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TECHNICAL MEMORANDUM REGARDING BENZENE PLUME INVESTIGATION AND SCOPE OF WORK AT STUDY AREA 36 NTC ORLANDO FL

12/24/2003

TETRA TECH

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1203-E494

December 29, 2003

Commander, Southern Division
Naval Facilities Engineering Command
ATTN: Ms. Barbara Nwokike, Code ES33
P.O. Box 190010
2155 Eagle Drive
North Charleston, SC 29419-9010

Reference: CLEAN Contract No. N62467-94-D-0888
Contract Task Order No. 0281

Subject: Technical Memorandum for Benzene Plume Investigation at Study Area 36 NW
Naval Training Center, Orlando, Florida

Dear Ms. Nwokike:

Enclosed is the Technical Memorandum that summarizes the results of the recent investigation of the benzene contamination in groundwater at Study Area 36. The memorandum outlines a risk based corrective action that is anticipated to lead to a no further action with land use controls for the site.

If you have any questions or comments please contact me at (865) 220-4730.

Sincerely,

Steven B. McCoy, P.E.
Task Order Manager

SBM:tko

Enclosure

c: Ms. Barbara Nwokike, Southern Division (Orlando Office)
Ms. Hope Oaks, Southern Division
Mr. Mike Singletary, Southern Division
Mr. David Grabka, FDEP
Mr. Gregory Fraley, USEPA Region 4
Mr. Steve Tsangaris, CH2M Hill
Mr. Mark Salvetti, MACTEC Engineering
Ms. Teresa Grayson, Tetra Tech NUS
Mr. Allan Jenkins, Tetra Tech NUS
Mr. J.E. Bentkowski, Gannett Fleming
File/db

Subject: **Benzene Plume Investigation and RBCA Scope of Work**
Study Area 36 NW, Naval Training Center, Orlando, Florida

To: Barbara Nwokike, SOUTHDIV

From: Allan Jenkins, TtNUS

Copies: Steve McCoy, TtNUS
Renna Warren, TtNUS
Teresa Grayson, TtNUS
File

Date: December 24, 2003

1.0 INTRODUCTION

This memorandum presents the results of the groundwater investigation conducted to determine the source of benzene in groundwater at Study Area 36 (SA 36). SA 36 is located within the Baldwin Park Development that was the former Main Base at the Naval Training Center (NTC) in Orlando, Florida. The investigation was focused on the area lying to the northwest of SA 36 (i.e., SA 36 NW) as shown in Figure 1-1. Based on the investigation results, it has been determined that the source of benzene in groundwater was a release of petroleum fuel from the former Main Base Auto Service Station (Facility No. 109) that was located to the northwest of SA 36. Groundwater flowing to the east from the release site resulted in benzene being detected in monitoring wells associated with the investigation of the chlorinated solvent plume at SA 36.

This memorandum proposes a path forward using Risk Based Corrective Action (RBCA) to address the SA 36 NW plume area. The goal of the RBCA process will be to use risk assessment, institution controls, and a justification for alternate cleanup target levels (CTLs) to support a finding of No Further Action (NFA) at the site. The NFA at the site will be tailored to protect human health and the environment and minimize impacts on the Baldwin Park development while achieving cost-effective closure of the site.

2.0 SITE DESCRIPTION

The site features of the SA 36 NW area are shown in Figure 1-1. For reference, the area shown in the figure includes the North Storage Area at SA 36 and the existing monitoring wells used during the investigation and monitoring of that site. Due to transfer of the Navy property to the City of Orlando and redevelopment of the site, all cultural features associated with the NTC Main Base no longer exist.

Figure 1-1 also shows the former locations of the Main Base Auto Service Station facilities: three, 20,000-gallon gasoline underground storage tanks (USTs) and the associated facilities (Building 109, Facility 4032). The former USTs are considered to be the source for the benzene plume. All of these facilities were located hydraulically upgradient of SA 36 with respect to flow in the surficial aquifer below the cemented-sand layer (i.e., depths greater than approximately 27 feet below ground surface [bgs], or Aquifer Zone C).

Building 109 / Facility 4032

In November 1993, groundwater samples were collected from the UST compliance monitoring wells at Building 109 (which have since been removed). Results of the analyses showed the presence of benzene and total volatile organic aromatic compounds above the Florida Department of Environmental Protection (FDEP) cleanup levels. In January 1994, the three USTs at the site were removed, and free product was observed in the excavation. A cofferdam was installed around the USTs, and dewatering (approximately 126,900 gallons extracted) was performed to support the excavation activities. The excavation resulted in the removal of 1,115 cubic yards of excessively contaminated soil (per Florida Administrative Code [F.A.C.] 62-770 definition) that was taken to a thermal treatment facility. Subsequent to the excavation, a concrete secondary containment structure was constructed at the tank pit and three, double-walled fiberglass tanks, equipped with level indicators and over-fill protection, were installed. ABB-Environmental Services conducted an contamination assessment of the site from November 1995 to September 1996 which resulted in a No Further Action proposal (ABB-ES, 1996)[1].

In March 2000, the South Carolina Research Authority, Environmental Enterprise Group (EEG) was tasked to close-in-place three, 20,000-gallon USTs at Building 109. The USTs had been pumped and officially closed in April 1999. EEG uncovered the USTs and pumped and flushed all three tanks and associated piping running to the dispensers. All equipment was reported to be in excellent condition. During the excavation performed to expose the USTs, soil samples were collected and screened. The soil screening resulted in no evidence of petroleum contaminants, and No Further Action was recommended for the site.

In April 2002, as part of pre-development activities, the development contractor for the City of Orlando tasked Nodarse and Associates, Inc., with assessing the presence of contaminants in soil and groundwater at the former Building 109 area. Soil borings were used to collect shallow soil samples and to install shallow temporary monitoring wells (approximately 15 feet in depth). The results of the soil and groundwater samples indicated the presence of petroleum fuel contamination [up to 42,470 µg/L total

[1] ABB-ES (ABB Environmental Services), 1996. Contamination Assessment Report, Building 109 Main Base, Naval Training Center, Orlando, Florida, October.

benzene, toluene, ethylbenzene, and total xylenes (BTEX) in groundwater] in the vicinity of the former USTs and piping (Nodarse, 2002a)[2]. Subsequently, a source removal action was performed by Nodarse that consisted of soil excavation and groundwater extraction. The area of the soil excavation and the location of monitoring and recovery wells are provided on maps in the source removal report (Nodarse, 2002b)[3]. Approximately 2.9 million gallons of groundwater were recovered, treated on site, and released to the City of Orlando sanitary sewer system. The results of three rounds of post-remediation groundwater sampling indicated that petroleum contaminants were no longer present at the site in excess of the FDEP Cleanup Levels, and No Further Action was proposed for the site.

Site Geology

The site geology was investigated during drilling for the installation of monitoring wells at SA 36 and during the current investigation of the benzene plume. The boring logs show consistency in the lithology and depths of materials encountered during the subsurface investigation of both areas. The shallow geology consists of undifferentiated Pleistocene and Recent marine terrace deposits which according to published reports are underlain by the Hawthorn Group. The undifferentiated sediments are about 65 feet in thickness and consist of gray to dark brown, predominantly quartz sand with varying amounts of silt and clay-sized grains, and shell fragments. The lithology of these sediments varies somewhat both laterally and vertically. The near-surface deposits consist of light colored, medium to coarse grained sand. An interval consisting of interbedded fine sand and silt, and indurated, cemented sand, locally called a “hardpan,” was encountered between depths of 15 to 27 feet bgs. Beneath the cemented sand interval is another unit of brown to dark brown, sand and silty sand with some clay lenses, and an interval containing shell fragments at about 60 feet bgs.

The Hawthorn Group in the vicinity of SA 36 is typically described as gray-green, calcareous, phosphatic sandy clay, and includes clayey sand interbedded with thin, discontinuous lenses of phosphatic sand or limerock. The deepest borings at SA 36 showed a coarsening of the sand and a change to a green color at a depth of about 60 to 65 feet bgs (beneath the interval of shell fragments described above); this is interpreted to represent the top of the Hawthorn Group. A plastic, green clay interval followed by limestone was encountered at depths of approximately 66 to 70 feet bgs.

[2] Nodarse (Nodarse & Associates), 2002a. Limited Contamination Assessment Report, Former Naval Training Center, Building 109, Orange County, Florida, FDEP ID No. 488841262.
[3] Nodarse, 2002b. Source Removal Report, Building 109, Former Naval Training Center, Orange County, Florida, FDEP ID No. 488841262.

Site Hydrogeology

The hydrogeologic setting of the site consists of a shallow, unconfined aquifer underlain by a semi-confined aquifer to depths of about 65 feet bgs. Together, these two aquifer zones comprise the surficial aquifer at the site. The water table lies at a depth of about 7 to 14 feet bgs across the site with 5 to 6 feet of seasonal variation observed in some wells at SA 36. The bottom of the surficial aquifer extends downward to the uppermost Hawthorn clay layer that defines its lower extent. Figure 2-1 provides a well depth schematic that demonstrates the relationship of the wells and the nomenclature used to distinguish the aquifer depth intervals at SA 36 and during the current investigation (e.g., "A" and "B" wells screened above the cemented sand interval, "C" and "D" wells screened between the cemented sand and the Hawthorn Group sediments). Groundwater elevation data from the initial round of groundwater sampling conducted during the benzene plume investigation are summarized in Table 2-1. At SA 36, comparison of groundwater elevations between wells screened above the cemented sand interval [e.g., OLD-36-10BR] with a nearby well screened deeper in the aquifer (e.g., OLD-36-11CR) shows that the potentiometric surface above the cemented sand layer (i.e., A and B wells) is typically several feet higher than the potentiometric surface at deeper well intervals (C and D wells). Thus, a strong downward gradient is observed across the cemented sand interval. For wells screened at different depths beneath the cemented sand interval (e.g., former wells OLD-36-9C and -13D), a small vertical gradient was observed and horizontal flow predominated in the deep surficial aquifer (TtNUS, 2003a)[4]. Comparison of the groundwater elevations between wells MW-41C and MW-40D, installed at SA 36 NW, shows a similar hydraulic condition for the deep surficial aquifer.

3.0 GROUNDWATER INVESTIGATION

Direct push technology (DPT) groundwater sampling was used as the initial screening tool to investigate the area to the northwest, north, and northeast of SA 36 for the presence of a benzene plume. The suspected plume source was the former Base Service Station (Building 109 and Facility 4032, west of SA 36) where USTs were previously used to store and distribute gasoline fuel. The results of the DPT sampling were used to select locations and screen depths for seven, new permanent monitoring wells. The new wells were sampled, and the data were used in conjunction with the previous sampling results (i.e., DPT results and historical well data at SA 36) to interpret the source and estimate the extent of the benzene plume as described in the following sections.

[4] TtNUS (Tetra Tech NUS), 2003a. Site Investigation Report for Study Area 36, Naval Training Center, Orlando, Florida, February.

DPT RESULTS

Potentiometric data from the deeper portion of the surficial aquifer at SA 36 (C Zone wells) indicated a groundwater flow direction to the southeast or east toward Lake Susannah. However, considering the relatively small footprint of the monitoring-well network at SA 36, the overall flow direction in the aquifer was deemed relatively uncharacterized prior to the investigation of the benzene plume outside the immediate area of SA 36. Lake Baldwin, located approximately 1500 feet to the northeast of SA 36, was considered to have a substantial influence on the groundwater flow direction, and the highest benzene concentration was observed in well OLD-36-23CR located along the northern perimeter of SA 36. This indicated that contaminant migration from the former USTs may have an eastward or even northeastern trend. Therefore, several DPT sampling points were installed to the west and north of SA 36 to investigate the former UST location as the source of the plume as shown in Figure 1-1. And, because benzene is relatively mobile in groundwater, the investigation was extended to the northeast of SA 36 (i.e., east of well OLD-36-23CR) in an effort to define the downgradient extent of the benzene plume. The final locations for the DPT samples, shown in Figure 1-1, were based on SA 36 potentiometric data, potential lake influences on groundwater flow, and contaminant transport patterns determined using the latest sample results from previous monitoring well sampling (May 2002) at SA 36. The DPT sampling was conducted by Tetra Tech NUS (TtNUS) between May 14 and 15, 2003.

A potential complexity in the plume geometry, based on observations at SA 36, was that the benzene plume may have originated in the shallow portion of the aquifer and spread downward through the surficial aquifer as it migrated laterally away from the source area. Therefore, in areas close to the former USTs, the DPT sampling tool was used to collect both shallow (immediately above the cemented sand layer at approximately 20 feet bgs) and deep (below cemented sand layer at approximately 32 feet bgs) groundwater samples. As the investigation moved outward and away from the former USTs, DPT samples were only collected below the cemented sand layer (i.e., C zone depth).

The analytical results for locations DPT-1 through DPT-11 are summarized on Figure 3-1. Shallow groundwater samples were collected at all locations with the exception of downgradient location DPT-6. All DPT samples were analyzed for volatile organic compounds (VOCs) using USEPA Method 8260B. Due to push-rod refusal at a depth consistent with the cemented sand layer, the deep sample planned for 32 feet bgs at location DPT-3 could not be collected. Many of these locations were sampled on the first day of the investigation, and 24-hour laboratory turn-around was used to review results and determine that the lateral limits of the plume were defined prior to termination of the DPT sampling effort. Based on

real-time review of the data, no additional DPT samples were collected in addition to the 11 locations proposed in the work plan (TtNUS, 2003b)[5].

As shown in Figure 3-1, BTEX compounds were not detected in the shallow groundwater DPT samples, with the exception of location DPT-11 located immediately downgradient of the former USTs, at the former Main Base Auto Service Center. These samples were collected at a depth of 20 feet bgs and represent groundwater above the cemented sand layer. At the DPT-11 location, only ethylbenzene and xylenes were detected but at concentrations below their FDEP groundwater target cleanup levels (GCTLs) of 30 and 20 micrograms per liter (ug/L), respectively. This finding is consistent with the previous soil and groundwater remediation conducted at the former UST facility and provides strong evidence that shallow groundwater is not currently impacted by the release from the former UST facility.

In the deeper DPT samples below the cemented sand layer, at approximately 32 feet bgs, DPT locations near (i.e., DPT-11 and -1) and downgradient (i.e., DPT-9) of the former USTs showed concentrations of benzene, toluene, and methyl tert-butyl ether (MTBE) greater than their respective GCTLs of 1, 40, and 50 ug/L. The concentrations of ethylbenzene and xylenes also exceed their GCTLs at these locations. The maximum concentrations of all VOCs were detected at DPT-9 located approximately 140 feet to the northeast of the former USTs. MTBE was also detected in the most downgradient groundwater samples (i.e., DPT-4 and -6) but did not exceed the GCTL at these locations.

MONITORING WELL RESULTS

After the initial DPT results were reviewed, monitoring well locations were selected for seven permanent wells to define the extent of the plume and to provide for future groundwater monitoring. The locations shown in Figure 1-1 were selected in consideration of existing wells at SA 36 to provide the best coverage of the benzene plume. The wells were installed by TtNUS between September 2 and 8, 2003, at the following locations:

- MW-38C in the source area (in proximity to the former USTs).
- MW-41 in the zone of highest contaminant concentrations based on the DPT results; a deeper well, MW-40D, was also installed in this area to investigate the vertical extent of the plume.
- MW-39C and MW-42C to monitor the lateral spread of the plume; existing wells OLD-36-11CR and OLD-36-23CR may also be used for this purpose during future monitoring.

[5] TtNUS, 2003b. Work Plan for Benzene Source Investigation at Study Area 36, Naval Training Center, Orlando, Florida, April.

- MW-43C and MW-44C to monitor the downgradient extent of the benzene plume; the location for MW-44C was selected on the basis of the May 2002 detection of 168 ug/L of benzene at well OLD-36-23CR and in consideration of property development activities.

Based on the previous detections of benzene in wells screened below the cemented sand layer at SA 36 and the DPT results, the new wells were installed with 5-foot screen sections located between approximately 30 and 35 feet bgs, similar to existing C zone wells at SA 36. The construction of deep well MW-40D included protective casing to a depth of 40 feet bgs and 5 feet of screen at a depth interval of 49 to 54 feet bgs. The wells were developed by gentle surging with a bailer during installation of the filter pack and low-flow pumping during purging prior to sampling. Sampling was performed between September 9 and 10, 2003, using new, dedicated polyethylene tubing for each well and a peristaltic pump to purge the wells with minimal agitation and drawdown (i.e., low flow, low energy purging). The sample tubing was placed at the midpoint of the well screen, and water quality parameters were monitored. The purging process was successful at meeting the required parameter ranges as described in the work plan (TtNUS, 2003b). However, five of the seven wells displayed high turbidity levels, and two wells (MW-39C and -40D) had high pH (10 to 11 standard units) that suggested the cement grout had impacted local water quality. It is surmised that these conditions may be related to sampling the wells in close succession to the well completion, although none of the wells were purged/sampled sooner than 24 hours after construction, as required by the work plan.

As shown in Figure 3-2, benzene, toluene, ethylbenzene, and xylenes were not detected above the laboratory reporting limits (indicated by "<" symbol in the figure) at well MW39C, the most northern location, and well MW44C, the most downgradient location to the east. Furthermore, with the exception of xylenes, none of the VOCs detected at well MW-38C in the source area, and at well MW-43C, another downgradient location, exceeded any of the GCTLs. The results from these four wells in conjunction with previous results below the GCTL for benzene at wells OLD-36-11CR, -09CR, and -35CR define the horizontal limits of the benzene plume as indicated on Figure 3-2.

Benzene was detected at concentrations above the GCTL only at wells MW-41C and MW-42C located downgradient of the former USTs. The sample from MW-41C also contained concentrations of toluene, ethylbenzene, xylenes, and MTBE greater than their respective GCTLs. The maximum concentrations of all VOCs were detected at MW-41C located approximately 140 feet to the northeast of the former USTs, a location that is coincident with the DPT-9 location discussed above.

The results from the monitoring well samples were consistent with the DPT groundwater sampling results and indicate that the lateral extent of the benzene plume has been defined at the site as shown on

Figure 3-2. The single deep well MW-40D showed an exceedance of the benzene GCTL with a concentration of 5.4J ug/L. However, because of the absence of an aquitard layer to anchor the protective casing installed during construction of this shallow well through the highly contaminated groundwater at a depth of around 35 feet, it is possible that the relatively low concentration of benzene observed in this well is an artifact of the well installation. Future monitoring of benzene in this well is recommended prior to expanding the investigation of deeper aquifer contamination.

4.0 RISK-BASED CORRECTIVE ACTION PROCESS

Recent legislation passed by the State of Florida (Ch. 2003-173, Laws of Florida) has in effect implemented the use of risk-based corrective action (RBCA) for all contaminated sites within the state. This means that the default cleanup target levels (CTLs) provided in Chapter 62-777, F.A.C., will now be applicable to all contaminated sites. The new law also allows for the flexibility that RBCA provides by prescribing how alternative cleanup target levels for soil and groundwater may be used in conjunction with engineering and/or institutional controls to achieve a cleanup that protects human health and the environment. The criteria to be used for implementing RBCA at SA 36 NW are contained in the Draft Rule 62-780, F.A.C.

The RBCA process to be performed for SA 36 NW consists of several major work tasks as listed below:

- Site Assessment
- Site Assessment Report Update
  - Recommendation for Risk Assessment
- Risk Assessment Report
  - Exposure and Toxicity Assessment and Risk Characterization
  - Fate and Transport Modeling
  - Justification for site specific Alternate Groundwater CTLs
  - Recommendation for No Further Action (NFA) with Institutional Controls (assumed)
- Conduct one year of groundwater monitoring
- NFA Proposal
  - Document that Alternate Groundwater CTLs have not been exceeded (assumed)
  - Update fate and transport (F&T) model using all data to show future impacts are acceptable at the institutional control boundary (assumed)

Certain of the tasks listed above have been partially completed or initiated. A Contamination Assessment Report (CAR) (ABB-ES, 1996) and a Limited CAR and Source Removal Report (Nodarse, 2002a

and 2002b) were previously submitted to the FDEP for Building 109 (i.e., the former Main Base Auto Service Station). These reports documented the presence of soil and shallow groundwater contamination and activities conducted to remediate those media. However, deeper groundwater beneath the cemented-sand layer was not investigated nor remediated by these previous efforts. Therefore, it will be necessary to update the CAR to include the results of the current investigation of the benzene plume and to include a recommendation for a risk assessment. Concurrent with the CAR update, TtNUS will perform a risk assessment analysis for SA 36 NW to include the tasks outlined above. The exposure assessment is anticipated to include the following receptors and exposure routes:

RECEPTOR	EXPOSURE ROUTE	COMMENTS
Resident Adult	Groundwater*	Ingestion, dermal, inhalation
Resident Child	Groundwater*	Ingestion, dermal, inhalation
Recreator Adult	Surface Water	Ingestion, dermal, inhalation
Recreator Child	Surface Water	Ingestion, dermal, inhalation
Maintenance Worker	Groundwater	Pathway incomplete, plume is <25 ft bgs
Maintenance Worker	Surface Water	Ingestion, dermal, inhalation at downgradient lake

*Included for point of comparison.

As indicated by the above table, a risk evaluation for soil is not anticipated. This is a result of previous soil removal actions and sampling showing that excessively contaminated soil is not present at the site. In addition, exposure via volatilization from groundwater and vapor intrusion into residences or exposure for excavation/construction workers at the site are not planned for this risk assessment. These routes of exposure are deemed incomplete, based on the following site conditions:

- VOCs are only present in groundwater at depths greater than approximately 25 feet bgs in the aquifer.
- The contaminant plume lies below the cemented-sand layer interval (between depths of approximately 20 to 27 feet bgs) that separates the shallow and deeper (contaminated) aquifer zones.
- The contaminant plume lies beneath the overlying aquifer zone (approximately 10 feet saturated thickness) that does not contain VOCs above GCTLs.
- Residences at the site and downgradient areas do not include basements.

Exposure to groundwater will be evaluated as indicated above, but the deed for all property overlying the plume and downgradient areas (i.e., all former Navy property at the Main Base) includes a restriction that

does not allow the extraction or use of groundwater; therefore, this pathway is not complete. The current site conditions and planned future property use for residential purposes leads to the conclusion that the only potential route of exposure to the VOC plume is downgradient migration, discharge into a surface water body, and exposure of recreational users and maintenance workers.

Fate and transport modeling will be used to examine the potential for the groundwater plume to impact downgradient areas (simulate plume movement over time) and the potential discharge of contaminants to surface water bodies. The calibrated model will also be used to back-calculate source area concentrations that will be protective of any potential future receptor. The model results along with the risk assessment will be the basis for the justification for an alternate groundwater CTL. Based on the current site data and knowledge of the hydrogeologic setting, it is anticipated that an NFA with Institutional Controls to prevent any use of site groundwater will be the conclusion reached by the Risk Assessment Report. The report will also include the justification for alternate groundwater CTLs that will result in no active remediation of groundwater at SA 36 NW.

Finally, the RBCA rule requires one year of groundwater quarterly monitoring to demonstrate that groundwater at the site does not exceed the alternate CTL. Furthermore, the quarterly monitoring results must be used to validate or update the fate and transport modeling to show that future conditions will not violate the basis for the proposed NFA. Once these conditions have been demonstrated, an NFA Proposal invoking institutional controls and monitoring will be submitted to the FDEP for review and approval.

TABLES

TABLE 2-1
MONITORING WELL LOCATIONS AND GROUNDWATER ELEVATIONS
STUDY AREA 36 NW
SEPTEMBER 9 – 10, 2003

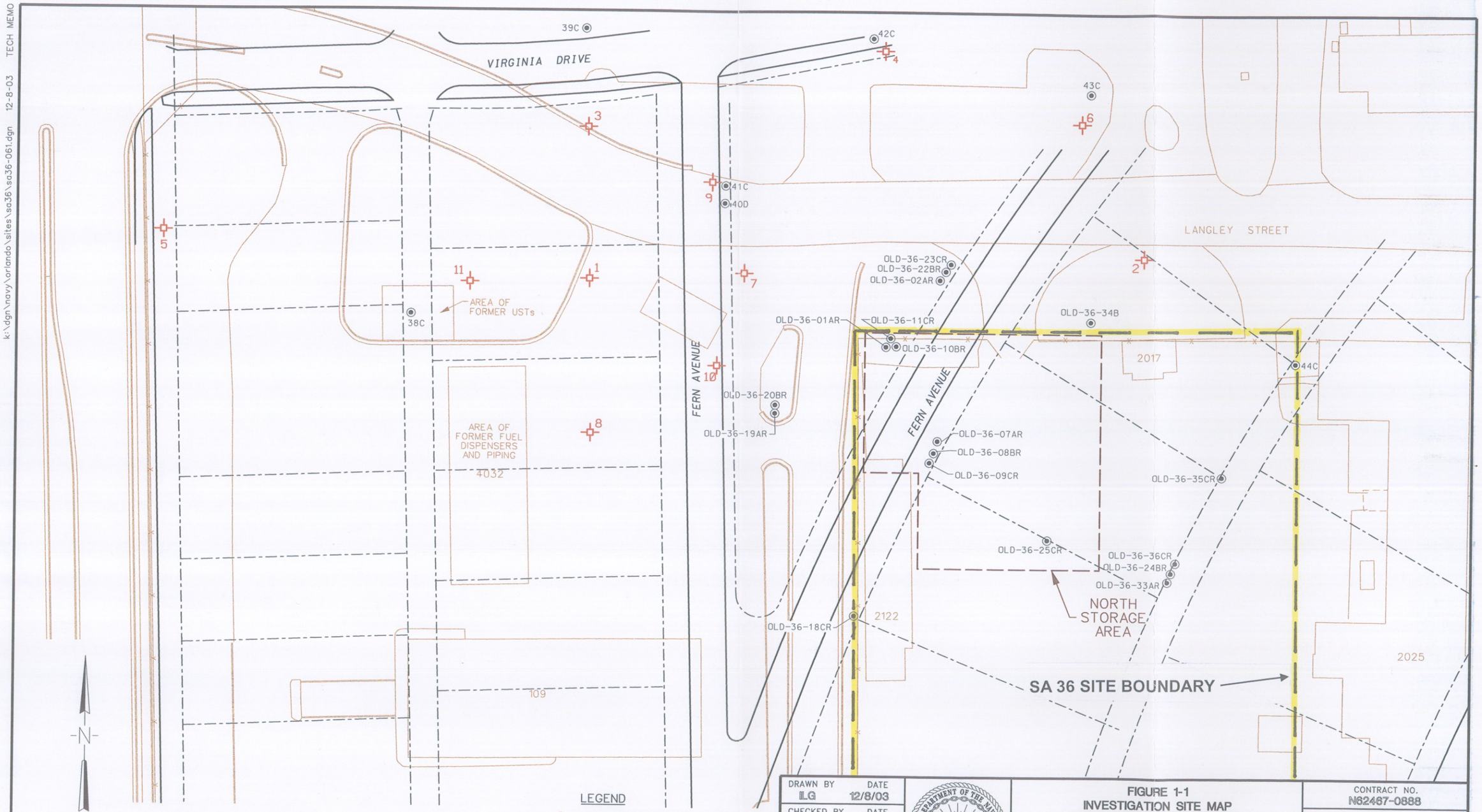
NAVAL TRAINING CENTER
ORLANDO, FLORIDA

Well ID	Screen Interval, Depth BGS (feet)	Northing	Easting	Well Top Elevation (feet)	Depth to Water (feet)	Groundwater Elevation (feet)
MW-38C	30 - 35	1538002.58	549256.67	115.59	6.17	109.42
MW-39C	30 - 35	1538128.53	549333.25	114.765	6.55*	--
MW-40D	49 - 54	1538014.69	549423.36	115.185	8.96	106.225
MW-41C	30 - 35	1538027.58	549420.83	114.62	7.9	106.72
MW-42C	30 - 35	1538131.51	549549.84	113.085	6.69	106.395
MW-43C	30 - 35	1538065.7	549591.51	113.35	7.1	106.25
MW-44C	30 - 35	1537939.02	549717.5	114.65	8.75	105.9

***** Well top not completed due to site construction activities; top of casing elevation changed after measurement and prior to elevation survey conducted 12/02/03.

FIGURES

k:\dgn\navy\orlando\sites\sa36\sa36-061.dgn 12-8-03 TECH MEMO



50 0 50
SCALE IN FEET

SOURCE:
PRE-DEVELOPMENT FEATURES (ROADS, BUILDINGS, ETC.) ARE FROM A PHOTOGRAMMETRIC SURVEY BY DEMAPS, INC. AND REPS, INC. IN 1997. THE PRE-DEVELOPMENT FEATURES ARE SHOWN IN COLOR FOR BACKGROUNDING. NEW FEATURES WERE DIGITIZED FROM AVAILABLE FIGURES AND ARE APPROXIMATE.

LEGEND

6 DPT SAMPLE LOCATION WITH SEQUENCE NUMBER

MONITORING WELLS

BROWN INDICATES NAVY FEATURES
BLACK INDICATES BALDWIN PARK DEVELOPMENT

DRAWN BY ILG	DATE 12/8/03	
CHECKED BY ATJ	DATE 12/9/03	
REVISED BY —	DATE —	
SCALE 1"=50'		

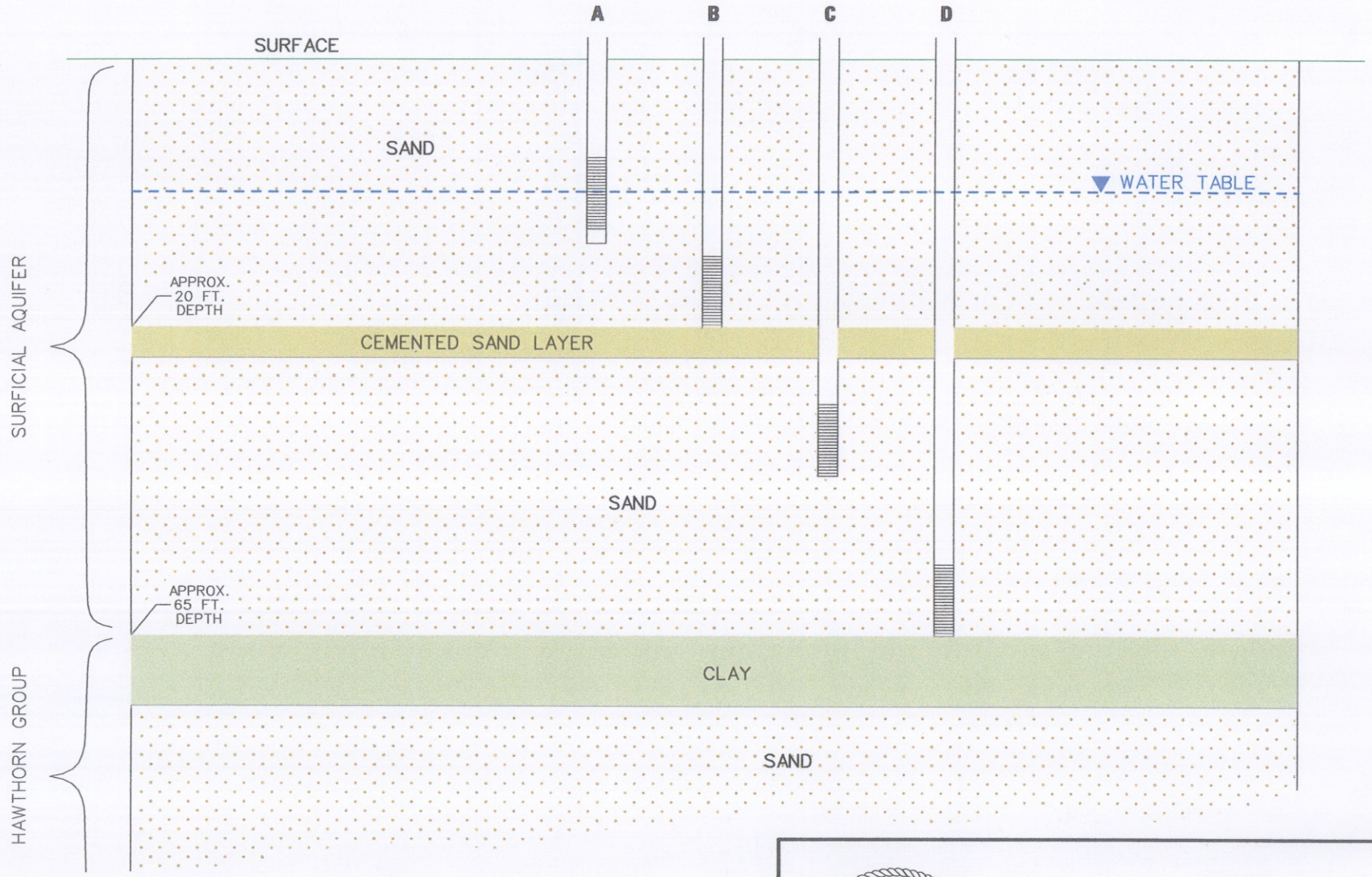
DEPARTMENT OF THE NAVY SOUTHERN DIV FACILITIES ENGINEERING COMD

FIGURE 1-1
INVESTIGATION SITE MAP
STUDY AREA 36 NORTHWEST
MAIN BASE

NAVAL TRAINING CENTER
ORLANDO, FLORIDA

CONTRACT NO. N62467-0888	
OWNER NO. N7457	
APPROVED BY ATJ	DATE 12/9/03
DRAWING NO. FIGURE 1-1	REV. 0

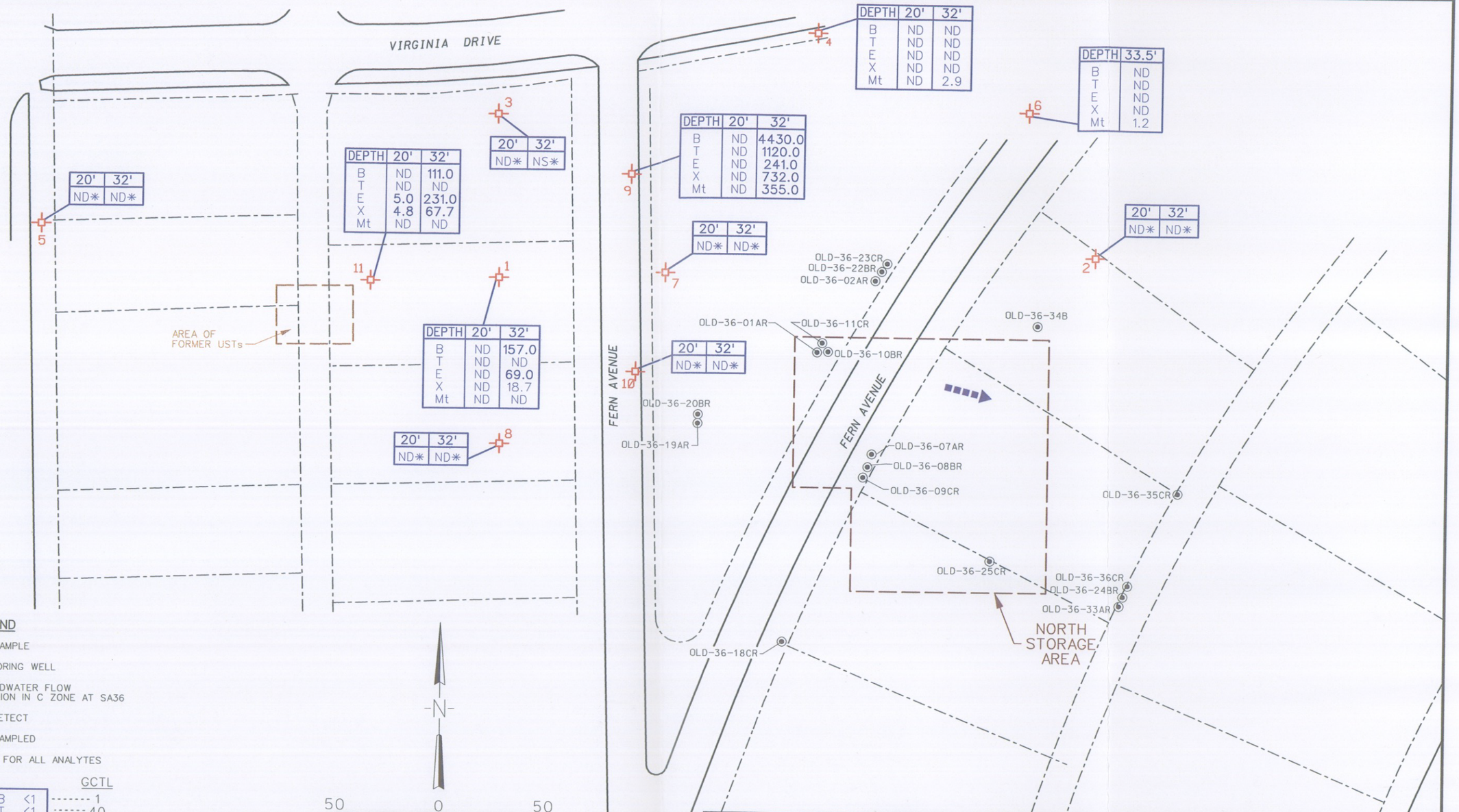
FORM CADD NO. SDIV-BH.DGN - REV 2 - 10/23/03



NOT TO SCALE

FIGURE 2-1
WELL DEPTH SCHEMATIC
STUDY AREA 36 - NORTH STORAGE YARD

NAVAL TRAINING CENTER
ORLANDO, FLORIDA



LEGEND

- DPT SAMPLE
- MONITORING WELL
- GROUNDWATER FLOW DIRECTION IN C ZONE AT SA36
- ND NON-DETECT
- NS NOT SAMPLED
- * VALUE FOR ALL ANALYTES

		GCTL
BENZENE — B	<1	1
TOLUENE — T	<1	40
ETHYLBENZENE — E	<2	30
XYLENE — X	<3	20
MTBE — Mt	<2	50

BOLD INDICATES GCTL EXCEEDANCE

ALL CONCENTRATIONS IN MICROGRAM PER LITER.
GCTL - GROUNDWATER CLEANUP TARGET LEVEL.
BOLD CONCENTRATION INDICATES GCTL EXCEEDANCE

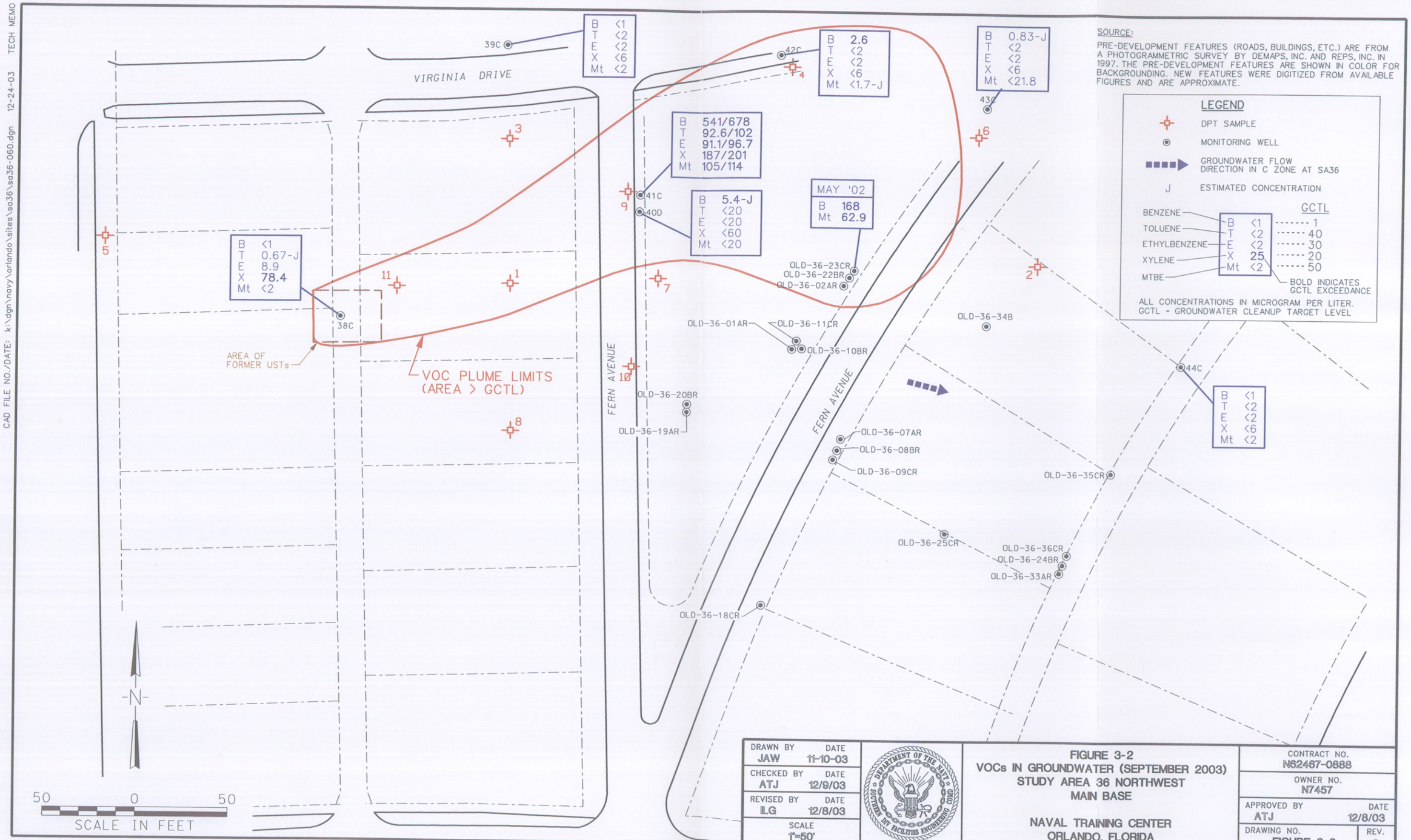
SOURCE:
PRE-DEVELOPMENT FEATURES (ROADS, BUILDINGS, ETC.) ARE FROM A PHOTOGRAMMETRIC SURVEY BY DEMAPS, INC. AND REPS, INC. IN 1997. THE PRE-DEVELOPMENT FEATURES ARE SHOWN IN COLOR FOR BACKGROUNDING. NEW FEATURES WERE DIGITIZED FROM AVAILABLE FIGURES AND ARE APPROXIMATE.

DRAWN BY ILG	DATE 12/8/03
CHECKED BY ATJ	DATE 12/9/03
REVISED BY —	DATE —
SCALE 1"=50'	

FIGURE 3-1
DPT SAMPLE RESULTS - MAY 2003
STUDY AREA 36 NORTHWEST
MAIN BASE

NAVAL TRAINING CENTER
ORLANDO, FLORIDA

CONTRACT NO. N62467-0888	
OWNER NO. N7457	
APPROVED BY ATJ	DATE 12/9/03
DRAWING NO. FIGURE 3-1	REV. 0



SOURCE:

PRE-DEVELOPMENT FEATURES (ROADS, BUILDINGS, ETC.) ARE FROM A PHOTOGRAMMETRIC SURVEY BY DEMAPS, INC. AND REPS, INC. IN 1997. THE PRE-DEVELOPMENT FEATURES ARE SHOWN IN COLOR FOR BACKGROUNDING. NEW FEATURES WERE DIGITIZED FROM AVAILABLE FIGURES AND ARE APPROXIMATE.

LEGEND

- DPT SAMPLE
- MONITORING WELL
- GROUNDWATER FLOW DIRECTION IN C ZONE AT SA36
- J ESTIMATED CONCENTRATION

		GCTL
BENZENE	B <1	1
TOLUENE	T <2	40
ETHYLBENZENE	E <2	30
XYLENE	X 25	20
MTBE	Mt <2	50

BOLD INDICATES GCTL EXCEEDANCE

ALL CONCENTRATIONS IN MICROGRAM PER LITER.
GCTL = GROUNDWATER CLEANUP TARGET LEVEL

DRAWN BY JAW	DATE 11-10-03
CHECKED BY ATJ	DATE 12/9/03
REVISED BY ILG	DATE 12/8/03
SCALE 1"=50'	

FIGURE 3-2
VOCs IN GROUNDWATER (SEPTEMBER 2003)
STUDY AREA 36 NORTHWEST
MAIN BASE

NAVAL TRAINING CENTER
ORLANDO, FLORIDA

CONTRACT NO. N62467-0888	
OWNER NO. N7457	
APPROVED BY ATJ	DATE 12/8/03
DRAWING NO. FIGURE 3-2	REV. 0

CAD FILE NO./DATE: k:\dgn\navy\orlando\sites\sa36\sa36-060.dgn 12-24-03 TECH MEMO

FORM CADD NO. SDIV-BH.DGN - REV 2 - 10/23/03