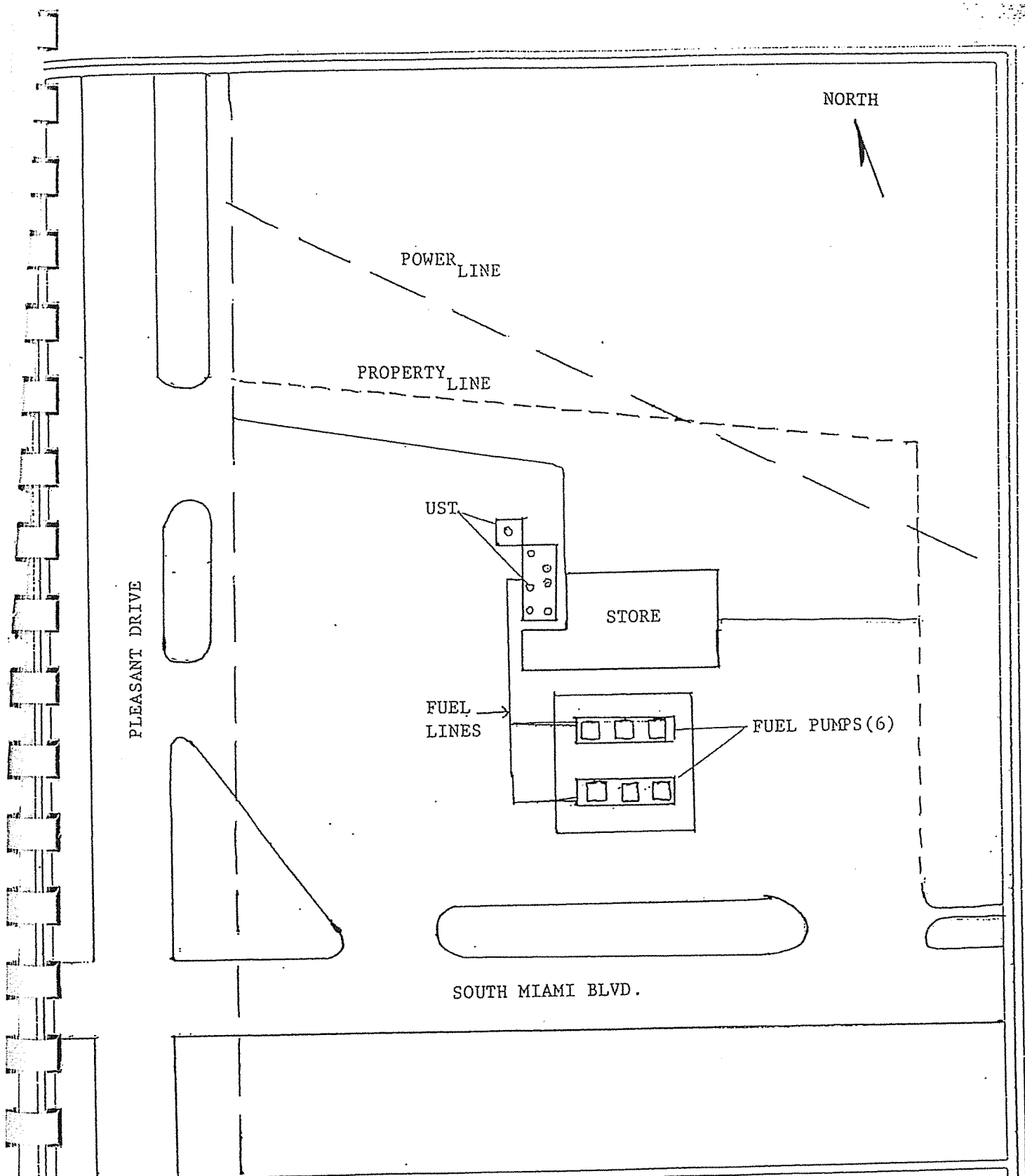
1. Perched groundwater conditions were observed in the tank excavation.

2. No free floating product was observed on the perched groundwater except a slight sheen.

3. Excavation was halted at 13 feet below grade due to encountering weathered rock.

4. The soils at the project site are impacted by hydrocarbon contamination at levels exceeding the DEM guidelines of 10.0 ppm. However, the levels observed are minor (i.e. 14.7 ppm) and are limited to one location only (i.e. near the sample location designated as tank #4).

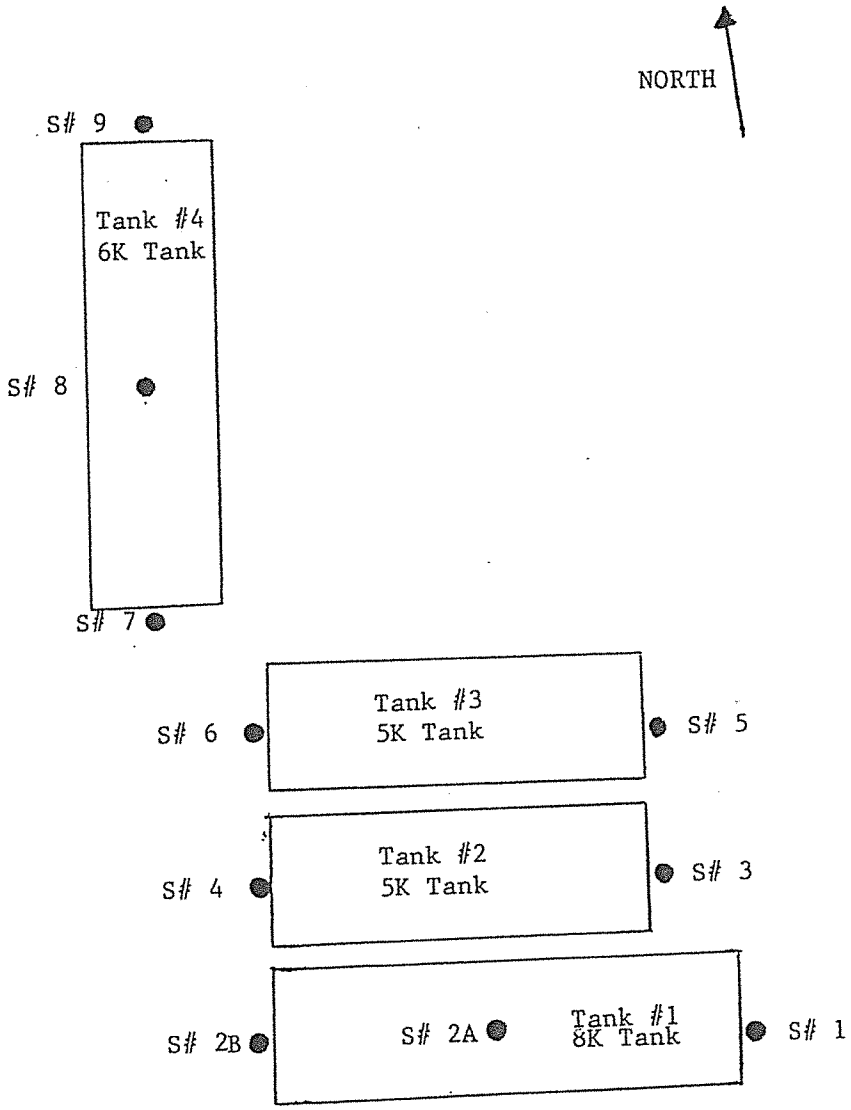
5. Composite samples which were collected from the stockpile soil indicated high levels of TPH (i.e. 293 ppm) but did not indicate presence of any TCLP metals above the active levels.



SITE MAP FOR CROWN CENTRAL STATION
N.C.#567
1001 SOUTH MIAMI BLVD.
DURHAM, NORTH CAROLINA

ATEC Associates, Inc.
of North Carolina
6614 Davis Circle
Raleigh, North Carolina 27613
(919) 782-2832 Raleigh
(919) 781-7558 FAX

SCALE:	DRAWN BY:	CHECKED BY:	DATE:	PROJECT NO.	DRAWING NO.
1"=15'	JSJ	BS	7/9/90	35-08449	NA



SOIL SAMPLE LOCATION
CROWN CENTRAL
NC 567
1001 South Miami Blvd.
Durham N.C.

ATEC Environmental Consultants
Division of ATEC Associates, Inc.
6614 Davis Circle
Raleigh, North Carolina 27613
(919) 782-2832 Raleigh
(919) 781-7558 FAX

SCALE:	DRAWN BY:	CHECKED BY:	DATE:	PROJECT NO.	FIGURE NO.
1"=10'	JTG		1/31/91	35-08449	

Rec'd
3-6-92
@ RRO

Comprehensive Site Assessment
Crown NC-567
Ground Water Incident No. 6684
Durham, North Carolina
ATEC Project No. 35-17234

ATEC ENVIRONMENTAL CONSULTANTS
6814 Davis Circle
Raleigh, North Carolina 27613
(919) 782-2832 Fax: (919) 781-7558

1.0 INTRODUCTION

In May 1990 Crown Central Petroleum Corporation (Crown) contracted ATEC Environmental Consultants (ATEC), to investigate subsurface conditions at Crown NC-567 facility located at 1001 South Miami Boulevard, Durham, North Carolina. The initial subsurface investigation began with installation of four monitoring wells to evaluate petroleum hydrocarbons in the ground water. Based on the results of this investigation, Crown authorized ATEC to document the removal and closure of four underground storage tanks (UST's). ATEC supervised the removal of two 5,000 gallon, one 6,000 gallon and one 8,000 gallon UST from the facility. A report summarizing tank closure activities was submitted to the North Carolina Division of Environmental Management (DEM) in April 1991.

In June 1991, the DEM issued Crown a Notification of Corrective Action Requirements to perform a comprehensive site assessment (CSA) and corrective action plan (CAP). Since the Notification, ATEC has installed a total of 17 monitoring wells. These wells are used to collect ground water samples, evaluate free product, and establish the flow in the surficial aquifer across the site.

The following report presents our procedures, findings, conclusions and recommendations. This report provides the basic tasks and elements that are required by the DEM for a CSA.

1.1 Purpose

The purpose of this investigation was to characterize the extent of petroleum hydrocarbons in the ground water at Crown NC-567 located in Durham, North Carolina. The objectives of this investigation were to:

- Determine contaminant source(s);
- Determine the horizontal and vertical extent of the contaminated ground water;
- Describe the geologic and hydrogeologic characteristics relevant to the site which influence migration and transportation of contaminates, and
- Develop and formulate information that is required to initiate the Corrective Action Plan and remedial action.

1.2 Scope of Services

In July, 1991, ATEC was authorized to conduct a CSA at Crown 567. The following activities were performed:

- Reviewed previous investigation reports;
- Reviewed available geologic and hydrogeologic publications to describe regional geologic and hydrogeologic units;
- Installed ground water quality monitoring wells, collected ground water samples, and analyzed the samples for gasoline components;

- Established vertical control at each monitoring well, measured ground water elevations, and estimated direction of ground water flow and hydraulic gradient across the site;

- Located potable wells within a one-quarter mile radius of the site;

- Conducted a survey of underground utilities at the site; and,

- Prepared this comprehensive site assessment (CSA) report to summarize the areas of contamination at the site.

2.0 BACKGROUND INFORMATION

2.1 Area of Investigation

Crown NC-567 is located at the southeast intersection of South Miami Boulevard (US Highway 70) and Pleasant Road in Durham, North Carolina (Figure 1). The site currently consists of a newly constructed retail gasoline and convenience store, car wash facility, and underground fuel system (Figure 2). The underground fuel system currently consist of four UST's. Fuel is pumped to two separate pump islands through underground distribution lines. The area of investigation includes the Crown site, and adjacent land including the Department of Transportation (DOT) right-of-way and Tellis Automotive.

2.2 Site History and Operations

Crown Central Petroleum Corporation owns the subject property. The former Fast Fare (Crown) Store building was located in the center of the property with the UST's located off the northeast side of the building. The UST vault contained four tanks which were two 5,000 gallons, one 6,000 gallon and one 8,000 gallon tanks. All UST's were constructed of steel and contained various grades of gasoline (Figure 2).

In the fall of 1991, (August through November), the site was renovated to its current configuration. The new facility includes a new Crown store building, car wash and fuel storage and dispensing system (Figure 2).

2.3 Site Topography and Surface Drainage

The site is located on the Southeast Durham Quadrangle, 7.5 Minute Topographic Map, at latitude 35° 50' 48" N and longitude 78° 50' 48" W. The ground surface elevation is approximately 375 feet above sea level (Figure 1). The majority of the property is covered with asphalt and appears flat.

Stormwater run-off from the north side of the site flows overland to a storm drain located along Pleasant Drive. Surface water that enters the storm drain discharges into a drainage swale along the south side of Pleasant Drive. The swale parallels pleasant drive and discharges into a creek east of the site. Stormwater run-off from the south side of the site flows overland to a storm drain located along Highway 70. Surface water that enters the storm drain discharges to a swale along Highway 70. The swale parallels Highway 70 and discharges into a creek southeast of the site.

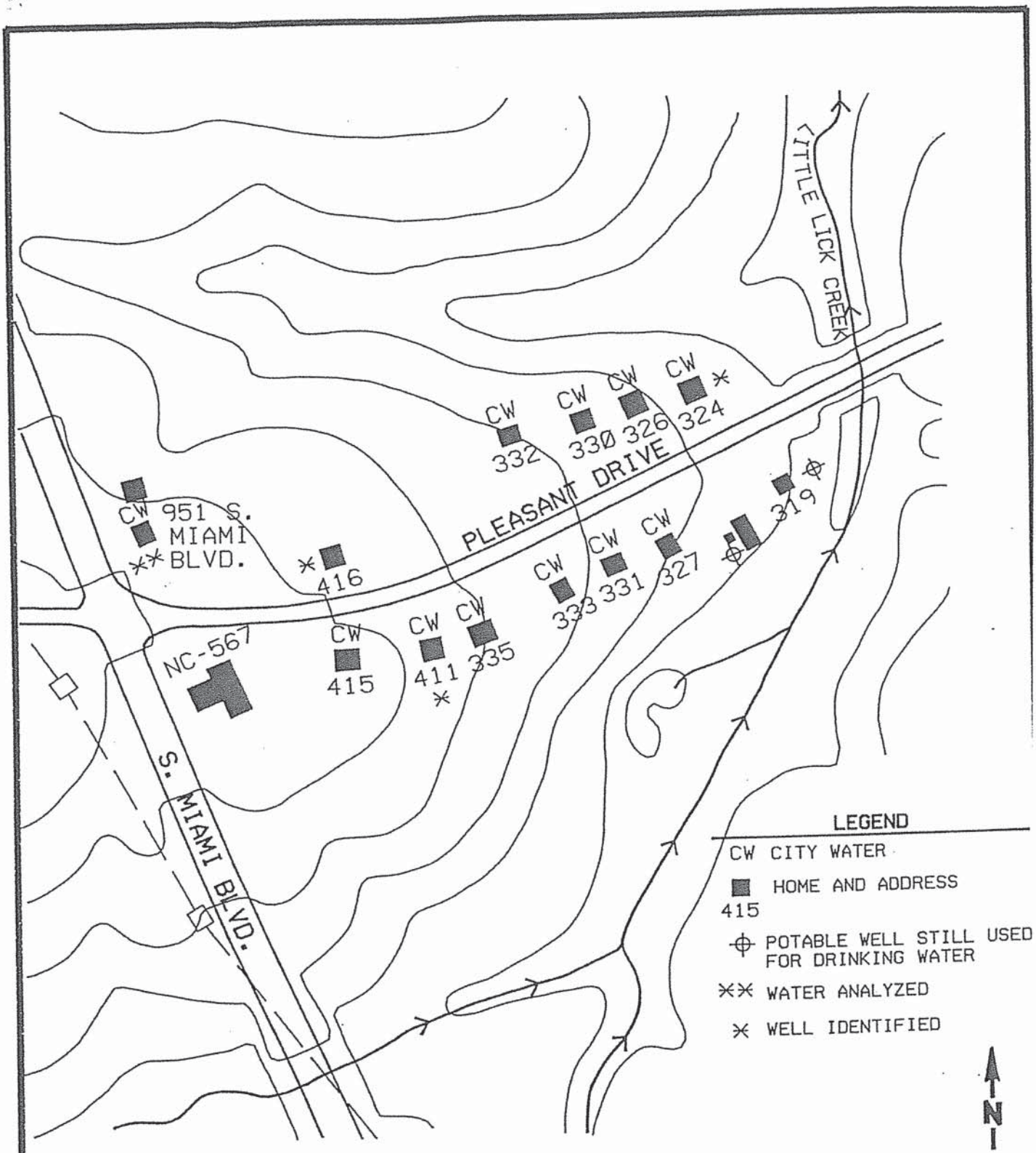
2.4 Potable Well Survey

A potable well survey was conducted by reviewing available water well completion reports from the Raleigh Regional Public Water Supply Section and by performing and field reconnaissance within a 1/4 mile radius from the site. According to Ms. Martha Moore of the Public Water Supply Section, no potable wells are located in the area of the site. During our field survey, we located six wells east of the site (Figure 3). Based on interviews conducted, four of the wells are use for non-drinking purposes while two are used for potable water supply.

2.5 Utility Survey

ATEC performed a survey to identify underground utilities. Underground utilities may cause preferential flow routes for petroleum hydrocarbons vapors and liquid. The backfill material surrounding the underground utility generally has a greater hydraulic conductivity than native subsurface materials. Contaminated ground water or liquid phase petroleum hydrocarbon that enters the backfill material may move faster through the subsurface. Typically the underground utilities are located within the upper four feet of the subsurface.

Underground utilities have been identified north of the site along Pleasant Drive (Figure 2). The utility lines supply water and natural gas. The sanitary sewer appears to be underneath Pleasant Drive. However, the exact location has not been determined.



CONTOUR INTERVAL 10'

NOT TO SCALE

TITLE

FIGURE 3

PRIVATE WELL LOCATION MAP
CROWN CENTRAL PETROLEUM CORP.
FACILITY NC-567
DURHAM, NORTH CAROLINA

ATEC Environmental Consultants

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2.6 Previous Investigation

In August 1990, ATEC initiated a subsurface investigation around UST system for Crown at the former Fast Fare facility. The objective was to determine if the UST's had leaked into the surrounding soils and ground water. During this stage of investigation four exploratory monitoring wells were installed. Laboratory analysis indicated that a release had occurred and was contaminating ground water.

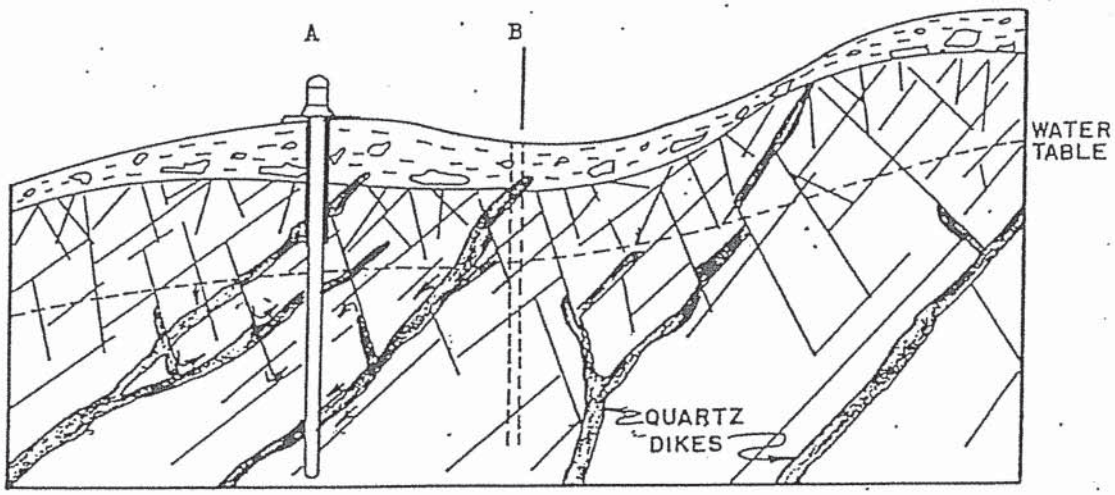
The April 11, 1991, ATEC report details the UST closure findings and conclusions. Soil analysis indicated contaminants present at one location sampled at the base of the excavated tank pit. The excavation depth was limited due to encountering rock at 13 feet below the ground surface.

3.0 GEOLOGIC FRAME WORK

3.1 Regional Geology

The site is located in the Triassic Basin within the Piedmont Province. The Triassic basin trends northeast in Durham County and has a width of 5 to 20 miles.

The Triassic Basin consist of maroon to reddish-gray sandstones (arkosic), shales, siltstones, and conglomerates. These rocks are separated from metamorphic and igneous rocks to the east by the Jonesboro fault, and to the west by volcanic and igneous rocks of the Slate belt. In general the Triassic age rocks dip 10 to 20 degrees to the southeast. The average thickness of the Triassic rocks ranges from 7,000 to 8,000 feet. The sedimentary rocks were intruded by dikes and sills creating a series of fractures and joints (Figure 4).



Diagrammatic section illustrating fracture and quartz-dike development in rocks of the Durham area. When well at A is pumped, water moves toward the well as indicated by arrows. (Bain, George L., et al. 1966).

DIAGRAMMATIC SECTION
DURHAM AREA

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SCALE:	DRAWN BY:	CHECKED BY:	DATE:	PROJECT NO.	
NONE					Figure 4

The soils which overlie the Triassic rocks are a product of chemical and physical weathering of the parent rock. These soil vary in thickness feet across Durham County.

3.2 Site Geology

A total of 17 borings were advanced at the site using a combination air rotary, hollow-stem auger, and rock coring drilling techniques. The methods used by ATEC are described in Appendix A. The soils identified during drilling were silty fine sands with intermittent layers of clay. Bedrock was encountered at a depth of 8 to 13 feet across the site. Soil boring logs are shown in Appendix B while geologic profiles are shown in Figures 5A, 5B, and 5C.

3.3 Regional Hydrogeology

According to the USGS Bulletin No. 7, "Geology and Ground Water in the Durham Area, North Carolina", the hydrogeology in the Triassic Basin predominantly has ground water movement in secondary joints and fractures. Sedimentary rock intruded with dikes and sills generally have a higher yield. Average yields for 100 foot wells in the Triassic Basin unit range from 0.07 to 0.15 gallons per foot of uncased hole.

3.4 Site Hydrogeology

Ground water was initially intercepted in bedrock ranging from depths of 25 feet in MW-6 to 45 feet in MW-10. The unconfined aquifer consists of weathered and unweathered fractured maroon sandstone, siltstone and mudstone. The shallow monitoring wells average 45 feet in depth with the screened intervals extending at or above the water table. Monitoring well construction is discussed in Appendix A while Appendix B contains the monitoring well construction details. The monitoring well permits are shown in Appendix C.

The purpose of installing the monitoring wells was to measure depth of ground water and collect water samples. The measuring point of each monitoring well was surveyed for vertical control using standard surveying practices from a temporary benchmark with an arbitrary assumed elevation of 100 feet. Ground water elevations in each monitoring well were calculated and used to estimate the direction and gradient of ground water flow in the water table aquifer. Ground water level techniques are discussed in Appendix A.

Depth to ground water was measured in each monitoring well on several occasions during this study. Depth to ground water and ground water elevations are shown in Table 1 for September and November 1991, and February 1992.

The general direction of ground water flow in the surficial aquifer (within the fractured rock) appears to be towards the north and northeast. The hydraulic gradient ranges from 0.046 to 0.048 feet per foot. Ground water flow across the site is effected by fractures and joints in the rock. The ground water table map for February 1992 is shown as Figure 6.

4.0 DATA RESULTS

4.1 Release Scenario

In January, 1991 four UST's were removed from the site. Upon removal, a perched water condition with an oily sheen was present at the bottom of the tank pit. Testing of the soil beneath the tank pit indicated a release of product from the UST system had occurred.

TABLE 1

GROUND WATER TABLE MEASUREMENTS
CROWN CENTRAL NC-567
DURHAM, NORTH CAROLINA

Well I.D.	BOW Approximate Elevation	TOC Elevation	09/26/90 Water Depth	09/26/90 Water Elevation	11/12/91 Water Depth	11/12/91 Water Elevation	01/29/92 Water Depth	01/29/92 Water Elevation	02/05/92 Water Depth	02/05/92 Water Elevation
MW-1	-	97.45	23.83	73.62	**	**	**	**	**	**
MW-2	73.9	98.91	DRY	DRY	**	**	**	**	**	**
MW-2A	69.1	99.09	7.39	91.70	DRY	DRY	DRY	DRY	DRY	DRY
MW-3	62.2	97.19	28.68	68.51	29.51	67.68	28.09	69.10	27.95	69.24
MW-4	63.4	98.38	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY
MW-4A	68.0	98.02	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY
MW-5	52.1	99.56	*	*	**	**	**	**	**	**
MW-6	51.8	97.84	*	*	25.95	71.89	23.48	74.36	23.39	74.45
MW-7	49.1	95.12	*	*	35.32	59.80	34.95	60.17	34.84	60.28
MW-8	37.4	97.42	*	*	39.52	57.90	39.02	58.40	38.90	58.52
MW-9	54.3	99.33	*	*	28.80	70.53	25.97	73.36	25.25	74.08
MW-10	52.1	97.12	*	*	44.62	52.50	35.23	61.89	35.32	61.80
MW-11	46.4	91.40	*	*	32.47	58.93	32.03	59.37	31.88	59.52
MW-12	51.5	96.48	*	*	37.33	59.15	36.38	60.10	36.27	60.21
MW-13	52.9	97.71	*	*	38.47	59.24	37.59	60.12	37.44	60.27
MW-14	44.0	94.46	*	*	*	*	*	*	34.65	59.81
MW-15	49.4	99.41	*	*	*	*	*	*	DRY	DRY

* - Well not constructed at this date
** - Wells destroyed during renovation
TOC - Top of Casing
BOW - Bottom of Well

4.2 Contaminated Soil

During removal of the former UST's, 10 soil samples were collected from the bottom of the excavation. The soil samples were screened in the field using a photo-ionization detector (PID). PID readings ranged from 7.8 to 20.8 parts per million. Ten soil samples were also submitted to the laboratory for total petroleum hydrocarbon (TPH) analysis using EPA Method 8015/5030. Of the 10 soil sample submitted for analyses, one contained TPH levels in concentrations of 14.7 parts per million (ppm). The analytical results of the soil samples are shown in Appendix D.

4.3 Ground Water Contamination

Ground water samples were collected from monitoring wells in August 1990; in July and November 1991; and in February 1992. The analysis of the ground water samples are discussed in Appendix A. Appendix E contains the laboratory reports while Table 2 summarizes the analytical results.

4.4 Free Product Evaluation

Free product was initially detected on January 29, 1992 in monitoring well MW-10. No other wells installed currently contain free product. During the investigation, ATEC measured each well for petroleum product. The method used is discussed in Appendix A.

ATEC contacted Crown to discuss the discovery of the free product. Crown initiated a tank and line test to determine if the free product was the results of an on-going release. The test results indicate that the tanks and lines were tight. Crown has authorized ATEC to perform weekly removal of the free product from monitoring well MW-10. The product removed is stored on-site in a covered 55-gallon drum.

TABLE 2

GROUND WATER ANALYSIS SUMMARY
CONCENTRATIONS OF BTEX, AND MTBE
CROWN CENTRAL NC-567
DURHAM, NORTH CAROLINA

Description	MW-1	MW-2	MW-2A	MW-3	MW-4A	MW-5	MW-6	MW-7	MW-8	MW-9	MW-10	MW-11	MW-12	MW-13	MW-14	MCL
Benzene																1.0
08/23/90	170	1.0		1.0	3560											
07/02/91		ND	ND	ND		ND	ND	6860	ND	1.9	NS[5]	NS[5]	NS[5]	NS[5]	NS[5]	
11/21/91		NS[3]	NS[1]	ND		NS[3]	ND	2600	ND	ND	8340	1.2	ND	10400	NS[5]	
02/05/92		NS[3]	NS[1]	NS[2]		NS[3]	ND	7510	ND	ND	NS[4]	2630	ND	23.5	4620	
Toluene																1000.0
08/23/90	170	1.0		1.0	4570											
07/02/91		ND	ND	ND		ND	ND	8160	ND	ND	NS[5]	NS[5]	NS[5]	NS[5]	NS[5]	
11/21/91		NS[3]	NS[1]	ND		NS[3]	ND	1100	ND	ND	24200	1.9	ND	12700	NS[5]	
02/05/92		NS[3]	NS[1]	NS[2]		NS[3]	ND	8640	ND	ND	NS[4]	794	ND	25.3	5960	
Ethylbenzene																29.0
08/23/90	167	1.0		1.0	817											
07/02/91		ND	ND	ND		ND	ND	1170	ND	2.4	NS[5]	NS[5]	NS[5]	NS[5]	NS[5]	
11/21/91		NS[3]	NS[1]	ND		NS[3]	ND	670	ND	ND	5210	ND	ND	1700	NS[5]	
02/05/92		NS[3]	NS[1]	NS[2]		NS[3]	ND	1310	ND	ND	NS[4]	644	ND	ND	2050	
Total Xylenes																400.0
08/23/90	842	1.0		1.0	5530											
07/02/91		ND	ND	ND		ND	ND	8220	2.7	4.2	NS[5]	NS[5]	NS[5]	NS[5]	NS[5]	
11/21/91		NS[3]	NS[1]	ND		NS[3]	ND	3300	ND	ND	27600	6.1	ND	10000	NS[5]	
02/05/92		ND[3]	NS[1]	NS_2		NS[3]	ND	9550	ND	ND	NS[4]	3270	ND	41.5	10400	
MTBE																50.0
07/02/91		ND	ND	217		58.3	ND	6940	29.1	60.1	NS[5]	NS[5]	NS[5]	NS[5]	NS[5]	
11/21/91		NS[3]	NS[1]	50.0		NS[3]	53.3	1900	97.9	ND	ND	14.1	126	5300	NS[5]	
02/05/92		NS[3]	NS[1]	NS[2]		NS[3]	72.3	3780	74.1	ND	NS[4]	1650	15.2	251	1380	

ND - None Detected
NS[1] - Not Sampled (well was dry)
NS[2] - Not Sampled (not enough water in well)
NS[3] - Not Sampled (well was destroyed)
NS[4] - Not Sampled (free product was present)
NS[5] - Not Sampled (well did not exist)

MCL - Maximum Concentration Limit

Between January 29, 1992 and February 17, 1992, approximately 3/4 gallons of gasoline has been removed from MW-10. The product thickness appears to have decreased since first observed. Initially over one foot of product existed in MW-10. As of February 17, 1992 less than 0.1 feet was observed, prior to removal. Free product is not measurable in any of the other monitoring wells at the site.

5.0 DISCUSSION

5.1 Source of Petroleum Contamination

Previous work completed at the former UST's location indicated that the source of contamination may be related to the failure of the UST system. Ground water testing around the tank pit indicated that the extent of contamination was not confined to the former UST area. During the UST removal no free product was observed in the excavated tank pit. Soil analyses show relatively low concentrations of TPH. The actual source of the contamination remains unknown.

5.2 Extent of Free Product

A review of the free product measurements indicates that free product was first observed in MW-10 on January 29, 1992. No other wells indicate measurable product. The free product plume appears to be isolated in the area around monitoring well MW-10. Weekly removal of free product appears to have reduced the thickness in MW-10.

5.3 Extent of Soil Contamination

Review of field screening (with a PID) and laboratory results (TPH) indicates that petroleum contaminated soil appears to exists in the northeastern part of the former tank area. This appears to be localized at a depth of approximately 13 feet below land surface. Bed rock exists at 8 to 13 feet below land surface across the site.

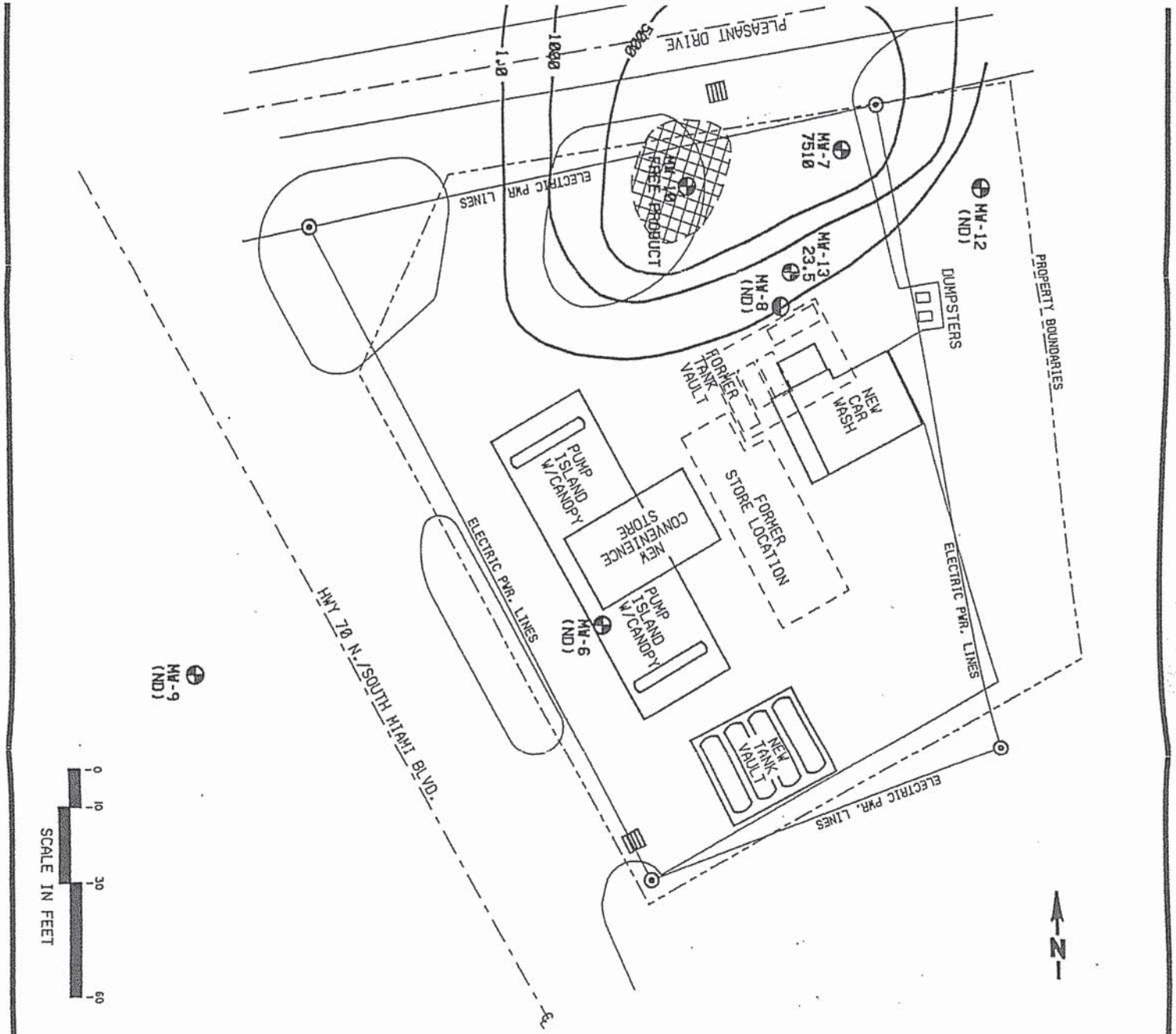
5.4 Extent of Dissolved Ground Water Contamination

The analytical results of the ground water samples, and the ground water flow direction were used to estimate extent and movement of the dissolved contamination. The North Carolina Administrative Code and DEM establishes the standards for dissolved levels of contaminants in ground water. The maximum contaminant level (MCL) for benzene is 1.0 ppb; toluene 1000 ppb; xylene 400 ppb; ethylbenzene 29.0 ppb; and methyl-tert-butyl-ether (MTBE) 50.0 ppb. Appendix E contains the laboratory reports. Table 2 summarizes the ground water analyses.

The February 5, 1992 sampling event indicates that MCL's were exceeded for the following compounds in the respective monitoring wells:

- Benzene — MW-7, MW-11, MW-13, and MW-14
- Toluene — MW-7, and MW-14
- Ethylbenzene — MW-7, MW-11 and MW-14
- Xylenes — MW-7, MW-11 and MW-14
- MTBE — MW-6, MW-7, MW-8, MW-11, MW-13, and MW-14

Figures 7 through 11 illustrate the concentration maps of benzene, toluene, ethylbenzene, xylenes (BTEX) and MTBE. As shown by these figures, the most contaminant area appears to be centered around monitoring wells MW-10, MW-7, and Pleasant Drive between MW-11 and MW-14.



NOTES:
FIGURE 7

PARTS PER BILLION CONCENTRATIONS
IN GROUND WATER
NOT DETECTED (ND)

TITLE
BENZENE CONCENTRATION MAP
FEB. 5, 1992
CROWN CENTRAL PETROLEUM CORP.
FACILITY NC-567
DURHAM, NORTH CAROLINA

ĀTEC Environmental Consultants

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125006A.DGN	J.D.B.	M.R.	02-14-92	35-17234

The northerly ground water flow direction and the contaminant levels detected in MW-11 and MW-14 indicate an undefined downgradient extent of ground water contamination.

MTBE exists above the MCL in the ground water samples from MW-6 and MW-8, while none of the BTEX compounds were detected in these two wells. Monitoring Well MW-6 represents the most upgradient well for the February 5, 1992 sampling event. The vertical extent well (MW-8) indicates that MTBE exists above the MCL at a depth of 48 to 60 feet below land surface.

The July 1991 sampling event indicates the presence of 39.6 ppb of chloroform and 90.2 ppb of 1, 2 dichloroethane in monitoring well MW-7. The State MCL for chloroform is 0.19 ppb. The MCL for 1, 2 dichloroethane is 0.38 ppb. These compounds are not typically associated with petroleum products. The source of the compounds are not currently known.

6.0 REMEDIAL OPTIONS

6.1 Ground Water Remediation

A range of applicable technologies are present as potential components of remedial action (Remedial technologies are discussed in Appendix F). These technologies are rated by comparing their effectiveness, reliability, and cost. Data from literature studies are utilized, where appropriate, in this section. Based on the alternatives reviewed, a ground water removal through the use of recovery wells was considered highly over other options due to the hydrogeology (fracture flow). Based on low production rates (0.07 to 0.15 gallons per foot) from the recovery wells, a diffused air stripping system should be considered.

6.2 Effluent/Product Disposal

The existence of sanitary sewer lines in the vicinity of the site indicate disposal of the treated effluent to the locate waste water treatment plant the most feasible. The City of Durham, Department of Water Resources has stated that permission would be granted for discharge to the treatment plant upon approval of the remedial action plan. Levels of discharge must comply their required discharge units of Total Volatile Organic Compounds (VOC) 3.75 mg/l; petroleum distillates (sum of BTEX) of 1.25 mg/l; oil and greases 100.00 mg/l; and lead 0.17 mg/l. Table 3 summarizes the effluent limits.

7.0 CONCLUSIONS

Based on this assessment, ATEC concludes the following:

- The petroleum contamination in the soil and ground water appears to be from a leak in the previous UST system. The amount of product released is unknown.

- Petroleum contaminated soils were discovered during UST removal. The extent appears to be continued in the northern portion of the previous tank pit.

- Dissolved ground water contamination exists at this site. The petroleum contaminants have migrated off-site. The horizontal extent of contamination remains unknown although highest concentration are in the area of the former tank pit.

TABLE 3

EFFLUENT LIMITATIONS FOR DISCHARGE
COMPREHENSIVE SITE ASSESSMENT
CROWN NC-567
DURHAM, NORTH CAROLINA

PARAMETERS	MAXIMUM DAILY CONCENTRATION
Petroleum Distillates*	1.25 mg/l
Oil and Grease	100.00 mg/l
Total Voc**	3.75 mg/l
Lead, Total	0.17 mg/l

* This value represents the sum of the concentrations of benzene, toluene, xylenes, and ethylbenzene

** VOC Listings

Acrolein
Acrylonitrile
Benzene
Bromodichloromethane
Bromomethane
Bromoform (tribromomethane)
Carbon tetrachloride (tetrachloromethane)
Chlorobenzene
Cloroethane
1,2-Dichlorobenzene
1,3-Dichlorobenzene
1,4-Dichlorobenzene
1,1-Dichloroethane
1,2-Dichloroethane
1,1-Dichloroethene
trans-1,2-Dichloroethane
1,2-Dichloropropane
cis-1,3-Dichloropropene
trans-1,3-Dichloropropene
Ethyl benzene
Methylene chloride (dichloromethane)
1,1,1-Trichloroethane
1,1,2,2-Tetrachloroethane
Tetrachloroethene
Trichloroethene
Trichlorofluoromethane
Vinyl chloride

- The free product first observed in monitoring well MW-10 on January 30, 1992, appears to have been from an old release. The extent of free product appears to be centered around MW-10.

- The hydrogeologic setting of the site is fracture flow. Flow appears to be along joints and fractures throughout the subsurface.

- Private potable well exist downgradient and within a 1/4 mile of the site. With the exception of Tellis Automotive, water quality data from the nearby potable wells remains unknown. Potable water is supplied by the City of Durham to most residents.

8.0 RECOMMENDATIONS

Based on the conclusion, the following recommendations are provided:

- Implementing a phased approach to remediation as outlined in the CAP. We recommend that during the phased approach monitoring of the ground water contamination plume be performed. This is to evaluate efficiencies of the system and impacts to the ground water quality.

- ATEC recommends obtaining construction specifications and well usage information of the nearby downgradient private wells.

Comprehensive Site Assessment
Crown Central Petroleum
Facility NC-567
Durham, North Carolina
ATEC Project No. 35-07-92-00041

ATEC Associates, Inc.
6814 Davis Circle
Raleigh, North Carolina 27613
(919) 782-2832 FAX: (919) 781-7558

1.0 BACKGROUND

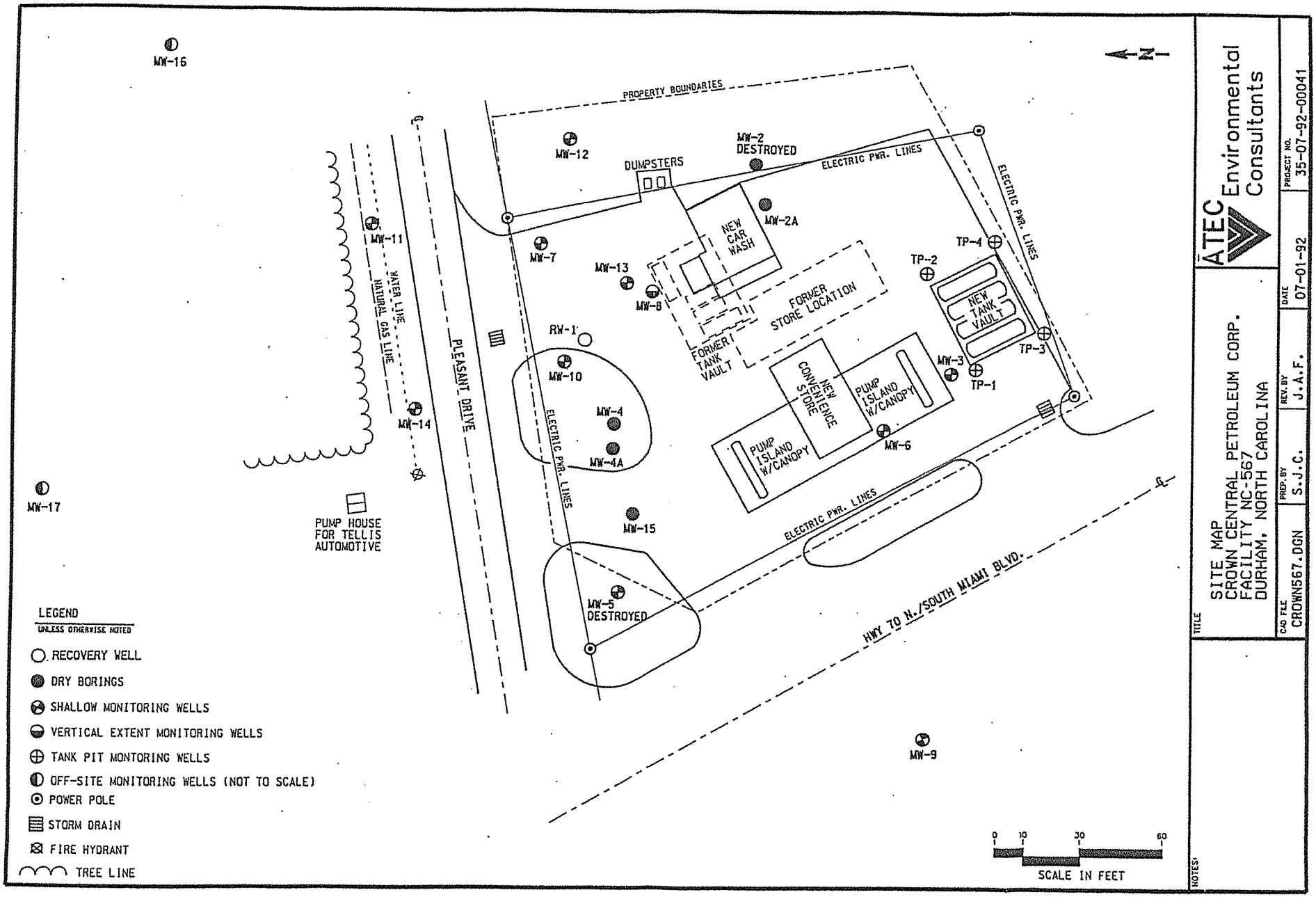
Crown Central Petroleum Corporation owns the subject property located at 1001 S. Miami Blvd., Durham, North Carolina which was formerly a Fast Fare store. The former building was located approximately at the center of the property, with the underground storage tank pit located off the northeast side of the building. While the site was being renovated, the four former steel underground storage tanks were removed and replaced with tanks located in a different area of the site.

In February, 1992 ATEC Associates, Inc. (ATEC) completed a comprehensive site assessment (CSA). During the original CSA investigation a total of 15 monitoring wells and borings were installed at this site, however, the dissolved phase plume was not delineated to the north of the site. To complete the CSA two additional monitoring wells were installed in June, 1992 to define the dissolved phase plume to the north of the site. This report will address the findings from this additional investigation.

2.0 MONITORING WELL INSTALLATION

2.1 Soil Boring Advancement

On June 22, 1992 ATEC advanced two borings (MW-16 and MW-17) with an air-hammer drill rig on two off-site properties (refer to Figure 1). Boring MW-16 was advanced to a depth of 50 feet below grade. A silty sand and clay was encountered from grade to 26 feet below grade. Sandstone was encountered from 26 to 50 feet below grade. The second soil boring, MW-17 was advanced through course sand to a depth of 16 feet below grade and shale to a depth of 35 feet below grade. This boring was terminated at 35 feet below grade (refer to Appendix A for Soil Boring Logs).



ATEC Environmental Consultants

TITLE: SITE MAP
CROWN CENTRAL PETROLEUM CORP.
FACILITY NC-567
DURHAM, NORTH CAROLINA

CAD FILE	PREP. BY	REV. BY	DATE	PROJECT NO.
CROWN567.DGN	S.J.C.	J.A.F.	07-01-92	35-07-92-00041

NOTES:

2.2 Well Installation

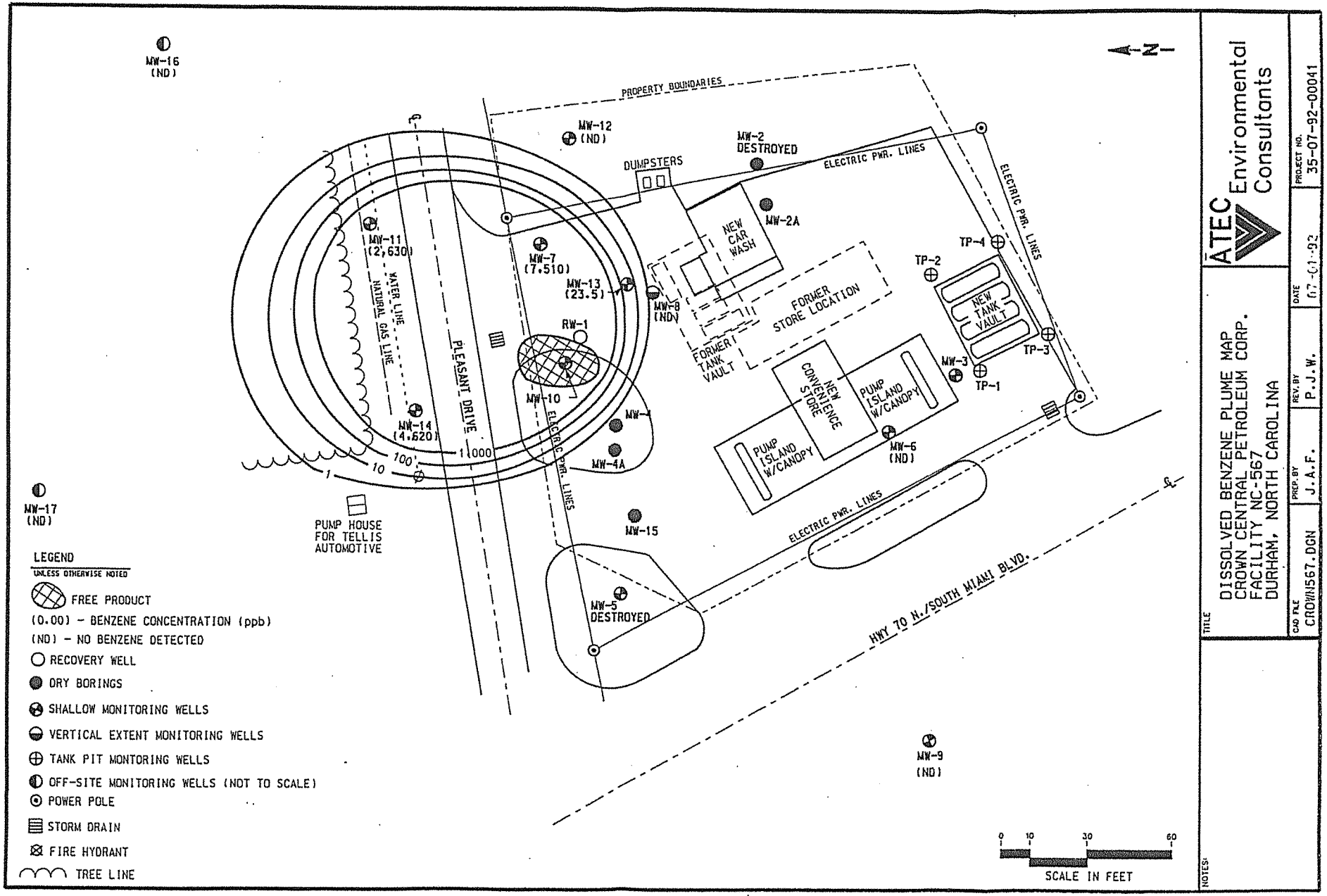
Each soil boring was completed as a monitoring well. The monitoring well MW-16 is constructed with two (2) inch diameter PVC well screen and casing. This well is screened from 26.5 to 50 feet below grade. Monitoring well MW-17 is also constructed with two (2) inch diameter PVC casing, and is screened from 15 to 35 feet below grade (refer to Appendix A). After installation, each monitoring well was developed to insure aquifer connection to the well.

2.3 Ground Water Sampling and Analysis

Approximately 24 hours after well installation, a ground water sample was collected. Prior to sampling, approximately four well volumes of ground water was removed from each well using a dedicated bailer. A ground water sample was collected and transferred to containers supplied by the laboratory. These containers were placed in a cooler and shipped to the ATEC laboratory in Atlanta, Georgia for analysis. The samples were analyzed for purgeable aromatics using EPA method 602.

3.0 ANALYTICAL RESULTS

The analytical results of the ground water samples are shown in Appendix B. The results indicate Benzene, Toluene, Ethylbenzene and Xylenes (BTEX) are below the MDL. Samples from monitoring well MW-16 indicated non-detectable levels of BTEX. However, analytical data from this well revealed a Methyl Tertiary Butyl Ether (MTBE) level of 63 ppb. Ground water samples from monitoring well MW-17 revealed non-detectable results for both BTEX and MTBE. These data were used to create revised dissolved phase plume maps (refer to Figures 2, 3 and 4).

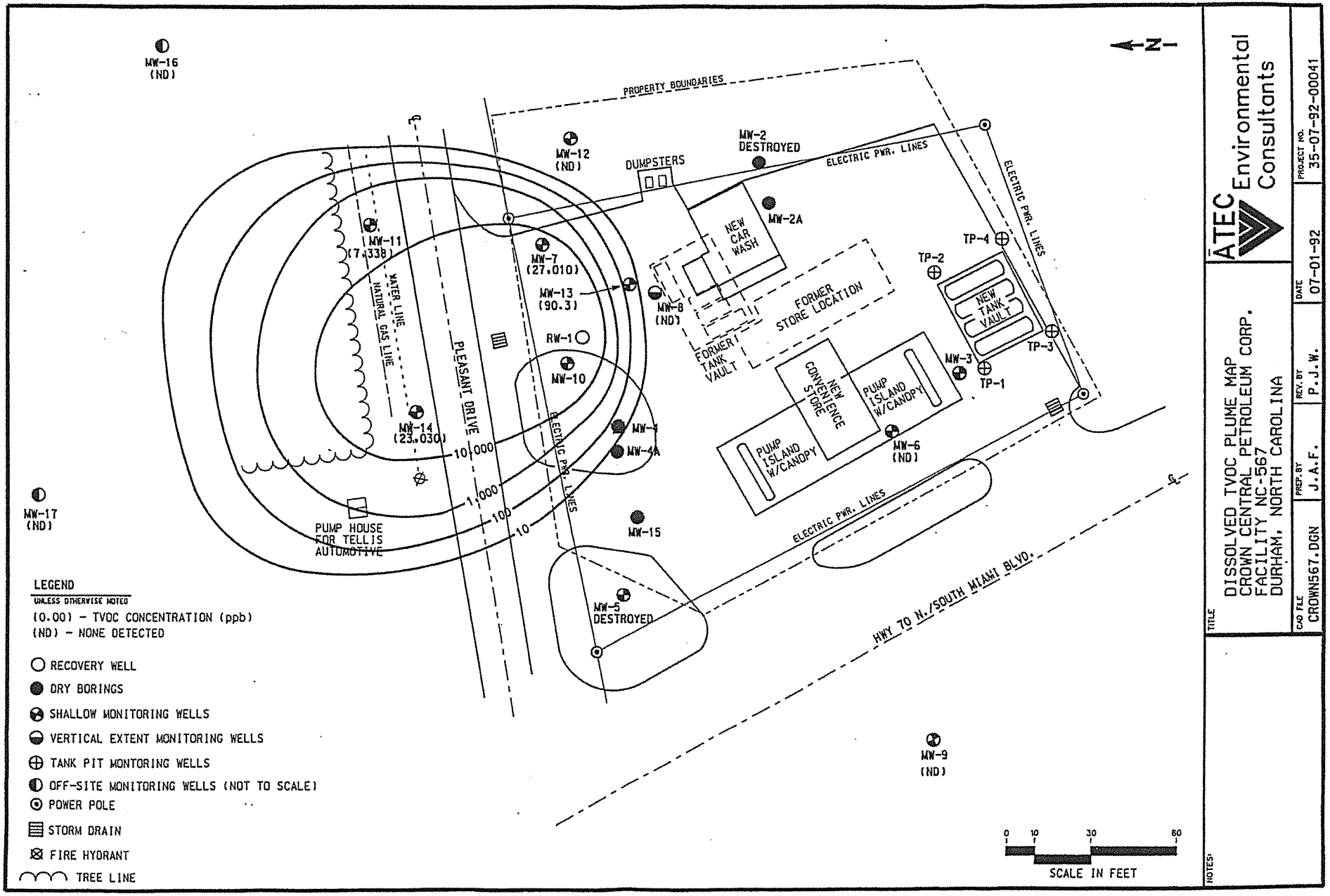


ATEC Environmental Consultants

TITLE: DISSOLVED BENZENE PLUME MAP
CROWN CENTRAL PETROLEUM CORP.
FACILITY NC-567
DURHAM, NORTH CAROLINA

CAD FILE	PREP. BY	REV. BY	DATE	PROJECT NO.
CROWN567.DGN	J.A.F.	P.J.W.	07-01-92	35-07-92-00041

NOTES:

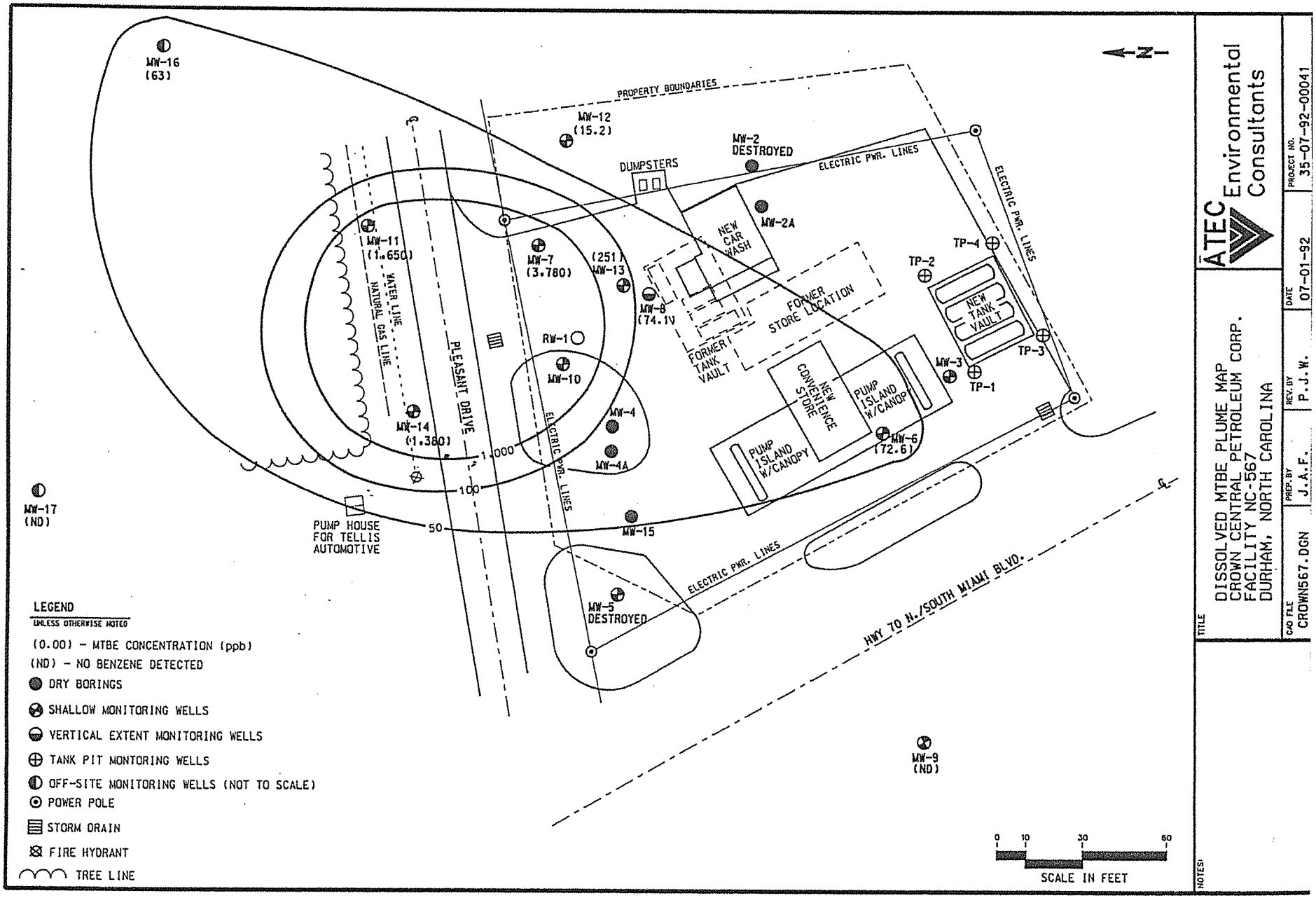


ATEC Environmental Consultants

TITLE: DISSOLVED TVOC PLUME MAP
CROWN CENTRAL PETROLEUM CORP.
FACILITY NC-567
DURHAM, NORTH CAROLINA

CAD FILE	PREP. BY	REV. BY	DATE	PROJECT NO.
CROWN567.DGN	J.A.F.	P.J.W.	07-01-92	35-07-92-00041

NOTES:



ATEC Environmental Consultants

TITLE: DISSOLVED MTBE PLUME MAP
CROWN CENTRAL PETROLEUM CORP.
FACILITY NC-567
DURHAM, NORTH CAROLINA

C/O FILE	PREP. BY	REV. BY	DATE	PROJECT NO.
CROWN567.DGN	J.A.F.	P.J.W.	07-01-92	35-07-92-00041

NOTES:

4.0 CONCLUSIONS AND RECOMMENDATIONS

Based upon this assessment, we conclude the following:

- Dissolved phase contamination has migrated off-site in a northerly direction across Pleasant Drive.
- The downgradient extent of contamination appears to be defined.

Based upon these conclusions, ATEC recommends the implementation of the corrective action plan, written in February, 1992, as soon as possible. This corrective action plan proposes the installation of a total fluids pump system combined with a diffused aeration treatment system. Ground water should be pumped from recovery well (RW-1) through the treatment system.

The corrective action plan for this site has already been approved by the North Carolina Department of Environment, Health, and Natural Resources. ATEC recently completed an authorization to construct permit request. Once this permit is received, ATEC will begin system installation.

ACTIVE REMEDIATION MONITORING REPORT

(FORMER) CROWN NC-567
1001 SOUTH MIAMI BOULEVARD
DURHAM, DURHAM COUNTY, NORTH CAROLINA

NCDENR INCIDENT NO. 6684
NPDES PERMIT NO. NCG510468
EXCEL PROJECT NO. 20140

DATE SUBMITTED:

January 18, 2013

SOURCE OF RELEASE:

Gasoline UST System
Amount Unknown

PREPARED FOR:

Crown Central, LLC
Responsible Party
Post Office Box 1168
Baltimore, Maryland 21203

Attn: Jim Janson

PREPARED BY:

Excel Civil & Environmental Associates, PLLC
Post Office Box 6172
Gastonia, NC 28056
Phone (704) 853-0800

1/18/2013

Thomas W. Garrison, III
Senior Project Manager

Michael T. Stanforth, P.E., DEE
Project Engineer

1.0 PROJECT INFORMATION

GENERAL INFORMATION

Primary Consultant:	Excel Civil & Environmental Associates, PLLC
Project Engineer:	Mike Stanforth
Crown Contact:	Jim Janson
General Geology:	Piedmont Physiographic Province, Triassic Basin. Predominantly silty fine sands with intermittent layers of clay; bedrock encountered at depths from 8-13 FBGL.

REGULATORY INTERACTION

Agency:	NCDENR, Raleigh Regional Office
Agency Contact:	Wayne Randolph
Request:	Semi-Annual sampling with associated analysis and reporting Quarterly effluent sampling with associated analysis and reporting
Site Activities:	Semi-Annual liquid level gauging of all monitoring wells and groundwater sampling of selected wells. Collect quarterly system effluent discharge samples.

RISK ASSESSMENT

Sensitive Receptors:	No structures with basements are located within the vicinity of the source area. Utilities onsite do not appear to be a pathway for vapor collection due to their locations below ground (< 3 feet below grade level). Several water supply wells are located within the immediate area of the subject property and are discussed below.
Closest Potable Wells:	Boyles residence water supply well is located within one-quarter mile to source. One additional drinking water supply well identified as part of the receptor survey and is located within 1,000 feet. The majority of the surrounding properties are now utilizing municipal water supply.

MONITORING REQUIREMENTS

Liquid Level Gauging & Frequency:	Semi-Annual Basis
Groundwater Sampling & Analyses Methodology:	Select wells are analyzed for EPA Method 602 extended

2.0 SUMMARY OF FIELD ACTIVITIES

7/30/12: Excel mobilized to the site to conduct routine O&M as part of the monthly scheduled site visit. During the site visit, the system was observed to be non-operational due to oil-water separator alarm at a high level. The air sparge compressor was down due to a broken electrical contactor. Excel conducted typical O&M and performed free product recovery by servicing the skimmer. The alarm was reset and the system was operational at departure.

8/14/12: Excel mobilized to the site to conduct routine O&M as part of the monthly scheduled site visit and effluent sample event. During the site visit, the system was observed to be non-operational due to oil-water separator fault alarm (high level). Excel conducted typical O&M and performed free product recovery by servicing the skimmer. Excel also collected an effluent sample during the site visit. The alarm was reset and the system was operational at departure.

9/11/12: Excel mobilized to the site to conduct routine O&M as part of the monthly scheduled site visit. During the site visit, the system was observed to be non-operational due to oil-water separator fault alarm (high level) and the sparge compressor repaired. Excel conducted typical O&M and performed free product recovery by servicing the skimmer. The alarm was reset and the system was operational at departure.

10/22/12: Excel mobilized to the site to conduct routine O&M as part of the monthly scheduled site visit. During the site visit, the system was observed to be non-operational due to oil-water separator fault alarm (high level). Excel also noticed that the system wasn't running due to a vapor-locked transfer pump associated with the air stripper. The problem was resolved and the system was operational at departure.

11/16/12: Excel mobilized to the site to conduct routine O&M as part of the monthly scheduled site visit. During the site visit, the system was observed to be non-operational due to oil-water separator fault alarm (high level). Excel conducted typical O&M and performed free product recovery by servicing the skimmer. The alarm was reset and the system was operational at departure.

12/20/12: Excel mobilized to the site to conduct routine O&M as part of the monthly scheduled site visit and semi-annual sampling event. During the site visit, groundwater samples were collected accordingly and the system was observed to be non-operational due to oil-water separator fault alarm (high level). Excel conducted typical O&M and performed free product recovery by servicing the skimmer. The alarm was reset and the system was operational at departure.

3.0 GROUNDWATER CONDITIONS

During the sampling event conducted on December 20, 2012 liquid levels were collected from select monitoring wells at the subject facility. A contoured plot of groundwater elevations as measured at each of the monitoring wells during the December 2012 sampling event is provided as **Figure 3**. Based on the latest groundwater data, the groundwater appears to flow towards the southeast.

TABLE 1 - LIQUID LEVEL DATA

Well ID Number	Top of Casing Elevation	Total Well Depth	Depth of Product	Depth of Water	Product Thickness	Water Table Elevation
MW-3	97.19'	28.0'	--	18.53'	--	78.66'
MW-6	97.84'	28.0'	--	23.65'	--	74.19'
MW-7	95.12'	45.0'	--	37.22'	--	57.90'
MW-8	97.42'	39.0'	NOT SAMPLED – DRY			
MW-10	97.12'	45.0'	--	39.04'	--	58.08'
MW-11	91.40'	41.5'	--	34.88'	--	56.52'
MW-12	96.48'	45.0'	--	38.82'	--	57.66'
MW-13	--	74.4'	--	40.38'	--	--
MW-16R	84.41'	33.0'	--	25.82'	--	58.59'
MW-18	82.43'	--	NOT SAMPLED - NOT LOCATED			
MW-19	--	18.0'	--	14.50'	--	--
MW-21	97.94'	43.0'	--	20.77'	--	77.17'
MW-22.	88.56'	40.0'	--	30.52'	--	58.04'
MW-23	89.58'	35.0'	--	32.24'	--	57.34'
MW-24	99.02'	45.0'	--	39.45'	--	59.57'
VEW-1	--	57.5'	--	41.80'	--	--
RW-1	95.51'	100'+	--	36.22'	--	59.29'
RW-2	93.43'	66.0'	--	36.93'	--	56.50'

NOTES:
Data provided in feet unless otherwise noted

4.0 REMEDIATION SYSTEM CONDITIONS

Excel personnel collected a remediation system effluent sample on November 16, 2012. Samples are collected quarterly during the routine inspection and analyzed for specific compounds in accordance with permitting requirements. The volume of treated water, which is discharged into an on-site drainage ditch, is also monitored continuously by a flow-meter located in the recovery compound. These totalizer meter readings, and the results of the laboratory analyses of the remediation system effluent samples, are summarized in the tables below. The flow-rate (in gallons per day) listed is the average flow-rate for the period of time between the two consecutive totalizer meter readings.

TABLE 2 – SUMMARY OF EFFLUENT ANALYTICAL RESULTS

CONSTITUENTS	EFFLUENT SAMPLING DATES				
	3/5/03	6/25/03	11/13/03	1/22/04	9/15/04
Benzene (ug/l)	< 1	< 1	19	< 1	< 1
Toluene (ug/l)	< 5	< 5	< 5	< 5	< 5
Ethylbenzene (ug/l)	< 1	< 1	4.3	< 1	< 1
Total Xylenes (ug/l)	< 2	< 2	11.6	< 2	< 2
MTBE (ug/l)	< 5	21	180	21	< 5
1,2-Dichloroethane (ug/l)	< 1	< 1	< 1	< 1	< 1
Lead (ug/l)	< 5	6.1	7	< 5	6.1
TSS (mg/l)	< 1	2.0	< 1	15.0	1.6
FLOW (gpd)	1,719	0	0	1,053	680

CONSTITUENTS	EFFLUENT SAMPLING DATES				
	9/15/04	6/21/07	2/27/08	3/25/08	9/18/08
Benzene (ug/l)	< 1	< 1	< 1	< 1	< 1
Toluene (ug/l)	< 5	< 1	< 1	< 5	< 1
Ethylbenzene (ug/l)	< 1	< 1	< 1	< 1	< 1
Total Xylenes (ug/l)	< 2	< 1	< 1	< 3	< 1
MTBE (ug/l)	< 5	150	***390***	< 1	***270***
1,2-Dichloroethane (ug/l)	< 1	< 1	< 1	< 1	< 1
Lead (ug/l)	6.1	< 3	--	< 5	< 10
TSS (mg/l)	1.6	< 4	< 4	5.9	< 2
FLOW (gpd)	680	0	410	492	645

NOTES:
*NA – Not Analyzed / * - Remediation system was down prior to the time of sampling / + - GAC columns were replaced prior to sampling*

TABLE 2 – SUMMARY OF EFFLUENT ANALYTICAL RESULTS (Continued)

CONSTITUENTS	EFFLUENT SAMPLING DATES				
	12/10/08	3/17/09	6/17/09 *	6/29/09 +	12/15/09 *
Benzene (ug/l)	< 1	< 1	***23 ******	< 1 +	***41***
Toluene (ug/l)	< 1	< 5	4.5 *	< 1 +	32
Ethylbenzene (ug/l)	< 1	< 1	4.9 *	< 1 +	7.8
Total Xylenes (ug/l)	< 1	< 2	19 *	< 1 +	41
MTBE (ug/l)	68	7.9	150 *	***250 +***	***40***
1,2-Dichloroethane (ug/l)	< 1	< 1	< 1 *	NA	< 1
Lead (ug/l)	< 3	< 25	< 10 *	3.2 +	< 10
TSS (mg/l)	< 1	< 1	250 *	NA	28
FLOW (gpd)	615	519	157	NA	0

CONSTITUENTS	EFFLUENT SAMPLING DATES				
	3/15/10	6/9/10	9/17/10	12/13/10	5/9/11
Benzene (ug/l)	*1.5*	*< 1*	*< 1*	*< 1*	*3.4*
Toluene (ug/l)	*< 5*	*< 5*	*< 5*	*< 5*	*< 5*
Ethylbenzene (ug/l)	*< 1*	*< 1*	*< 1*	*< 1*	*< 1*
Total Xylenes (ug/l)	*< 3*	*< 3*	*< 3*	*< 3*	*2.1*
MTBE (ug/l)	*26*	*23*	*46*	*70*	*13*
1,2-Dichloroethane (ug/l)	*< 1*	*< 1*	*< 1*	*NA*	*< 1*
Lead (ug/l)	*7.4*	*NA*	*NA*	*NA*	*NA*
TSS (mg/l)	*< 1*	*31*	*31*	*< 1*	*120*
FLOW (gpd)	*387*	*155*	*130*	*553*	*0*

CONSTITUENTS	EFFLUENT SAMPLING DATES				
	6/27/11	2/23/12	5/23/12	8/14/12	11/16/12
Benzene (ug/l)	*< 1*	*< 1*	*< 1*	*< 1*	*< 1*
Toluene (ug/l)	*< 5*	*< 5*	*< 5*	*< 5*	*< 5*
Ethylbenzene (ug/l)	*< 1*	*< 1*	*< 1*	*< 1*	*< 1*
Total Xylenes (ug/l)	*< 3*	*< 3*	*< 3*	*< 3*	*< 3*
MTBE (ug/l)	*10*	*< 1*	*< 1*	*< 1*	*< 1*
1,2-Dichloroethane (ug/l)	*< 1*	*< 1*	*< 1*	*< 1*	*< 1*
Lead (ug/l)	*NA*	*NA*	*< 5*	*< 5*	*< 5*
TSS (mg/l)	*< 1*	*34*	*13*	*6.9*	*4*
FLOW (gpd)	*96*	*0*	*44*	*81*	*156*

NOTES:
*NA – Not Analyzed / * - Remediation system was down prior to the time of sampling / + - GAC columns were replaced prior to sampling*

TABLE 3 – TOTAL GROUNDWATER DISCHARGE SUMMARY

Sample Date	Gallons Discharged (gal)	Total Discharge (gal)	Estimated Flow Rate (gpd)
4/16/03	75,654	75,654	1,719
5/15/03	12	75,666	0.4
6/25/03	114	75,780	2.7
7/28/03	34,920	110,700	1,058
8/12/03	39,400	150,100	2,626
9/11/03	9,232	159,332	297
10/30/03	0	159,332	0
11/1303	0	159,332	0
12/29/03	7,957	167,289	46
1/22/04	25,282	192,571	1,053
2/24/04	8,729	201,300	264
3/23/04	800	202,100	28.5
4/7/04	890	202,990	59.3
5/7/04	110	203,100	3.7
6/9/04	0	203,100	0
7/8/04	470	203,570	16.2
8/10/04	0	203,570	0
9/14-15/04	680	204,250	680
4/25/07	0	204,250	0
5/17/07	56,870	261,120	2,473
6/21/07	0	261,120	0
8/23/07	16,680	277,800	265
9/19/07	5,964	283,764	221
10/18/07	0	283,764	0
12/12/07	0	283,765	0
1/16/08	1	283,765	0.03
2/27/08	17,235	301,000	410
3/24/08	12,800	313,800	492
4/9/08	10,000	323,800	625
5/28/08	39,055	362,855	797
6/25/08	0	362,855	0
7/9/08	895	363,750	64
8/26/08	35,750	399,500	744
9/18/08	14,850	414,350	645
10/20/08	19,520	433,870	610
11/18/08	20,470	454,340	705
12/10/08	29,060	483,400	1,320
1/13/09	12,167	495,567	358
2/18/09	31,733	527,300	907
3/17/09	14,000	541,300	519

TABLE 3 – TOTAL GROUNDWATER DISCHARGE SUMMARY (Continued)

Sample Date	Gallons Discharged (gal)	Total Discharge (gal)	Estimated Flow Rate (gpd)
4/30/09	3,000	544,300	65
5/9/09	585	544,885	65
6/17/09	6,115	551,000	157
7/21/09	6,160	557,160	181
8/12/09 *	2,640	559,800 / 808,091	120
9/6/09	5,432	813,523	217
10/21/09 +	0	813,523	0
11/19/09	0	813,523	0
12/15/09 **	269	813,792	1,076
1/12/10	606	814,400	21
2/25/10	21,491	835,891	488
3/15/10	6,979	842,870	387
4/14/10	25,560	868,430	852
5/4/10	25,777	894,207	859
6/9/10	5,295	899,502	155
7/19/10	508	900,010	13
8/9/10	2,060	902,070	98
9/10/10	3,760	905,830	130
10/6/10	290	906,120	11
11/16/10	15,730	921,850	384
12/13/10	14,940	936,790	553
1/31/11	2,880	939,670	59
2/22/11	3,780	943,450	172
3/24/11	2,170	945,620	72
4/27/11	0	945,620	0
5/4/11	0	945,620	0
5/16/11	6,040	951,660	503
6/27/11	4,040	955,700	96
7/12/11	1,210	956,910	81
8/3/11	3,070	959,980	140
9/30/11	95	960,075	2
10/3/11	14	960,089	3.5
12/5/12	78	960,089 / 78.8	1.3
1/24/12	78	78.8	0
2/23/12	78	78.8	0
3/26/12	45,437	45,516	1,377
4/25/12	1,125	46,641	39
5/23/12	1,219	47,860	44
6/20/12	373	48,233	14
7/30/12	70,407	118,640	1,761
8/14/12	1,203	119,843	81

TABLE 3 – TOTAL GROUNDWATER DISCHARGE SUMMARY (Continued)

Sample Date	Gallons Discharged (gal)	Total Discharge (gal)	Estimated Flow Rate (gpd)
9/11/12	52,692	172,535	1,882
10/22/12	64,785	237,320	1,581
11/16/12	1,284	238,604	52
12/20/12	5,304	243,908	156

NOTES:
gal - gallons
GPD – Gallons Per Day

TABLE 4 – POTABLE WELLS DATA

Well ID Number	OWNERS NAME	PROPERTY ADDRESS	STATUS
SW-1 (Boyles Residence)	Tsoumbos Dimitrios	949 S. Miami Boulevard	Inactive
SW-2	Matthew Johnson	411 Pleasant Drive	Irrigation
SW-3	Vance Clayton	323 Pleasant Drive	Irrigation

TABLE 5 – FREE PRODUCT RECOVERY DATA

Well ID	Date	Product Type	Casing Diameter (in)	PT Before Recovery (ft)	PT After Recovery (ft)	Amount Recovered (gal)	DTW (ft)
MW-7	3/23/08	GAS	2	0.50	0.00	0.00 – PS	35.93
	4/9/08			0.60	0.00	0.50 – PS	35.80
	5/24/08			0.05	0.00	0.10 – PS	35.70
	6/25/08			0.01	0.00	< 0.10 – PS	34.73
	7/9/08	--		0.09	0.00	0.00	36.33
	8/26/08	GAS		0.18	0.00	0.50 – PS	35.41
	9/18/08			0.07	0.00	< 0.10 – PS	36.35
	10/20/08			0.04	0.00	0.25 – PS	36.72
	11/18/08	--		0.00	--	--	39.20
	12/10/08	GAS		0.07	0.00	< 0.10 – PS	38.77
	1/13/09			0.12	0.00	0.25 – PS	35.55
	2/18/09			0.24	ND	< 0.10 – PS	35.95
	3/16/09			0.09	0.00	0.00	35.10
	4/30/09	--		ND	ND	ND	ND
	5/9/09	GAS		0.08	0.00	0.25 – PS	38.29
	6/17/09			0.09	0.00	< 0.10 – PS	30.28
	7/21/09			0.09	0.00	0.25 – HB	33.39
	8/12/09			0.05	0.00	< 0.10 – PS	35.81
	9/6/09			0.04	0.00	< 0.10 – PS	37.99

TABLE 5 – FREE PRODUCT RECOVERY DATA (Continued)

Well ID	Date	Product Type	Casing Diameter (in)	PT Before Recovery (ft)	PT After Recovery (ft)	Amount Recovered (gal)	DTW (ft)
MW-7	10/21/09	--		0.00	--	0.00	37.80
	11/19/09	GAS		0.16	0.00	< 0.10 – PS	34.34
	12/7/09			0.12	0.00	< 0.10 – PS	35.61
	1/12/10			0.10	0.00	< 0.10 – PS	34.79
	2/25/10			0.15	0.02	< 0.10 – PS	27.76
	3/24/10			0.10	0.00	< 0.10 – PS	32.49
	4/14/10			0.12	0.01	< 0.10 – PS	30.09
	5/4/10			0.08	0.00	< 0.10 – PS	31.86
	6/9/10			0.05	0.00	< 0.10 – PS	29.90
	7/8/10			0.09	0.00	< 0.10 - PS	30.91
	8/9/10			0.05	0.00	< 0.10 - PS	32.67
	10/6/10			0.06	0.01	< 0.10 - PS	36.53
	11/16/10			0.02	0.00	< 0.10 - PS	36.82
	12/13/10	--		0.00	--	--	37.58
	1/31/11	GAS		0.05	0.00	< 0.10 – PS	36.19
	2/22/11	--		0.00	--	--	35.49
	3/24/11	--		0.00	--	--	34.65
	4/27/11	GAS		0.06	0.00	< 0.10 – PS	33.99
	5/16/11	--					
	6/27/11	--		0.00	--	--	35.02
	7/12/11	GAS		0.02	0.00	< 0.10 – PS	34.91
	8/3/11	--		0.00	--	--	36.53
	9/30/11	GAS		0.03	0.00	< 0.10 – PS	36.48
	10/3/11			0.04	0.00	< 0.10 – PS	36.62
	12/5/11	GAS					
	1/24/12			0.03	0.00	< 0.10 – PS	38.72
	2/23/12	--		0.00	--	--	37.31
	3/26/12	GAS		0.02	0.00	< 0.10 – PS	34.15
	4/25/12			0.05	0.00	< 0.10 – PS	34.14
	5/8/12			0.02	0.00	< 0.10 – PS	34.66
	6/20/12	--		0.00	--	--	34.41
	7/30/12			0.00	--	--	36.06
	8/14/12			0.00	--	--	37.00
	9/11/12			0.00	--	--	36.59
	10/22/12			0.00	--	--	36.96
	11/16/12			0.00	--	--	36.73
	12/20/12			0.00	--	--	37.22

TABLE 6 - SUMMARY OF ANALYTICAL RESULTS

Well	Sample Date	Benzene	Toluene	Ethylbenzene	Xylenes	MTBE	IPE	Naphthalene	Lead
NCAC 2L Standard		1	600	600	500	20	70	6	15
MW-3	2/24/03	< 1	< 5	< 1	3.1	17	< 5	< 5	< 5
	8/6/03	< 1	< 5	< 1	< 2	< 5	< 5	< 5	15
	2/24/04	< 1	< 5	< 1	< 2	410	< 5	< 5	36
	8/10/04	< 1	< 5	< 1	< 2	100	< 5	< 5	6.7
	6/7/07	< 1	< 1	< 1	< 1	< 1	< 1	NA	< 3
	10/18/07	< 1	< 1	< 1	< 1	76	5.3	NA	< 3
	2/27/08	< 1	< 1	< 1	< 1	< 1	< 1	NA	< 10
	5/28/08	< 1	< 1	< 1	< 1	200	< 1	NA	NA
	12/10/08	< 1	< 1	< 1	< 1	< 1	< 1	NA	NA
	6/18/09	350	42	280	290	< 5	< 5	NA	NA
	12/15/09	< 1	< 1	< 1	< 1	< 1	< 1	NA	NA
	6/9/10	< 0.5	< 5	< 0.5	< 1.5	3.8	1.7	NA	NA
	12/13/10	< 1	< 5	< 1	< 3	2	< 1	NA	NA
	7/12/11	3.4	< 5	1	4.9	84	< 1	NA	NA
	1/24/12	< 1	< 5	< 1	< 3	1.3	< 1	NA	NA
	6/20/12	< 1	< 5	< 1	< 3	< 1	< 1	NA	NA
	12/20/12	< 1	< 5	< 1	< 3	4.8	< 1	NA	NA
MW-6	2/24/03	< 1	< 5	< 1	< 2	240	< 5	< 5	25
	8/6/03	< 1	< 5	< 1	< 2	170	< 5	< 5	150
	2/24/04	< 1	< 5	< 1	< 2	360	< 5	< 5	160
	8/10/04	< 1	< 5	< 1	< 2	13	< 5	< 5	60
	6/7/07	< 1	< 1	< 1	< 1	250	< 1	NA	13
	10/18/07	< 2	< 2	< 2	< 2	720	12	NA	< 3
	2/27/08	< 1	< 1	< 1	< 1	400	< 1	NA	< 10
	5/28/08	9.7	2.4	< 1	7.3	1.6	< 1	NA	NA
	12/10/08	< 1	< 1	< 1	< 1	14	< 1	NA	NA

NOTES: *Data provided in ug/l (ppb) / MTBE – Methyl Tert Butyl Ether / IPE – Di-isopropyl Ether / EDB – 1,2-Dibromoethane / FP – Free Product / ND – No Data NA – Not Analyzed / NS – No Sample / Highlighted lines represent data from recent sampling round*

TABLE 6 - SUMMARY OF ANALYTICAL RESULTS (Continued)

Well	Sample Date	Benzene	Toluene	Ethylbenzene	Xylenes	MTBE	IPE	Naphthalene	Lead
NCAC 2L Standard		1	600	600	500	20	70	6	15
MW-6	6/18/09	< 1	< 1	< 1	< 1	< 1	< 1	NA	NA
	12/15/09	< 1	< 1	< 1	< 1	89	2.3	NA	NA
	6/9/10	< 0.5	< 5	< 0.5	< 1.5	79	1.4	NA	NA
	12/13/10	< 1	< 5	< 1	< 3	72	1.2	NA	NA
	7/12/11	< 1	< 5	< 1	< 3	56	1.2	NA	NA
	1/24/12	< 1	< 5	< 1	< 3	57	< 1	NA	NA
	6/20/12	< 1	< 5	< 1	< 3	12	< 1	NA	NA
	12/20/12	< 1	< 5	< 1	< 3	38	< 1	NA	NA
MW-7	2/04 – 6/12	NOT SAMPLED – FREE PRODUCT OBSERVED							
	12/20/12	220	280	420	3,800	120	< 20	NA	NA
MW-8	2/24/03	< 1	< 5	< 1	4.1	83	< 5	< 5	< 5
	8/6/03	< 1	< 5	< 1	< 2	24	< 5	< 5	8.3
	2/24/04	< 1	< 5	< 1	< 2	1,100	5	< 5	63
	8/10/04	< 1	< 5	< 1	< 2	16	5	< 5	5.1
	6/7/07	< 1	< 1	< 1	< 1	260	2.3	NA	9.8
	10/07 - 12/08	NOT SAMPLED – OBSERVED TO BE DRY							
	6/18/09	< 1	< 1	< 1	< 1	16	< 1	NA	NA
	12/15/09	< 1	< 1	< 1	< 1	8.4	< 1	NA	NA
	6/9/10	< 0.5	< 5	< 0.5	< 1.5	21	< 1	NA	NA
	12/10 - 12/12	NOT SAMPLED – OBSERVED TO BE DRY							
MW-10	11/21/91	8,340	24,200	5,210	27,600	ND	ND	ND	ND
	1/13/09	820	1,000	200	2,300	270	< 10	NA	NA
	12/13/10	990	360	360	2,300	350	< 10	NA	NA
	7/19/11	2,200	3,100	1,700	9,800	370	< 10	NA	NA
	1/24/12	66	< 25	130	430	69	< 5	NA	NA
	6/20/12	59	< 5	27	250	50	< 1	NA	NA
	12/20/12	39	9.6	62	160	19	< 1	NA	NA

NOTES: *Data provided in ug/l (ppb) / MTBE – Methyl Tert Butyl Ether / IPE – Di-isopropyl Ether / EDB – 1,2-Dibromoethane / FP – Free Product / ND – No Data NA – Not Analyzed / NS – No Sample / Highlighted lines represent data from recent sampling round*

TABLE 6 - SUMMARY OF ANALYTICAL RESULTS (Continued)

Well	Sample Date	Benzene	Toluene	Ethylbenzene	Xylenes	MTBE	IPE	Naphthalene	Lead
NCAC 2L Standard		1	600	600	500	20	70	6	15
MW-11	2/24/03	1,100	< 120	260	490	< 120	< 120	130	5.9
	8/6/03	210	< 5	65	77	< 5	6.2	55	8.5
	2/24/04	380	< 25	260	280	< 25	< 25	78	23
	8/10/04	210	< 50	150	220	89	< 50	72	12
	6/7/07	200	3.2	51	33	< 1	2.8	NA	4.4
	10/18/07	410	2.7	31	15	280	16	NA	< 3
	2/27/08	1,700	2,900	380	1,400	340	< 10	NA	< 10
	5/28/08	550	53	140	260	360	8.3	NA	NA
	12/10/08	360	2.6	28	41	160	4.7	NA	NA
	6/18/09	230	1.4	5	2.8	300	3.9	NA	NA
	12/15/09	78	1.5	5.6	5.2	300	3.3	NA	NA
	6/9/10	360	16	83	180	400	5.2	NA	NA
	12/13/10	290	< 25	50	59	190	5.3	NA	NA
	7/19/11	190	< 10	12	6.2	510	< 5	NA	NA
	1/24/12	330	< 25	10	24	130	< 5	NA	NA
	6/20/12	110	< 25	< 5	< 15	180	< 5	NA	NA
	12/20/12	1.3	< 5	< 1	< 3	400	3.1	NA	NA
MW-12	11/21/91	ND	ND	ND	ND	126	ND	ND	ND
	2/5/92	ND	ND	ND	ND	15.2	ND	ND	ND
	2/18/09	< 2	< 2	< 2	< 2	410	2.7	NA	NA
	12/13/10	< 1	< 5	< 1	< 3	1,000	6.4	NA	NA
	7/19/11	< 10	< 50	< 10	< 30	950	< 10	NA	NA
	1/24/12	< 10	< 50	< 10	< 30	860	< 10	NA	NA
	6/20/12	< 5	< 25	< 5	< 15	410	< 5	NA	NA
	12/20/12	< 5	< 25	< 5	< 15	640	< 5	NA	NA
MW-13	2/24/04	< 1	< 5	< 1	< 2	23	< 5	< 5	36
	8/10/04	< 1	< 5	< 1	< 2	13	< 5	< 5	< 5

NOTES: Data provided in ug/l (ppb) / MTBE – Methyl Tert Butyl Ether / IPE – Di-isopropyl Ether / EDB – 1,2-Dibromoethane / FP – Free Product / ND – No Data NA – Not Analyzed / NS – No Sample / Highlighted lines represent data from recent sampling round

TABLE 6 - SUMMARY OF ANALYTICAL RESULTS (Continued)

Well	Sample Date	Benzene	Toluene	Ethylbenzene	Xylenes	MTBE	IPE	Naphthalene	Lead
NCAC 2L Standard		1	600	600	500	20	70	6	15
MW-13	6/7/07	< 1	< 1	< 1	< 1	390	< 1	NA	< 3
	10/18/07	< 1	< 1	< 1	< 1	510	5.6	NA	< 3
	2/27/08	< 1	< 1	< 1	< 1	450	< 1	NA	< 10
	5/28/08	< 1	< 1	< 1	< 1	220	NA	NA	NA
	12/10/08	< 1	< 1	< 1	< 1	< 1	< 1	NA	NA
	6/18/09	< 1	< 1	< 1	< 1	4.1	< 1	NA	NA
	12/15/09	7.9	10	2	7.3	210	2.5	NA	NA
	6/9/10	0.84	< 5	0.66	< 1.5	690	7.4	NA	NA
	12/13/10	< 2	< 10	< 2	< 6	430	6.3	NA	NA
	7/19/11	< 1	< 1	< 1	< 1	1.7	< 1	NA	NA
	1/24/12	< 1	< 5	< 1	< 3	< 1	< 1	NA	NA
	6/20/12	< 1	< 5	< 1	< 3	56	< 1	NA	NA
	12/20/12	< 1	< 5	< 1	< 3	5.9	< 1	NA	NA
MW-16R	6/9/10	< 0.5	< 5	< 0.5	< 1.5	< 1	< 1	NA	NA
	12/13/10	< 1	< 5	< 1	< 3	< 1	< 1	NA	NA
	7/19/11	< 1	< 5	< 1	< 3	< 1	< 1	NA	NA
	1/24/12	< 1	< 5	< 1	< 3	< 1	< 1	NA	NA
	6/20/12	< 1	< 5	< 1	< 3	< 1	< 1	NA	NA
	12/20/12	< 1	< 5	< 1	< 3	< 1	< 1	NA	NA
MW-18	2/24/03	< 1	< 5	< 1	< 2	< 5	< 5	< 5	< 5
	8/6/03	< 1	< 5	< 1	< 2	< 5	< 5	< 5	9.7
	2/24/04	< 1	< 5	< 1	< 2	< 5	< 5	< 5	24
	8/10/04	< 1	< 5	< 1	< 2	< 5	< 5	< 5	18
	6/7/07	< 1	< 1	< 1	< 1	< 1	< 1	NA	< 3
	10/18/07	NOT SAMPLED – NOT LOCATED							
	2/27/08	< 1	< 1	< 1	< 1	< 1	< 1	NA	< 10

NOTES: *Data provided in ug/l (ppb) / MTBE – Methyl Tert Butyl Ether / IPE – Di-isopropyl Ether / EDB – 1,2-Dibromoethane / FP – Free Product / ND – No Data*
NA – Not Analyzed / NS – No Sample / Highlighted lines represent data from recent sampling round

TABLE 6 - SUMMARY OF ANALYTICAL RESULTS (Continued)

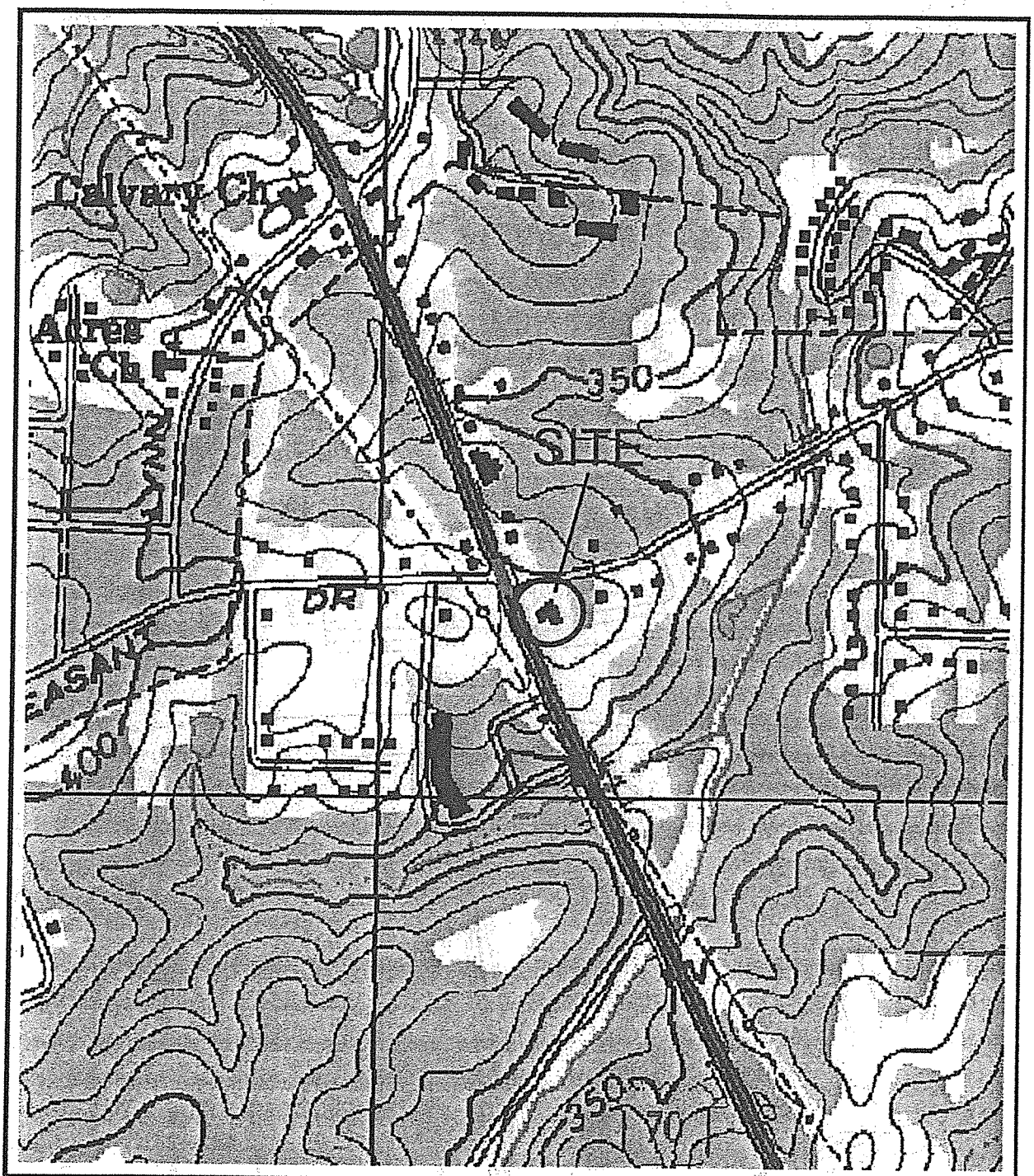
Well	Sample Date	Benzene	Toluene	Ethylbenzene	Xylenes	MTBE	IPE	Naphthalene	Lead
NCAC 2L Standard		1	600	600	500	20	70	6	15
MW-18	5/28/08	< 1	< 1	< 1	< 1	< 1	< 1	NA	NA
	12/08 - 12/12	NOT SAMPLED – NOT LOCATED							
MW-19	7/19/11	< 1	< 5	< 1	< 3	< 1	< 1	NA	NA
	1/24/12	< 1	< 5	< 1	< 3	< 1	< 1	NA	NA
	6/20/12	< 1	< 5	< 1	< 3	< 1	< 1	NA	NA
	12/20/12	< 1	< 5	< 1	< 3	< 1	< 1	NA	NA
MW-20	12/10/08	< 1	< 5	< 1	< 3	< 1	< 1	NA	NA
MW-21	6/9/10	< 0.5	< 5	< 0.5	< 1.5	< 1	< 1	NA	NA
	12/13/10	< 1	< 5	< 1	< 3	< 1	< 1	NA	NA
	7/19/11	< 1	< 5	< 1	< 3	< 1	< 1	NA	NA
	1/24/12	< 1	< 5	< 1	< 3	< 1	< 1	NA	NA
	6/20/12	< 1	< 5	< 1	< 3	< 1	< 1	NA	NA
	12/20/12	< 1	< 5	< 1	< 3	< 1	< 1	NA	NA
MW-22	8/3/11	**17**	< 5	43	58	9.8	< 1	NA	NA
	1/24/12	**16**	< 5	61	< 15	< 5	< 5	NA	NA
	6/20/12	**5**	< 5	8.3	< 3	16	< 1	NA	NA
	12/20/12	< 1	< 5	< 1	< 3	< 1	< 1	NA	NA
MW-23	8/3/11	< 1	< 5	< 1	< 3	< 1	< 1	NA	NA
	1/24/12	< 1	< 5	< 1	< 3	< 1	< 1	NA	NA
	6/20/12	< 1	< 5	< 1	< 3	< 1	< 1	NA	NA
	12/20/12	**1.1**	< 5	2.0	< 3	**180**	1.6	NA	NA
MW-24	8/3/11	< 1	< 5	< 1	< 3	**310**	< 1	NA	NA
	1/24/12	**2.3**	< 5	2.1	16	**440**	2.5	NA	NA
	6/20/12	< 1	< 5	< 1	< 3	1.2	1.3	NA	NA
	12/20/12	< 1	< 5	< 1	< 3	< 1	< 1	NA	NA
VEW-1	4/02–8/03	NOT SAMPLED – FREE PRODUCT OBSERVED							
	2/24/04	< 1	< 5	< 1	< 2	6.7	< 5	< 5	13
	8/10/04	< 1	< 5	< 1	< 2	**210**	< 5	< 5	**20**

NOTES: *Data provided in ug/l (ppb) / MTBE – Methyl Tert Butyl Ether / IPE – Di-isopropyl Ether / EDB – 1,2-Dibromoethane / FP – Free Product / ND – No Data NA – Not Analyzed / NS – No Sample / Highlighted lines represent data from recent sampling round*

TABLE 6 - SUMMARY OF ANALYTICAL RESULTS (Continued)

Well	Sample Date	Benzene	Toluene	Ethylbenzene	Xylenes	MTBE	IPE	Naphthalene	Lead
NCAC 2L Standard		1	600	600	500	20	70	6	15
VEW-1	6/7/07	< 1	< 1	< 1	< 1	5.4	< 1	NA	< 3
	10/18/07	< 1	< 1	< 1	< 1	9.7	< 1	NA	< 3
	2/27/08	< 1	< 1	< 1	< 1	< 1	< 1	NA	< 10
	5/28/08	< 1	< 1	< 1	< 1	3.3	< 1	NA	NA
	6/18/09	< 1	< 1	< 1	< 1	3.6	< 1	NA	NA
	12/15/09	< 1	< 1	< 1	< 1	230	7.5	NA	NA
	6/9/10	< 0.5	< 5	< 0.5	< 1.5	280	6.8	NA	NA
	12/13/10	< 1	< 5	< 1	< 3	64	< 1	NA	NA
	7/19/11	< 1	< 5	< 1	< 3	< 1	< 1	NA	NA
	1/24/12	< 1	< 5	< 1	< 3	< 1	< 1	NA	NA
	6/20/12	< 1	< 5	< 1	< 3	< 1	< 1	NA	NA
	12/20/12	< 1	< 5	< 1	< 3	< 1	< 1	NA	NA
RW-1	12/13/10	47	13	14	180	310	4.4	NA	NA
	7/19/11	44	< 25	14	66	170	< 5	NA	NA
	1/24/12	230	310	220	1,500	220	< 5	NA	NA
	6/20/12	200	2,000	50	2,400	210	< 5	NA	NA
	12/20/12	< 1	< 5	< 1	< 3	44	< 1	NA	NA
RW-2	12/13/10	26	< 5	10	8.1	160	2.4	NA	NA
	7/19/11	360	6.7	60	91	300	3.7	NA	NA
	1/24/12	290	540	92	840	73	4.3	NA	NA
	6/20/12	22	14	5.6	33	140	1.9	NA	NA
	12/20/12	30	8.5	11	40	120	1.5	NA	NA
SW-1	2/24/03	< 1	< 5	< 1	< 2	< 5	< 5	< 5	580
	8/6/03	< 1	< 5	< 1	< 2	< 5	< 5	< 5	36
	2/24/04	< 1	< 5	< 1	< 2	< 5	< 5	< 5	< 5
	6/7/07	< 1	< 1	< 1	< 1	< 1	< 1	NA	< 3
	10/18/07	< 1	< 1	< 1	< 1	< 1	< 1	NA	< 3
	2/27/08	< 1	< 1	< 1	< 1	< 1	< 1	NA	< 10
	5/28/08	NOT SAMPLED – WELL INOPERABLE							
	2/18/09	< 1	< 1	< 1	< 1	< 1	< 1	NA	NA
	6/09 - 12/12	NOT SAMPLED – WELL INOPERABLE							

NOTES: *Data provided in ug/l (ppb) / MTBE – Methyl Tert Butyl Ether / IPE – Di-isopropyl Ether / EDB – 1,2-Dibromoethane / FP – Free Product / ND – No Data*
NA – Not Analyzed / NS – No Sample / Highlighted lines represent data from recent sampling round

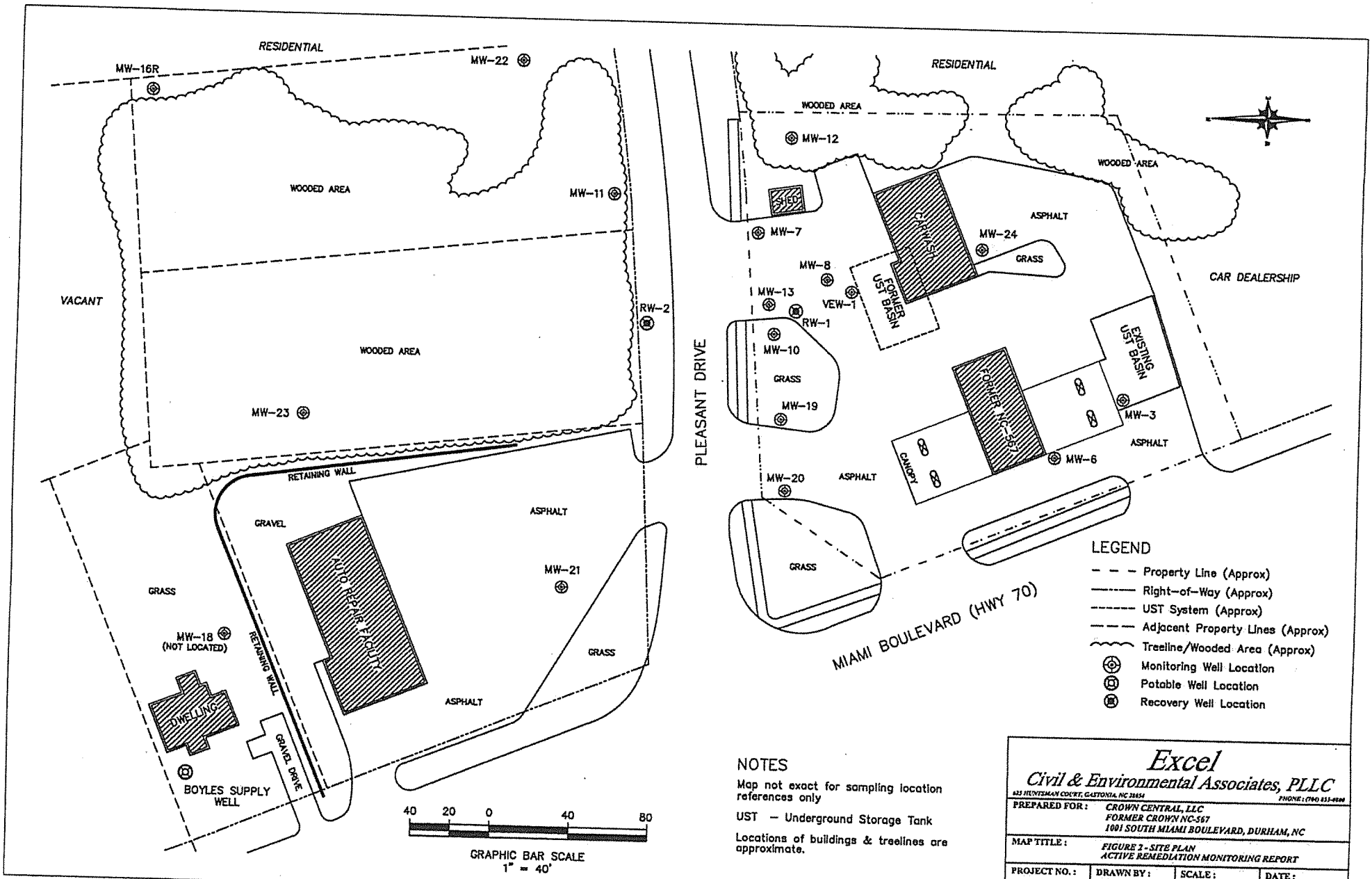


EXCEL CIVIL & ENVIRONMENTAL
ASSOCIATES, PLLC
625 HUNTSMAN COURT
GASTONIA, NC 28054
(704) 853-0800

FIGURE 1 – SITE VICINITY MAP

Source: U.S.G.S. 7.5 Minute Topographic Map
Southeast Durham, NC, Quadrangle, 1993

⇑
N



NOTES

Map not exact for sampling location references only

UST – Underground Storage Tank

Locations of buildings & treelines are approximate.

Excel
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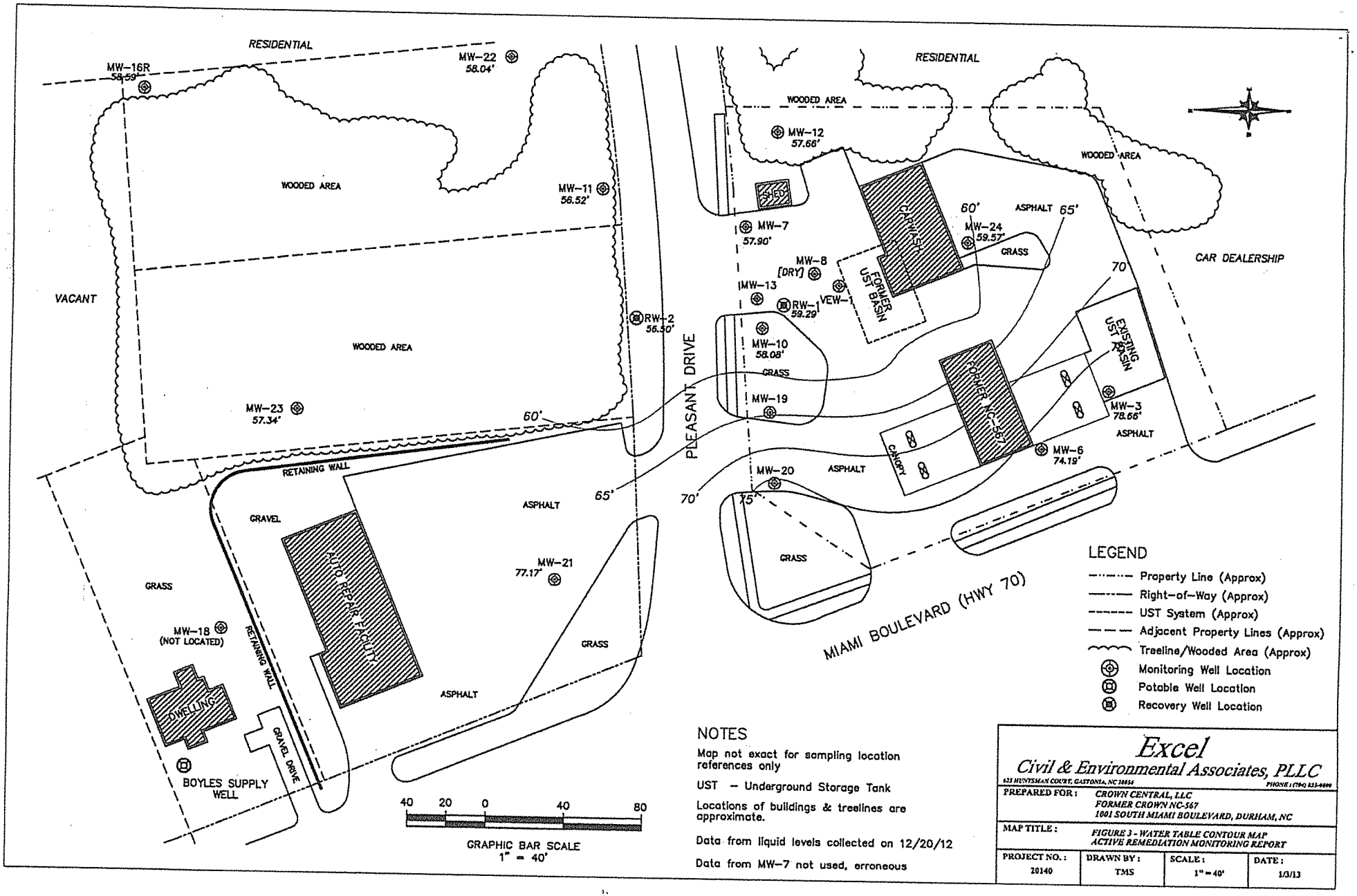
PREPARED FOR:	CROWN CENTRAL, LLC FORMER CROWN NC-567 1001 SOUTH MIAMI BOULEVARD, DURHAM, NC
MAP TITLE:	FIGURE 2 - SITE PLAN ACTIVE REMEDIATION MONITORING REPORT

PROJECT NO.:	DRAWN BY:	SCALE:	DATE:
20140	TWG	1" = 40'	1/9/13



LEGEND

- Property Line (Approx)
- Right-of-Way (Approx)
- UST System (Approx)
- Adjacent Property Lines (Approx)
- Treeline/Wooded Area (Approx)
- Monitoring Well Location
- Potable Well Location
- Recovery Well Location

NOTES

Map not exact for sampling location references only

UST – Underground Storage Tank

Locations of buildings & treelines are approximate.

Data from liquid levels collected on 12/20/12

Data from MW-7 not used, erroneous

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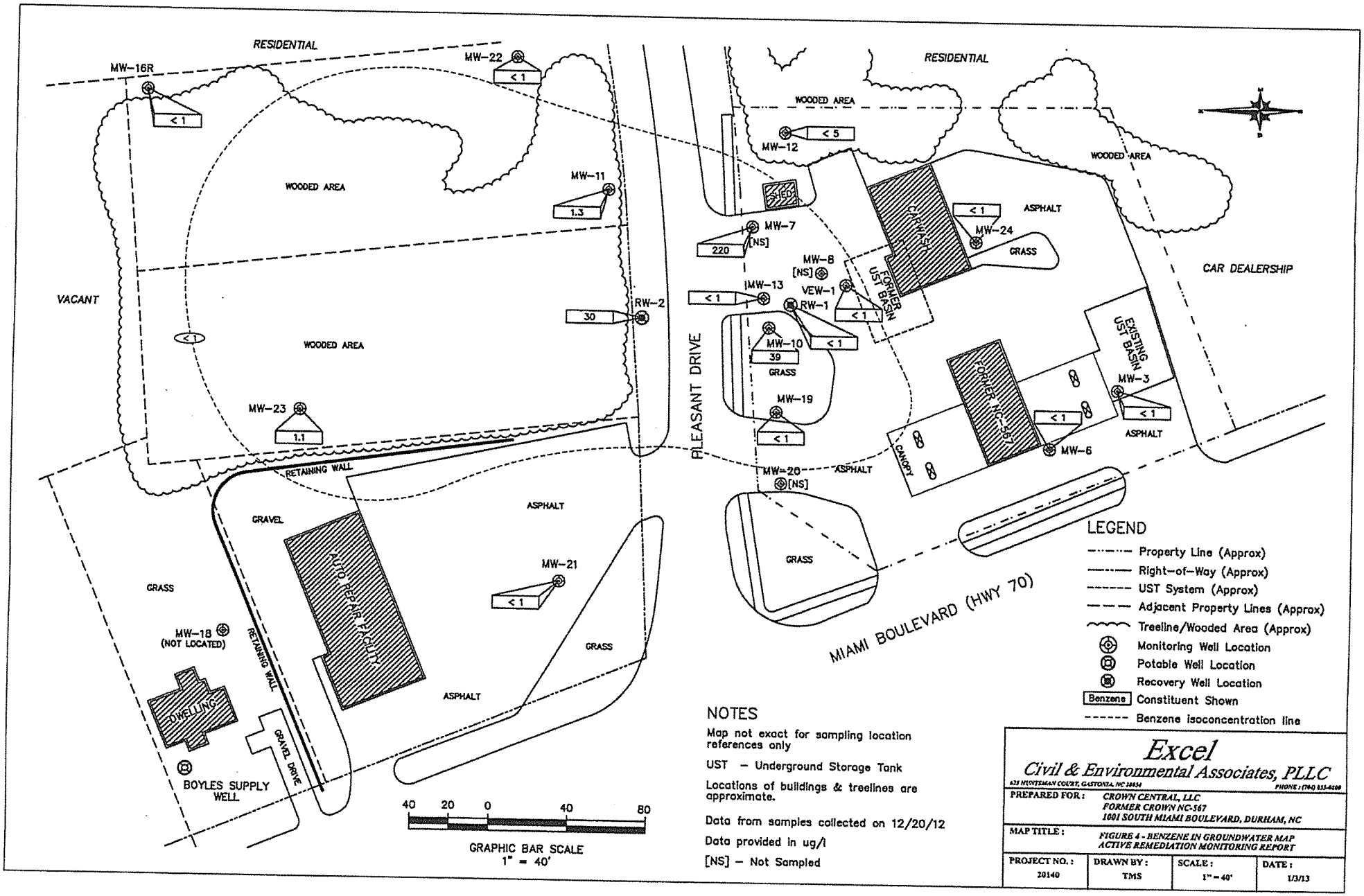
PREPARED FOR:	CROWN CENTRAL, LLC FORMER CROWN NC-567 1001 SOUTH MIAMI BOULEVARD, DURHAM, NC
MAP TITLE:	FIGURE 3 - WATER TABLE CONTOUR MAP ACTIVE REMEDIATION MONITORING REPORT

PROJECT NO.:	DRAWN BY:	SCALE:	DATE:
20140	TMS	1"=40'	1/3/13



NOTES

Map not exact for sampling location references only

UST – Underground Storage Tank

Locations of buildings & treelines are approximate.

Data from samples collected on 12/20/12

Data provided in ug/l

[NS] – Not Sampled

LEGEND

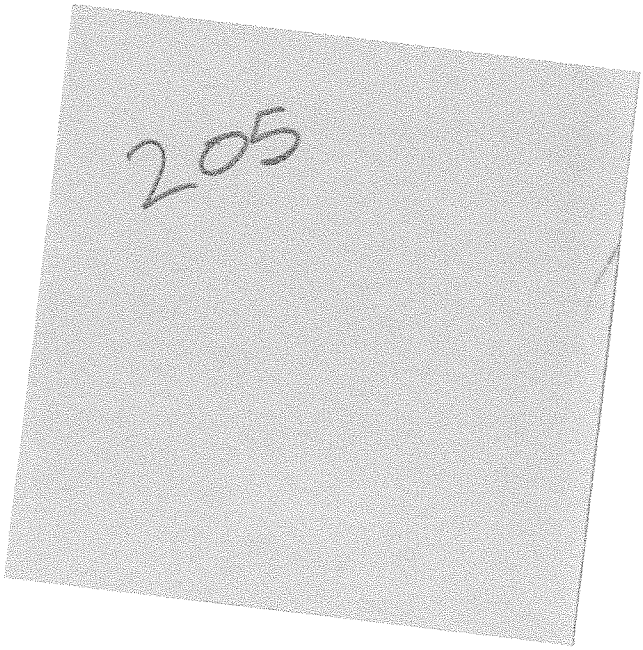
- Property Line (Approx)
- Right-of-Way (Approx)
- UST System (Approx)
- Adjacent Property Lines (Approx)
- Treeline/Wooded Area (Approx)
- Monitoring Well Location
- Potable Well Location
- Recovery Well Location
- Benzene — Constituent Shown
- Benzene isoconcentration line

Excel
Civil & Environmental Associates, PLLC
625 HUNTSMAN COURT, GASTONIA, NC 28054 PHONE : (704) 853-8100

PREPARED FOR :	*CROWN CENTRAL, LLC* *FORMER CROWN NC-567* *1001 SOUTH MIAMI BOULEVARD, DURHAM, NC*
MAP TITLE :	*FIGURE 4 - BENZENE IN GROUNDWATER MAP* *ACTIVE REMEDIATION MONITORING REPORT*

PROJECT NO. :	DRAWN BY :	SCALE :	DATE :
20140	TMS	1" = 40'	1/3/13

Corrective Action Plan (CAP)
Crown NC-567
Ground Water Incident No. 6684
Durham, North Carolina
ATEC Project No. 35-07-91-17234



ATEC ENVIRONMENTAL CONSULTANTS
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1.0 INTRODUCTION

1.1 Purpose

The purpose of this Corrective Action Plan is to outline the technical approach required to address petroleum contamination at the Crown Central Petroleum Corporation (Crown) site located in Durham, North Carolina. The objectives of this investigation include:

- Conceptually develop an initial remediation system to remove and treat petroleum contaminated ground water based on data collected in the Comprehensive Site Assessment (CSA);
- Develop an operation and maintenance (O&M) schedule;
- Outline additional task which maybe required to complete corrective action goals.

1.2 Scope

The scope of services included review of data collected from the CSA, evaluation of available remedial alternatives, and preparation of this Corrective Action Plan (CAP).

1.3 Site Description

The subject facility (NC-567), located at 1001 South Miami Boulevard in Durham, North Carolina, has U.S.G.S. Topographic Map coordinates of 78° 50' 48" longitude and 35° 50' 48" latitude (U.S.G.S. Topographic Quadrangle 7.5 Minute Series, Durham, North Carolina). The Site Location Map (Figure 1) shows the location of the site and the local topography.

2.0 BACKGROUND INFORMATION

2.1 Area of Investigation

Crown NC-567 is located at the southeast intersection of South Miami Boulevard (US Highway 70) and Pleasant Road in Durham, North Carolina (Figure 1). The site currently consists of a newly constructed retail gasoline and convenience store, car wash facility, and underground fuel system (Figure 2). The underground fuel system currently consist of four UST's. Fuel is pumped to two separate pump islands through underground distribution lines. The area of investigation includes the Crown site, and adjacent land including the Department of Transportation (DOT) right-of-way and Tellis Automotive.

2.2 Summary of Comprehensive Site Assessment

2.2.1 Geologic Framework

The project site is located in the Triassic Basin within the Piedmont Province. This basin trends northeast in Durham County and has a width of 5 to 20 miles and dip 10 to 20 degrees to the southeast. The rocks within this basin consist of maroon to reddish-gray sandstones (arkosic), shales, siltstones, and conglomerates and range in thickness from 7,000 to 8,000 feet. The Triassic Basin is separated from metamorphic and igneous rocks to the east by the Jonesboro fault, and to the west by volcanic and igneous rocks of the Slate belt. The sedimentary rocks within the basin were intruded by dikes and sills creating several fractures and joints. The soils above the Triassic Basin are a product chemical and physical weathering of the parent rock.

A total of 17 borings were advanced at the site using a combination air rotary, hollow-stem auger, and rock coring drilling techniques. The soils identified by drilling were silty fine sands with intermittent layers of clay. Bedrock was encountered at a depth of 8 to 13 feet across the site.

According to the USGS Bulletin No. 7, "Geology and Ground Water in the Durham Area, North Carolina", the hydrogeology in the Triassic basin predominantly has ground water movement in secondary joints and fractures. Sedimentary rock intruded with dikes and sills generally have a higher yield. Average yields for 100 foot wells in the Triassic Basin range from 0.07 to 0.15 gallons per foot of uncased hole.

2.2.2 Ground Water Flow

Ground water was initially intercepted in bedrock ranging from depths from 25 to 45 feet below land surface. Depth to ground water was measured in each monitoring well on several occasions during the CSA. Depth to ground water and ground water elevations are shown in the CSA.

The general direction of ground water flow in the surficial aquifer (within the fractured rock) appears to be towards the north and northeast. The hydraulic gradient ranges from 2.5 to 13 ft/ft. Ground water flow across the site is effected by fractures and joints in the bed rock.

2.2.3 Extent of Dissolved Ground Water Contamination

The analytical results of the ground water samples, and the ground water flow direction were used to estimate extent and movement of the dissolved contamination. Figures 3 through 7 illustrate the concentrations of the Total Volatile Organic Compounds (VOC) and Methyl Tert Butyl Ether (MTBE) compounds in the ground water. As shown by these figures, the most concentrated portion of the contaminant

plume is centered around monitoring wells MW-10, MW-7, MW-11 and MW-14. The northerly ground water flow direction and the contaminant levels detected in MW-11 and MW-14 indicate an undefined downgradient extent of contamination.

2.3.4 Remedial Alternatives

As part of the CSA, ATEC evaluated remedial alternatives to remove and treat petroleum contaminated ground water. The CSA outlines each method of removal and treatment of ground water. Based on the site hydrogeologic conditions and the ability to discharge treated effluent to a publicly owned treatment works (POTW), ATEC recommends a ground water recovery well and a diffused air stripping treatment system. The technical approach further describes recovery well locations, pumping rates, treatment, and disposal of petroleum contaminated ground water.

3.0 TECHNICAL APPROACH

3.1 Ground Water/Product Recovery System

3.1.1 Recovery Well

Due to the fracture flow aquifer system, a phase approach to recovery well installation is proposed. Initially, one recovery well will be installed. The proposed location is shown on Figure 8.

The recovery well diameter and screen size will be designed based on soil type and hydrogeologic setting. At the present time, we anticipate the recovery well to be six-inch diameter to a depth approximately 20 feet below the water table. The actual depth of the recovery well will be based on the ground water data collected during well installation. The well will be constructed using PVC wire wrap screen and riser.

Based on data collected during the CSA, pumping rates estimated for ground water recovery well will range from 1 - 2 gallons per minute (gpm) or approximately 1,440 to 2,880 gallons per 24 hour period.

3.2 Ground Water Treatment System

The initial ground water treatment system will consist of a low profile diffused-air stripper system. A schematic of the treatment system is shown in Figure 9. At the present time, we propose the diffused-air stripper system be placed on a skid mounted system. The purpose of the skid mounted system is three fold: (1) cost, (2) effectiveness of the system; and (3) uncertainties of the final design.

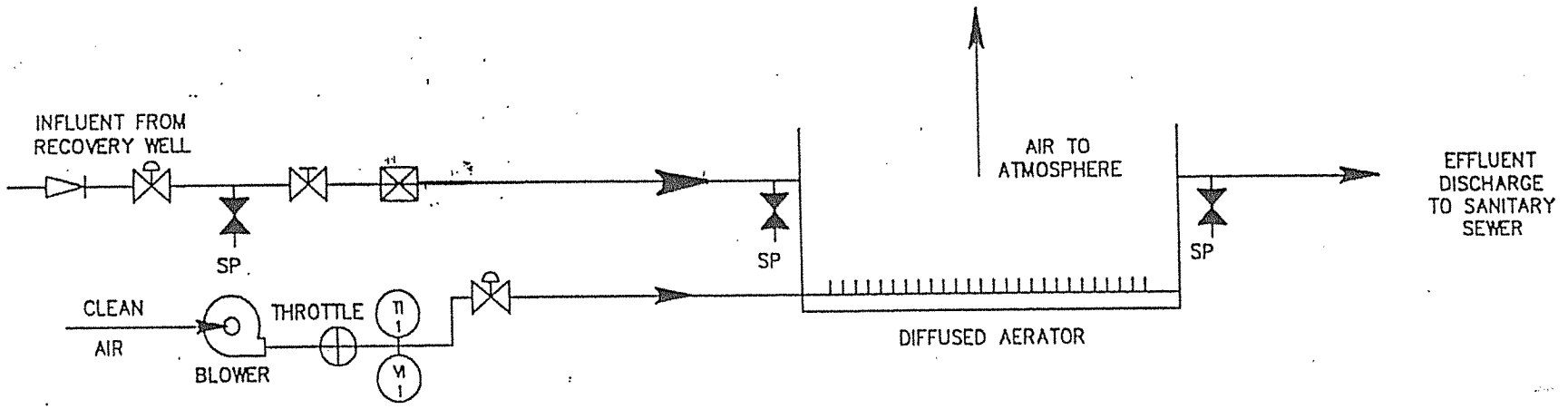
At the present time the diffused air stripping system is designed to handle 5 gpm with an influent concentration of 30 ppm of VOC. With this system, according to the manufacturer, an efficiency rating of 95 percent is achievable with this influent concentration and rate.

3.3 Effluent Holding and Disposal

The treated ground water from the diffused air-stripper system will be discharged to the sanitary sewer. At the present time we have received verbal authorization to discharge up to 5 gpm (during off hours of 4 pm to 10 am) and 2 gpm during high use hours (10 am to 4 pm). The limits for disposal outlined by the POTW are summarized in Table 1.

3.4 Operations and Maintenance

While the ground water treatment system is in its initial operation, (first week) a daily inspection will be conducted and recorded in a logbook. After this start-up period (one week), maintenance inspection will be performed on a bi-weekly basis for the



LEGEND

- TI 1 — TEMPERATURE INDICATOR
- VI 1 — VELOCITY INDICATOR
- SP — SAMPLE POINT
- TOTALIZER
- CONTROL VALVE
- GATE VALVE
- CHECK VALVE

DIFFUSED AERATOR SYSTEM
CROWN CENTRAL PETROLEUM CORP.
FACILITY NC-567
DURHAM, NORTH CAROLINA

ATEC Environmental Consultants
Division of ATEC Associates, Inc.
6814 Davis Circle
Raleigh, North Carolina 27613
(919) 782-2832 Raleigh
(919) 781-7558 FAX

SCALE:	DRAWN BY:	CHECKED BY:	DATE:	PROJECT NO.	FIGURE NO.
NTS			03/06/92	35-17234	9

first month. Table 2 summarizes the proposed Operation and Maintenance activities. Sampling of the influent/effluent will also be performed bi-weekly for the first month. Sampling will then be performed monthly. The samples will be analyzed for the parameters outlined in Table 1.

3.5 Project Schedule and Project Life

The installation of the recovery well/treatment system will require and estimated nine (9) weeks from the time of approval of the CAP. This time includes two (2) weeks for application and approval of the required county and state permits, one (1) week for recovery well installation, (5) weeks for design and building of the skid mounting/treatment system, and one (1) week to install and perform field test.

The life of this project can not be determined at this time. However, the CAP will be modified after data collected from the initial removal and treatment system are evaluated. At the present time, we are scheduling a three month period to evaluate the proposed ground water recovery/treatment system.

4.0 SITE SECURITY

The treatment system will be enclosed with a privacy fence to prevent access by unauthorized personnel. In additional, local police will be requested to routinely inspect the area to ensure that the site is not vandalized.

TABLE 2

OPERATION AND MAINTENANCE SCHEDULE
CORRECTIVE ACTION PLAN
CROWN NC-567
DURHAM, NORTH CAROLINA

ACTIVITY	MONITORING	
	Weekly to Biweekly	Monthly
Visual inspection of the site and treatment system.	●	
Product holding tanks inspection for full capacity.	●	
Pump and blower over-heating inspection.	●	
Flow indicator check.	●	
Pipe integrity visual check.	●	
Collected free product removal.*		●
Diffused air stripping visual inspection for clogging		●
Water meter cleaning.		●
Water table measurements	●	
Sampling and analytical testing of groundwater from all monitoring wells.***		
Influent/Effluent sampling	●**	●

* Estimated
** For start-up only
*** To be determined

5.0 REPORTING

Monthly reports will be provided to DEM summarizing the activities at the Crown NC-567 site. The reports will, at minimum will contain: summary of work performed at the site, ground water analytical results, and treatment operation and effectiveness. The report will also include recommendations for further or changed operations as necessary.

6.0 REMARKS

The recommendations, findings, or specifications contained in this report represent our professional opinions. These opinions were arrived at in accordance with currently accepted hydrogeologic and engineering practices at this time and location. Other than this, no warranty is implied or intended.

This report was prepared by **ATEC ENVIRONMENTAL CONSULTANTS, INC.**

Mike Reinhardt, P.G.
Project Manager

3/6/92
Date

Paul J. Warmus, P.G.
District Manager

3/6/92
Date

Appendix C

Schnabel Engineering Geophysical Survey Report

Schnabel
ENGINEERING

July 25, 2013

Mr. Matt Bramblett
Hart & Hickman, PC
2923 South Tryon Street, Suite 100
Charlotte, NC 28203

RE:
State Project: U-0071
WBS Element: 34745.1.1
County: Durham
Description: Durham East End Connector from NC 147 (Buck Dean Freeway) to North of NC 98

Subject: **Project 11821014.28, Report on Geophysical Surveys**
Parcel 205, Fast Fare Markets of NC, Inc. Property, Durham, North Carolina

Dear Mr. Bramblett:

SCHNABEL ENGINEERING SOUTH, PC (Schnabel) is pleased to present this report on the geophysical surveys we performed on the subject property. The report includes two 11x17 color figures and two 8.5x11 color figures. This study was performed in accordance with our proposal for Geophysical Surveys to Locate Possible USTs dated May 21, 2013, as approved by Cathy Houser on May 30, 2013, and our agreement dated June 2, 2011. Terry Fox provided a verbal notice to proceed on May 24, 2013.

INTRODUCTION

The field work described in this report was performed on May 28 and June 25, 2013, by Schnabel under our 2011 contract with the NCDOT. The purpose of the geophysical surveys was to evaluate the potential presence of metal underground storage tanks (USTs) in the accessible areas of the right-of-way and/or easement. Photographs of the property are included on Figure 1. The property is located in the southeast quadrant of US 70 and Pleasant Road, in Durham, NC (1001 S. Miami Boulevard).

The geophysical surveys consisted of an electromagnetic (EM) induction survey. The EM survey was performed using a Geonics EM61-MK2 instrument. The EM61 is a time domain metal detector that stores data digitally for later processing and review. Sensitivity to metallic objects is dependent on the size, depth, and orientation of the buried object and the amount of noise (i.e. response from spurious metallic objects) in the area. The EM61 can generally observe a single buried 55 gallon drum at a depth of 10 feet or less. The EM61 makes measurements by creating an electromagnetic pulse and then measuring the

response from metallic objects with time after the pulse is generated. We recorded the response at several times after the pulse to help evaluate relative size and depth of metallic objects in the earth.

A photograph of the equipment used is shown on Figure 2.

FIELD METHODOLOGY

We obtained locations of geophysical data points were obtained using a sub-meter Trimble Pro-XRS differential global positioning system (DGPS). References to direction and location in this report are based on the US State Plane 1983 System, North Carolina 3200 Zone, using the NAD 83 datum, with units in US survey feet. We recorded the locations of existing site features (metal objects, signs, etc.) with the DGPS for later correlation with the geophysical data and locations provided by the NCDOT.

The EM61 data were collected along parallel survey lines spaced approximately 2.5 feet apart. The EM61 and DGPS data were recorded digitally using a field computer and later transferred to a desktop computer for data processing.

DISCUSSION OF RESULTS

The contoured EM61 data collected over Parcel 205 are shown on Figure 3, EM61 Early Time Gate Response, and Figure 4, EM61 Differential Response. Areas outside the colored, contoured EM61 data were not surveyed. Early time data refer to the response measured at a short time after the initial EM pulse is generated. Early time data typically contain responses from all metal objects, small or large and shallow or deep, within the sensitivity range of the instrument. Differential data represent the difference in response between the top and bottom coils of the EM61 instrument at a later time after the initial pulse than early time data. Differential data naturally tend to filter out the effect of surface and very shallowly buried metallic objects. Typically, the differential response emphasizes anomalies from deeper and larger objects such as USTs.

The early time gate and differential results contain anomalies apparently caused by buried utilities or known site features (Figures 3 and 4). GPR data were not collected at the site due to a lack of differential EM61 anomalies that suggest a potential presence of unknown USTs. The geophysical data collected at the site do not indicate the presence of metallic USTs within the areas surveyed.

CONCLUSIONS

As shown in Figures 3 and 4, the EM data we collected over Parcel 205 cover nearly all of the planned survey area with the exception of a few small vegetated areas. The EM data include responses from several visible metallic objects at grade (e.g. signs, surface metal, etc.). We did not observe anomalies in the geophysical data at the subject property that we interpret to be the results of metallic USTs within about 6 feet of the ground surface.

LIMITATIONS

These services have been performed and this report prepared for Hart & Hickman, PC and the North Carolina Department of Transportation in accordance with generally accepted guidelines for conducting geophysical surveys. It is generally recognized that the results of geophysical surveys are non-unique and may not represent actual subsurface conditions.

We appreciate the opportunity to have provided these services. Please call if you need additional information or have any questions.

Sincerely,

SCHNABEL ENGINEERING SOUTH, PC

James W. Whitt, PG
Senior Staff Geophysicist

Gary D. Rogers, PG
Senior Associate

JWW:MAP:GDR
Attachments: Figures (4)
CC: NCDOT, Terry Fox
FILE: G:\2011-SDE-JOBS\11821014_00_NCDOT_2011_GEOTECHNICAL_UNIT_SERVICES\11821014_28_U-0071_DURHAM_COUNTY\REPORT\PARCEL 205\SCHNABEL GEOPHYSICAL REPORT ON PARCEL 205 (U-0071).DOCX

Attachments:

- Figure 1 - Parcel 205 Site Photos
- Figure 2 - Photo of Geophysical Equipment Used
- Figure 3 - Parcel 205 Early Time Gate Response
- Figure 4 - Parcel 205 Differential Response

Parcel 205 (Fast Fare Markets of NC, Inc. Property), looking northeast

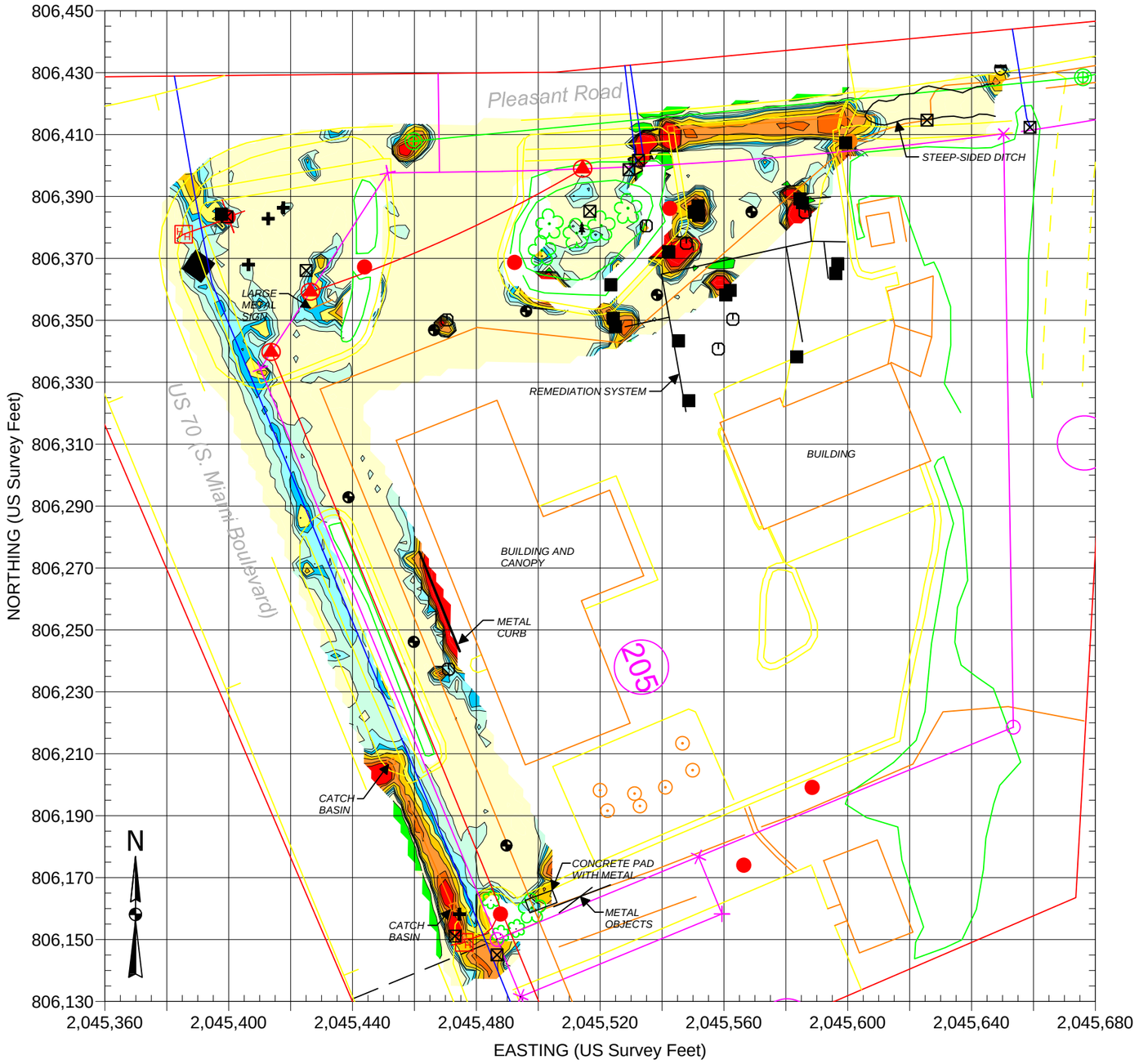
Parcel 205 (Fast Fare Markets of NC, Inc. Property), looking southeast

Schnabel ENGINEERING	STATE PROJECT U-0071 NC DEPT. OF TRANSPORTATION DURHAM CO., NORTH CAROLINA PROJECT NO. 11821014.28	PARCEL 205 SITE PHOTOS FIGURE 1

Geonics EM61-MK2 Metal Detector with Trimble DGPS Unit

Note: Stock photograph – not taken on site.

Schnabel ENGINEERING	STATE PROJECT U-0071 NC DEPT. OF TRANSPORTATION DURHAM CO., NORTH CAROLINA PROJECT NO. 11821014.28	PHOTO OF GEOPHYSICAL EQUIPMENT USED FIGURE 2



PARCEL 205

EM61 Early Time Gate Response (mV)

-15000 -100 0 50 100 150 200 300 500 750 1000 2000

Scale in US Survey Feet: 1 in = 40 ft

0 40 80 120

EXPLANATION

- PROPOSED BORING LOCATION (HART & HICKMAN)
- SIGN
- MISCELLANEOUS METALLIC OBJECT
- UTILITY MANHOLE, METER, BOX, ETC.
- GUY WIRE
- MONITORING WELL
- EDGE OF NCDOT PROPOSED R/W

BASE PLAN FROM NCDOT FILE:
u0071_rdy_psh22.dgn
(FOR SOME SITE FEATURES)

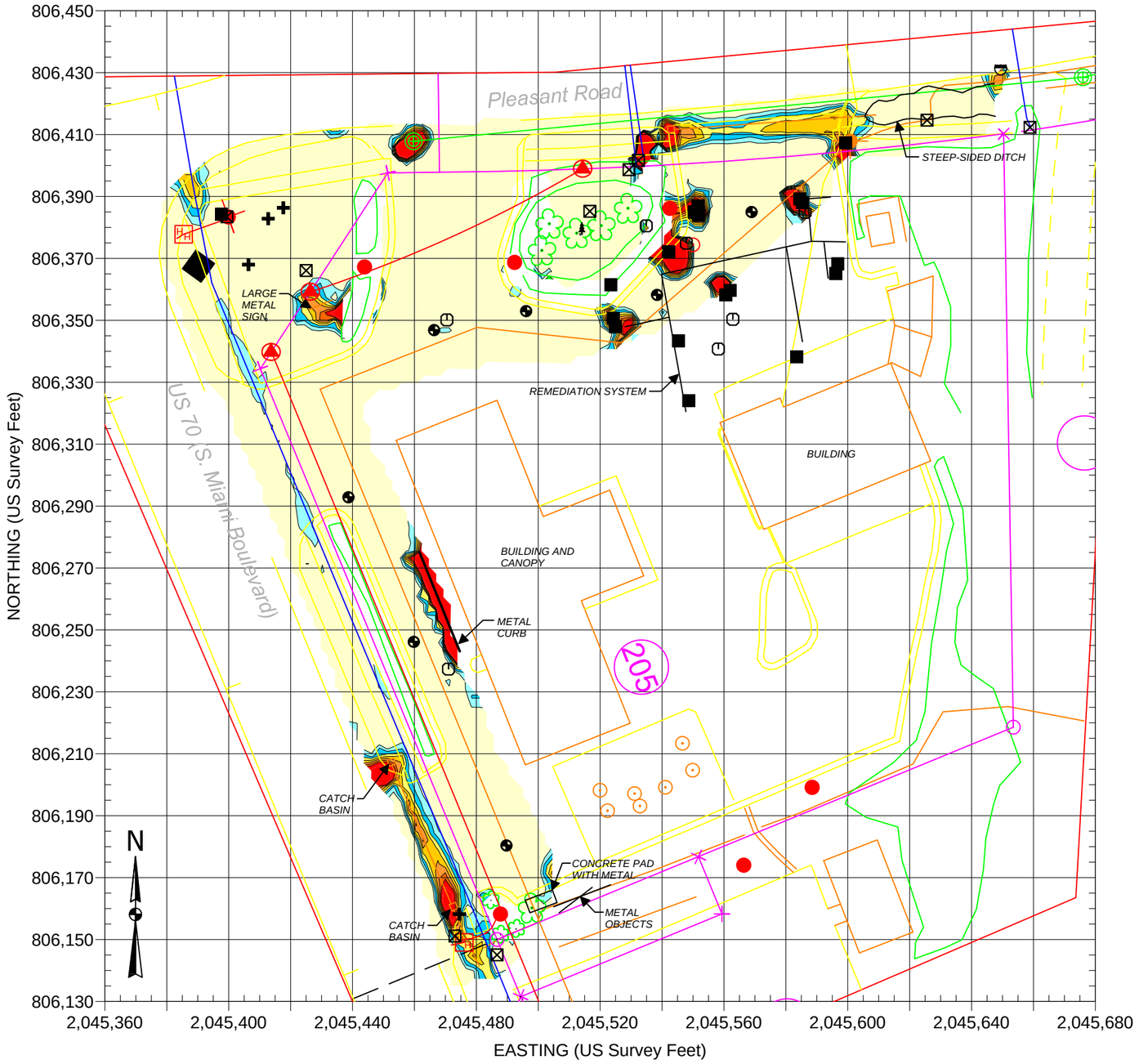
Note: The contour plot shows the earliest and more sensitive time gate of the EM61 bottom coil/channel in millivolts (mV). The EM data were collected on May 28, 2013, using a Geonics EM61-MK2 instrument. Positioning for the EM61 survey was provided using a submeter Trimble ProXRS DGPS system. Coordinates are in the US State Plane 1983 System, North Carolina Zone 3200, using the NAD 1983 datum. GPR data were acquired on June 25, 2013, using a Geophysical Survey Systems SIR 3000 equipped with a 400 MHz antenna.

Schnabel ENGINEERING

STATE PROJECT U-0071
NC DEPARTMENT OF TRANSPORTATION
DURHAM COUNTY, NC
PROJECT NO. 11821014.28

EM61
EARLY TIME GATE
RESPONSE

FIGURE 3



PARCEL 205

EM61 Differential Response (mV)

-20000 -100 0 40 60 80 100 120 140 160 200

Scale in US Survey Feet: 1 in = 40 ft

0 40 80 120

EXPLANATION

- PROPOSED BORING LOCATION (HART & HICKMAN)
- SIGN
- MISCELLANEOUS METALLIC OBJECT
- UTILITY MANHOLE, METER, BOX, ETC.
- GUY WIRE
- MONITORING WELL
- EDGE OF NCDOT PROPOSED R/W

BASE PLAN FROM NCDOT FILE:
u0071_rdy_psh22.dgn
(FOR SOME SITE FEATURES)

Note: The contour plot shows the difference, in millivolts (mV), between the readings from the top and bottom coils of the EM61. The difference is taken to reduce the effect of shallow metal objects and emphasize anomalies caused by deeper metallic objects, such as drums and tanks. The EM data were collected on May 28, 2013, using a Geonics EM61-MK2 instrument. Positioning for the EM61 survey was provided using a submeter Trimble ProXRS DGPS system. Coordinates are in the US State Plane 1983 System, North Carolina 3200 Zone, using the NAD 1983 datum. GPR data were acquired on June 25, 2013, using a Geophysical Survey Systems SIR 3000 equipped with a 400 MHz antenna.

Schnabel ENGINEERING

STATE PROJECT U-0071
NC DEPARTMENT OF TRANSPORTATION
DURHAM COUNTY, NC
PROJECT NO. 11821014.28

EM61
DIFFERENTIAL
RESPONSE

FIGURE 4

Appendix D

Soil Boring Logs

hart hickman
SMARTER ENVIRONMENTAL SOLUTIONS

2923 South Tryon Street-Suite 100
Charlotte, North Carolina 28203
704-586-0007(p) 704-586-0373(f)

3334 Hillsborough Street
Raleigh, North Carolina 27607
919-847-4241(p) 919-847-4261(f)

BORING NUMBER 205-1

PROJECT: NC DOT State Project U-0071 - Parcel 205
JOB NUMBER: ROW-416
LOCATION: Durham, NC

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	BORING DIAGRAM
0.0		GB	0	0		Gravel	
			0	0		Brown, sandy SILT	
			0	0		Orange brown, sandy SILT	
2.5			0	0			
			0	0			
			0	0			
5.0			0	0		Tan orange, clayey SILT	
			0	0			
			0	0			
7.5			0	0		Moist, brownish red, clayey SILT	
			0	0			
			0	0			
10.0			0	0			
			0	0			
12.5						Bottom of borehole at 12.0 feet.	

DRILLING CONTRACTOR: Probe Technology
DRILL RIG/ METHOD: Geoprobe
SAMPLING METHOD: Macro-Core
LOGGED BY: MJG
DRAWN BY: GES

BORING STARTED: 7/9/13
BORING COMPLETED: 7/9/13
TOTAL DEPTH: 12 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Soil sample collected from 0 to 1 ft bgs

BORING LOG - HART HICKMAN.GDT - 8/13/13 11:00 - S:\AAA-MASTER GINT PROJECTS\ROW-416\ROW.205.GPJ

hart hickman
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Charlotte, North Carolina 28203
704-586-0007(p) 704-586-0373(f)

3334 Hillsborough Street
Raleigh, North Carolina 27607
919-847-4241(p) 919-847-4261(f)

BORING NUMBER 205-2

PROJECT: NC DOT State Project U-0071 - Parcel 205
JOB NUMBER: ROW-416
LOCATION: Durham, NC

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	BORING DIAGRAM
0.0						Asphalt	
			0	0		Brown, sandy SILT	
			0	0		Orange brown, sandy SILT	
2.5			0	0			
			0	0			
			0	0		Brownish red, sandy SILT, petroleum odor	
5.0			0	373			
			0	533		Brownish red, clayey SILT, petroleum odor	
7.5		GB	0	784			
			0	273			
10.0						Refusal at 9.0 feet. Bottom of borehole at 9.0 feet.	

DRILLING CONTRACTOR: Probe Technology
DRILL RIG/ METHOD: Geoprobe
SAMPLING METHOD: Macro-Core
LOGGED BY: MJG
DRAWN BY: GES

BORING STARTED: 7/9/13
BORING COMPLETED: 7/9/13
TOTAL DEPTH: 9 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Soil sample collected from 7 to 8 ft bgs

BORING LOG - HART HICKMAN.GDT - 8/13/13 11:00 - S:\AAA-MASTER GINT PROJECTS\ROW-416\ROW.205.GPJ

hart hickman
SMARTER ENVIRONMENTAL SOLUTIONS

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3334 Hillsborough Street
Raleigh, North Carolina 27607
919-847-4241(p) 919-847-4261(f)

BORING NUMBER 205-3

PROJECT: NC DOT State Project U-0071 - Parcel 205
JOB NUMBER: ROW-416
LOCATION: Durham, NC

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	BORING DIAGRAM
0.0						Asphalt	
		GB	0	0		Brown, sandy SILT	
			0	0			
2.5			0	0		Reddish brown, sandy SILT, with clay	
			0	0			
			0	0			
5.0			0	0		Tan brown, sandy SILT, trace of mica	
			0	0			
7.5			0	0		Refusal at 8.0 feet. Bottom of borehole at 8.0 feet.	

DRILLING CONTRACTOR: Probe Technology
DRILL RIG/ METHOD: Geoprobe
SAMPLING METHOD: Macro-Core
LOGGED BY: MJG
DRAWN BY: GES

BORING STARTED: 7/9/13
BORING COMPLETED: 7/9/13
TOTAL DEPTH: 8 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Soil sample collected from 0 to 1 ft bgs

BORING LOG - HART HICKMAN.GDT - 8/13/13 11:00 - S:\AAA-MASTER GINT PROJECTS\ROW-416\ROW.205.GPJ

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SMARTER ENVIRONMENTAL SOLUTIONS

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3334 Hillsborough Street
Raleigh, North Carolina 27607
919-847-4241(p) 919-847-4261(f)

BORING NUMBER 205-4

PROJECT: NC DOT State Project U-0071 - Parcel 205
JOB NUMBER: ROW-416
LOCATION: Durham, NC

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	BORING DIAGRAM
0.0						Asphalt	
		GB	0	10.4		Reddish brown, sandy SILT	
			0	4.4			
2.5			0	3.2		Reddish brown, sandy SILT, trace of mica	
			0	1.2			
			0	0			
5.0			0	0			
						Refusal at 6.0 feet. Bottom of borehole at 6.0 feet.	

DRILLING CONTRACTOR: Probe Technology
DRILL RIG/ METHOD: Geoprobe
SAMPLING METHOD: Macro-Core
LOGGED BY: MJG
DRAWN BY: GES

BORING STARTED: 7/9/13
BORING COMPLETED: 7/9/13
TOTAL DEPTH: 6 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Soil sample collected from 0 to 1 ft bgs

BORING LOG - HART HICKMAN.GDT - 8/13/13 11:00 - S:\AAA-MASTER GINT PROJECTS\ROW-416\ROW.205.GPJ

hart hickman
SMARTER ENVIRONMENTAL SOLUTIONS

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Charlotte, North Carolina 28203
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3334 Hillsborough Street
Raleigh, North Carolina 27607
919-847-4241(p) 919-847-4261(f)

BORING NUMBER 205-5

PROJECT: NC DOT State Project U-0071 - Parcel 205
JOB NUMBER: ROW-416
LOCATION: Durham, NC

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	BORING DIAGRAM
0.0						Asphalt	
		GB	0	5		Brown, sandy SILT	
			0	0			
						Reddish brown, sandy SILT, trace of mica	
2.5			0	0			
			0	0			
			0	0			
5.0			0	0			
			0	0			
7.5						Refusal at 7.0 feet. Bottom of borehole at 7.0 feet.	

DRILLING CONTRACTOR: Probe Technology
DRILL RIG/ METHOD: Geoprobe
SAMPLING METHOD: Macro-Core
LOGGED BY: MJG
DRAWN BY: GES

BORING STARTED: 7/9/13
BORING COMPLETED: 7/9/13
TOTAL DEPTH: 7 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Soil sample collected from 0 to 1 ft bgs

BORING LOG - HART HICKMAN.GDT - 8/13/13 11:00 - S:\AAA-MASTER GINT PROJECTS\ROW-416\ROW.205.GPJ

hart hickman
SMARTER ENVIRONMENTAL SOLUTIONS

2923 South Tryon Street-Suite 100
Charlotte, North Carolina 28203
704-586-0007(p) 704-586-0373(f)

3334 Hillsborough Street
Raleigh, North Carolina 27607
919-847-4241(p) 919-847-4261(f)

BORING NUMBER 205-6

PROJECT: NC DOT State Project U-0071 - Parcel 205
JOB NUMBER: ROW-416
LOCATION: Durham, NC

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	BORING DIAGRAM
0						Asphalt	
		GB	0	0		Brown, sandy SILT	
1			0	0			
2			0	0		Reddish brown, sandy SILT, trace of mica	
3			0	0			
4						Refusal at 4.0 feet. Bottom of borehole at 4.0 feet.	
5							

DRILLING CONTRACTOR: Probe Technology
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Hand Auger
LOGGED BY: MJG
DRAWN BY: GES

BORING STARTED: 7/9/13
BORING COMPLETED: 7/9/13
TOTAL DEPTH: 4 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Soil sample collected from 0 to 1 ft bgs

BORING LOG - HART HICKMAN.GDT - 8/13/13 11:00 - S:\AAA-MASTER GINT PROJECTS\ROW-416\ROW.205.GPJ

hart hickman
SMARTER ENVIRONMENTAL SOLUTIONS

2923 South Tryon Street-Suite 100
Charlotte, North Carolina 28203
704-586-0007(p) 704-586-0373(f)

3334 Hillsborough Street
Raleigh, North Carolina 27607
919-847-4241(p) 919-847-4261(f)

BORING NUMBER 205-7

PROJECT: NC DOT State Project U-0071 - Parcel 205
JOB NUMBER: ROW-416
LOCATION: Durham, NC

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	BORING DIAGRAM
0.0						Asphalt	
		GB	0	0		Brown, sandy SILT	
			0	0			
2.5			0	0		Orange tan brown, sandy SILT	
			0	0			
5.0			0	0		Reddish brown, sandy SILT, trace of mica	
			0	0			
7.5						Refusal at 7.0 feet. Bottom of borehole at 7.0 feet.	

DRILLING CONTRACTOR: Probe Technology
DRILL RIG/ METHOD: Geoprobe
SAMPLING METHOD: Macro-Core
LOGGED BY: MJG
DRAWN BY: GES

BORING STARTED: 7/9/13
BORING COMPLETED: 7/9/13
TOTAL DEPTH: 7 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Soil sample collected from 0 to 1 ft bgs

BORING LOG - HART HICKMAN.GDT - 8/13/13 11:00 - S:\AAA-MASTER GINT PROJECTS\ROW-416\ROW.205.GPJ

Appendix E

Laboratory Analytical Report

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July 18, 2013

Chemical Testing Engineer
NCDOT
Materials & Tests Unit
1801 Blue Ridge Road
Raleigh, NC 27607

RE: Project: NCDOT ROW-416 WBS#34745.1.1
Pace Project No.: 92164612

Dear Chemical Engineer:
Enclosed are the analytical results for sample(s) received by the laboratory on July 10, 2013. The results relate only to the samples included in this report. Results reported herein conform to the most current TNI standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

Analyses were performed at the Pace Analytical Services location indicated on the sample analyte page for analysis unless otherwise footnoted.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Kevin Godwin

kevin.godwin@pacelabs.com
Project Manager

Enclosures

cc: David Graham, NCDOT East Central

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CERTIFICATIONS

Project: NCDOT ROW-416 WBS#34745.1.1
Pace Project No.: 92164612

Charlotte Certification IDs
9800 Kincey Ave. Ste 100, Huntersville, NC 28078
North Carolina Drinking Water Certification #: 37706
North Carolina Field Services Certification #: 5342
North Carolina Wastewater Certification #: 12
South Carolina Certification #: 99006001
Florida/NELAP Certification #: E87627
Kentucky UST Certification #: 84
West Virginia Certification #: 357
Virginia/VELAP Certification #: 460221

REPORT OF LABORATORY ANALYSIS

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SAMPLE ANALYTE COUNT

Project: NCDOT ROW-416 WBS#34745.1.1
Pace Project No.: 92164612

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
92164612001	**205-1 @ 0-1'**	EPA 8015 Modified	EJK	2	PASI-C
		EPA 8015 Modified	GAW	2	PASI-C
		ASTM D2974-87	TNM	1	PASI-C
92164612002	**205-2 @ 7-8'**	EPA 8015 Modified	EJK	2	PASI-C
		EPA 8015 Modified	GAW	2	PASI-C
		ASTM D2974-87	TNM	1	PASI-C
92164612003	**205-3 @ 0-1'**	EPA 8015 Modified	EJK	2	PASI-C
		EPA 8015 Modified	GAW	2	PASI-C
		ASTM D2974-87	TNM	1	PASI-C
92164612004	**205-4 @ 0-1'**	EPA 8015 Modified	EJK	2	PASI-C
		EPA 8015 Modified	GAW	2	PASI-C
		ASTM D2974-87	TNM	1	PASI-C
92164612005	**205-5 @ 0-1'**	EPA 8015 Modified	EJK	2	PASI-C
		EPA 8015 Modified	GAW	2	PASI-C
		ASTM D2974-87	TNM	1	PASI-C
92164612006	**205-6 @ 0-1'**	EPA 8015 Modified	EJK	2	PASI-C
		EPA 8015 Modified	GAW	2	PASI-C
		ASTM D2974-87	TNM	1	PASI-C
92164612007	**205-7 @ 0-1'**	EPA 8015 Modified	EJK	2	PASI-C
		EPA 8015 Modified	GAW	2	PASI-C
		ASTM D2974-87	TNM	1	PASI-C

REPORT OF LABORATORY ANALYSIS

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PROJECT NARRATIVE

Project: NCDOT ROW-416 WBS#34745.1.1
Pace Project No.: 92164612

Method: **EPA 8015 Modified**
Description: 8015 GCS THC-Diesel
Client: NCDOT East Central
Date: July 18, 2013

General Information:
7 samples were analyzed for EPA 8015 Modified. All samples were received in acceptable condition with any exceptions noted below.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Sample Preparation:
The samples were prepared in accordance with EPA 3546 with any exceptions noted below.

QC Batch: OEXT/22995

P3: Sample extract could not be concentrated to the routine final volume, resulting in elevated reporting limits.
- 205-1 @ 0-1' (Lab ID: 92164612001)

Initial Calibrations (including MS Tune as applicable):
All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:
All criteria were within method requirements with any exceptions noted below.

Surrogates:
All surrogates were within QC limits with any exceptions noted below.

QC Batch: OEXT/22995

S4: Surrogate recovery not evaluated against control limits due to sample dilution.
- 205-1 @ 0-1' (Lab ID: 92164612001)
  - n-Pentacosane (S)

Method Blank:
All analytes were below the report limit in the method blank with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

QC Batch: OEXT/22936

A matrix spike and matrix spike duplicate (MS/MSD) were performed on the following sample(s): 92164560006

M3: Matrix spike recovery was outside laboratory control limits due to matrix interferences.
- MS (Lab ID: 1007759)
  - Diesel Components
- MSD (Lab ID: 1007760)
  - Diesel Components

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PROJECT NARRATIVE

Project: NCDOT ROW-416 WBS#34745.1.1
Pace Project No.: 92164612

Method: **EPA 8015 Modified**
Description: 8015 GCS THC-Diesel
Client: NCDOT East Central
Date: July 18, 2013

QC Batch: OEXT/22936

A matrix spike and matrix spike duplicate (MS/MSD) were performed on the following sample(s): 92164560006

R1: RPD value was outside control limits.

- MSD (Lab ID: 1007760)
  - Diesel Components

Additional Comments:

Analyte Comments:

QC Batch: OEXT/22995

D3: Sample was diluted due to the presence of high levels of non-target analytes or other matrix interference.

- 205-1 @ 0-1' (Lab ID: 92164612001)
  - n-Pentacosane (S)

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PROJECT NARRATIVE

Project: NCDOT ROW-416 WBS#34745.1.1
Pace Project No.: 92164612

Method: **EPA 8015 Modified**
Description: Gasoline Range Organics
Client: NCDOT East Central
Date: July 18, 2013

General Information:
7 samples were analyzed for EPA 8015 Modified. All samples were received in acceptable condition with any exceptions noted below.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Sample Preparation:
The samples were prepared in accordance with EPA 5035A/5030B with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):
All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:
All criteria were within method requirements with any exceptions noted below.

Internal Standards:
All internal standards were within QC limits with any exceptions noted below.

Surrogates:
All surrogates were within QC limits with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

This data package has been reviewed for quality and completeness and is approved for release.

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ANALYTICAL RESULTS

Project: NCDOT ROW-416 WBS#34745.1.1
Pace Project No.: 92164612

Sample: 205-1 @ 0-1' **Lab ID: 92164612001** Collected: 07/09/13 11:20 Received: 07/10/13 15:50 Matrix: Solid

Results reported on a "dry-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
8015 GCS THC-Diesel	Analytical Method: EPA 8015 Modified Preparation Method: EPA 3546							
Diesel Components	ND	mg/kg	290	10	07/16/13 15:28	07/17/13 11:10	68334-30-5	
Surrogates								
n-Pentacosane (S)	0	%	41-119	10	07/16/13 15:28	07/17/13 11:10	629-99-2	D3,P3, S4
Gasoline Range Organics	Analytical Method: EPA 8015 Modified Preparation Method: EPA 5035A/5030B							
Gasoline Range Organics	ND	mg/kg	5.7	1	07/12/13 15:58	07/12/13 21:22	8006-61-9	
Surrogates								
4-Bromofluorobenzene (S)	80	%	70-167	1	07/12/13 15:58	07/12/13 21:22	460-00-4	
Percent Moisture	Analytical Method: ASTM D2974-87							
Percent Moisture	**13.9**	%	0.10	1		07/11/13 13:07		

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: NCDOT ROW-416 WBS#34745.1.1
Pace Project No.: 92164612

Sample: 205-2 @ 7-8' **Lab ID: 92164612002** Collected: 07/09/13 11:40 Received: 07/10/13 15:50 Matrix: Solid

Results reported on a "dry-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
8015 GCS THC-Diesel	Analytical Method: EPA 8015 Modified Preparation Method: EPA 3546							
Diesel Components	**15.0**	mg/kg	6.1	1	07/10/13 17:30	07/11/13 22:44	68334-30-5	
Surrogates								
n-Pentacosane (S)	86	%	41-119	1	07/10/13 17:30	07/11/13 22:44	629-99-2	
Gasoline Range Organics	Analytical Method: EPA 8015 Modified Preparation Method: EPA 5035A/5030B							
Gasoline Range Organics	**8.9**	mg/kg	6.0	1	07/12/13 15:58	07/12/13 21:44	8006-61-9	
Surrogates								
4-Bromofluorobenzene (S)	81	%	70-167	1	07/12/13 15:58	07/12/13 21:44	460-00-4	
Percent Moisture	Analytical Method: ASTM D2974-87							
Percent Moisture	**17.4**	%	0.10	1		07/11/13 13:07		

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ANALYTICAL RESULTS

Project: NCDOT ROW-416 WBS#34745.1.1
Pace Project No.: 92164612

Sample: 205-3 @ 0-1' **Lab ID: 92164612003** Collected: 07/09/13 12:45 Received: 07/10/13 15:50 Matrix: Solid

Results reported on a "dry-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
8015 GCS THC-Diesel	Analytical Method: EPA 8015 Modified Preparation Method: EPA 3546							
Diesel Components	**68.8**	mg/kg	6.1	1	07/10/13 17:30	07/12/13 20:10	68334-30-5	
Surrogates								
n-Pentacosane (S)	109	%	41-119	1	07/10/13 17:30	07/12/13 20:10	629-99-2	
Gasoline Range Organics	Analytical Method: EPA 8015 Modified Preparation Method: EPA 5035A/5030B							
Gasoline Range Organics	ND	mg/kg	6.0	1	07/12/13 15:58	07/12/13 16:02	8006-61-9	
Surrogates								
4-Bromofluorobenzene (S)	87	%	70-167	1	07/12/13 15:58	07/12/13 16:02	460-00-4	
Percent Moisture	Analytical Method: ASTM D2974-87							
Percent Moisture	**18.1**	%	0.10	1		07/11/13 13:07		

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ANALYTICAL RESULTS

Project: NCDOT ROW-416 WBS#34745.1.1
Pace Project No.: 92164612

Sample: 205-4 @ 0-1' **Lab ID: 92164612004** Collected: 07/09/13 13:05 Received: 07/10/13 15:50 Matrix: Solid

Results reported on a "dry-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
8015 GCS THC-Diesel	Analytical Method: EPA 8015 Modified Preparation Method: EPA 3546							
Diesel Components	**65.2**	mg/kg	5.7	1	07/10/13 17:30	07/11/13 23:08	68334-30-5	
Surrogates								
n-Pentacosane (S)	87	%	41-119	1	07/10/13 17:30	07/11/13 23:08	629-99-2	
Gasoline Range Organics	Analytical Method: EPA 8015 Modified Preparation Method: EPA 5035A/5030B							
Gasoline Range Organics	ND	mg/kg	6.1	1	07/14/13 10:02	07/14/13 13:33	8006-61-9	
Surrogates								
4-Bromofluorobenzene (S)	80	%	70-167	1	07/14/13 10:02	07/14/13 13:33	460-00-4	
Percent Moisture	Analytical Method: ASTM D2974-87							
Percent Moisture	**12.6**	%	0.10	1		07/11/13 13:07		

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ANALYTICAL RESULTS

Project: NCDOT ROW-416 WBS#34745.1.1
Pace Project No.: 92164612

Sample: 205-5 @ 0-1' **Lab ID: 92164612005** Collected: 07/09/13 13:25 Received: 07/10/13 15:50 Matrix: Solid

Results reported on a "dry-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
8015 GCS THC-Diesel	Analytical Method: EPA 8015 Modified Preparation Method: EPA 3546							
Diesel Components	ND	mg/kg	5.4	1	07/10/13 17:30	07/11/13 23:08	68334-30-5	
Surrogates								
n-Pentacosane (S)	69	%	41-119	1	07/10/13 17:30	07/11/13 23:08	629-99-2	
Gasoline Range Organics	Analytical Method: EPA 8015 Modified Preparation Method: EPA 5035A/5030B							
Gasoline Range Organics	ND	mg/kg	5.5	1	07/14/13 10:02	07/14/13 15:04	8006-61-9	
Surrogates								
4-Bromofluorobenzene (S)	84	%	70-167	1	07/14/13 10:02	07/14/13 15:04	460-00-4	
Percent Moisture	Analytical Method: ASTM D2974-87							
Percent Moisture	**7.2**	%	0.10	1		07/11/13 13:08		

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ANALYTICAL RESULTS

Project: NCDOT ROW-416 WBS#34745.1.1
Pace Project No.: 92164612

Sample: 205-6 @ 0-1' **Lab ID: 92164612006** Collected: 07/09/13 13:40 Received: 07/10/13 15:50 Matrix: Solid

Results reported on a "dry-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
8015 GCS THC-Diesel	Analytical Method: EPA 8015 Modified Preparation Method: EPA 3546							
Diesel Components	**189**	mg/kg	6.0	1	07/10/13 17:30	07/11/13 23:32	68334-30-5	
Surrogates								
n-Pentacosane (S)	84	%	41-119	1	07/10/13 17:30	07/11/13 23:32	629-99-2	
Gasoline Range Organics	Analytical Method: EPA 8015 Modified Preparation Method: EPA 5035A/5030B							
Gasoline Range Organics	ND	mg/kg	5.4	1	07/14/13 10:02	07/14/13 15:27	8006-61-9	
Surrogates								
4-Bromofluorobenzene (S)	79	%	70-167	1	07/14/13 10:02	07/14/13 15:27	460-00-4	
Percent Moisture	Analytical Method: ASTM D2974-87							
Percent Moisture	**16.1**	%	0.10	1		07/11/13 13:08		

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ANALYTICAL RESULTS

Project: NCDOT ROW-416 WBS#34745.1.1
Pace Project No.: 92164612

Sample: 205-7 @ 0-1' **Lab ID: 92164612007** Collected: 07/09/13 13:55 Received: 07/10/13 15:50 Matrix: Solid

Results reported on a "dry-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
8015 GCS THC-Diesel	Analytical Method: EPA 8015 Modified Preparation Method: EPA 3546							
Diesel Components	**58.7**	mg/kg	5.6	1	07/10/13 17:30	07/12/13 20:10	68334-30-5	
Surrogates								
n-Pentacosane (S)	81	%	41-119	1	07/10/13 17:30	07/12/13 20:10	629-99-2	
Gasoline Range Organics	Analytical Method: EPA 8015 Modified Preparation Method: EPA 5035A/5030B							
Gasoline Range Organics	ND	mg/kg	5.7	1	07/14/13 10:02	07/14/13 15:50	8006-61-9	
Surrogates								
4-Bromofluorobenzene (S)	82	%	70-167	1	07/14/13 10:02	07/14/13 15:50	460-00-4	
Percent Moisture	Analytical Method: ASTM D2974-87							
Percent Moisture	**11.3**	%	0.10	1		07/11/13 13:08		

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QUALITY CONTROL DATA

Project: NCDOT ROW-416 WBS#34745.1.1
Pace Project No.: 92164612

QC Batch: GCV/7072 Analysis Method: EPA 8015 Modified
QC Batch Method: EPA 5035A/5030B Analysis Description: Gasoline Range Organics
Associated Lab Samples: 92164612001, 92164612002, 92164612003

METHOD BLANK: 1009045 Matrix: Solid
Associated Lab Samples: 92164612001, 92164612002, 92164612003

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Gasoline Range Organics	mg/kg	ND	6.0	07/12/13 15:39	
4-Bromofluorobenzene (S)	%	90	70-167	07/12/13 15:39	

LABORATORY CONTROL SAMPLE: 1009046

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Gasoline Range Organics	mg/kg	50	49.2	98	70-165	
4-Bromofluorobenzene (S)	%			90	70-167	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1009173 1009174

Parameter	Units	92164612003 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Qual
Gasoline Range Organics	mg/kg	ND	49.7	49.7	60.6	58.7	122	118	47-187	3	
4-Bromofluorobenzene (S)	%						87	92	70-167		

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QUALITY CONTROL DATA

Project: NCDOT ROW-416 WBS#34745.1.1
Pace Project No.: 92164612

QC Batch: GCV/7074 Analysis Method: EPA 8015 Modified
QC Batch Method: EPA 5035A/5030B Analysis Description: Gasoline Range Organics
Associated Lab Samples: 92164612004, 92164612005, 92164612006, 92164612007

METHOD BLANK: 1009905 Matrix: Solid
Associated Lab Samples: 92164612004, 92164612005, 92164612006, 92164612007

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Gasoline Range Organics	mg/kg	ND	6.0	07/14/13 13:10	
4-Bromofluorobenzene (S)	%	81	70-167	07/14/13 13:10	

LABORATORY CONTROL SAMPLE: 1009906

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Gasoline Range Organics	mg/kg	49.6	47.7	96	70-165	
4-Bromofluorobenzene (S)	%			79	70-167	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1009907 1009908

Parameter	Units	92164612004 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Qual
Gasoline Range Organics	mg/kg	ND	51.2	51.2	58.3	58.3	113	113	47-187	0	
4-Bromofluorobenzene (S)	%						82	83	70-167		

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
205 East Meadow Road - Suite A
Eden, NC 27288
(336)623-8921

Pace Analytical Services, Inc.
2225 Riverside Dr.
Asheville, NC 28804
(828)254-7176

Pace Analytical Services, Inc.
9800 Kincey Ave. Suite 100
Huntersville, NC 28078
(704)875-9092

QUALITY CONTROL DATA

Project: NCDOT ROW-416 WBS#34745.1.1
Pace Project No.: 92164612

QC Batch: OEXT/22936 Analysis Method: EPA 8015 Modified
QC Batch Method: EPA 3546 Analysis Description: 8015 Solid GCSV
Associated Lab Samples: 92164612002, 92164612003, 92164612004, 92164612005, 92164612006, 92164612007

METHOD BLANK: 1007757 Matrix: Solid
Associated Lab Samples: 92164612002, 92164612003, 92164612004, 92164612005, 92164612006, 92164612007

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Diesel Components	mg/kg	ND	5.0	07/11/13 19:11	
n-Pentacosane (S)	%	90	41-119	07/11/13 19:11	

LABORATORY CONTROL SAMPLE: 1007758

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Diesel Components	mg/kg	66.7	49.9	75	49-113	
n-Pentacosane (S)	%			86	41-119	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1007759 1007760

Parameter	Units	92164560006 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Qual
Diesel Components	mg/kg	376	78.7	78.7	617	325	307	-64	10-146	62	M3,P6,R1
n-Pentacosane (S)	%						94	94	41-119		

REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: NCDOT ROW-416 WBS#34745.1.1
Pace Project No.: 92164612

QC Batch: OEXT/22995
QC Batch Method: EPA 3546
Analysis Method: EPA 8015 Modified
Analysis Description: 8015 Solid GCSV
Associated Lab Samples: 92164612001

METHOD BLANK: 1010492 Matrix: Solid
Associated Lab Samples: 92164612001

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Diesel Components	mg/kg	ND	5.0	07/16/13 12:12	
n-Pentacosane (S)	%	79	41-119	07/16/13 12:12	

LABORATORY CONTROL SAMPLE & LCSD: 1010493 1010494

Parameter	Units	Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec	% Rec Limits	RPD	Max RPD	Qualifiers
Diesel Components	mg/kg	66.7	48.9	43.5	73	65	49-113	12	30	
n-Pentacosane (S)	%				85	85	41-119			

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QUALITY CONTROL DATA

Project: NCDOT ROW-416 WBS#34745.1.1
Pace Project No.: 92164612

QC Batch: PMST/5663 Analysis Method: ASTM D2974-87
QC Batch Method: ASTM D2974-87 Analysis Description: Dry Weight/Percent Moisture
Associated Lab Samples: 92164612001, 92164612002, 92164612003, 92164612004, 92164612005, 92164612006, 92164612007

SAMPLE DUPLICATE: 1007871

Parameter	Units	92164610001 Result	Dup Result	RPD	Qualifiers
Percent Moisture	%	7.0	6.2	13	

SAMPLE DUPLICATE: 1007872

Parameter	Units	92164586001 Result	Dup Result	RPD	Qualifiers
Percent Moisture	%	6.3	6.0	6	

REPORT OF LABORATORY ANALYSIS

QUALIFIERS

Project: NCDOT ROW-416 WBS#34745.1.1
Pace Project No.: 92164612

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to changes in sample preparation, dilution of the sample aliquot, or moisture content.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PRL - Pace Reporting Limit.

RL - Reporting Limit.

S - Surrogate

1,2-Diphenylhydrazine (8270 listed analyte) decomposes to Azobenzene.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Acid preservation may not be appropriate for 2-Chloroethylvinyl ether, Styrene, and Vinyl chloride.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

LABORATORIES

PASI-C	Pace Analytical Services - Charlotte

ANALYTE QUALIFIERS

D3	Sample was diluted due to the presence of high levels of non-target analytes or other matrix interference.
M3	Matrix spike recovery was outside laboratory control limits due to matrix interferences.
P3	Sample extract could not be concentrated to the routine final volume, resulting in elevated reporting limits.
P6	Matrix spike recovery was outside laboratory control limits due to a parent sample concentration notably higher than the spike level.
R1	RPD value was outside control limits.
S4	Surrogate recovery not evaluated against control limits due to sample dilution.

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: NCDOT ROW-416 WBS#34745.1.1
Pace Project No.: 92164612

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
92164612001	**205-1 @ 0-1'**	EPA 3546	OEXT/22995	EPA 8015 Modified	GCSV/15080
92164612002	**205-2 @ 7-8'**	EPA 3546	OEXT/22936	EPA 8015 Modified	GCSV/15055
92164612003	**205-3 @ 0-1'**	EPA 3546	OEXT/22936	EPA 8015 Modified	GCSV/15055
92164612004	**205-4 @ 0-1'**	EPA 3546	OEXT/22936	EPA 8015 Modified	GCSV/15055
92164612005	**205-5 @ 0-1'**	EPA 3546	OEXT/22936	EPA 8015 Modified	GCSV/15055
92164612006	**205-6 @ 0-1'**	EPA 3546	OEXT/22936	EPA 8015 Modified	GCSV/15055
92164612007	**205-7 @ 0-1'**	EPA 3546	OEXT/22936	EPA 8015 Modified	GCSV/15055
92164612001	**205-1 @ 0-1'**	EPA 5035A/5030B	GCV/7072	EPA 8015 Modified	GCV/7076
92164612002	**205-2 @ 7-8'**	EPA 5035A/5030B	GCV/7072	EPA 8015 Modified	GCV/7076
92164612003	**205-3 @ 0-1'**	EPA 5035A/5030B	GCV/7072	EPA 8015 Modified	GCV/7076
92164612004	**205-4 @ 0-1'**	EPA 5035A/5030B	GCV/7074	EPA 8015 Modified	GCV/7077
92164612005	**205-5 @ 0-1'**	EPA 5035A/5030B	GCV/7074	EPA 8015 Modified	GCV/7077
92164612006	**205-6 @ 0-1'**	EPA 5035A/5030B	GCV/7074	EPA 8015 Modified	GCV/7077
92164612007	**205-7 @ 0-1'**	EPA 5035A/5030B	GCV/7074	EPA 8015 Modified	GCV/7077
92164612001	**205-1 @ 0-1'**	ASTM D2974-87	PMST/5663		
92164612002	**205-2 @ 7-8'**	ASTM D2974-87	PMST/5663		
92164612003	**205-3 @ 0-1'**	ASTM D2974-87	PMST/5663		
92164612004	**205-4 @ 0-1'**	ASTM D2974-87	PMST/5663		
92164612005	**205-5 @ 0-1'**	ASTM D2974-87	PMST/5663		
92164612006	**205-6 @ 0-1'**	ASTM D2974-87	PMST/5663		
92164612007	**205-7 @ 0-1'**	ASTM D2974-87	PMST/5663		

Pace Analytical	Sample Condition Upon Receipt (SCUR)	Page 1 of 2
	Document Number: F-CHR-CS-03-rev.11	Issuing Authority: Pace Huntersville Quality Office

Client Name: H&H

Where Received: ☑ Huntersville ☐ Asheville ☐ Eden ☐ Raleigh

Courier: ☐ Fed Ex ☐ UPS ☐ USPS ☐ Client ☐ Commercial ☑ Pace Other_____

Custody Seal on Cooler/Box Present: ☐ yes ☑ no Seals intact: ☐ yes ☐ no

Optional
Proj. Due Date:
Proj. Name:

Packing Material: ☐ Bubble Wrap ☐ Bubble Bags ☐ None ☐ Other_____

Thermometer Used: IR Gun T1102 T1301 **Type of Ice:** Wet Blue None ☐ Samples on ice, cooling process has begun

Temp Correction Factor **T1102**: No Correction **T1301**: No Correction

Corrected Cooler Temp.: 2.8 C **Biological Tissue is Frozen:** Yes No N/A

Temp should be above freezing to 6°C **Comments:**

Date and Initials of person examining contents: MT 7/10

Chain of Custody Present:	☑Yes ☐No ☐N/A	1.
Chain of Custody Filled Out:	☑Yes ☐No ☐N/A	2.
Chain of Custody Relinquished:	☑Yes ☐No ☐N/A	3.
Sampler Name & Signature on COC:	☑Yes ☐No ☐N/A	4.
Samples Arrived within Hold Time:	☑Yes ☐No ☐N/A	5.
Short Hold Time Analysis (<72hr):	☐Yes ☑No ☐N/A	6.
Rush Turn Around Time Requested:	☐Yes ☑No ☐N/A	7.
Sufficient Volume:	☑Yes ☐No ☐N/A	8.
Correct Containers Used:	☑Yes ☐No ☐N/A	9.
-Pace Containers Used:	☑Yes ☐No ☐N/A	
Containers Intact:	☑Yes ☐No ☐N/A	10.
Filtered volume received for Dissolved tests	☐Yes ☐No ☑N/A	11.
Sample Labels match COC:	☑Yes ☐No ☐N/A	12.
-Includes date/time/ID/Analysis Matrix:_____		
All containers needing preservation have been checked.	☐Yes ☐No ☑N/A	13.
All containers needing preservation are found to be in compliance with EPA recommendation.	☐Yes ☐No ☑N/A	
exceptions: VOA, coliform, TOC, O&G, WI-DRO (water)	☐Yes ☐No	
Samples checked for dechlorination:	☐Yes ☐No ☑N/A	14.
Headspace in VOA Vials (>6mm):	☐Yes ☐No ☑N/A	15.
Trip Blank Present:	☐Yes ☐No ☑N/A	16.
Trip Blank Custody Seals Present	☐Yes ☐No ☑N/A	
Pace Trip Blank Lot # (if purchased):_____		

Client Notification/ Resolution: Field Data Required? Y / N

Person Contacted:_____ Date/Time:_____

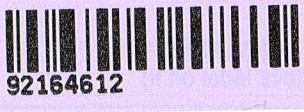
Comments/ Resolution:_____

SCURF Review: [signature] **Date:** 7/10/13

SRF Review: [signature] **Date:** 7/11/13

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e out of hold, incorrect preservative, out of temp, incorrect containers)

WO#: 92164612



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www.pacelabs.com

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Page: 1 of 1

1686030

Section A — **Required** Client Information:

Company: Hart & Hickman
Address: 2923 S. Tryon Street
Suite 100 Charlotte, NC
Email To: DGraham@harthickman.com
Phone: 704-887-4630 Fax:
Requested Due Date/TAT:

Section B — **Required** Project Information:

Report To: David Graham
Copy To:
Purchase Order No.: WBS# 34745.1.1
Project Name: NCDOT - ROW-416
Project Number: ROW-416

Section C — Invoice Information:

Attention: Cynthia Wells
Company Name: Hart & Hickman
Address: CWells@harthickman.com
Pace Quote Reference:
Pace Project Manager:
Pace Profile #: 5279-2

REGULATORY AGENCY

☐ NPDES ☐ GROUND WATER ☐ DRINKING WATER
☐ UST ☐ RCRA ☐ OTHER _____

Site Location STATE: NC

Section D — **Required** Client Information

SAMPLE ID
(A-Z, 0-9 / ,-)
Sample IDs MUST BE UNIQUE

Matrix Codes (MATRIX / CODE)

Drinking Water	DW
Water	WT
Waste Water	WW
Product	P
Soil/Solid	SL
Oil	OL
Wipe	WP
Air	AR
Tissue	TS
Other	OT

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED: COMPOSITE START DATE	COMPOSITE START TIME	COMPOSITE END/GRAB DATE	COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test Y/N	TPH - GRO	TPH - DRO	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
1	205-1 @ 0-1'	SL	G	7/9/13		7/9/13	1120		4										X	X		001
2	205-2 @ 7-8'						1140												X	X		002
3	205-3 @ 0-1'						1245												X	X		003
4	205-4 @ 0-1'						1305												X	X		004
5	205-5 @ 0-1'						1325												X	X		005
6	205-6 @ 0-1'						1340												X	X		006
7	205-7 @ 0-1'						1355												X	X		007
8																						
9																						
10																						
11																						
12																						

92164612

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS: Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
*Separate report	Matt Gillis	7/10/13	1025	[signature]	7/10/13	1025				
required for each site	[signature] pace	7/10/13	1550	Omale Pace	7-10-13	1550	2.8	Y	A-Y	Y

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Matt Gillis
SIGNATURE of SAMPLER: [signature] DATE Signed (MM/DD/YY): 7/10/13

ORIGINAL

*Important Note: By signing this form you are accepting Pace's NET 30 day payment terms and agreeing to late charges of 1.5% per month for any invoices not paid within 30 days.