FINAL REPORT

PHASE I PRELIMINARY SITE INVESTIGATION FOR WILCO #211 SITE RALEIGH, NORTH CAROLINA

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1.0 INTRODUCTION

1.1 Purpose and Scope-of-Work

This report summarizes the findings and results of a Phase I Preliminary Site Investigation conducted at the Wilco #211 Station (Wilco) site, located at 850 Capital Boulevard in Raleigh, North Carolina (Figure 1). The objectives of this investigation were to determine if gasoline and/or diesel fuel hydrocarbons have impacted groundwater, to establish groundwater flow direction, to investigate other potential sources from adjacent properties, and to evaluate subsurface geologic and hydrogeologic conditions. This was accomplished by drilling four soil borings to an average depth of approximately 14 feet (ft) below land surface (bls), and installing monitor wells in each of the boreholes. An incident records search was conducted at the North Carolina Department of Environment, Health, and Natural Resources, Groundwater Section (NC DEHNR/GW), to determine if other potential sources exist adjacent to or near the Wilco property.

ESE Biosciences, Inc. (**EBIO**) was contracted by A. T. Williams Oil Company to perform the above mentioned scope-of-work. In this report, **EBIO** has focused on the existence of hydrocarbons in the soil and groundwater which relate to the hydrogeologic factors pertaining to the site.

1.2 Site History, Description, and Location

This preliminary site investigation was prompted because of the results obtained during the Capital Boulevard roadway expansion project investigation dated February 26, 1992 (Law Engineering, 1992). During this investigation, several roadway foundation borings were drilled along Capital Boulevard and on the Wilco property. Soil samples collected from borings located on the Wilco property revealed petroleum hydrocarbon (PHC) concentrations relative to a gasoline standard in concentrations ranging from 27 to 4,600 parts per million (ppm).

This prompted the issuance of a letter of "Notice of Regulatory Requirements" by the NC DEHNR/GW to A. T. Williams on January 23, 1992. Subsequent to this letter, A. T. Williams contracted with **EBIO** to perform a preliminary site check in March of 1992. The results of this investigation are summarized in the *Preliminary Site Check at the Wilco Station #211, Raleigh, North Carolina* report issued on March 24, 1992 (**EBIO**, 1992). In brief, the results of this site check revealed hydrocarbon concentrations in soil samples collected adjacent to the product lines and the tank pit area in excess of the 10 ppm action level established by the NC DEHNR/GW.

The Wilco property has a total of seven underground storage tanks (USTs), one diesel tank and six gasoline tanks. All tanks are located on the Wilco property. Presently, the site operates as a convenience store and gasoline station.

The Wilco site, as defined in this report, is located on the east side of Capital Boulevard approximately 0.15 miles north of the Peace Street interchange in Raleigh, North Carolina. The Wilco site is bounded on the north by a Meineke Muffler Shop, the east by Southern Railway, the south by Reeve's Wrecker Service, and the west by Capital Boulevard. This investigation was conducted solely on the Wilco property. The site is flat to gently sloped towards Capital Boulevard. The majority of the site is covered with asphalt and concrete paving in the traffic areas on the western portion of the site. The eastern portion of the site is soil covered due to recent excavation. Structurally, one main building and three pump islands are present (Figure 2).

2.0 ENVIRONMENTAL SETTING

2.1 Physiography

The Wilco site is located within the eastern-most edge of the Piedmont physiographic province of North Carolina.

The site is generally flat with a gentle slope towards the west and north. Pigeon House Creek, located due west of the site, is considered to be a topographic low in this area. The railroad tracks to the east provide a topographic high or ridge. It is apparent from the field investigation that significant soil "excavation" and "fill" activities have taken place in this area, associated with the construction of Capital Boulevard and the properties to the east and west. These past activities have altered the landscape, surface water runoff, and potentially groundwater flow.

2.2 Regional Geology

The regional geology of the area is described as being injected gneiss and consisting of foliated biotite gneiss and schist intruded by numerous sills and dikes of granite, pegmatite, and aplite which comprise the Raleigh Belt formation (Brown et al., 1985). The soils of this area, commonly referred to as saprolite, are described as being unconsolidated rock having the same structure as the parent rock. These soils overly partially weathered rock (PWR), which is considered to be the zone of transition between the soil and parent bedrock material.

2.3 Regional Hydrogeology and Water Use

The regional hydrogeology of the area is classified as having unconfined aquifers contained within the saprolitic, PWR, or bedrock portions of the subsurface. These aquifers are associated with the Metaigneous, intermediate aquifer system (Daniel and Payne, 1990). Potable water in this area is supplied by the City of Raleigh.

3.0 INVESTIGATION METHODS

3.1 Summary of Activities

The Phase I Preliminary Site Investigation of the soil and groundwater regimes included the drilling of four soil borings and installation of monitoring wells in each boring. Drilling activities occurred from June 1, 1992 through June 2, 1992 and groundwater sampling activities occurred on June 2 and June 3, 1992. Bore & Core Drilling Company of Raleigh, NC provided the drilling for the soil borings and monitor well installations, while **EBIO** personnel obtained soil and groundwater samples. The soil and groundwater samples were analyzed at the **EBIO** laboratories in Raleigh, NC.

Prior to beginning the field activities of this investigation, a groundwater pollution incident file search was conducted at the NC DEHNR/GW. The purpose for this file search was to determine if other groundwater pollution incidents adjacent to the Wilco property existed.

3.2 Methods

3.2.1 Soil Boring and Soil Sampling

The five soil borings (EB-MW-1, EB-MW-1A, EB-MW-2, EB-MW-3, and EB-MW-4) were drilled utilizing a CME 45C drill rig with 7.25-inch outside diameter hollow stem augers. All soil borings were sampled at 3.5 ft bls, then at 5 ft intervals thereafter using a 1.5 ft long split-spoon sampler in accordance with ASTM Method D-1586 (ASTM, 1985). Soils were classified in accordance with the Unified Soil Classification System by the project geologist. A representative sample from each interval was then placed in a clean ziplock bag and sealed. After allowing the samples to equilibrate with atmospheric temperatures, the headspace within the bag was analyzed by inserting the probe of a Foxboro OVA flame ionization detector (FID) through the plastic bag and recording the resultant concentration of total organic vapors. The FID was calibrated prior to use each day. The FID values obtained during soil headspace screening are included in the Field Sample Record in Appendix A. The soil sample from the 8.5 to 10.0 ft bls interval from each borehole was held for further chemical analyses for PHCs versus gasoline and diesel fuel standards using EPA Methods 5030 and 3550/GC-FID. No sample was attainable from EB-MW-1 due to the high soil density as determined by split-spoon testing. Soil samples were transferred to the **EBIO** laboratories in Raleigh, on ice and under chain-of-custody control. The chain-of-custody records are provided in Appendix B.

3.2.2 Monitor Well Installation and Groundwater Sampling

Upon completion of the boreholes, 2-inch diameter monitor wells were constructed in the borings located at EB-MW-1A, EB-MW-2, EB-MW-3, and EB-MW-4 (Figure 2). No well was constructed at EB-MW-1 due to auger

refusal. This borehole was grouted to the surface. A 10 ft length of 2-inch, schedule 40 polyvinyl chloride (PVC) Tri-Loc® well screen, having 0.010-inch slot size and equipped with an end cap, was installed in each 7.25-inch borehole, except for EB-MW-4, in which a 5 ft. length of screen was installed. A 2-inch PVC riser pipe connected to the screen completed the well to land surface. Generally, the top of the screened interval was placed 2 to 3 ft above the observed water level in each well to bracket groundwater fluctuations during the year and to intercept any phase-separated hydrocarbons. No PVC primer or solvent was used in construction of the wells. The filter pack for all monitor wells consisted of a fine to medium graded sand, and was installed to a height of approximately 2 ft above the screened interval. A bentonite seal, approximately 2 ft in thickness, was placed above the filter pack. The remainder of the annular space was then grouted with neat cement to the surface. The four wells were equipped with locking caps. EB-MW-1A was protected with an above ground protective casing, while the remaining wells were protected with below ground vault type manhole covers finished to ground level. Table 1 summarizes the monitor well construction details.

The **EBIO** site geologist maintained lithologic logs for all boreholes. These logs, the well completion logs, the well construction records, and the well abandonment record are provided in Appendix C. Following completion of monitor well construction, each monitor well was developed with a pre-cleaned stainless steel bailer until signs of turbidity were absent or greatly reduced. The amount of water recorded from each well is included in the well completion logs and the well sampling data forms included in Appendix D. All water removed from wells during development was stored in a 55-gallon polyethylene drum.

Prior to drilling each borehole and well construction, all downhole drilling tools and associated drilling equipment were thoroughly washed with a high pressure steam cleaner. In addition, the split-spoon samplers were decontaminated with a tap water rinse and Liquinox™ wash, tap water rinse, organic-free deionized (DI) water rinse, two pesticide grade isopropanol rinses and a final DI water rinse. Decontamination water was provided by the City of Raleigh water supply. Well casing and screen remained plastic-wrapped in boxes until ready for installation. These materials were handled with clean disposable latex gloves at all times.

The groundwater quality monitoring program at the Wilco site consisted of measuring for the presence of phase-separated hydrocarbons and sampling the groundwater from EB-MW-1A through EB-MW-4. Procedures for groundwater sampling were as follows:

1. Initially, the caps on all monitor wells were removed to allow the water levels to stabilize for one hour. Next, the depth to water from the measuring point (MP) on the top of casing was measured.

2. The sampler then calculated the volume of water in the well by using the monitor well construction details and water level data.

3. A minimum of three saturated well-volumes were removed from each monitor well to purge it of stagnant water and to ensure that representative formation water would be sampled. The wells were purged using a pre-cleaned stainless steel bailer. Purge water was collected and transported to a 55-gallon holding drum and stored on site for later disposal.

4. Wells were sampled with a stainless steel bailer that had been decontaminated according to the procedures described below in item 5. Care was taken during volatile organic compounds (VOC) sample collection not to aerate the sample. Samples were collected in laboratory prepared containers, labeled with laboratory identification numbers, sampler's initials and sampling time and date. Upon collection, samples were preserved with sulfuric acid. The samples were then packed in ice for shipment to the laboratory. A chain-of-custody document was maintained from the time of the sample collection through analysis and is provided in Appendix B. Groundwater samples were analyzed for benzene, toluene, ethylbenzene, and xylenes (BTEX) by EPA Method 602 and PHCs by EPA Methods 5030 and 3550/GC-FID.

5. The groundwater samples were protected from cross-contamination using the following procedures:

   a. Sampling equipment, which contacted the sample matrix (i.e., bailers, etc.), was decontaminated using a Liquinox wash, tap water rinse, DI water rinse, double isopropanol rinse, and a final DI water rinse followed by air drying.

   b. Polyethylene plastic sheeting was placed around the well head to prevent soil from contaminating sampling containers and equipment placed on the ground. Clean disposable latex gloves were worn by sampling personnel while purging and sampling. Gloves were changed between monitor wells.

3.2.3 Water Level Measurements

Water levels in all the monitor wells were measured prior to the collection of the groundwater samples. All well caps were removed and the water levels allowed to stabilize for approximately one hour before collecting water level data. An oil/water interface probe was used to obtain water level measurements on June 2, 1992 and again on June 17, 1992. These measurements were used to generate two water level contour and flow maps of the site. The water level measurements are summarized in Table 2. Water/Hydrocarbon Level Data forms are included in Appendix E.

3.2.4 Site Survey

Following monitor well completion and sampling, all monitor wells were surveyed for horizontal and vertical location, and a MP established on a point on each well casing. The MP elevation was determined relative to a designated mark made on each casing by the site geologist following monitor well completion. The monitor well elevations at the Wilco site were established with respect to a designated benchmark located at the northeast corner of the Wilco store, and given a relative elevation of 100 ft. The MP elevations are shown in Table 2.

3.2.5 Biofeasibility Analysis

Soil and water samples obtained from EB-MW-3 were used to perform a Level 1 Biofeasibility Analysis. The purpose of this analysis was to determined if soils and groundwater were suitable for implementation of *in situ* bioremediation. In brief, soils and groundwater were determined to be non-toxic to microorganisms which would be used for bioremediation. A more complete report of this analysis is provided in Appendix F.

3.2.6 Sieve Analysis

A soil sample was obtained from EB-MW-4 at a depth of 8.5 to 10.0 ft bls to verify soil grain size and determine the vertical hydraulic conductivity. The results of which are included in Appendix G.

4.0 INVESTIGATIVE RESULTS

4.1 Site Geology

The subsurface lithology encountered during the investigation consisted of fill soil, saprolitic soils, and PWR. For a detailed explanation and illustrated view of the subsurface conditions, refer to the lithologic logs contained in Appendix C. Figure 3 depicts the location of the lithologic cross section illustrated in Figure 4.

The data collected from the soil borings was used to briefly describe the subsurface conditions. The fill soil ranged in thickness from 3.0 ft in EB-MW-1A to 9.0 ft in EB-MW-3 and is described as clayey silt. Below the fill material, a layer of weathered gneiss (saprolite) was encountered and consisted of loose to medium dense micaceous silty sand. The PWR was found to range from 3.5 ft bls at the eastern portion of the site to 13.5 ft bls at the western portion. The saprolite, as well as the PWR, exhibited characteristics of gneissic rock found in the Raleigh Slate Belt formation. All borings were terminated by the site geologist, except for EB-MW-1 and EB-MW-4 which encountered impenetrable material at 9.2 and 10.4 ft bls, respectively.

4.2 Site Hydrogeology

The site hydrogeology was interpreted as having an unconfined water table aquifer, which exists within the saprolite/PWR unit as previously described in Section 4.1. An aquifer is described as being a saturated, permeable geologic unit capable of transmitting significant quantities of water under ordinary hydraulic gradients (Driscoll, 1986). Based on the sieve test analysis, the vertical hydraulic conductivity (Kv) of the soil sample obtained from EB-MW-4 was calculated to be 0.057 ft/day. Hydraulic conductivity is defined as the rate of flow of water in feet per day through a cross section of one square foot under natural hydraulic gradients (Driscoll, 1986). Refer to Appendix G for the sieve test analysis calculations.

4.2.1 Groundwater Flow Direction

Groundwater flow direction at the site was determined using the *Surfer* program (Golden Software, Inc., 1991), which triangulates the water level elevations between the monitoring wells. As seen in Figure 5 and Figure 6, groundwater flow direction on June 2 and June 17, 1992 was determined to be to the northwest. The groundwater gradient was determined by taking the difference in the groundwater head elevation divided by the distance between two points on a line perpendicular to groundwater flow contours. The gradient at the site ranged from 0.04 to 0.05 ft/ft and is considered to be low.

4.3 Assessment Results

Four soil samples, five groundwater samples, and two quality assurance/quality control (QA/QC) samples were obtained to determine if organic chemicals commonly associated with gasoline were present in the site matrices. The QA/QC samples were analyzed to ensure the validity of the data. Soil and groundwater samples were also obtained for a Level I Biofeasibility Analysis.

4.3.1 Soil Results

Of the five soil borings drilled, soil samples were collected from all but two borings, EB-MW-1 and EB-MW-1A. Sampling was attempted in these borings, however samples could not be obtained due to subsurface conditions which prevented their acquisition. All of the samples showed some concentration of volatiles based on either OVA readings or sample analysis results for PHC compounds. OVA values ranged from 12 to 1,000+ ppm in EB-MW-3 and EB-MW-4. As noted previously, no soil samples could be obtained from EB-MW-1 and EB-MW-1A. Additionally, OVA readings could not be obtained from the soil sample collected from EB-MW-2 as summarized in Table 3. Soil samples analyzed for low-boiling point (lbp) PHCs via EPA Method 5030 against a gasoline standard yielded results ranging from below the method detection limit (BDL) at EB-MW-4 to 5,500 ppm at EB-MW-3. EB-MW-3 is located hydraulically downgradient from the tank pit area and near one of the roadway borings drilled during the Capital Boulevard widening project. Soil samples analyzed for high-boiling point (hbp) PHCs via EPA Method 3550/GC-FID against a diesel fuel standard yielded results ranging from 1.1 at EB-MW-4 to 2,700 ppm at EB-MW-3. These analytical results are illustrated in Figure 7. The complete laboratory results are included in this report as Appendix H.

4.3.2 Groundwater Results

Four groundwater samples were obtained from each of the previously referenced monitor wells. The groundwater samples were analyzed for lbp-PHCs via EPA Method 5030 against a non-aged gasoline standard, hbp-PHCs via EPA Method 3510/GC-FID against a non-aged diesel fuel standard, and EPA Method 602 for BTEX compounds. The QA/QC samples were analyzed for BTEX compounds only.

The QA/QC samples revealed no cross-contamination from the sampling equipment cleaning procedures or during sample transport to the laboratory. Groundwater samples analyzed for lbp-PHCs ranged from BDL at EB-MW-1A to 100 ppm at EB-MW-3. Groundwater samples analyzed for hbp-PHCs ranged from 0.04 at EB-MW-1A to 42 ppm at EB-MW-3.

BTEX compounds were found in monitor wells EB-MW-2 and EB-MW-3 only. Toluene was detected in the highest concentration of these compounds at 26,000 parts per billion (ppb) in EB-MW-2, which is adjacent to the tank pit area. Also, a phase-separated hydrocarbon sheen was detected in wells EB-MW-2 and EB-MW-3 on June 17, 1992. The results of the lbp-PHC, hbp-PHC, and the BTEX analyses are summarized in Table 4 and illustrated in Figure 8. The complete analytical results are included in Appendix H.

4.3.3 Biofeasibility Results

The Level 1 Biofeasibility Analysis results obtained from soil and groundwater samples, collected from EB-MW-3 are discussed in detail in Appendix F. These results revealed that site conditions are amenable to *in situ* biorestoration. The following conclusions and recommendations are cited.

- Soil and groundwater from the referenced site appear to contain no toxic materials which would inhibit microbial metabolism.

- Inorganic nutrient concentrations in the site matrix soil and groundwater are limiting based on the concentration of petroleum contaminants measured for this site. Supplementation of limiting nutrients will be required for optimum contaminant biodegradation.

- Indigenous microorganisms are present in moderate numbers in the site matrix groundwater at this site. The soil composite contained no measurable quantity of microorganisms. The absence of microorganisms in the soil was not due to toxicity. It is anticipated that upon proper introduction of microorganisms, nutrient supplementation, and oxygenation, petroleum compounds will be efficiently removed at the Wilco #211 site by biological mechanisms.

Refer to Appendix F for the complete Biofeasibility Analysis Report.

4.3.4 Incident File Search Results

The results of the incident file search revealed no information on groundwater or soil pollution incidents adjacent to or around the Wilco property. However, upon a field inspection, several potential sources are apparent. They are potential USTs located on the Meineke Muffler property to the north of the Wilco property, and potential surface discharges associated with petroleum compounds, within the confines of the Reeve's Wrecker property adjacent to and south of the Wilco site.

5.0 CONCLUSIONS AND RECOMMENDATIONS

In conclusion, groundwater flow beneath the Wilco site is towards the northwest. Results obtained from soil samples collected from monitoring well borings EB-MW-2 and EB-MW-3 due west of the tank pit area revealed high concentrations of PHCs typically associated with gasoline and diesel fuel contamination. These sample results were above the 10 ppm action limit for soil cleanup established by the NC DEHNR/GW. Groundwater samples obtained from the two previously mentioned wells were analyzed for gasoline and diesel fuel fractions. The results revealed that these compounds also exist in the groundwater. Although no regulatory limit has been established for PHCs in groundwater, the individual BTEX compounds were above regulatory limits as established in 15A NCAC 2L.0200 for groundwater quality.

It cannot be shown at this time that no off-site sources are impacting the Wilco site as evidenced by the lack of contamination found in EB-MW-1A and EB-MW-4. Based on the data collected to date, soils and groundwater have been impacted beneath the Wilco site and the bulk of the contamination appears to be coming from near the UST pit and pipeline areas. Also, it is apparent that the partially weathered rock zone and groundwater are transporting the gasoline and diesel contamination to the northwest, beneath Capital Boulevard.

It is recommended that to prevent the further spread of the gasoline and diesel fuel contamination in the groundwater regime and to capture any phase-separated product, that a recovery well or trench system be installed near EB-MW-3. Additionally, to further assess the impact of groundwater contamination, a phase II investigation should be implemented to determine the vertical and horizontal extent to the north and west of the Wilco site. Once the Capital Boulevard widening project begins, a plan should be implemented to remove or biologically treat *in situ* the impacted soils between the tank pit area and Capital Boulevard. Then, based on the outcome of the phase II investigation, a Corrective Action Plan (CAP) should be implemented to treat potentially affected groundwater west of Capital Boulevard.

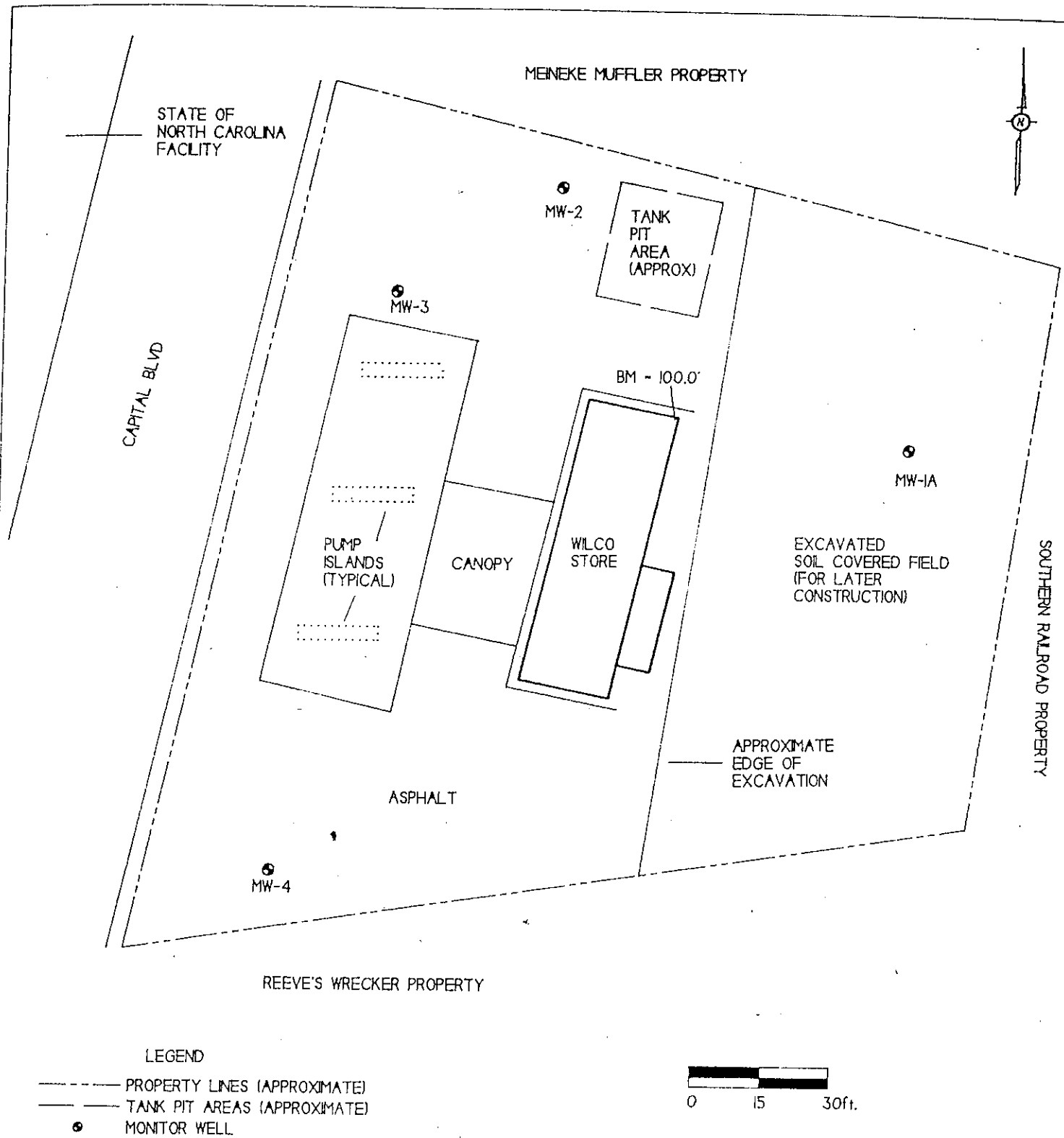

FIGURE 2. SITE MAP AND MONITOR WELL LOCATIONS FOR THE WILCO #211 SITE RALEIGH, NC.

SOURCE: ESE BIOSCIENCES, INC., 1992

ESE BIOSCIENCES, INC. RALEIGH, NC

DRAWN BY: LDL
CHECKED BY: JAB
PROJ. MGR.: JAB
PROJ. NO.: J320-1
SCALE: 1" = 30'
DATE: 6/12/92

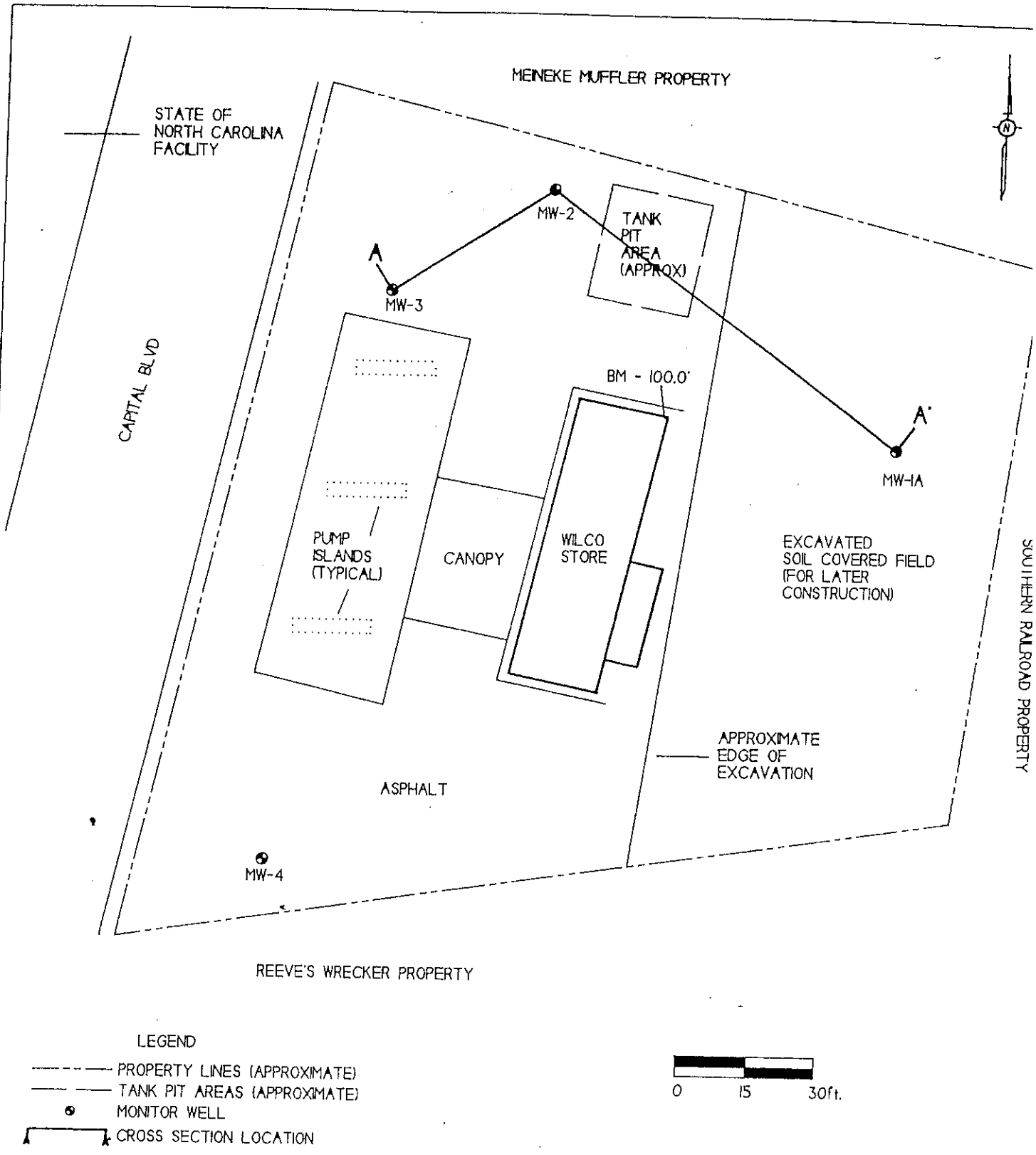

FIGURE 3. CROSS SECTION LOCATION MAP FOR THE WILCO #211 SITE, RALEIGH, NC.

SOURCE: ESE BIOSCIENCES, INC., 1992

ESE BIOSCIENCES, INC. RALEIGH, NC

DRAWN BY:	LDL
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PROJ. MGR.:	JAB
PROJ. NO.:	J320-1
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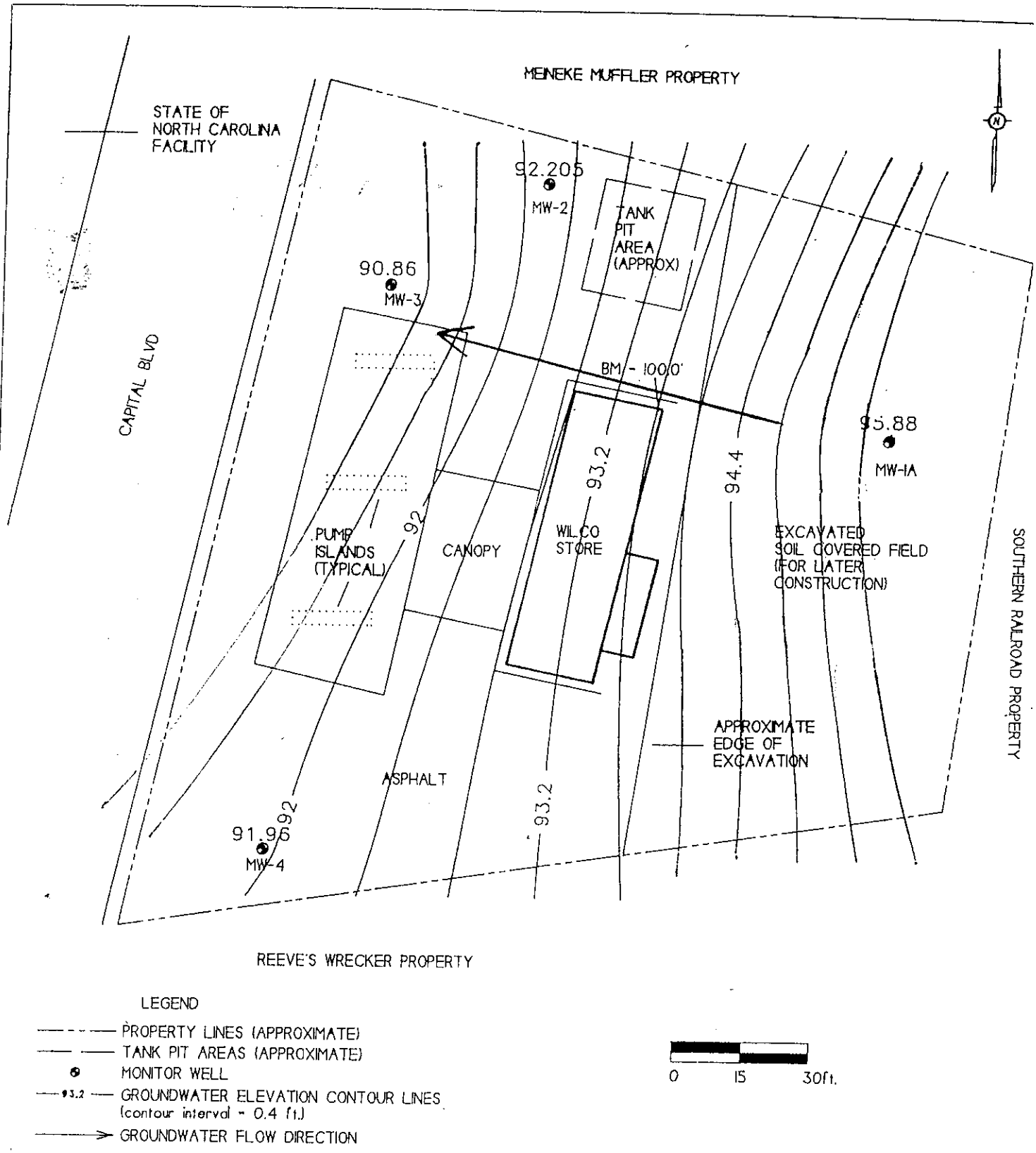

FIGURE 5. GROUNDWATER ELEVATION AND CONTOUR MAP FOR 6/2/92 FOR THE WILCO #211 SITE, RALEIGH, NC.

SOURCE: ESE BIOSCIENCES, INC., 1992

ESE BIOSCIENCES, INC. RALEIGH, NC

DRAWN BY:	LDL
CHECKED BY:	JAB
PROJ. MGR.:	JAB
PROJ. NO.:	J320-1
SCALE:	1" = 30'
DATE:	6/12/92

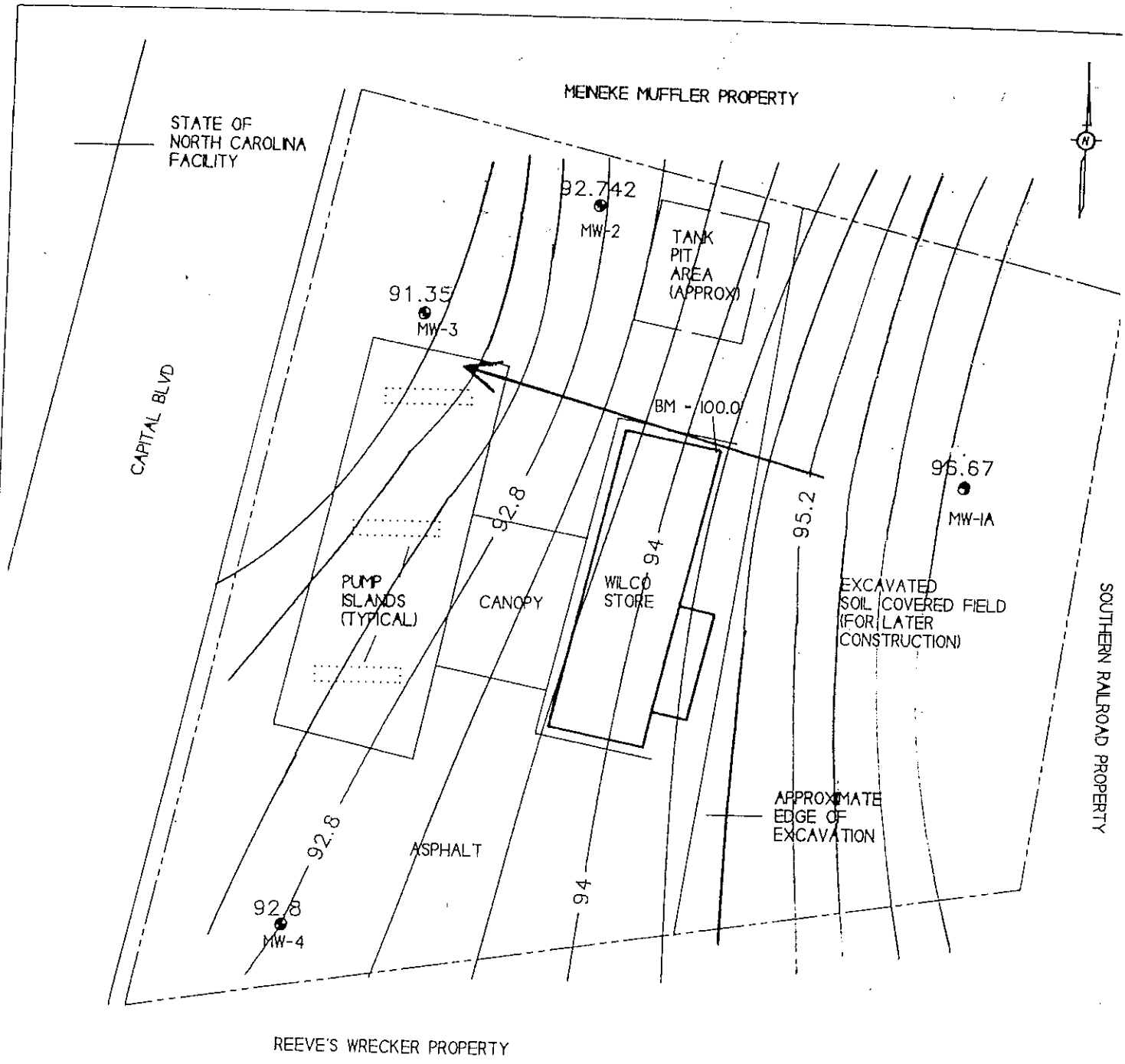

FIGURE 6. GROUNDWATER ELEVATION AND CONTOUR MAP FOR 6/17/92 FOR THE WILCO #211 SITE, RALEIGH, NC.

SOURCE: ESE BIOSCIENCES, INC., 1992

ESE BIOSCIENCES, INC. RALEIGH, NC

DRAWN BY: LDL
CHECKED BY: JAB
PROJ. MGR.: JAB
PROJ. NO.: J320-1
SCALE: 1" - 30'
DATE: 6/12/92

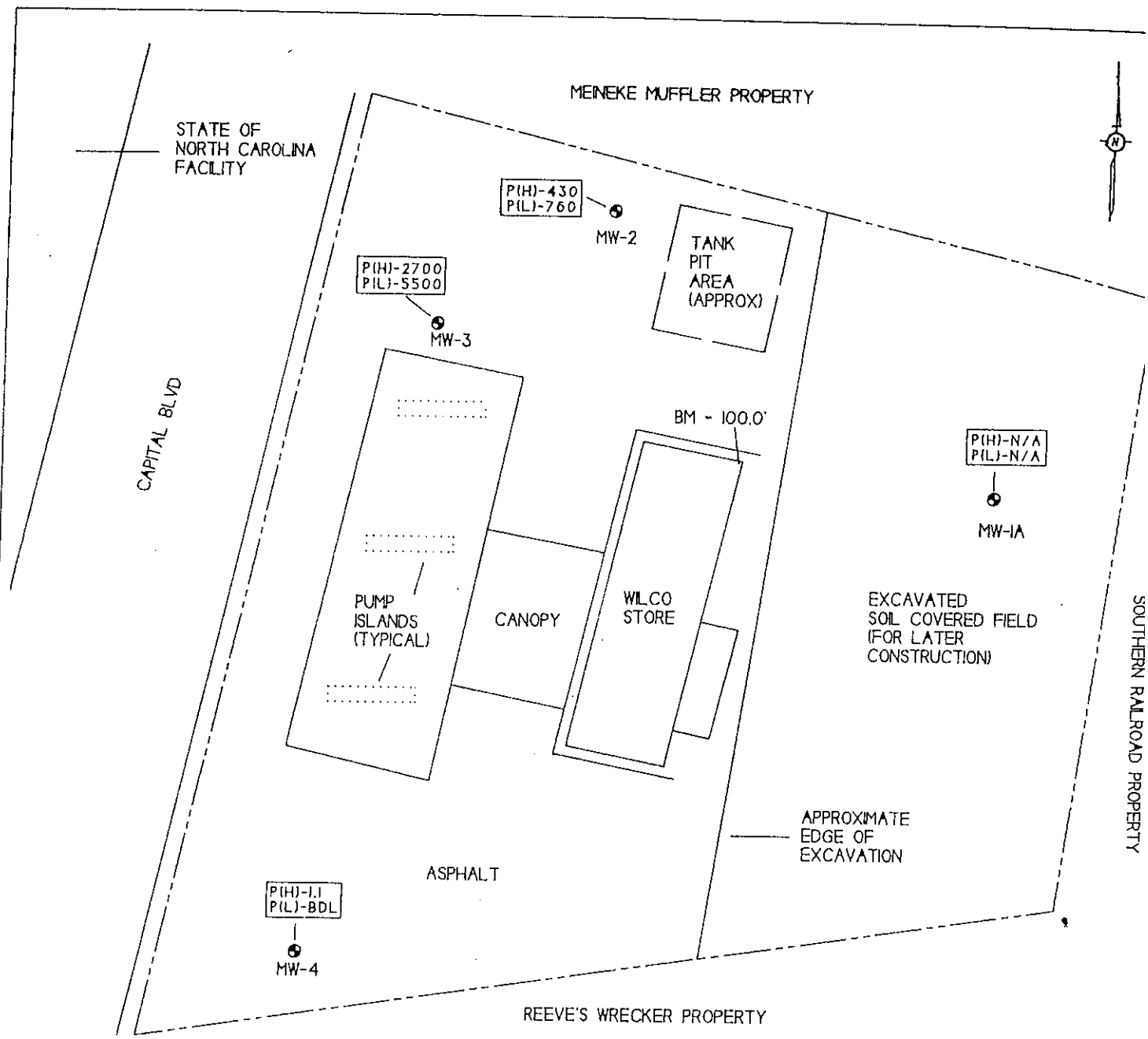

FIGURE 7. PHC-HIGH AND PHC-LOW BOILING POINT CONCENTRATIONS IN SOILS, 8.5-10.0' BLS. FOR THE WILCO #211 SITE, RALEIGH, NC.

SOURCE: ESE BIOSCIENCES, INC., 1992

ESE BIOSCIENCES, INC. RALEIGH, NC

DRAWN BY:	LDL
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PROJ. MGR.:	JAB
PROJ. NO.:	J320-1
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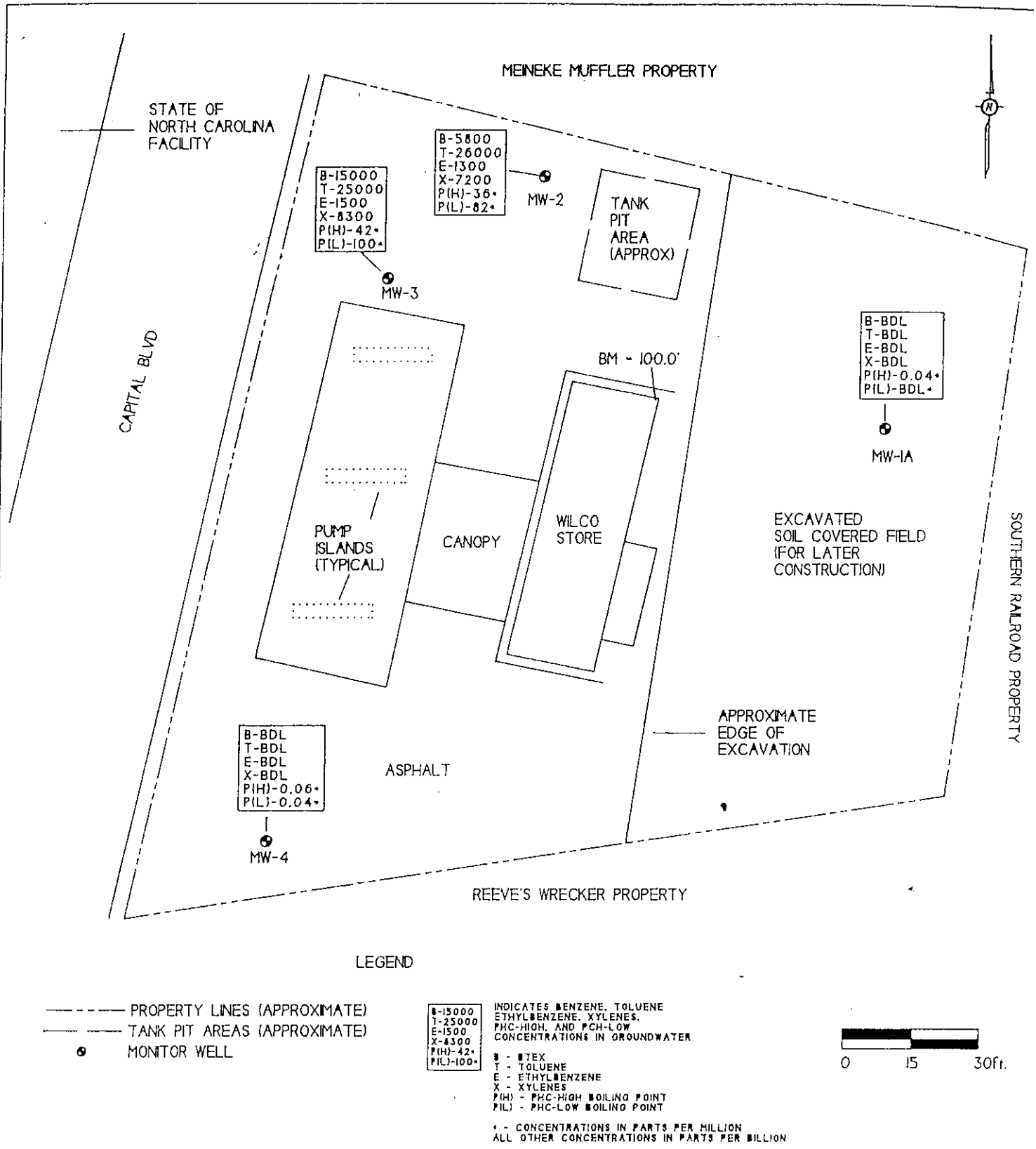

FIGURE 8. BENZENE, TOLUENE, ETHYLBENZENE, XYLENES, bbp-PHC, AND lbp-PHC CONCENTRATIONS IN GROUNDWATER FOR 6/2/92 FOR THE WILCO #211 SITE, RALEIGH, NC.

SOURCE: ESE BIOSCIENCES, INC., 1992

ESE BIOSCIENCES, INC. RALEIGH, NC

DRAWN BY:	LDL
CHECKED BY:	JAB
PROJ. MGR.:	JAB
PROJ. NO.:	J320-1
SCALE:	1" = 30'
DATE:	6/12/92

Table 1. EBIO Monitor Well Construction Details at the Wilco #211 Site, Raleigh, NC.

MW No.	Drilling Method	Type of Protective Casing	Well Material	Well Diameter (inches)	Screen Slot Size (inches)
EB-MW-1	HSA	-	-	AB	-
EB-MW-1A	HSA	A	PVC	2	0.010
EB-MW-2	HSA	B	PVC	2	0.010
EB-MW-3	HSA	B	PVC	2	0.010
EB-MW-4	HSA	B	PVC	2	0.010

MW No.	Elevation of MP (ft)*	Elevation of Land Surface* (ft)	Depth of Boring (ft-bls)	Screened Interval (ft-bls)	Date Installed
EB-MW-1	-	102.27	9.2	0.5 - 15.0	6/1/92
EB-MW-1A	105.14	102.27	15.0	0.5 - 15.0	6/1/92
EB-MW-2	99.45	99.72	15.0	0.5 - 15.0	6/1/92
EB-MW-3	98.72	99.00	15.0	0.5 - 15.0	6/1/92
EB-MW-4	98.65	99.02	10.0	0.5 - 10.0	6/2/92

Notes:
MP = Measuring point on top of casing
HSA = Hollow stem auger
B = Below ground with bolt-down manhole cover
PVC = Polyvinyl chloride
*ft = Elevation referenced to site elevation point
ft-bls = feet below land surface
A = Above ground protective casing
AB = Borehole abandonment

Table 2. **Water Level Measurements and Measuring Point Elevations at the Wilco #211 Site, Raleigh, NC.**

MW No.	Date Observed	MP Elevation (ft)	Water Below MP (ft)	Hydrocarbon Thickness (ft)	Water Level Elevation (ft)
EB-MW-1A	6/2/92	105.14	9.26	-	95.88
EB-MW-2	6/2/92	99.45	7.24	-	92.21
EB-MW-3	6/2/92	98.72	7.86	-	90.86
EB-MW-4	6/2/92	98.65	6.69	-	91.96

MW No.	Date Observed	MP Elevation (ft)	Water Below MP (ft)	Hydrocarbon Thickness (ft)	Water Level Elevation (ft)
EB-MW-1A	6/17/92	105.14	8.47	-	96.67
EB-MW-2	6/17/92	99.45	6.71	0.01	92.74
EB-MW-3	6/17/92	98.72	7.38	0.01	91.35
EB-MW-4	6/17/92	98.65	5.85	-	92.80

Notes:
Water levels correctd for hydrocarbon density at 0.73 specific gravity.

Table 3. Summary of Petroleum Hydrocarbon (PHC) Concentrations (EPA Methods 5030 and 3550/GC-FID) in Soil at the Wilco #211 Site, Raleigh, NC.

Sample Location	OVA Reading (ppm)	Depth (ft-bls)	hbp-PHC (ppm)	lbp-PHC (ppm)
EB-MW-1A	N/A	N/A	N/A	N/A
EB-MW-2	NA	8.5 - 10.0	430	760
EB-MW-3	1,000+	8.5 - 10.0	2,700	5,500
EB-MW-4	12	8.5 - 10.0	1.1	BDL

Table 4. Summary of Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX), lbp-PHC, and hbp-PHC Concentrations (EPA Methods 602, 5030, and 3510/GC-FID) in Groundwater at the Wilco #211 Site, Raleigh, NC.

	Well ID				
Compound	EB-MW-1A	EB-MW-2	EB-MW-3	EB-MW-4	NC Limit
Method 602					
Benzene	BDL	5,800	15,000	BDL	1
Toluene	BDL	26,000	25,000	BDL	1,000
Ethylbenzene	BDl	1,300	1,500	BDL	29
Xylene (total)	BDL	7,200	8,300	BDL	400
Method 5030					
hbp-PHC*	0.04	36	42	0.06	NE
Method 3510					
lbp-PHC*	BDL	82	100	0.04	NE

Notes:
*Results are presented in parts per million (mg/L); all others are reported in parts per billion (µg/L).
NE = not established
hbp-PHC = high-boiling point petroleum hydrocarbons
lbp-PHC = low-boiling point petroleum hydrocarbons