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Round 1 Summary Report

for

Denitrification-Based Biodegradation Pilot Test Navy Exchange Service Station

Naval Air Station Brunswick, Maine

Naval Facilities Engineering Command Mid-Atlantic

Contract Number N62472-03-D-0057
Contract Task Order 14

May 2007

TETRA TECH

TETRA TECH

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Project Number GN4590

Mr. Lonnie Monaco
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Reference: CLEAN Contract No. N62472-03-D-0057
Contract Task Order (CTO) No. 14

Subject: Round 1 and Round 2 Summary Reports
Navy Exchange Service Station
Naval Air Station, Brunswick, Maine

Dear Mr. Monaco:

As discussed during the May 15, 2007 telephone conference call, I have submitted copies of the Round 1 and Round 2 Summary Reports for Denitrification-Based Biodegradation at the Navy Exchange Service Station to the list shown below. Both reports were prepared as final documents. I have also placed a copy of each document on our FTP Site if someone needs a digital version.

Please contact me at (978) 474-8431 if you have any questions.

Very truly yours,

Arnold Ostrofsky

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Project Manager

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Enclosure

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ROUND 1 SUMMARY REPORT

FOR

DENITRIFICATION-BASED BIODEGRADATION
PILOT TEST
NAVY EXCHANGE SERVICE STATION

NAVAL AIR STATION
BRUNSWICK, MAINE

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

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1.0 INTRODUCTION

Tetra Tech NUS, Inc. (TtNUS) has prepared this summary report for the Navy Exchange (NEX) Service Station Site located at the Naval Air Station (NAS) in Brunswick, Maine (Figures 1-1 and 1-2). This report was prepared for Engineering Field Activity Northeast Naval Facilities Engineering Command under Contract Number N62472-03-D-0057, Contract Task Order 014. The purpose of this report is to summarize the results of the Round 1 field and sampling activities completed in March 2005. The field activities were performed in accordance with the *Final Work Plan for Denitrification-Based Biodegradation Pilot Test* (TtNUS, November 2004).

1.1 PILOT TEST OBJECTIVE

The objective of the pilot test is to assess the effectiveness of the Geovation Technologies, Inc.'s (Geovation) Denitrification-Based Biodegradation (DBB) process to mitigate sorbed-phase petroleum hydrocarbon contamination in the vicinity of the NEX Service Station. This assessment will be based on whether the site-specific remedial goal of 500 mg/Kg of gasoline range organics (GRO) can be achieved in the saturated overburden unit using the DBB process.

1.2 DENITRIFICATION-BASED BIODEGRADATION PROCESS

Geovation's DBB process involves the application of N-Blend, a proprietary nitrate-based electron acceptor reagent, into subsurface soils contaminated with petroleum hydrocarbons. The N-Blend reagent stimulates the growth of naturally-occurring denitrification microbes thereby increasing the rate of biodegradation of the petroleum hydrocarbons. In this pilot study, the N-Blend is added into existing and newly installed mini-wells situated in a portion of the residual source area.

1.3 PILOT TEST PROGRAM

The pilot test consists of performing baseline monitoring, treating a portion of the residual source area by applying Geovation's N-Blend reagent into selected existing and newly installed mini-wells, performing periodic sampling and analysis, and evaluating the data to assess the DBB process effectiveness. Geovations was subcontracted by TtNUS to perform the baseline monitoring of biogeochemical conditions and molecular analysis, to perform additions of the N-Blend reagent into the mini-wells, and to assess the degree of biodegradation during the pilot test. TtNUS will perform baseline and periodic soil and groundwater sampling to determine whether the 500 mg/Kg GRO treatment goal can be attained through in-situ anaerobic biodegradation using the native microbes present in the pilot test area.

For the pilot study, the area to be treated is depicted in Figure 1-2. This area is bounded approximately by Burbank Avenue to the north and by the northwestern corner of Building 27 to the south. The test area footprint corresponds to the lower half of one of the two residual source areas delineated during the 2003 investigation.

Seventeen addition wells (DB-01 to DB-17) were installed in September 2004 and three existing sparging wells (AS-6, AS-7, and AS-8) were used to apply Geovation's N-Blend into the test portion of the residual source area. Ten applications of N-Blend were planned over an approximate 12-month period to foster the growth of the denitrification bacteria and to increase the degradation rate. To date, the nitrate reagent was applied in October, November, and December 2004, and during January, February, April, and June 2005. Sub-freezing conditions during March 2005 prevented applications of N-Blend. Because microbial communities develop (reproduce) gradually, application of nutrients over an extended period allows the applied nitrate to be utilized by the bacteria rather than migrating out of the pilot test area.

Three periodic sampling events are planned over an 18-month period, with each periodic event occurring approximately 6 months apart. The first round of periodic sampling (March 2005) is discussed in this report. The second and third periodic sampling events are tentatively scheduled for October 2005 and April 2006, respectively. A letter report will be prepared for the second periodic event while the third periodic event results will be incorporated into a pilot test report. Results of each periodic event will be compared with the baseline sampling data to assess pilot test progress.

1.4 SUMMARY OF ACTIVITIES

Because the pilot test involves the stimulation of naturally occurring microbes in the test area, the growth of the microbiological population is expected to increase gradually and biodegradation is expected to occur over a period of 12 to 18 months after the initial application of N-Blend. Therefore, periodic sampling of soil and groundwater was selected to evaluate the progress of the biodegradation. Baseline sampling of test area soil and groundwater was performed during August and September 2004. The baseline event consisted of collection of soil and groundwater samples, and the installation of 17 new mini-wells for reagent application. Three periodic sampling events were planned at approximate 6 month intervals to monitor the pilot test progress.

In March 2005, the following activities were completed as part of Round 1:

- groundwater sampling,
- soil sampling, and
- installation of two new mini-wells.

1.5 2003 SITE ENVIRONMENTAL CONDITIONS

As a result of past releases of gasoline from corroded fuel lines and the bulk storage of petroleum products associated with the NEX Service Station, soil and groundwater underlying the area spanned by the NEX Service Station and Building 27 were contaminated by petroleum hydrocarbons, specifically the gasoline range organics (GROs). As presented in the *Corrective Action Plan* (EA, 2003), two areas of residual GRO contamination remain in subsurface soil along with two plumes of contaminated groundwater. The areas of GRO-contaminated soil and groundwater delineated in 2003 are depicted in Figures 1-3 and 1-4, respectively.

Previous efforts to remove petroleum hydrocarbon contaminated soil included: excavation and removal of 440 tons of petroleum product-contaminated soil in 1992; soil vapor extraction/air sparging (SVE/AS) treatment implemented from 1993 through 2003, and a limited in-situ chemical oxidation (ISCO) pilot test performed during 2002. While SVE/AS had been effective in removing some of the petroleum hydrocarbons from subsurface soil, it was ineffective in addressing the sorbed-phase mass present in the saturated overburden materials present in the area between the NEX Service Station and Building 27. Application of ISCO resulted in the unwanted partial mobilization of sorbed-phase GRO.

A limited baseline biodegradation evaluation was performed in June 2003 to assess site-specific biogeochemical conditions. The results of the study indicated that anaerobic and reducing conditions were dominant within the plume, the microbial populations were discernable in the source areas, and the presence of ammonium indicated that anaerobic processes via denitrification were occurring. These indications favored the anaerobic degradation of the petroleum hydrocarbons through the denitrification process. As a result, denitrification-based biodegradation was evaluated in the *Focused Feasibility Study* (EA 2004) and presented in the *Corrective Action Plan* (EA 2004) as the recommended remedial action.

1.6 2004 BASELINE ENVIRONMENTAL CONDITIONS

In preparation for the initiation of the in-situ biodegradation pilot test, baseline sampling and chemical analysis of groundwater and soil samples were completed during August and September 2004. Results of the baseline GRO concentrations in groundwater and soil are presented in the *Baseline Summary Report for Denitrification-Based Biodegradation Pilot Test* (TtNUS, 2005). Interpreted distributions of baseline groundwater GRO and the sums of benzene, toluene, ethylbenzene, and xylenes (BTEX) are depicted in Figures 1-5 and 1-6, respectively. The interpreted baseline soil GRO extent is presented in Figure 1-7.

Comparison of the 2004 (Figure 1-5) and 2003 (Figure 1-4) results indicated that the delineated extent of the GRO plume were comparable during the two sampling events. Dissolved phase GRO concentrations

of up to 28 mg/L were detected in the pilot test area during the baseline event. Groundwater samples were also analyzed for select aromatic hydrocarbons: benzene, ethylbenzene, toluene, xylenes (BTEX). The BTEX extent (Figure 1-6) in the plume was generally similar to the dissolved phase GRO extent (Figure 1-5). The 2004 data indicated that only low concentrations of methyl tert-butyl ether (MTBE) were detected in a few samples. MTBE did not appear to be a significant contaminant.

However, the interpreted extent of GRO-contaminated soil (exceeding 500 mg/Kg) appeared to be greater in the 2003 delineation (Figure 1-3) than in the 2004 delineation (Figure 1-7). It is likely that heterogeneity in the soil stratigraphy and in the distribution of petroleum hydrocarbons account for some of the disparity.

To assess the types of organic compounds present in the petroleum hydrocarbons, four samples were analyzed using the Massachusetts volatile petroleum hydrocarbon (VPH) method, which provides for the analysis of aromatics in the C9 - C10 range and aliphatics in the C5 - C8 and C9 - C12 ranges. Also, the VPH method provides identification of specific aromatic compounds (benzene, ethylbenzene, naphthalene, toluene, m&p-xylenes, and o-xylene) and methyl tert-butyl ether (MTBE).

1.7 HYDRAULIC CONDUCTIVITY TESTING

In August 2004, hydraulic conductivity testing was performed as part of the design of the mini-wells to be installed. Results of the testing were presented in the *Mini-Wells Design Letter Report* (TtNUS, September 2004), which was submitted previously to the Maine Department of Environmental Protection (MEDEP). As requested per the March 25, 2005 correspondence from the MEDEP to the Navy, a copy of this letter report is presented in Appendix A.

1.8 MODIFICATIONS TO THE PLANNED SCOPE

While the majority of field activities were completed in accordance with the *Final Work Plan for Denitrification-Based Biodegradation Pilot Test* (TtNUS, November 2004), modifications to the planned activities were required in response to changes in investigation conditions.

VPH and VOCs Analysis – The Work Plan specified that GRO analysis of soil samples would be performed. Based on communications with the MEDEP prior to the baseline sampling event, it was decided that additional analyses should be performed in order to better evaluate the effectiveness of the in-situ biodegradation process and the types of petroleum hydrocarbons that would be degraded. The

Massachusetts VPH method and EPA Method 8260B (with tentatively identified compounds [TICs]) were proposed for the analysis for a few samples to supplement the GRO analysis of soil.

For the baseline sampling event, seven sets of samples were collected for paired GRO and VPH analyses while five sets were collected for paired GRO and EPA Method 8260B analyses to provide a preliminary assessment of different analytical methods to evaluate petroleum hydrocarbon presence.

The Massachusetts VPH method (May 2004, rev. 1.1) provides the identification of ranges of aromatic and aliphatic hydrocarbons, targeted analytes (benzene, ethylbenzene, naphthalene, toluene, m&p-xylenes, and o-xylene) and MTBE. The VPH method provides characterization of hydrocarbon ranges while the GRO method provides a total value for all organic compounds within the gasoline range. EPA Method 8260B with TICs analysis provides for identification of specific volatile organic compounds (VOCs) while also identifying other possible VOCs.

Results of the baseline sampling event were presented in the *Baseline Summary Report* (TtNUS, February 2005). Correlation between GRO, VPH, and VOCs results were poor, probably due to the inherent heterogeneities of petroleum hydrocarbon contamination distributed in the soil matrix. Although paired samples were obtained from the same borings and depth intervals, the actual soil specimens used for chemical analysis came from different sample containers (i.e., one set of containers for GRO analysis, a second set for VPH analysis). However, the VPH results provided useful information of the composition on detected petroleum hydrocarbons. EPA Method 8260 results were appropriate for identifying specific VOCs, but were not representative of all associated gasoline residuals.

After the baseline event, TtNUS proposed that the Round 1 samples be collected for both GRO and VPH analysis. GRO results will provide an overall assessment of compliance with the site-specific soil remediation goal of 500 mg/Kg. The VPH analysis will provide data to evaluate how the composition of petroleum hydrocarbons may be changing as the result of biodegradation. This proposed change was presented to the MEDEP and concurrence was received (per electronic mail of March 16, 2005).

MTBE - Based on the baseline results, it was determined that MTBE was only present at low concentrations in groundwater and would therefore not be analyzed for. However, the Massachusetts VPH method automatically provides MTBE results as part of the analysis. Therefore, MTBE information will be continue to be reported.

Nitrate and Nitrite Analysis - Groundwater samples were originally planned for analysis of ammonium (a biodegradation waste product), as evidence of microbial activity. Upon further discussion between

Geovation and TtNUS, it was determined that nitrate and nitrite analysis would be more useful to Geovation in evaluating aquifer conditions to formulate the reagent mixes. The MEDEP was notified of the proposed change in chemical analysis, and concurrence was provided for the modification (per electronic mail of March 16, 2005).

2.0 FIELD INVESTIGATION ACTIVITIES

Summaries of the field activities completed as part of the Round 1 sampling event are included in this Section. All field activities were completed in accordance with the *Final Work Plan for Denitrification-Based Biodegradation Pilot Test* (TtNUS, November 2004), with the exception of changes noted in Section 1.7.

2.1 GROUNDWATER SAMPLING

Groundwater samples were collected from 12 existing monitoring and mini-wells (MW-DP09, MW-DP13, MW-DB01, MW-DB04, MW-DB07, MW-DB10, MW-DB11, MW-DB14, SDP-5, and MW-300 through MW-302) and one new well (DB-18) from March 29 to 31, 2005. Table 2-1 presents the water levels and elevations in the wells samples. Table 2-2 presents the sample summary, which lists the samples collected and the analyses performed. The sample log sheets are presented in Appendix B.

All wells were sampled following the EPA Region 1 procedure for *Low Stress (low flow) Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells* (EPA SOP No. GW 001), which is summarized below:

- Peristaltic pumps and dedicated ¼-inch inner diameter [I.D.] Teflon-lined tubing was used to purge the wells.

- Wells were purged at flow rates between 100 and 400 mL/min to minimize drawdown. The drawdown did not exceed 0.3 feet in any of the wells sampled.

- The water level, pumping rate, turbidity, DO, ORP, specific conductance, temperature, pH, and any other relevant observations were recorded every 3 to 5 minutes. The groundwater parameters were measured using a Horiba U-22 multi-parameter meter along with a separate turbidity meter. Stabilization was considered to be achieved when three consecutive readings, taken at 3 to 5-minute intervals, were within the defined limits.

- Groundwater samples were obtained from the sample tubing filled with water to the sample point and free of air bubbles or air pockets to minimize changes in the water chemistry upon contact with the atmosphere.

Groundwater from all of the wells sampled was submitted to Katahdin Analytical Services, Inc. (Katahdin) of Westbrook, Maine for 7-day turnaround analysis of GRO, VPH, and nitrate/nitrite (EPA Method 353.2). Katahdin is approved by the State of Maine for GRO analysis. Quality assurance/quality control (QA/QC) samples were also collected including field duplicates, rinsate blanks, laboratory QC samples, and trip blanks.

Samples from 8 wells (MW-300 through MW-302, MW-DP09, MW-SDP5, MW-DB10, MW-DB11, and MW-DB14) were also collected and shipped to Geovation, Inc. and its laboratory for analysis of microbial parameters.

Water level measurements for the wells sampled were converted into elevations and a water table surface map was prepared, as depicted in Figure 2-1. This interpretation is limited by the number of wells sampled.

2.2 SOIL SAMPLING

For Round 1, soil samples were collected from the same locations and depth intervals sampled during the baseline event. Certain baseline sampling locations (i.e., top of clay) were omitted because GRO contamination was not detected. Most of the soil samples were collected within one foot southeast of 13 soil borings (MW-DB01, MW-DB03, MW-DB05, MW-DB08, MW-DB09, MW-DB10, MW-DB12, MW-DB13, MW-DB15, MW-DB17, and MW-300 through MW-302). Soil samples associated with reference boring SB-01 were not collected during this round due to utility clearance concerns. Appendix C presents the soil boring logs. For these borings, soil samples were logged from the four or six foot zone of interest identified in the baseline sampling event; analytical samples were collected from the individual sampling zones or depth intervals identified in the baseline sampling event. Soil samples were collected using a 1.5-inch I.D. sampler with a 4-foot disposable plastic liner sleeve. Refer to the *Baseline Summary Report* (TtNUS, February 2005) for the complete soil profiles for these borings.

Based on the review of soil baseline and groundwater sampling results, two new wells were added to the DBB pilot test program to better delineate the western edge of the GRO plume and to provide two new mini-wells for monitoring and reagent applications. The new mini-well locations (DB-18 and DB-19) were added to the west of the line of wells adjacent to the sidewalk in front of the NEX, and were spaced approximately 25 and 15 feet west of DB-01, respectively. Soil at these locations was logged from the ground surface to the top of the blue clay interface. Two analytical samples were collected from each well from the two depth intervals below the water table, using a 1.5-inch I.D. sampler with a 4-foot disposable plastic liner sleeve. If the zone of potential contamination (between the water table and the marine clay) was 4 feet or less (one depth interval), soil sample collection depths were spaced as far apart as possible

from the same sleeve. The TtNUS field geologist determined sample collection depths based on the highest concentration of organic vapors as determined by the photoionization detector (PID) readings, or from portions showing visual or olfactory evidence of petroleum hydrocarbon contamination.

Table 2-2 presents the sample summary, which lists the samples collected and the analyses performed.

Yarmouth Environmental Services, Inc. (YES) of Yarmouth, Maine, the TtNUS drilling subcontractor, used a direct-push technology (DPT) rig to advance samplers into the subsurface, retrieve the samplers, remove the acetate liner containing the sample, and slice open the liner. Soil samples were collected according to TtNUS Standard Operating Procedure (SOP) SA-1.3 as described below. The TtNUS field geologist representative performed the following activities during soil sampling:

- Identified the sample depth interval and collected soils for laboratory analyses.
- Screened each soil sample using a PID.
- Determined the amount of soil sloughed in the top of the sampler.
- Classified soil samples according to the Unified Soil Classification System (TtNUS SOP No. GH-1.5), noting the depth of change in each strata and any other pertinent visual observations (i.e., discolorations, odors, residual product).
- Decontaminated TtNUS soil sampling equipment prior to each use.

Soil samples were sent for analysis of GRO and VPH. <u>In order to limit variation between the VPH and GRO analyses due to heterogeneities inherent in soil and between different samples, the analytical laboratory was instructed to use the same sample aliquot for both GRO and VPH analyses</u>. The soil sampling methodology is presented below:

- A pre-tare weighted 40-ml amber VOC vial was labeled with the sample location number.
- A grab soil core (about 10 g) was collected with a 10-ml pre-cut syringe. The soil sample was extruded into the 40-ml VOC vial and immersed with at least 10 mL of methanol.
- The vial was capped and shaken to mix the preservative with the sample.
- The preserved sample was weighed and the value was recorded in the sample collection/ preservation log.

Samples were shipped to Katahdin Analytical at 4 degrees Celsius for chemical analysis.

QA/QC samples were also collected as part of the soil investigation including field duplicates, rinsate (equipment) blanks, laboratory QC samples, and trip blanks. All quality control samples were collected according to the schedules outlined in the Work Plan.

All soil samples were identified in accordance with the sample location identification system presented in the Work Plan. Soil samples were handled and delivered in accordance with the chain-of-custody procedures detailed in the Work Plan. Required data were recorded on the boring logs, which were used as sample log sheets, including sample device used, sampling personnel, date and time of sample, and analyses to be performed.

2.3 MINI-WELL INSTALLATION

The subcontracted drilling company, YES, advanced 2 DPT soil borings, which were completed as 1.0-inch inner diameter monitoring wells (MW-DB18 and MW-DB19) located 25 and 15 feet east of DB-01, along the sidewalk. The wells were installed into the saturated overburden with residual GRO petroleum hydrocarbon contamination. Well locations were determined based on location of subsurface utilities and soil and groundwater results from the baseline sampling.

The mini-well screen and casing were constructed of 1.0-inch I.D., non-glued, flush-threaded Schedule 40 PVC with a threaded PVC end plug. Each well screen was machine slotted (0.010-inch slot size) and surrounded by silica sand (20-40 grade) to 3.25-inch outer diameter (O.D.). The sand was placed in the annular space around the well screen to a height of approximately 1 foot above the screen. A seal consisting of a 1-foot layer (minimum) of bentonite pellets was placed above the filter pack to approximately 0.5 feet below the base of the protective well cover. The mini-wells were completed with a flush-to-grade metal protective well cover and capped with a lockable expansion cap (“J-cap”).

Mini-well screens were placed at the top of the clay layer, as determined by the borehole logging conducted during drilling. The top of the screens were set at 5 feet below ground surface (bgs), which was assumed to be above the seasonally high water table. Well construction details are presented in Table 2-3. The well construction logs are presented in Appendix D.

3.0 SAMPLING RESULTS

The Round 1 soil and groundwater chemical analytical results are presented in this section.

The groundwater samples collected for evaluation of biological activity by Geovation are in the process of being analyzed. Once the data have been reviewed and evaluated, a summary of the findings will be prepared and distributed for review.

3.1 GROUNDWATER

Table 3-1 presents the groundwater analytical results. The interpreted extent of dissolved phase GRO, VPH aromatic hydrocarbon, and VPH aliphatic hydrocarbons in the pilot test area are depicted in Figures 3-1, 3-2, and 3-3, respectively.

3.1.1 Round 1 Groundwater Contamination

GRO - Groundwater GRO concentrations (Figure 3-1) detected during March 2005 (Round 1) ranged from non-detect (0.010 U mg/L) to 45 mg/L (at DB-01). The highest GRO concentrations were detected in the area encompassed approximately by DB-01 and DB-14.

VPH – Groundwater VPH data are presented in Table 3-1. Total VPH (as sum of unadjusted aliphatics and unadjusted aromatics) concentrations are generally in good correlation with the corresponding GRO concentrations.

The VPH analytical results were evaluated as aromatic and aliphatic hydrocarbons. The purpose of this division is to allow for future tracking and evaluation of the effects of biodegradation during the remainder of the pilot test. Changes in VPH aromatics or VPH aliphatics over time may provide insight into the types of petroleum hydrocarbons for which the denitrification bacteria are effective.

The VPH aromatic hydrocarbon concentrations consist of the sum of the C9 – C10 aromatic hydrocarbons and the targeted analytes (including benzene, ethylbenzene, naphthalene, toluene, m&p-xylenes, and o-xylene). VPH aliphatic concentrations consist of the sum of the C5 - C8 and the C9 – C12 range concentrations. In many of the samples with detectable petroleum hydrocarbons, the sum of VPH aromatic concentrations were approximately twice as high as the sum of VPH aliphatics. These results indicate that the aromatic hydrocarbons are predominant in the dissolved phase. The primary contributors to the sum of VPH aromatics are ethylbenzene, toluene, and xylenes. Benzene was not detected in any of the Round 1 samples. MTBE was only detected in MW-301.

The sum of VPH aromatics ranged from non-detect (10U ug/L) to 34,820 ug/L (DB-14). The interpreted extent of the VPH aromatics is similar to that of the GRO, and extends from the three storage tanks to the vicinity of MW-301 (Figure 3-2).

The sum of VPH aliphatics ranged from non-detect (10U ug/L) to 17,100 ug/L (DB-01). The interpreted extent of the VPH aliphatics is smaller than the GRO or aromatics footprint (Figure 3-2).

In general, the highest total VPH contamination appears to occur the in the vicinity between DB-01 and DB-14, which is within the pilot test area.

Nitrates/Nitrites – These results, presented in Table 3-1, were used by Geovation to determine the status of these parameters so that they could formulate the appropriate nitrate reagent dose for the April 2005 addition.

3.1.2 Comparison with Baseline Results

The dissolved-phase GRO concentration distribution for March 2005 (Figure 3-1) was compared to the August 2004 (Figure 1-5) results. The interpreted GRO contours for 2005 are generally similar to those observed during 2004 within the pilot test area. The core of the plume contained much higher GRO concentrations (up to 45 mg/L) during 2005.

The 2005 data were obtained from relatively new monitoring wells (DB-series) while the 2004 data were obtained from existing wells. Direct comparison of 2004 and 2005 data for the same wells was not possible for most sampling locations. At MW-SDP5, GRO decreased from 25 mg/L (2004) to 9.6 mg/L (2005). It is uncertain at this time what may be the cause of the GRO reduction at this monitoring well location, considering increased GRO at other portions of the plume.

At the end of Round 1, the groundwater GRO extent appears to be comparable to the interpreted baseline extent. These results do not provide an indication whether the denitrification microbes stimulated by the addition of nitrate reagents are actively degrading petroleum hydrocarbons in groundwater. It should be noted that the contaminated soil upgradient of the pilot test area is continuing to contribute dissolved phase petroleum hydrocarbons to the pilot test area, which may affect the pilot test results.

3.2 SOIL

The soil analytical results for GRO and VPH are presented in Table 3-2. The lateral extent of GRO, VPH aromatics, and VPH aliphatics in the pilot test area are presented in Figures 3-4, 3-5, and 3-6, respectively.

3.2.1 Round 1 Soil Contamination

GRO - Soil GRO concentrations (Figure 3-4) detected during the Round 1 event ranged between non-detect (3.0 U mg/Kg) to 11,000 mg/Kg (DB-01, 8-9 ft interval; DB-09, 8-9 ft interval). The areal extent of the GRO contamination exceeding the site-specific 500 mg/Kg GRO cleanup goal is limited to the area bounded approximately by DB-18, DB-05, DB-15, and DP-9.

VPH – The soil VPH analytical results were evaluated as aromatic and aliphatic hydrocarbons to assess the types of petroleum hydrocarbons present and for future data comparisons. Comparison of the total VPH concentration with corresponding GRO result for the same sample indicates generally good agreement between the numerical values. In some cases, the total VPH was slightly higher, in others, the GRO was higher. These differences are likely the result of differences in the analytical methods. However, by having both the GRO and VPH analysis performed using the extract from the same sample containers, the effect of sample heterogeneity on analytical result has been greatly reduced.

Review of the VPH data indicated that the sum of aromatic hydrocarbon concentrations were generally equal to the sum of aliphatic concentrations for highly contaminated soil samples, indicating that the saturated soil within the pilot test area appears to be contaminated almost equally by aromatics and apliphatics.

The sum of VPH aromatics ranged from non-detect (1.3 U mg/Kg) to 8,240 mg/Kg (DB-01). The interpreted extent of the VPH aromatics is similar to that of the GRO, and extends from the three storage tanks to the vicinity of MW-300 (Figure 3-5). The March 2005 extent of VPH aromatics was interpreted to be slightly smaller than the GRO extent.

Of the targeted analytes detected by the VPH method, neither benzene not MTBE was detected in any soil sample.

For soil samples containing elevated GRO or total VPH concentrations (exceeding 500 mg/Kg), the targeted aromatic analytes (comprising ethylbenzene, naphthalene, toluene, xylenes) represent between 9 and 35 percent of the total aromatic hydrocarbon presence.

The sum of VPH aliphatics ranged from non-detect (27U mg/Kg) to 7,000 mg/Kg (DB-01). The interpreted extent of the VPH aliphatics (Figure 3-6) is smaller than the GRO (Figure 3-4), but comparable to the VPH aromatics footprint (Figure 3-5).

In general, the highest total VPH contamination within the pilot test area appears to occur in the vicinity between DB-01 and DB-14.

3.2.2 Comparison with Baseline Results

The areal extent of GRO-contaminated soil exceeding the 500 mg/Kg cleanup goal in 2005 (Figure 3-4) appears to correspond to the 2004 baseline conditions (Figure 1-7). Both the 2005 and 2004 delineations of soil GRO are smaller than identified previously in 2003 (Figure 1-4). The estimated GRO concentration contours were also similar, indicating no detectable change in GRO concentrations between the 2004 and 2005 results.

Table 3-3 presents a summary of the soil data that compares 2004 GRO and VPH results to the 2005 data. Based on the available data, it does not appear in general that there have been appreciable changes in the GRO concentrations between 2004 and 2005. At DB-05 (8-9 feet interval), GRO decreased from 5,300 mg/Kg to 220mg/Kg. At DB-15 (8-9 feet interval), GRO concentrations increased from 76 mg/Kg to 260 mg/Kg. Based on the limited observation of changes of GRO, it is too early in the pilot test to be able to assess whether decreases in detected GRO concentration are attributable to biodegradation processes.

Because VPH data was not collected for all sample locations during the baseline event, it is not possible to evaluate changes in the VPH aromatic or aliphatic fractions to assess potential biodegradation effects. Future sampling results for paired GRO and VPH analyses will yield data will that can be used to evaluate potential biodegradation of petroleum hydrocarbons.

4.0 CONCLUSION AND RECOMMENDATIONS

4.1 CONCLUSIONS

Based on the Round 1 sampling program, the following conclusions were reached:

Groundwater Contamination

- The extent of the interpreted GRO plumes during the baseline (2004) and Round 1 (2005) sampling events were approximately the same. Groundwater GRO concentrations were generally comparable as well.

- The baseline and Round 1 plume extents and concentrations were also comparable to those observed previously during 2003 (post in-situ chemical oxidation pilot test).

- Based on available Round 1 data, there do not appear to be discernible changes in GRO concentrations that can be attributable to the denitrification-based biodegradation. However, stimulation of microbial population growth and increasing the biodegradation processes will require time because this is a biological system and growth is non-linear.

- The sum of VPH aromatic concentrations were approximately twice as high as the sum of VPH aliphatics. These results indicate that the aromatic hydrocarbons are predominant in the dissolved phase.

- The primary contributors to the total VPH aromatic in groundwater consisted of xylenes (total), toluene, and ethylbenzene. Benzene, which is a carcinogenic compound, was not detected in any sample. MTBE was only detected at low concentration in one sample.

Soil Contamination

- The interpreted extent of GRO-contaminated saturated soil in March 2005 appears to be comparable to the interpreted baseline extent (2004). Both interpreted extents of contamination exceeding the 500 mg/Kg clean-up goal are smaller than the previously identified extent in 2003.

- The areal extent of the GRO contamination exceeding the site-specific 500 mg/Kg GRO cleanup goal is limited to the area bounded approximately by DB-18, DB-05, DB-15, and DP-9.

- The sum of aromatic hydrocarbon concentrations was generally equal to the sum of aliphatic concentrations for highly contaminated soil samples, indicating that the saturated soil within the pilot test area appears to be contaminated almost equally by aromatics and apliphatics.

- Neither benzene nor MTBE was detected in any of the Round 1 soil samples.

- For soil samples with elevated GRO or total VPH concentrations, the targeted aromatic analytes (comprising ethylbenzene, naphthalene, toluene, xylenes) represent between 9 and 35 percent of the total aromatic hydrocarbon presence. These results indicate using only BTEX data will provide an inaccurate assessment of aromatic petroleum hydrocarbons.

Analytical Methods

- The use of the same soil sample for paired GRO and VPH analysis resulted in generally very good correlation between the two data sets. Heterogeneity in the sample matrix and contaminant distribution was greatly reduced by obtaining the methanol extract from the same sample container for both analyses.

- Some variations between GRO and total VPH results are expected because different analytical methods were used.

4.2 RECOMMENDATIONS

Based on the findings of the Round 1 sampling, these recommendations are proposed for the Round 2 sampling event:

Pilot Test

- Although the 2004 and 2005 interpreted extent of GRO-contaminated soil are smaller than the 2003 interpretation, only a few positive detections of GRO affect the interpretations. It is likely that the heterogeneity in the soil affected the sample results. It is possible that during the future periodic soil sampling event, new results will require a reinterpretation of the GRO contamination extent, which may be greater than the 2004 delineation. Therefore, it is recommended that the pilot test continue to treat the full extent of the area delineated during 2003 to ensure maximum degradation of any gasoline hydrocarbon residuals, in the event GRO residuals are present beyond the 2004 and 2005 delineations.

Soil Analysis

- Based on the results of the baseline sampling events, it is recommended that paired GRO and VPH analyses continue to be used to identify petroleum hydrocarbons presence.

- Because GRO and VPH analyses will be performed to compare analytical results, the analyses should continue to be performed using only one sub-sample vial rather than collecting two distinct grab samples, which may lead to variability in soil contaminant concentrations.

- Although the VPH analysis provides more useful information regarding the effectiveness of the pilot test, soil and groundwater samples should continue to be collected for GRO analysis to provide an assessment of compliance with site-specific remediation targets.

- It is recommended that samples continue to be collected for VPH to will provide details in changes in the aromatic and aliphatic ranges that would be useful in evaluating biodegradation progress.

- Because the VPH method identifies specific ranges of aliphatics and aromatics as well as selected aromatic VOCs, this analytical method produces data that may be used to estimate risk-based numerical remediation goals.

Next Periodic Sampling Event

- The next sampling event is scheduled for the fall (October 2005). Tentatively, 28 samples (2 samples per boring) will be collected from 14 boring locations (including the new DB-18 and DB-19 locations) These samples will be collected from adjacent to the same mini-well boring locations and depths that were sampled during Round 1.

TABLES

TABLE 2-1

GROUNDWATER ELEVATION SUMMARY
NAVY EXCHANGE SERVICE STATION
NAVAL AIR STATION, BRUNSWICK, MAINE

WELL IDENTIFICATION	WELL INSIDE DIAMETER (inch)	WATER LEVEL MP ELEVATION (feet-NGVD)	TOP OF SCREEN (feet-BGS)	BOTTOM OF SCREEN (feet-BGS)	DEPTH TO GROUNDWATER March 2005 (feet-BMP)	GROUNDWATER ELEVATION August 16, 2004 (feet-NGVD)
DB-01	1.00	66.06	5.0	13.8	7.03	59.03
DB-04	1.00	66.58	5.0	11.5	7.40	59.18
DB-07	1.00	67.00	5.0	12.0	ND	ND
DB-10	1.00	65.92	5.0	12.0	6.83	59.09
DB-11	1.00	66.16	5.0	11.5	6.99	59.17
DB-14	1.00	66.11	5.0	13.5	7.75	58.36
DB-18*	1.00	66.10	5.0	15.7	7.09	59.01
MW-300	1.00	65.92	5.0	14.0	ND	ND
MW-301	1.00	64.49	5.0	12.0	6.15	58.34
MW-302**	1.00	59.89	3.0	7.0	5.50	54.39
DP-09	1.00	66.15	5.0	15.0	6.83	59.32
DP-13	1.25	66.89	5.0	15.5	7.15	59.74
SDP-5	1.00	65.93	4.0	14.0	6.83	59.10

*Water level MP estimated; well not surveyed.
**Anomalous water table elevation. 3 feet below August 2004 water levels and inconsistent with observed conditions (post-snowmelt ground saturation); well not used for water table contours.

Abbreviations:
BGS - below ground surface
MP - measuring point
BMP - below measuring point
ND - no data
NGVD - National Geodetic Vertical Datum of 1929

TABLE 2-2

SAMPLE SUMMARY
NAVY EXCHANGE SERVICE STATION
NAVAL AIR STATION, BRUNSWICK, MAINE

MATRIX	LOCATION	SAMPLE ID	QC TYPE	DATE	GRO	Nitrate/ Nitrite	VPH	BIO
Groundwater	MW300	NEX-GW-DUP01	Field Dup. NEX-GW-MW300	03/29/05	X	X	X	
Groundwater	MW300	NEX-GW-MW300	Field Dup. NEX-GW-MW300	03/29/05	X	X	X	X
Groundwater	MW301	NEX-GW-MW301	None	03/29/05	X	X	X	X
Groundwater	MW302	NEX-GW-MW302	None	03/29/05	X	X	X	X
Groundwater	MW-DP09	NEX-GW-MW-DP09	None	03/31/05	X	X	X	X
Groundwater	MW-DP13	NEX-GW-MW-DP13	None	03/31/05	X	X	X	
Groundwater	MW-SDP05	NEX-GW-MW-SDP05	None	03/30/05	X	X	X	X
Groundwater	DB01	NEX-GW-DB01	None	03/30/05	X	X	X	
Groundwater	DB04	NEX-GW-DB04	None	03/30/05	X	X	X	
Groundwater	DB07	NEX-GW-DB07	None	03/30/05	X	X	X	
Groundwater	DB10	NEX-GW-DB10	None	03/30/05	X	X	X	X
Groundwater	DB11	NEX-GW-DB11	None	03/30/05	X	X	X	X
Groundwater	DB14	NEX-GW-DB14	None	03/29/05	X	X	X	X
Groundwater	DB18	NEX-GW-DB18	Field Dup. NEX-GW-DB18	03/31/05	X	X	X	
Groundwater	DB18	NEX-GW-DUP02	Field Dup. NEX-GW-DB18	03/31/05	X	X	X	
Soil	DB01	NEX-SO1-DB01-0809	None	03/29/05	X		X	
Soil	DB01	NEX-SO1-DB01-1213	None	03/29/05	X		X	
Soil	DB03	NEX-SO1-DB03-1011	None	03/29/05	X		X	
Soil	DB03	NEX-SO1-DB03-1213	None	03/29/05	X		X	
Soil	DB05	NEX-SO1-DB05-0809	None	03/29/05	X		X	
Soil	DB05	NEX-SO1-DB05-0910	None	03/29/05	X		X	
Soil	DB08	NEX-SO1-DB08-0809	None	03/29/05	X		X	
Soil	DB08	NEX-SO1-DB08-1011	Field Dup. NEX-SO-DB08-1011	03/29/05	X		X	
Soil	DB08	NEX-SO1-DUP01	Field Dup. NEX-SO-DB08-1011	03/29/05	X		X	
Soil	DB09	NEX-SO1-DB09-0809	Field Dup. NEX-SO-DB09-0809	03/29/05	X		X	
Soil	DB09	NEX-SO1-DB09-1112	None	03/29/05	X		X	
Soil	DB09	NEX-SO1-DUP02	Field Dup. NEX-SO-DB09-0809	03/29/05	X		X	
Soil	DB10	NEX-SO1-DB10-0708	None	03/29/05	X		X	
Soil	DB10	NEX-SO1-DB10-0910	None	03/29/05	X		X	
Soil	DB10	NEX-SO1-DB10-1212	None	03/29/05	X		X	
Soil	DB12	NEX-SO1-DB12-0910	None	03/29/05	X		X	
Soil	DB13	NEX-SO1-DB13-0910	None	03/30/05	X		X	
Soil	DB13	NEX-SO1-DB13-1213	Field Dup. NEX-SO-DB13-1213	03/30/05	X		X	
Soil	DB13	NEX-SO1-DUP03	Field Dup. NEX-SO-DB13-1213	03/30/05	X		X	
Soil	DB15	NEX-SO1-DB15-0809	None	03/30/05	X		X	
Soil	DB15	NEX-SO1-DB15-1011	None	03/30/05	X		X	
Soil	DB17	NEX-SO1-DB17-0809	None	03/29/05	X		X	
Soil	DB17	NEX-SO1-DB17-0910	None	03/29/05	X		X	
Soil	DB18	NEX-SO1-DB18-0910	None	03/30/05	X		X	
Soil	DB18	NEX-SO1-DB18-1415	None	03/30/05	X		X	
Soil	DB19	NEX-SO1-DB19-0809	None	03/30/05	X		X	
Soil	DB19	NEX-SO1-DB19-1213	None	03/30/05	X		X	
Soil	MW300	NEX-SO1-MW300-0910	None	03/29/05	X		X	
Soil	MW300	NEX-SO1-MW300-1213	None	03/29/05	X		X	
Soil	MW300	NEX-SO1-MW300-1414	None	03/29/05	X		X	
Soil	MW300	NEX-SO1-MW300-1515	None	03/29/05	X		X	
Soil	MW301	NEX-SO1-MW301-0708	None	03/29/05	X		X	
Soil	MW301	NEX-SO1-MW301-0910	None	03/29/05	X		X	
Soil	MW302	NEX-SO1-MW302-0304	None	03/29/05	X		X	
Soil	MW302	NEX-SO1-MW302-0506	None	03/29/05	X		X	
Blank	Blank	NEX-GW-TB01	Trip Blank	03/29/05	X		X	
Blank	Blank	NEX-GW-TB02	Trip Blank	03/30/05	X		X	
Blank	Blank	NEX-GW-TB03	Trip Blank	03/31/05	X		X	
Blank	Blank	NEX-SO1-DIUF-FB01	Field Blank	03/30/05	X		X	
Blank	Blank	NEX-SO1-DIUF-FB02	Field Blank	03/30/05	X		X	
Blank	Blank	NEX-SO1-DIUF-FB03	Field Blank	03/31/05	X		X	
Blank	Blank	NEX-SO1-RB01	Rinsate Blank	03/30/05	X		X	
Blank	Blank	NEX-SO1-RB02	Rinsate Blank	03/30/05	X		X	
Blank	Blank	NEX-SO1-RB03	Rinsate Blank	03/31/05	X		X	
Blank	Blank	NEX-SO1-TB01	Trip Blank	03/29/05	X		X	
Blank	Blank	NEX-SO1-TB02	Trip Blank	03/30/05	X		X	

abbr: GRO - gasoline range organics by Maine HETL Method 4.2.17
BIO - microbial
VPH - MADEP volatile petroleum hydrocarbons hydrocarbon analysis

TABLE 2-3

MONITORING WELL CONSTRUCTION SUMMARY
NAVY EXCHANGE SERVICE STATION
NAVAL AIR STATION, BRUNSWICK, MAINE

WELL IDENTIFICATION	WELL INSIDE DIAMETER (inch)	TOP OF SCREEN (feet-bgs)	BOTTOM OF SCREEN (feet-bgs)
B27-DP2	1.00	2.0	9.0
B27-DP4	1.00	2.0	6.0
DB-01	1.00	5.0	13.8
DB-02	1.00	5.0	14.5
DB-03	1.00	5.0	13.0
DB-04	1.00	5.0	11.5
DB-05	1.00	5.0	10.5
DB-06	1.00	5.0	10.0
DB-07	1.00	5.0	12.0
DB-08	1.00	5.0	11.5
DB-09	1.00	5.0	13.0
DB-10	1.00	5.0	12.0
DB-11	1.00	5.0	11.5
DB-12	1.00	5.0	10.0
DB-13	1.00	5.0	15.5
DB-14	1.00	5.0	13.5
DB-15	1.00	5.0	12.0
DB-16	1.00	5.0	11.0
DB-17	1.00	5.0	9.5
DB-18	1.00	5.0	15.7
DB-19	1.00	5.0	13.6
DP-01	1.25	5.0	15.0
DP-02	1.25	5.0	15.0
DP-03	1.25	5.0	15.0
DP-09	1.00	5.0	15.0
DP-13	1.25	5.0	15.0
DP-15	1.25	5.0	15.0
DP-19	1.00	4.0	14.0
MW-300	1.00	5.0	14.0
MW-301	1.00	5.0	12.0
MW-302	1.00	3.0	7.0
NASB-8	2.00	3.5	13.5
NASB-23	2.00	5.0	21.0
NASB-24	4.00	4.0	14.0
NASB-25	4.00	5.0	15.0
NASB-26	2.00	5.0	13.0
NASB-225	2.00	5.0	15.0
NASB-226	2.00	8.0	13.0
NASB-250	1.00	0.5	12.5
NASB-251	1.00	3.0	15.0
NASB-252	1.00	2.0	12.0
SDP-5	1.00	4.0	14.0

Abbreviations:
- BGS - below ground surface
- BMP - below measuring point
- MP - measuring point
- NGVD - National Geodetic Vertical Datu

TABLE 3-1

GROUNDWATER ANALYTICAL RESULTS
NAVY EXCHANGE SERVICE STATION
NAVAL AIR STATION, BRUNSWICK, MAINE
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Sample Number		NEX-GW1-MW-DP09	NEX-GW1-DP13	NEX-GW1-DB01	NEX-GW-DB04	NEX-GW-DB07	NEX-GW-DB10	NEX-GW-DB11	NEX-GW-MW-SDP5
Sample Location		MW-DP09	MW-DP13	MW-DB01	MW-DB04	MW-DB07	MW-DB10	MW-DB11	MW-SDP5
Date Sampled		3/31/2005	3/31/2005	3/30/2005	3/30/2005	3/30/2005	3/30/2005	3/30/2005	3/30/2005
Dup									
QC Identifier		None		None	None			None	None
	CRITERIA								
	Maine Guidelines [2]								
Gasoline Range Organic Analysis (ug/L) [1]	50	12000	12000	45000	14000	75	12000	5700	9600
Volatile Petroleum Hydrocarbons (ug/L) [3]									
Unadjusted C5-C8 Aliphatics	NA	3900	5000 U	11000	5000 U	100 U	5300	4100	10000 U
Unadjusted C9-C12 Aliphatics	NA	13000	8900	38000	15000	100 U	16000	4400	12000
Total VPH (Sum of unadjusted C5 - C12 Aliphatics)		**16900**	**8900**	**49000**	**15000**	**100** U	**21300**	**8500**	**12000**
VPH Ranges (ug/L)									
C5-C8 Aliphatics	NA	3400	5000 U	11000	5000 U	100 U	5300	4100	10000 U
C9-C12 Aliphatics	NA	2100	5100	6100	5000 U	100 U	5000 U	2000 U	10000 U
C9-C10 Aromatics	NA	4600	5000 U	10000	13000	100 U	9500	3200	10000 U
Targeted VPH Analytes (ug/L)									
Benzene	5	100 U	250 U	250 U	250 U	5 U	250 U	100 U	500 U
Ethylbenzene	NA	910	870	2900	250 U	5 U	430	100 U	500 U
Naphthalene	NA	250	250 U	530	250 U	5 U	310	100 U	500 U
Toluene	NA	480	250 U	300	250 U	5 U	250 U	100 U	500 U
m&p-Xylene	NA	4100	2900	13000	500 U	10 U	2400	270	3100
o-Xylene	NA	1100	250 U	5800	250 U	5 U	720	130	1000
Methyl tert-Butyl Ether	35	100 U	250 U	250 U	250 U	5 U	250 U	100 U	500 U
Sum of VPH Aliphatics (C5-C8, C9-C12) (ug/L)	NA	**5500**	**5100**	**17100**	**ND**	**ND**	**5300**	**4100**	**ND**
Sum of Aromatics (C9-C12 & targeted analytes) (ug/L)	NA	**11440**	**3770**	**32530**	**13000**	**ND**	**13360**	**3600**	**4100**
Total VPH (Sum of C5-C12 & targeted analytes) (ug/L)	NA	**16940**	**8870**	**49630**	**13000**	**ND**	**18660**	**7700**	**4100**
Wet Chemistry Analysis (mg/L)									
Nitrate as N	NA	77	1.5	38	140	6800	540	49	280
Nitrite as N	NA	0.69	0.11	0.082	1	0.48	0.85	0.39	0.67

TABLE 3-1

GROUNDWATER ANALYTICAL RESULTS
NAVY EXCHANGE SERVICE STATION
NAVAL AIR STATION, BRUNSWICK, MAINE
PAGE 2 OF 3

Sample Number		NEX-GW-DB14	NEX-GW1-DB18	NEX-GW1-DUP02	NEX-GW-MW300	NEX-GW-DUP01	NEX-GW-MW301	NEX-GW-MW302
Sample Location		MW-DB14	MW-DB18	MW-DB18	MW300	MW300	MW301	MW302
Date Sampled		3/29/2005	3/31/2005	3/31/2005	3/29/2005	3/29/2005	3/29/2005	3/29/2005
Dup								
QC Identifier		None	DUP NEX-GW1-DP18	DUP NEX-GW1-DP18			None	None
	CRITERIA							
	Maine Guidelines [2]							
Gasoline Range Organic Analysis (ug/L) [1]	50	40000	14000	11000	6200	7100	630	28
Volatile Petroleum Hydrocarbons (ug/L) [3]								
Unadjusted C5-C8 Aliphatics	NA	11000	5300	5800	2000 U	5000 U	500 U	100 U
Unadjusted C9-C12 Aliphatics	NA	40000	10000	10000	5100	5200	670	100 U
Total VPH (Sum of unadjusted C5 - C12 Aliphatics)		**51000**	**15300**	**15800**	**5100**	**5200**	**670**	**ND**
VPH Ranges (ug/L)								
C5-C8 Aliphatics	NA	9400	3300	3400	2000 U	5000 U	500 U	100 U
C9-C12 Aliphatics	NA	7100	2000 U	2000 U	2000 U	5000 U	500 U	100 U
C9-C10 Aromatics	NA	10000	5400	5200	2800	5000 U	520	100 U
Targeted VPH Analytes (ug/L)								
Benzene	5	250 U	100 U	100 U	100 U	250 U	25 U	5 U
Ethylbenzene	NA	2900	400	520	310	370	25 U	5 U
Naphthalene	NA	720	220	210	120	250 U	25 U	5 U
Toluene	NA	1900	1900	2400	300	330	25 U	5 U
m&p-Xylene	NA	13000	2200	2600	1200	1400	25 U	10 U
o-Xylene	NA	6300	440	600	2200	250 U	50	5 U
Methyl tert-Butyl Ether	35	250 U	100 U	100 U	100 U	250 U	36	5 U
Sum of VPH Aliphatics (C5-C8, C9-C12) (ug/L)	NA	**16500**	**3300**	**3400**	**ND**	**ND**	**ND**	**ND**
Sum of Aromatics (C9-C12 & targeted analytes) (ug/L)	NA	**34820**	**10560**	**11530**	**6930**	**2100**	**570**	**ND**
Total VPH (Sum of C5-C12 & targeted analytes) (ug/L)	NA	**51320**	**13860**	**14930**	**6930**	**2100**	**570**	**ND**
Wet Chemistry Analysis (mg/L)								
Nitrate as N	NA	210	20	19	18	18	5.2	1.8
Nitrite as N	NA	0.44	0.67	0.67	0.077	0.083	0.076	10.01

TABLE 3-1

GROUNDWATER ANALYTICAL RESULTS
NAVY EXCHANGE SERVICE STATION
NAVAL AIR STATION, BRUNSWICK, MAINE
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Sample Number		NEX-GW-TB01	NEX-GW-TB02	NEX-GW-TB03
Sample Location		Blank	Blank	Blank
Date Sampled		3/29/2005	3/30/2005	3/31/2005
Dup				
QC Identifier		Trip Blank	Trip Blank	Trip Blank
	CRITERIA			
	Maine Guidelines [2]			
Gasoline Range Organic Analysis (ug/L) [1]	50	10 U	10 U	10 U
Volatile Petroleum Hydrocarbons (ug/L) [3]				
Unadjusted C5-C8 Aliphatics	NA	100 U	100 U	100 U
Unadjusted C9-C12 Aliphatics	NA	100 U	100 U	100 U
Total VPH (Sum of unadjusted C5 - C12 Aliphatics)		**ND**	**ND**	**ND**
VPH Ranges (ug/L)				
C5-C8 Aliphatics	NA	100 U	100 U	100 U
C9-C12 Aliphatics	NA	100 U	100 U	100 U
C9-C10 Aromatics	NA	100 U	100 U	100 U
Targeted VPH Analytes (ug/L)				
Benzene	5	5 U	5 U	5 U
Ethylbenzene	NA	5 U	5 U	5 U
Naphthalene	NA	5 U	5 U	5 U
Toluene	NA	5 U	5 U	5 U
m&p-Xylene	NA	10 U	10 U	10 U
o-Xylene	NA	5 U	5 U	5 U
Methyl tert-Butyl Ether	35	5 U	5 U	5 U
Sum of VPH Aliphatics (C5-C8, C9-C12) (ug/L)	NA	**ND**	**ND**	**ND**
Sum of Aromatics (C9-C12 & targeted analytes) (ug/L)	NA	**ND**	**ND**	**ND**
Total VPH (Sum of C5-C12 & targeted analytes) (ug/L)	NA	**ND**	**ND**	**ND**
Wet Chemistry Analysis (mg/L)				
Nitrate as N	NA			
Nitrite as N	NA			

Notes:
1) Black Background - Criterion Exceeded
2) *Procedural Guidelines for Establishing Action Levels and Remediation Goals for the Remediation of Oil Contaminanted Soil and Groundwater in Maine* , Maine DEP, Revised March 13, 2000.
3) Massachusetts VPH Method

Abbr:
* - From dilution analysis

J - Quantitation approximate
UJ - Detection limit approximate
NA - Not analyzed for
ND - Not detected
R - Rejected
U - Not detected;

UJ - Detection limit approximate

TABLE 3-2

2005 SOIL ANALYTICAL RESULTS
NAVY EXCHANGE SERVICE STATION
NAVAL AIR STATION, BRUNSWICK, MAINE
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		NEX-SO1-DB01-0809	NEX-SO1-DB01-1213	NEX-SO1-DB03-1011	NEX-SO1-DB03-1213	NEX-SO1-DB05-0809	NEX-SO1-DB05-0910	NEX-SO1-DB08-0809
Sample Location		DB01	DB01	DB03	DB03	DB05	DB05	DB08
Date Sampled		3/29/2005	03/29/05	03/29/05	03/29/05	03/29/05	03/29/05	03/29/05
Dup								
QC Identifier		None	None	None	None	None	None	
	CRITERIA							
Gasoline Range Organic Analysis (mg/Kg) [1]	**500** [2]	11000	52	8800	52	220	2.5 U	2.6 U
Volatile Petroleum Hydrocarbon Analysis (mg/Kg) [3]								
Unadjusted C5-C8 Aliphatics	NA	7000	31 U	3400	27 U	180	27 U	28 U
Unadjusted C9-C12 Aliphatics	NA	9000	31 U	3400	31	160	27 U	28 U
Total VPH (Sum of C5 - C12 Aliphatics)		**16000**	**0**	**6800**	**31**	**340**	**0**	**0**
VPH Ranges (mg/Kg)								
C5 - C8 Aliphatics	NA	7000	31 U	3400	27 U	180	27 U	27 U
C9 - C12 Aliphatics	NA	3100 U	31 U	1200 U	28	110	27 U	27 U
C9 - C10 Aromatics	NA	5400	30 U	2500	27 U	42	27 U	27 U
Targeted VPH Analysis (mg/Kg)								
Benzene	NA	150 U	1.4 U	57 U	1.3 U	1.5 U	1.3 U	1.3 U
Ethylbenzene	NA	330	1.4 U	57 U	1.3 U	1.5 U	1.3 U	1.3 U
Methyl tert-Butyl Ether	NA	150 U	1.4 U	57 U	1.3 U	1.5 U	1.3 U	1.3 U
Naphthalene	NA	160 B	1.4 U	79	1.3 U	1.5 U	1.3 U	1.3 U
Toluene	NA	150 U	1.4 U	57 U	1.3 U	1.5 U	1.3 U	1.3 U
m&p-Xylene	NA	1800	3.2	220	2.9	3 U	2.6 U	2.6 U
o-Xylene	NA	550	1.4 U	57 U	1.3 U	1.5 U	1.3 U	1.3 U
Sum of VPH Aliphatics (C5-C8, C9-C12)		**7000**	**0**	**3400**	**28**	**290**	**0**	**0**
Sum of Aromatics (C9-C12 & targeted analytes)		**8240**	**3.2**	**2799**	**2.9**	**42**	**0**	**0**
Total VPH (Sum of C5-C12 & targeted analytes)		**15240**	**3.2**	**6199**	**30.9**	**332**	**0**	**0**

TABLE 3-2

2005 SOIL ANALYTICAL RESULTS
NAVY EXCHANGE SERVICE STATION
NAVAL AIR STATION, BRUNSWICK, MAINE

		NEX-SO1-DB08-1011	NEX-SO1-DUP01	NEX-SO1-DB09-0809	NEX-SO1-DUP02	NEX-SO1-DB09-1112	NEX-SO1-DB10-0910	NEX-SO1-DB10-1212
Sample Location		DB08	DB08	DB09	DB09	DB09	DB10	DB10
Date Sampled		03/29/05		03/29/05		03/29/05	03/29/05	03/29/05
Dup			DUP		DUP			
QC Identifier		DUP NEX-SO1-DB08-1011	DUP NEX-SO1-DB08-1011	DUP NEX-SO1-DB09-0809	DUP NEX-SO1-DB09-0809	None		None
	CRITERIA							
Gasoline Range Organic Analysis (mg/Kg) [1]	**500** [2]	2.8 U	2.5 U	11000 B	6800 B	17	720	2.5 U
Volatile Petroleum Hydrocarbon Analysis (mg/Kg) [3]								
Unadjusted C5-C8 Aliphatics	NA	28 U	27 U	3400	3600	32 U	340	27 U
Unadjusted C9-C12 Aliphatics	NA	28 U	27 U	6400	6400	32 U	270	27 U
Total VPH (Sum of C5 - C12 Aliphatics)		**0**	**0**	**9800**	**10000**	**0**	**610**	**0**
VPH Ranges (mg/Kg)								
C5 - C8 Aliphatics	NA	28 U	27 U	3400	3600	32 U	340	27 U
C9 - C12 Aliphatics	NA	28 U	27 U	1500 U	1500	32 U	120 U	27 U
C9 - C10 Aromatics	NA	27 U	27 U	3800	3500	31 U	220	27 U
Targeted VPH Analysis (mg/Kg)								
Benzene	NA	1.3 U	1.3 U	70 U	69 U	1.5 U	5.8 U	1.3 U
Ethylbenzene	NA	1.3 U	1.3 U	130	110	1.5 U	5.8 U	1.3 U
Methyl tert-Butyl Ether	NA	1.3 U	1.3 U	70 U	69 U	1.5 U	5.8 U	1.3 U
Naphthalene	NA	1.3 U	1.3 U	110	100	1.5 U	6	1.3 U
Toluene	NA	1.3 U	1.3 U	70 U	69 U	1.5 U	5.8 U	1.3 U
m&p-Xylene	NA	2.6 U	2.6 U	1100	980	3 U	16	2.6 U
o-Xylene	NA	1.3 U	1.3 U	400	320	1.5 U	5.8 U	1.3 U
Sum of VPH Aliphatics (C5-C8, C9-C12)		**0**	**0**	**3400**	**5100**	**0**	**340**	**0**
Sum of Aromatics (C9-C12 & targeted analytes)		**0**	**0**	**5540**	**5010**	**0**	**242**	**0**
Total VPH (Sum of C5-C12 & targeted analytes)		**0**	**0**	**8940**	**10110**	**0**	**582**	**0**

TABLE 3-2

2005 SOIL ANALYTICAL RESULTS
NAVY EXCHANGE SERVICE STATION
NAVAL AIR STATION, BRUNSWICK, MAINE

		NEX-SO1-DB12-0910	NEX-SO1-DB13-0910	NEX-SO1-DB13-1213	NEX-SO1-DUP03	NEX-SO1-DB15-0809	NEX-SO1-DB15-1011	NEX-SO1-DB17-0809
Sample Location		DB12	DB13	DB13	DB13	DB15	DB15	DB17
Date Sampled		03/29/05	03/30/05	03/30/05	03/30/05	03/30/05	03/30/05	03/29/05
Dup					DUP			
QC Identifier		None	None	DUP NEX-SO1-DB13-1213	DUP NEX-SO1-DB13-1213	None	None	None
	CRITERIA							
Gasoline Range Organic Analysis (mg/Kg) [1]	**500** [2]	3.3 U	17 B	6.2 B	5.7 U	260	18	2.5 U
Volatile Petroleum Hydrocarbon Analysis (mg/Kg) [3]								
Unadjusted C5-C8 Aliphatics	NA	33 U	30 U	30 U	30 U	170	30 U	27 U
Unadjusted C9-C12 Aliphatics	NA	33 U	30 U	30 U	30 U	150	30 U	27 U
Total VPH (Sum of C5 - C12 Aliphatics)		**0**	**0**	**0**	**0**	**320**	**0**	**0**
VPH Ranges (mg/Kg)								
C5 - C8 Aliphatics	NA	33 U	30 U	30 U	30 U	170	30 U	27 U
C9 - C12 Aliphatics	NA	33 U	30 U	30 U	30 U	57 U	30 U	27 U
C9 - C10 Aromatics	NA	33 U	30 U	30 U	30 U	98	30 U	27 U
Targeted VPH Analysis (mg/Kg)								
Benzene	NA	1.6 U	1.4 U	1.5 U	1.4 U	2.8 U	1.4 U	1.3 U
Ethylbenzene	NA	1.6 U	1.4 U	1.5 U	1.4 U	3.9	1.4 U	1.3 U
Methyl tert-Butyl Ether	NA	1.6 U	1.4 U	1.5 U	1.4 U	2.8 U	1.4 U	1.3 U
Naphthalene	NA	1.6 U	1.4 U	1.5 U	1.4 U	3.4	1.4 U	1.3 U
Toluene	NA	1.6 U	1.4 U	1.5 U	1.4 U	2.8 U	1.4 U	1.3 U
m&p-Xylene	NA	3.2 U	2.9 U	2.9 U	6.1	19	2.9 U	2.6 U
o-Xylene	NA	1.6 U	1.4 U	1.5 U	2.5	5.7	1.4 U	1.3 U
Sum of VPH Aliphatics (C5-C8, C9-C12)		**0**	**0**	**0**	**0**	**170**	**0**	**0**
Sum of Aromatics (C9-C12 & targeted analytes)		**0**	**0**	**0**	**8.6**	**130**	**0**	**0**
Total VPH (Sum of C5-C12 & targeted analytes)		**0**	**0**	**0**	**8.6**	**300**	**0**	**0**

TABLE 3-2

2005 SOIL ANALYTICAL RESULTS
NAVY EXCHANGE SERVICE STATION
NAVAL AIR STATION, BRUNSWICK, MAINE

		NEX-SO1-DB17-0910	NEX-SO1-DB18-0910	NEX-SO1-DB18-1415	NEX-SO1-DB19-0809	NEX-SO1-DB19-1213	NEX-SO1-MW300-0910	NEX-SO1-MW300-1213
Sample Location		DB17	DB18	DB18	DB19	DB19	MW300	MW300
Date Sampled		03/29/05	03/30/05	03/30/05	03/30/05	03/30/05	03/30/05	03/30/05
Dup								
QC Identifier		None					None	None
	CRITERIA	1) Black Background - Criterion Exceeded						
Gasoline Range Organic Analysis (mg/Kg) [1]	**500** [2]	3.4	16	5.9	7000 B	5.7	16 B	7.5
Volatile Petroleum Hydrocarbon Analysis (mg/Kg) [3]								
Unadjusted C5-C8 Aliphatics	NA	30 U	28 U	29 U	3300	30 U	28 U	31 U
Unadjusted C9-C12 Aliphatics	NA	30 U	28 U	29 U	8800	30 U	28 U	31 U
Total VPH (Sum of C5 - C12 Aliphatics)		**0**	**0**	**0**	**12100**	**0**	**0**	**0**
VPH Ranges (mg/Kg)								
C5 - C8 Aliphatics	NA	30 U	28 U	29 U	3300	30 U	28 U	31 U
C9 - C12 Aliphatics	NA	30 U	28 U	29 U	3200 U	30 U	28 U	31 U
C9 - C10 Aromatics	NA	30 U	28 U	29 U	5100	30 U	28 U	31 U
Targeted VPH Analysis (mg/Kg)								
Benzene	NA	1.4 U	1.3 U	1.4 U	150 U	1.4 U	1.4 U	1.5 U
Ethylbenzene	NA	1.4 U	1.3 U	2.3	230	1.4 U	1.4 U	1.5 U
Methyl tert-Butyl Ether	NA	1.4 U	1.3 U	1.4 U	150 U	1.4 U	1.4 U	1.5 U
Naphthalene	NA	1.4 U	1.3 U	2.7 B	150 U	1.4 U	1.4 U	1.5 U
Toluene	NA	1.4 U	1.9	1.4 U	150 U	1.4 U	1.4 U	1.5 U
m&p-Xylene	NA	2.9 U	4.2	9.7	1500	2.9 U	2.8 U	3 U
o-Xylene	NA	1.4 U	1.3 U	3.9	150 U	1.4 U	1.4 U	1.5 U
Sum of VPH Aliphatics (C5-C8, C9-C12)		**0**	**0**	**0**	**3300**	**0**	**0**	**0**
Sum of Aromatics (C9-C12 & targeted analytes)		**0**	**6.1**	**18.6**	**6830**	**0**	**0**	**0**
Total VPH (Sum of C5-C12 & targeted analytes)		**0**	**6.1**	**18.6**	**10130**	**0**	**0**	**0**

TABLE 3-2

2005 SOIL ANALYTICAL RESULTS
NAVY EXCHANGE SERVICE STATION
NAVAL AIR STATION, BRUNSWICK, MAINE

		NEX-SO1-MW301-0708	NEX-SO1-MW301-0910	NEX-SO1-MW302-0304	NEX-SO1-MW302-0506	NEX-SO1-TB01-032905	NEX-SO1-TB02-033005	NEX-SO1-RB01-033005
Sample Location		MW301	MW301	MW302	MW302	Blank	Blank	Blank
Date Sampled		03/30/05	03/30/05	3/29/2005	3/29/2005	3/29/2005	3/30/2005	3/30/2005
Dup								
QC Identifier			None	None	None			Rinsate Blank
	CRITERIA							
Gasoline Range Organic Analysis (mg/Kg) [1]	**500** [2]	13	7	2.8 U	3.1 U	3.5 B	3.9 B	10 U
Volatile Petroleum Hydrocarbon Analysis (mg/Kg) [3]								
Unadjusted C5-C8 Aliphatics	NA	30 U	27 U	28 U	32 U	28 U	28 U	100 U
Unadjusted C9-C12 Aliphatics	NA	30 U	27 U	28 U	33	28 U	28 U	100 U
Total VPH (Sum of C5 - C12 Aliphatics)		**0**	**0**	**0**	**33**	**0**	**0**	**0**
VPH Ranges (mg/Kg)								
C5 - C8 Aliphatics	NA	30 U	27 U	28 U	32 U	28 U	28 U	100 U
C9 - C12 Aliphatics	NA	30 U	27 U	28 U	33	28 U	28 U	100 U
C9 - C10 Aromatics	NA	30 U	27 U	28 U	31 U	28 U	28 U	100 U
Targeted VPH Analysis (mg/Kg)								
Benzene	NA	1.4 U	1.3 U	1.3 U	1.5 U	1.3 U	1.3 U	5 U
Ethylbenzene	NA	1.4 U	1.3 U	1.3 U	1.5 U	1.3 U	1.3 U	5 U
Methyl tert-Butyl Ether	NA	1.4 U	1.3 U	1.3 U	1.5 U	1.3 U	1.3 U	5 U
Naphthalene	NA	1.4 U	1.3 U	1.7	3.2	2.7 U	2.7 U	5 U
Toluene	NA	1.4 U	1.3 U	1.3 U	1.5 U	1.3 U	1.3 U	5 U
m&p-Xylene	NA	2.9 U	2.6 U	2.7 U	2.9 U	2.7 U	2.7 U	10 U
o-Xylene	NA	1.4 U	1.3 U	1.3 U	1.5 U	1.3 U	1.3 U	5 U
Sum of VPH Aliphatics (C5-C8, C9-C12)		**0**	**0**	**0**	**33**	**0**	**0**	**0**
Sum of Aromatics (C9-C12 & targeted analytes)		**0**	**0**	**1.7**	**3.2**	**0**	**0**	**0**
Total VPH (Sum of C5-C12 & targeted analytes)		**0**	**0**	**1.7**	**36.2**	**0**	**0**	**0**

TABLE 3-2

2005 SOIL ANALYTICAL RESULTS
NAVY EXCHANGE SERVICE STATION
NAVAL AIR STATION, BRUNSWICK, MAINE

		NEX-SO1-RB02-033005	NEX-SO1-RB03-033105	NEX-SO1-DIUF-FB01-033005	NEX-SO1-DIUF-FB02-033005	NEX-SO1-DIUF-FB03-033105
Sample Location		Blank	Blank	Blank	Blank	Blank
Date Sampled		3/30/2005	3/31/2005	3/30/2005	3/30/2005	3/31/2005
Dup						
QC Identifier		Rinsate Blank	Rinsate Blank	Field Blank	Field Blank	Field Blank
	CRITERIA					
Gasoline Range Organic Analysis (mg/Kg) [1]	**500** [2]		10 U	12	10 U	33
Volatile Petroleum Hydrocarbon Analysis (mg/Kg) [3]						
Unadjusted C5-C8 Aliphatics	NA	100 U	100 U	100 U	100 U	100 U
Unadjusted C9-C12 Aliphatics	NA	100 U	100 U	100 U	100 U	100 U
Total VPH (Sum of C5 - C12 Aliphatics)		**0**	**0**	**0**	**0**	**0**
VPH Ranges (mg/Kg)						
C5 - C8 Aliphatics	NA	100 U	100 U	100 U	100 U	100 U
C9 - C12 Aliphatics	NA	100 U	100 U	100 U	100 U	100 U
C9 - C10 Aromatics	NA	100 U	100 U	100 U	100 U	100 U
Targeted VPH Analysis (mg/Kg)						
Benzene	NA	5 U	5 U	5 U	5 U	5 U
Ethylbenzene	NA	5 U	5 U	5 U	5 U	5 U
Methyl tert-Butyl Ether	NA	5 U	7.8	5 U	5 U	5 U
Naphthalene	NA	5.4	5 U	5 U	5 U	5 U
Toluene	NA	5 U	5 U	5 U	5 U	5 U
m&p-Xylene	NA	10 U	10 U	10 U	10 U	10 U
o-Xylene	NA	5 U	5 U	5 U	5 U	5 U
Sum of VPH Aliphatics (C5-C8, C9-C12)		**0**	**0**	**0**	**0**	**0**
Sum of Aromatics (C9-C12 & targeted analytes)		**5.4**	**0**	**0**	**0**	**0**
Total VPH (Sum of C5-C12 & targeted analytes)		**5.4**	**0**	**0**	**0**	**0**

Notes:

1) Black Background - Criterion Exceeded
2) *Procedural Guidelines for Establishing Action Levels and Remediation Goals for the Remediation of Oil Contaminated Soil and Groundwater in Maine*, Maine DEP, Revised March 13, 2000.

3) Massachusetts VPH Method

1) Black Background - Criterion Exceeded

* - From dilution analysis
J - Quantitation approximate
NA - Not analyzed for

R - Rejected
U - Not detected;
UJ - Detection limit approximate

TABLE 3-3

SUMMARY OF SOIL GRO AND VPH DATA
NAVY EXCHANGE SERVICE STATION
NAVAL AIR STATION, BRUNSWICK, MAINE

LOCATION-DEPTH	DATE	GRO	VPH	VPH Aro	VPH Ali
DB01-0809	9/27/2004	10000	NA	NA	NA
DB01-0809	3/29/2005	11000	16000	8240	7000
DB01-0809	9/30/2005				
DB01-0809	4/1/2006				
DB01-1213	9/27/2004	3.5 U			
DB01-1213	3/29/2005	52	31 U	3.2	30 U
DB01-1213	9/30/2005				
DB01-1213	4/1/2006				
DB03-1011	9/27/2004	8900			
DB03-1011	3/29/2005	8800	6800	2799	3400
DB03-1011	9/30/2005				
DB03-1011	4/1/2006				
DB03-1213	9/27/2004	11 U			
DB03-1213	3/29/2005	52	31	2.9	28
DB03-1213	9/30/2005				
DB03-1213	4/1/2006				
DB05-0809	9/28/2004	5300			
DB05-0809	3/29/2005	220	340	42	290
DB05-0809	9/30/2005				
DB05-0809	4/1/2006				
DB05-0910	9/27/2004	18 U			
DB05-0910	3/29/2005	2.5 U	31	2.9	28
DB05-0910	9/30/2005				
DB05-0910	4/1/2006				
DB08-0910	9/28/2004	3.0 U			
DB08-0910	3/29/2005	2.6 U	28 U	1.3 U	27 U
DB08-0910	9/30/2005				
DB08-0910	4/1/2006				
DB08-1011	9/28/2004	2.5 U			
DB08-1011	3/29/2005	2.8 U	28 U	2.6 U	27 U
DB08-1011	9/30/2005				
DB08-1011	4/1/2006				
DB09-0809	9/28/2004	9000			
DB09-0809	3/29/2005	11000	9800	2240	3400
DB09-0809	9/30/2005				
DB09-0809	4/1/2006				
DB09-1112	9/28/2004	19 U			
DB09-1112	3/29/2005	17	32 U	1.3 U	32 U
DB09-1112	9/30/2005				

TABLE 3-3

SUMMARY OF SOIL GRO AND VPH DATA
NAVY EXCHANGE SERVICE STATION
NAVAL AIR STATION, BRUNSWICK, MAINE

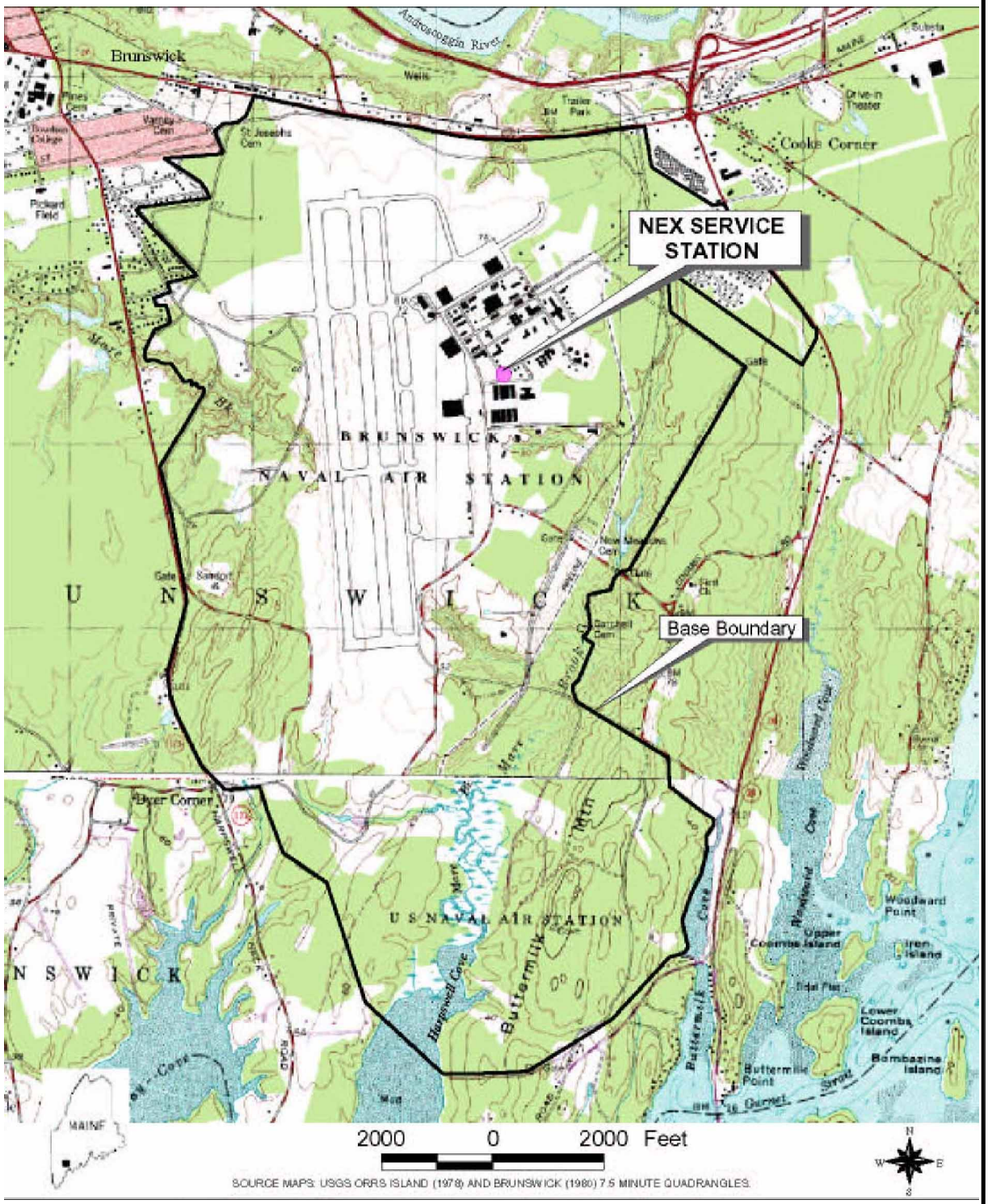
LOCATION-DEPTH	DATE	GRO	VPH	VPH Aro	VPH Ali
DB09-1112	4/1/2006				
DB10-0910	9/29/2004	5.6	30	1.8 U	30
DB10-0910	3/29/2005	720	610	242	27 U
DB10-0910	9/30/2005				
DB10-0910	4/1/2006				
DB10-1212	9/29/2004	3.4 U			
DB10-1212	3/29/2005	2.5 U	27 U	1.3 U	27 U
DB10-1212	9/30/2005				
DB10-1212	4/1/2006				
DB12-0910	9/29/2004	3.1 U			
DB12-0910	3/30/2005	3.3 U	33 U	1.6 U	33 U
DB12-0910	9/30/2005				
DB12-0910	4/1/2006				
DB13-0910	9/29/2004	12			
DB13-0910	3/30/2005	17	30 U	1.4 U	30 U
DB13-0910	9/30/2005				
DB13-0910	4/1/2006				
DB13-1213	9/29/2004	3.7 U			
DB13-1213	3/30/2005	6.2	30 U	1.5 U	30 U
DB13-1213	9/30/2005				
DB13-1213	4/1/2006				
DB15-0809	9/29/2004	76			
DB15-0809	3/30/2005	260	320	130	170
DB15-0809	9/30/2005				
DB15-0809	4/1/2006				
DB15-1011	9/29/2004	14			
DB15-1011	3/30/2005	18	30 U	1.4 U	30 U
DB15-1011	9/30/2005				
DB15-1011	4/1/2006				
DB17-0809	9/30/2004	5.4			
DB17-0809	3/30/2005	2.5 U	27 U	1.3 U	27 U
DB17-0809	9/30/2005				
DB17-0809	4/1/2006				
DB17-0910	9/30/2004	2.8 U			
DB17-0910	3/30/2005	3.4	30 U	1.4 U	30 U
DB17-0910	9/30/2005				
DB17-0910	4/1/2006				
DB18-0910	9/30/2004	NA	NA	NA	NA

TABLE 3-3

SUMMARY OF SOIL GRO AND VPH DATA
NAVY EXCHANGE SERVICE STATION
NAVAL AIR STATION, BRUNSWICK, MAINE

LOCATION-DEPTH	DATE	GRO	VPH	VPH Aro	VPH Ali
DB18-0910	3/30/2005	16	28 U	6.1	29 U
DB18-0910	9/30/2005				
DB18-0910	4/1/2006				
DB18-1415	9/30/2004	NA	NA	NA	NA
DB18-1415	3/30/2005	5.9	29 U	18.6	29 U
DB18-1415	9/30/2005				
DB18-1415	4/1/2006				
DB19-0809	9/30/2004	NA	NA	NA	NA
DB19-0809	3/30/2005	7000	12100	6830	3300
DB19-0809	9/30/2005				
DB19-0809	4/1/2006				
DB19-1213	9/30/2004	NA	NA	NA	NA
DB19-1213	3/30/2005	5.7	30 U	1.4 U	30 U
DB19-1213	9/30/2005				
DB19-1213	4/1/2006				
MW300-0910	9/30/2004	10			
MW300-0910	3/30/2005	16	28 U	1.4 U	28 U
MW300-0910	9/30/2005				
MW300-0910	4/1/2006				
MW300-1213	9/30/2004	2.6 U			
MW300-1213	3/30/2005	7.5	31 U	1.5 U	31 U
MW300-1213	9/30/2005				
MW300-1213	4/1/2006				
MW301-0708	9/30/2004	3.3 U	9.5	2.4	9.5
MW301-0708	3/30/2005	13	30 U	1.4 U	30 U
MW301-0708	9/30/2005				
MW301-0708	4/1/2006				
MW301-0910	9/30/2004	2.9 U			
MW301-0910	3/30/2005	7	27 U	1.7	27 U
MW301-0910	9/30/2005				
MW301-0910	4/1/2006				
MW302-0304	9/30/2004	2.5 U			
MW302-0304	3/30/2005	2.8 U	28 U	1.7	28 U
MW302-0304	9/30/2005				
MW302-0304	4/1/2006				
MW302-0506	9/30/2004	2.9 U			
MW302-0506	3/30/2005	3.1 U	33	3.2	33
MW302-0506	9/30/2005				
MW302-0506	4/1/2006				

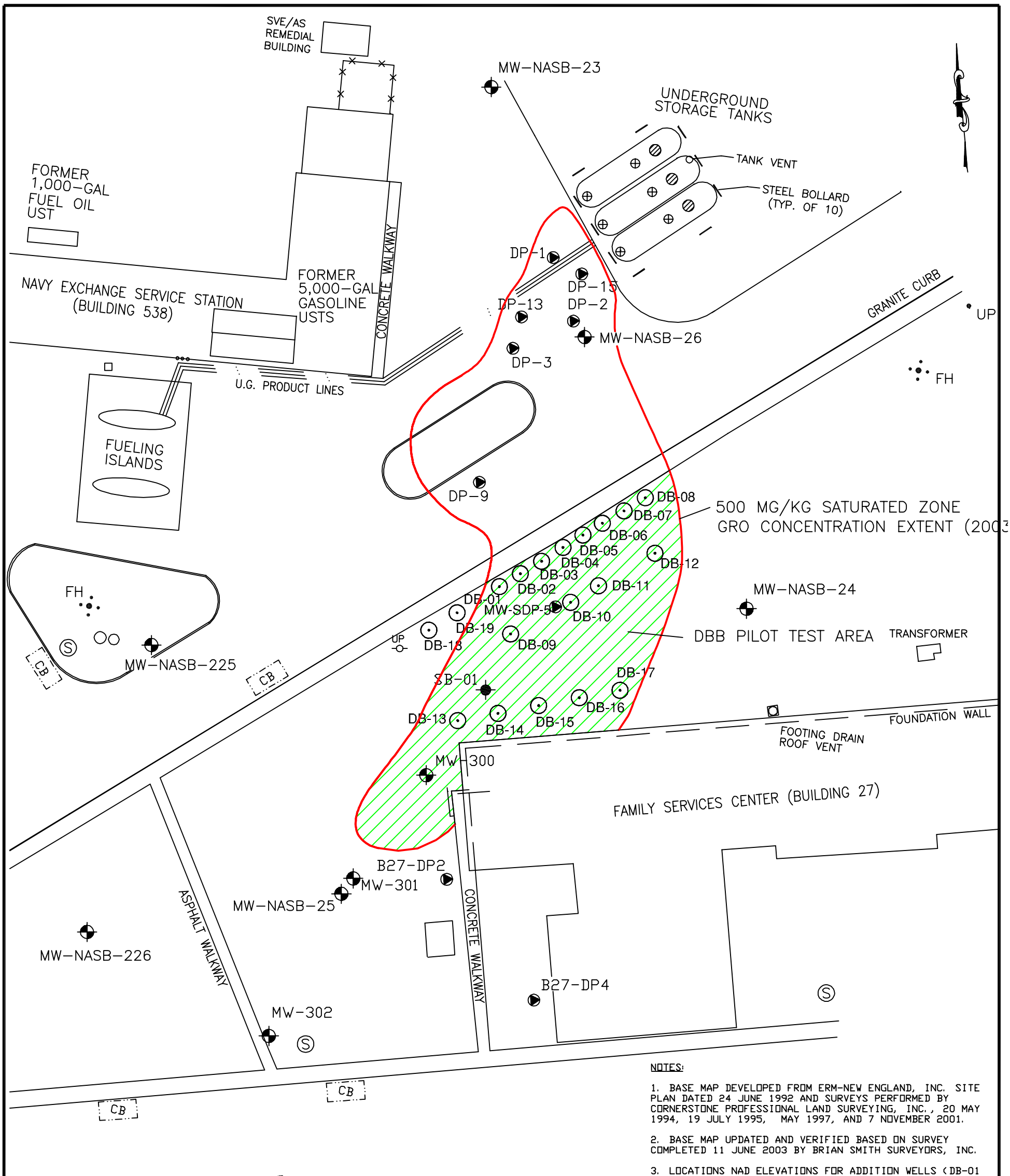
FIGURES



TETRA TECH NUS, INC.

SITE LOCATION MAP
NAVY EXCHANGE SERVICE STATION
US NAVY NAVFAC EFANE
NAVAL AIR STATION, BRUNSWICK, MAINE

SCALE	AS NOTED
FILE	DWG\4590\W5205342D\FIG_1-1.DWG
REV 0	DATE 04/27/05
FIGURE NUMBER	1-1



NOTES:

1. BASE MAP DEVELOPED FROM ERM-NEW ENGLAND, INC. SITE PLAN DATED 24 JUNE 1992 AND SURVEYS PERFORMED BY CORNERSTONE PROFESSIONAL LAND SURVEYING, INC., 20 MAY 1994, 19 JULY 1995, MAY 1997, AND 7 NOVEMBER 2001.

2. BASE MAP UPDATED AND VERIFIED BASED ON SURVEY COMPLETED 11 JUNE 2003 BY BRIAN SMITH SURVEYORS, INC.

3. LOCATIONS NAD ELEVATIONS FOR ADDITION WELLS (DB-01 TO DB-17) AND NEW MONITORING WELLS (MW-300, -301, -302) SURVEYED BY DEST ASSOCIATES, INC. ON NOVEMBER 2, 2004.

4. ADDITIONAL WELLS DB-18 AND DB-19 LOCATIONS APPROXIMATE.

SOURCE:

CORRECTIVE ACTION PLAN, NAVY EXCHANGE SERVIE STATION, NAVAL AIR STATION, BRUNSWICK, MAINE; EA ENGINEERING, SCIENCE, AND TECHNOLOGY, INC. MARCH 2004.

LEGEND

MW-NASB-24	MONITORING WELL (2-INCH OR 4-INCH INSIDE DIAMETER)
DB-01	DIRECT-PUSH N-BLEND ADDITION WELL (2004)
B27-DP2	DIRECT-PUSH MONITORING WELL
SB-01	DIRECT-PUSH SOIL BORING (2004)
FH	FIRE HYDRANT WITH BOLLARDS
UP	UTILITY POLE
CB	STORM WATER CATCH BASIN
S	SEWER MANHOLE
—— ——	UNDERGROUND STRUCTURE

GRAPHIC SCALE

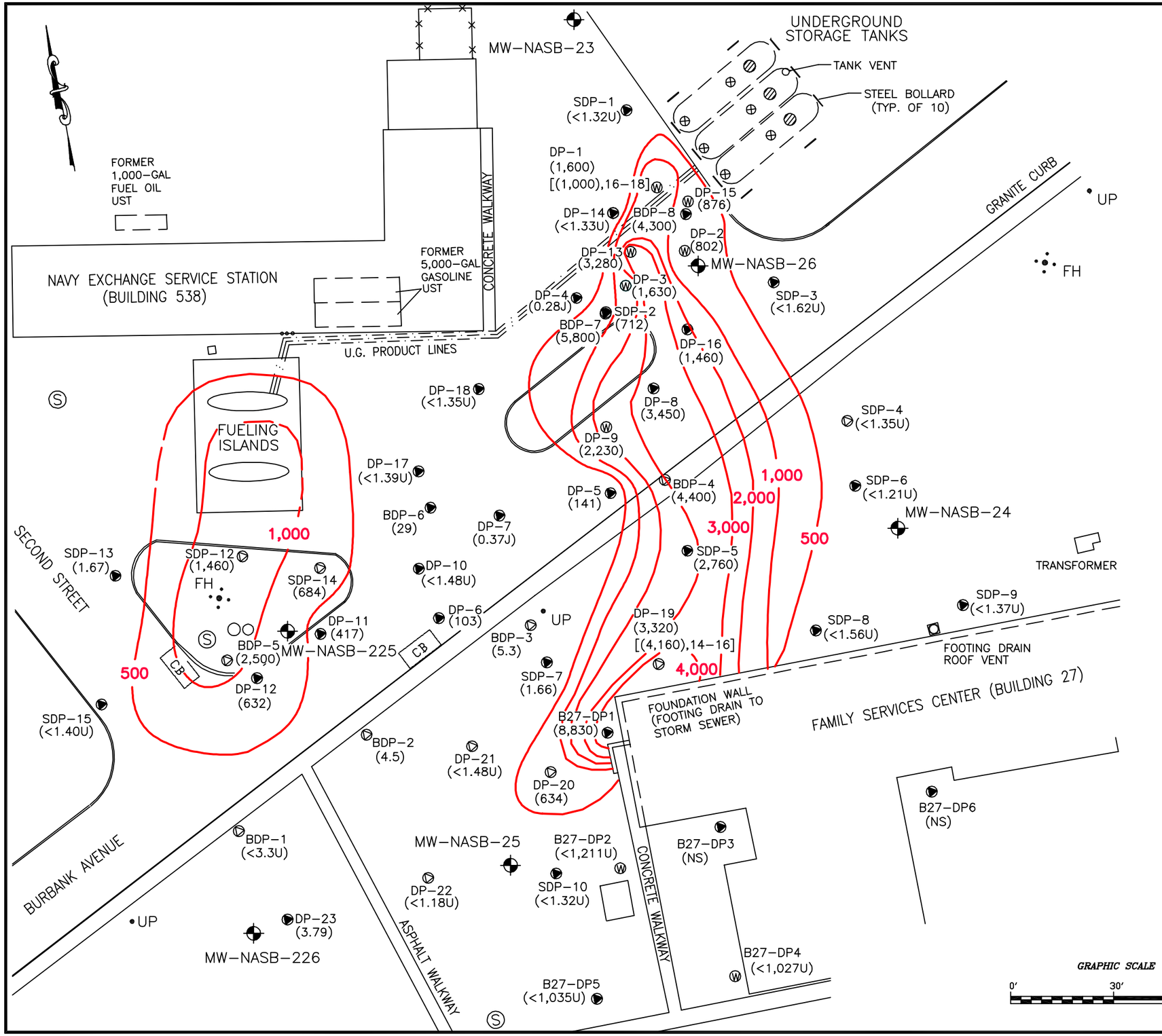
0′ 30′ 60′

TETRA TECH NUS, INC.

SITE PLAN
NAVAL EXCHANGE SERVICE STATION
US NAVY NAVFAC EFANE
NAVAL AIR STATION, BRUNSWICK, MAINE

FILE	SCALE
DWG\4590\W5205342D\FIG_1-2.DWG	AS NOTED

FIGURE NUMBER	REV	DATE
1-2	0	04/27/05



LEGEND

- MONITORING WELL
- FH — FIRE HYDRANT WITH BOLLARDS
- UP — UTILITY POLE
- CB — STORMWATER CATCH BASIN
- MANHOLE
- EXISTING CHAIN LINK FENCE
- UNDERGROUND STRUCTURE
- DIRECT-PUSH SOIL BORING (LOCATION CONFIRMED BY SURVEY)
- DIRECT-PUSH SOIL BORING (LOCATION BASED ON FIELD NOTES)
- DIRECT-PUSH SOIL BORING COMPLETED AS 1.5-IN FLUSH MOUNT MONITORING WELL
- DP-1 (1,600) [(1,000),16-18] — (TPH-GRO CONCENTRATION, MG/KG) NS = NOT SAMPLED NOTE: UNLESS OTHERWISE NOTED, SOIL SAMPLING INTERVAL IS 8-12 FT BGS. [TPH-GRO CONCENTRATION AT 16-18 FT BGS]
- 500 — TOTAL SORBED-PHASE TPH-GRO CONCENTRATION ISOPLETH (MG/KG) (DASHED WHERE INFERRED)

B27 = LIMITED DIRECT-PUSH INVESTIGATION AT BUILDING 27 (9-10 JUNE 2003).
BDP = BASELINE DIRECT-PUSH SOIL BORING (20 MARCH 2002).
DP = POST-ISCO DIRECT PUSH SOIL BORING (22-24 MAY 2002).
SDP = POST-ISCO SUPPLEMENTAL DIRECT-PUSH SOIL BORING (18-20 JUNE 2002).

NOTES:

1. BASE MAP DEVELOPED FROM ERM-NEW ENGLAND, INC. SITE PLAN DATED 24 JUNE 1992 AND SURVEYS PERFORMED BY CORNERSTONE PROFESSIONAL LAND SURVEYING, INC., 20 MAY 1994, 19 JULY 1995, MAY 1997, AND 7 NOVEMBER 2001.

2. BASE MAP UPDATED AND VERIFIED BASED ON SURVEY COMPLETED 11 JUNE 2003 BY BRIAN SMITH SURVEYORS, INC.

3. BASELINE DIRECT-PUSH POINTS MAY OVER-REPRESENT CURRENT SATURATED ZONE TPH-GRO CONCENTRATIONS. TPH-GRO CONCENTRATION ISOPLETHS WERE DEVELOPED PRIMARILY BASED ON POST-ISCO DIRECT-PUSH DATA (i.e., DP AND SDP SOIL BORINGS).

4. 1-IN. FLUSH MOUNTED MICRO-WELLS WERE INSTALLED AT POST-ISCO DIRECT-PUSH SOIL BORING LOCATION DP-19 AND POST-ISCO SUPPLEMENTAL DIRECT-PUSH SOIL BORING LOCATION SDP-5 ON 10 JUNE 2003.

5. NEWLY INSTALLED MICRO-WELLS (AT LOCATIONS DP-19 AND SPD-5) AND ALL B27 DIRECT-PUSH SOIL BORINGS (B27-DP1 THROUGH B27-DP6) WERE SURVEYED BY BRIAN SMITH SURVEYORS ON 10 JUNE 2003.

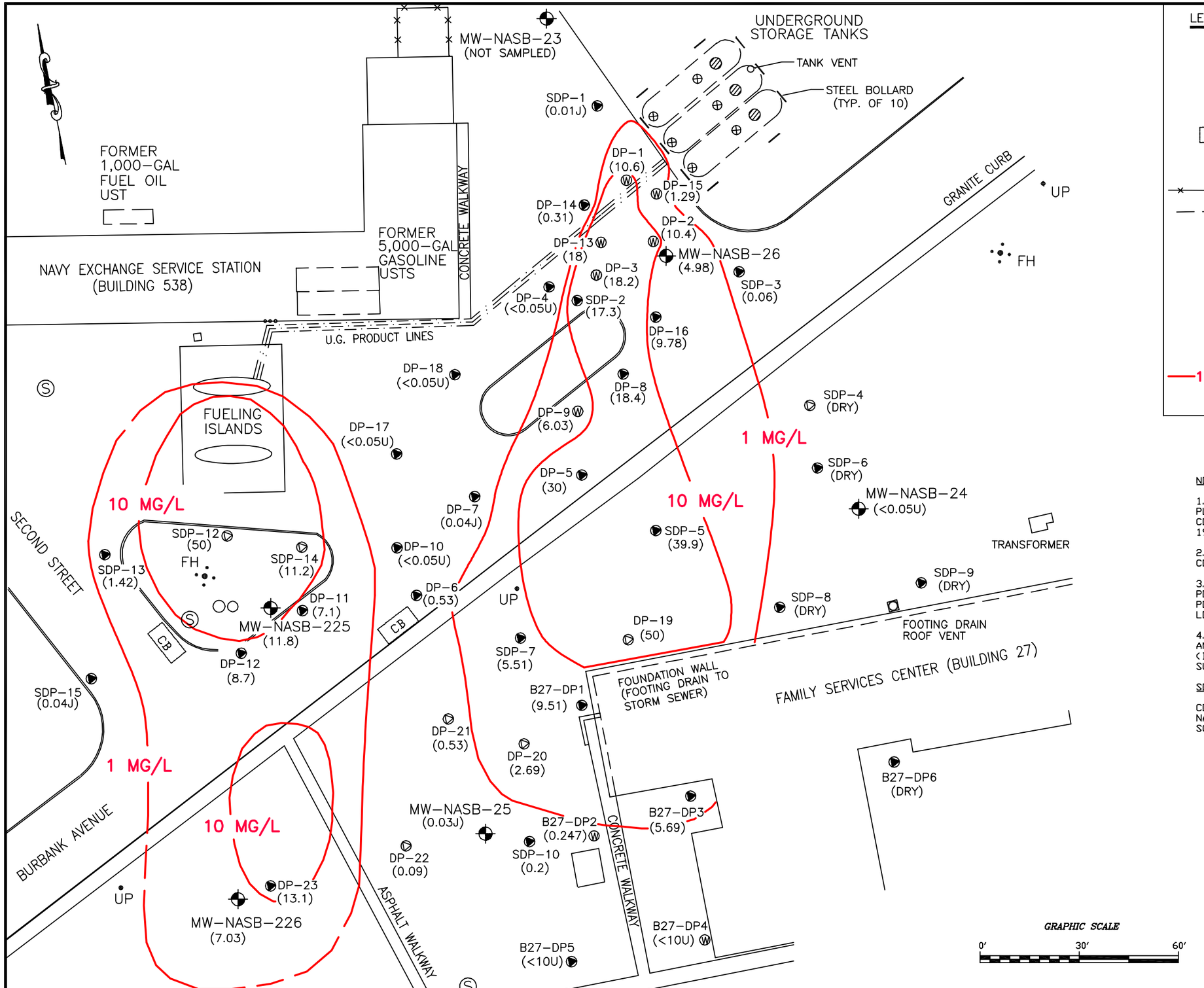
SOURCE:

CORRECTIVE ACTION PLAN, NAVY EXCHANGE SERVIE STATION, NAVAL AIR STATION, BRUNSWICK, MAINE; EA ENGINEERING, SCIENCE, AND TECHNOLOGY, INC. MARCH 2004.

TETRA TECH NUS, INC.

SATURATED ZONE SOIL TPH-GRO CONCENTRATIONS (MG/KG)
FOLLOWING IN-SITU CHEMICAL OXIDATION INJECTION
NAVAL EXCHANGE SERVICE STATION
US NAVY NAVFAC EFANE
NAVAL AIR STATION, BRUNSWICK, MAINE

FILE	SCALE
DWG\4590\W5205342D\FIG_1-3.DWG	AS NOTED
FIGURE NUMBER 1-3	REV 1 / DATE 04/27/05



LEGEND

- MONITORING WELL
- FH — FIRE HYDRANT WITH BOLLARDS
- UP — UTILITY POLE
- CB — STORMWATER CATCH BASIN
- MANHOLE
- EXISTING CHAIN LINK FENCE
- UNDERGROUND STRUCTURE
- DIRECT-PUSH SOIL BORING (LOCATION CONFIRMED BY SURVEY)
- DIRECT-PUSH SOIL BORING (LOCATION BASED ON FIELD NOTES)
- DIRECT-PUSH SOIL BORING COMPLETED AS 1.5-IN. FLUSH MOUNT MONITORING WELL
- B27 = LIMITED DIRECT-PUSH INVESTIGATION AT BUILDING 27 (9-10 JUNE 2003).
- DP = POST-ISCO DIRECT PUSH SOIL BORING (22-24 MAY 2002).
- SDP = POST-ISCO SUPPLEMENTAL DIRECT-PUSH SOIL BORING (18-20 JUNE 2002).
- 1 MG/L — TOTAL DISSOLVED-PHASE TPH-GRO CONCENTRATION ISOPLETH (MG/L) (DASHED WHERE INFERRED)

NOTES:

1. BASE MAP DEVELOPED FROM ERM-NEW ENGLAND, INC. SITE PLAN DATED 24 JUNE 1992 AND SURVEYS PERFORMED BY CORNERSTONE PROFESSIONAL LAND SURVEYING, INC., 20 MAY 1994, 19 JULY 1995, MAY 1997, AND 7 NOVEMBER 2001.

2. BASE MAP UPDATED AND VERIFIED BASED ON SURVEY COMPLETED 18 JUNE 2003 BY BRIAN SMITH SURVEYORS, INC.

3. 1-IN. FLUSH MOUNTED MICRO-WELLS WERE INSTALLED AT POST-ISCO DIRECT-PUSH SOIL BORING LOCATION DP-19 AND POST-ISCO SUPPLEMENTAL DIRECT-PUSH SOIL BORING LOCATION SDP-5 ON 10 JUNE 2003.

4. NEWLY INSTALLED MICRO-WELLS (AT LOCATIONS DP-19 AND SPD-5) AND ALL B27 DIRECT-PUSH SOIL BORINGS (B27-DP1 THROUGH B27-DP6) WERE SURVEYED BY BRIAN SMITH SURVEYORS ON 10 JUNE 2003.

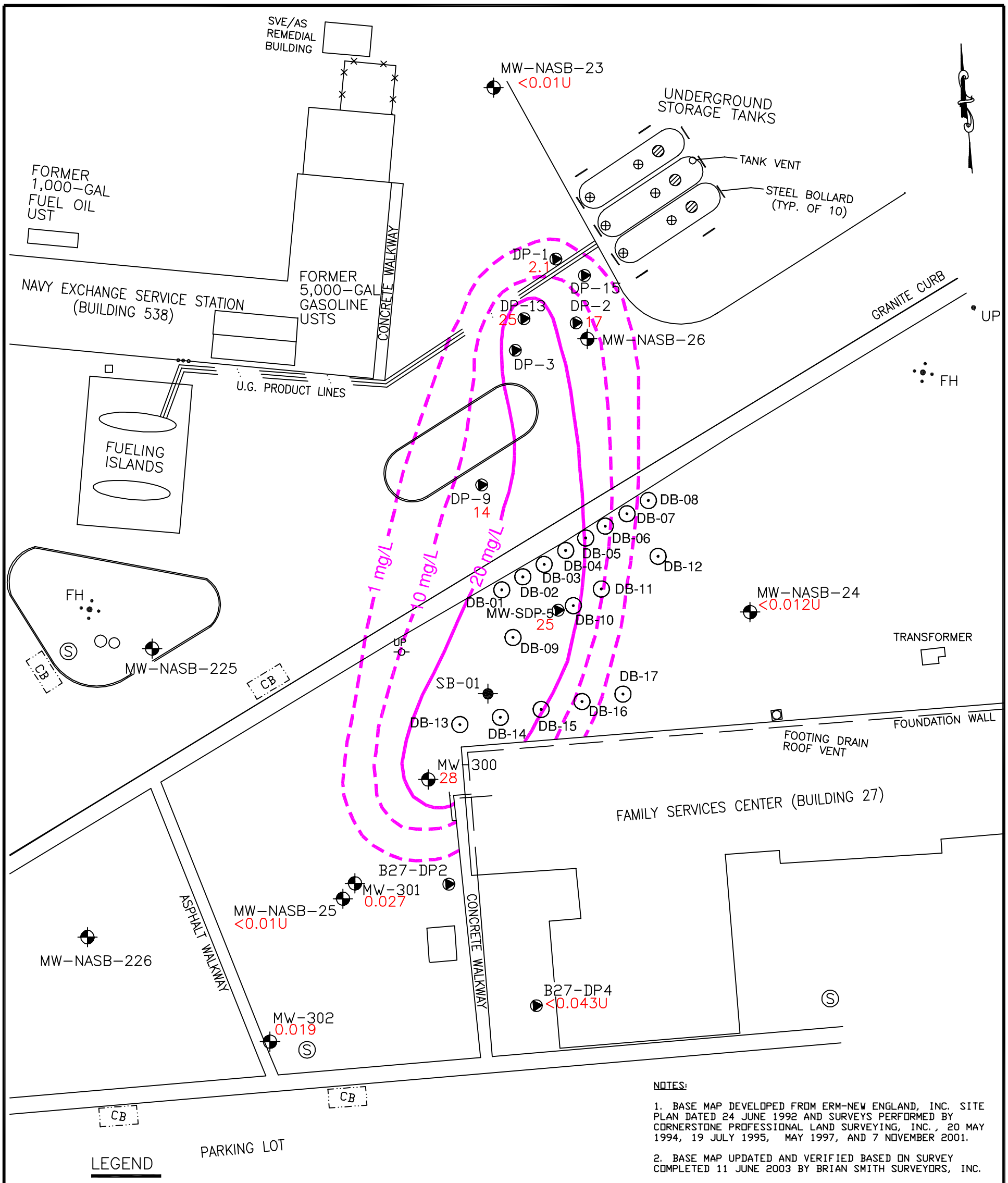
SOURCE:

CORRECTIVE ACTION PLAN, NAVY EXCHANGE SERVIE STATION, NAVAL AIR STATION, BRUNSWICK, MAINE; EA ENGINEERING, SCIENCE, AND TECHNOLOGY, INC. MARCH 2004.

TETRA TECH NUS, INC.

DISSOLVED-PHASE TPH-GRO CONCENTRATIONS (MG/L)
FOLLOWING IN-SITU CHEMICAL OXIDATION INJECTION
NAVAL EXCHANGE SERVICE STATION
US NAVY NAVFAC EFANE
NAVAL AIR STATION, BRUNSWICK, MAINE

FILE	SCALE
DWG\4590\W5205342D\FIG_1-4.DWG	AS NOTED
FIGURE NUMBER 1-4	REV 1 / DATE 04/27/05



LEGEND

MW-NASB-24	MONITORING WELL (2-INCH OR 4-INCH INSIDE DIAMETER)
DB-01	DIRECT-PUSH N-BLEND ADDITION WELL (2004)
B27-DP2	DIRECT-PUSH MONITORING WELL
SB-01	DIRECT-PUSH SOIL BORING (2004)
FH	FIRE HYDRANT WITH BOLLARDS
UP	UTILITY POLE
CB	STORM WATER CATCH BASIN
S	SEWER MANHOLE
	EXISTING CHAIN LINK FENCE
	UNDERGROUND STRUCTURE
	LINE OF EQUAL GRO CONCENTRATION IN GROUNDWATER (mg/L) – DASHED WHERE ESTIMATED

GRAPHIC SCALE

0' 30' 60'

NOTES:

1. BASE MAP DEVELOPED FROM ERM-NEW ENGLAND, INC. SITE PLAN DATED 24 JUNE 1992 AND SURVEYS PERFORMED BY CORNERSTONE PROFESSIONAL LAND SURVEYING, INC., 20 MAY 1994, 19 JULY 1995, MAY 1997, AND 7 NOVEMBER 2001.

2. BASE MAP UPDATED AND VERIFIED BASED ON SURVEY COMPLETED 11 JUNE 2003 BY BRIAN SMITH SURVEYORS, INC.

3. LOCATIONS NAD ELEVATIONS FOR ADDITION WELLS (DB-01 TO DB-17) AND NEW MONITORING WELLS (MW-300, -301, -302) SURVEYED BY DEST ASSOCIATES, INC. ON NOVEMBER 2, 2004.

SOURCE:

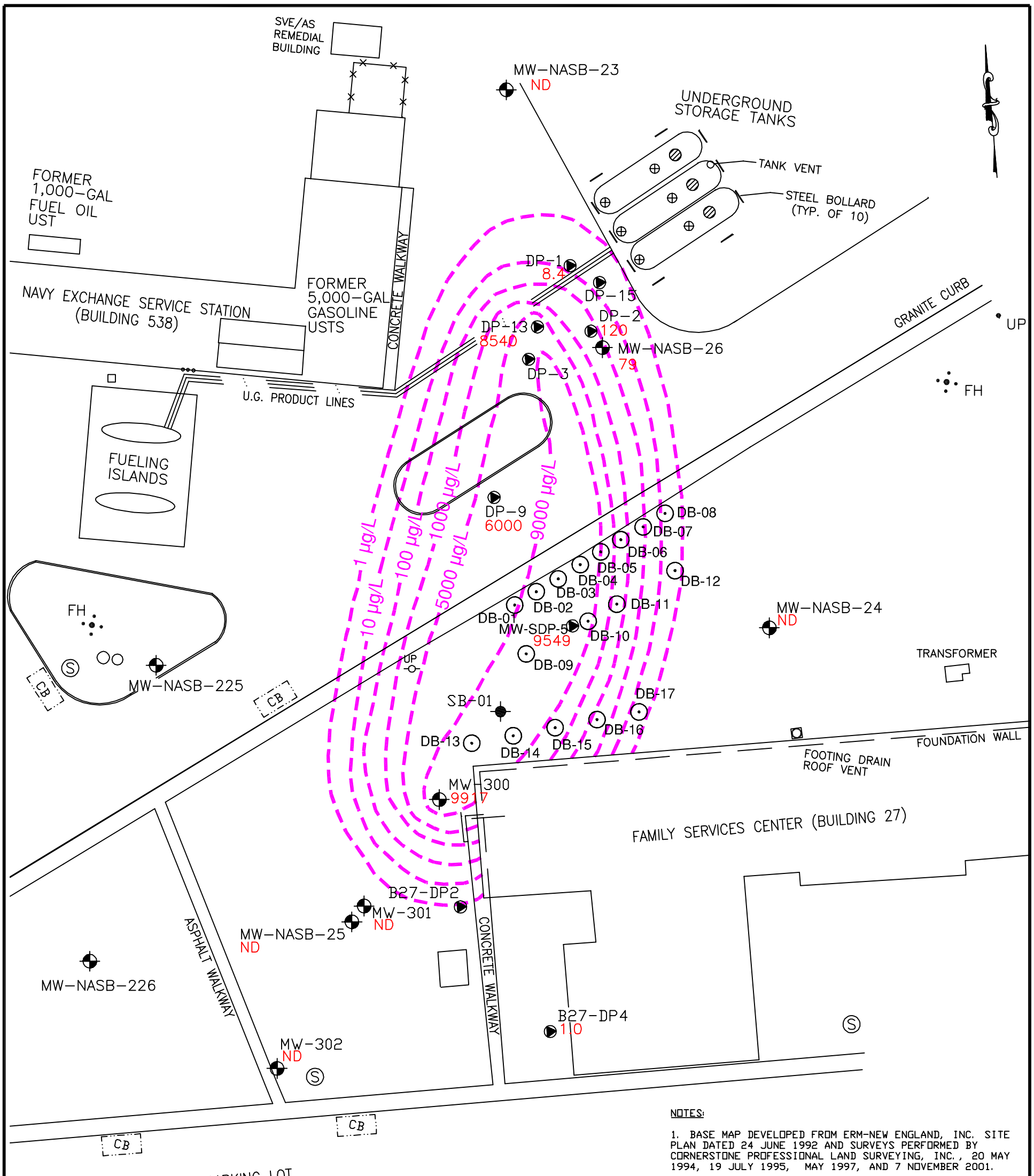
CORRECTIVE ACTION PLAN, NAVY EXCHANGE SERVIE STATION, NAVAL AIR STATION, BRUNSWICK, MAINE; EA ENGINEERING, SCIENCE, AND TECHNOLOGY, INC. MARCH 2004.

TETRA TECH NUS, INC.

2004 DISSOLVED PHASE GRO CONCENTRATIONS IN GROUNDWATER
NAVAL EXCHANGE SERVICE STATION
US NAVY NAVFAC EFANE
NAVAL AIR STATION, BRUNSWICK, MAINE

FILE	SCALE
DWG\4590\W5205342D\FIG_1-5.DWG	AS NOTED

FIGURE NUMBER	REV	DATE
1-5	0	04/27/05



LEGEND

MW-NASB-24	MONITORING WELL (2-INCH OR 4-INCH INSIDE DIAMETER)
DB-01	DIRECT-PUSH N-BLEND ADDITION WELL (2004)
B27-DP2	DIRECT-PUSH MONITORING WELL
SB-01	DIRECT-PUSH SOIL BORING (2004)
FH	FIRE HYDRANT WITH BOLLARDS
UP	UTILITY POLE
CB	STORM WATER CATCH BASIN
S	SEWER MANHOLE
	EXISTING CHAIN LINK FENCE
	UNDERGROUND STRUCTURE
	LINE OF EQUAL BTEX CONCENTRATION IN GROUNDWATER (µg/L) – DASHED WHERE ESTIMATED

GRAPHIC SCALE

0' 30' 60'

NOTES:

1. BASE MAP DEVELOPED FROM ERM-NEW ENGLAND, INC. SITE PLAN DATED 24 JUNE 1992 AND SURVEYS PERFORMED BY CORNERSTONE PROFESSIONAL LAND SURVEYING, INC., 20 MAY 1994, 19 JULY 1995, MAY 1997, AND 7 NOVEMBER 2001.

2. BASE MAP UPDATED AND VERIFIED BASED ON SURVEY COMPLETED 11 JUNE 2003 BY BRIAN SMITH SURVEYORS, INC.

3. LOCATIONS NAD ELEVATIONS FOR ADDITION WELLS (DB-01 TO DB-17) AND NEW MONITORING WELLS (MW-300,-301,-302) SURVEYED BY DEST ASSOCIATES, INC. ON NOVEMBER 2, 2004.

SOURCE:

CORRECTIVE ACTION PLAN, NAVY EXCHANGE SERVIE STATION, NAVAL AIR STATION, BRUNSWICK, MAINE; EA ENGINEERING, SCIENCE, AND TECHNOLOGY, INC. MARCH 2004.

TETRA TECH NUS, INC.

2004 DISSOLVED PHASE BTEX CONCENTRATIONS IN GROUNDWATER
NAVAL EXCHANGE SERVICE STATION
US NAVY NAVFAC EFANE
NAVAL AIR STATION, BRUNSWICK, MAINE

FILE	SCALE
DWG\4590\W5205342D\FIG_1-6.DWG	AS NOTED

FIGURE NUMBER	REV	DATE
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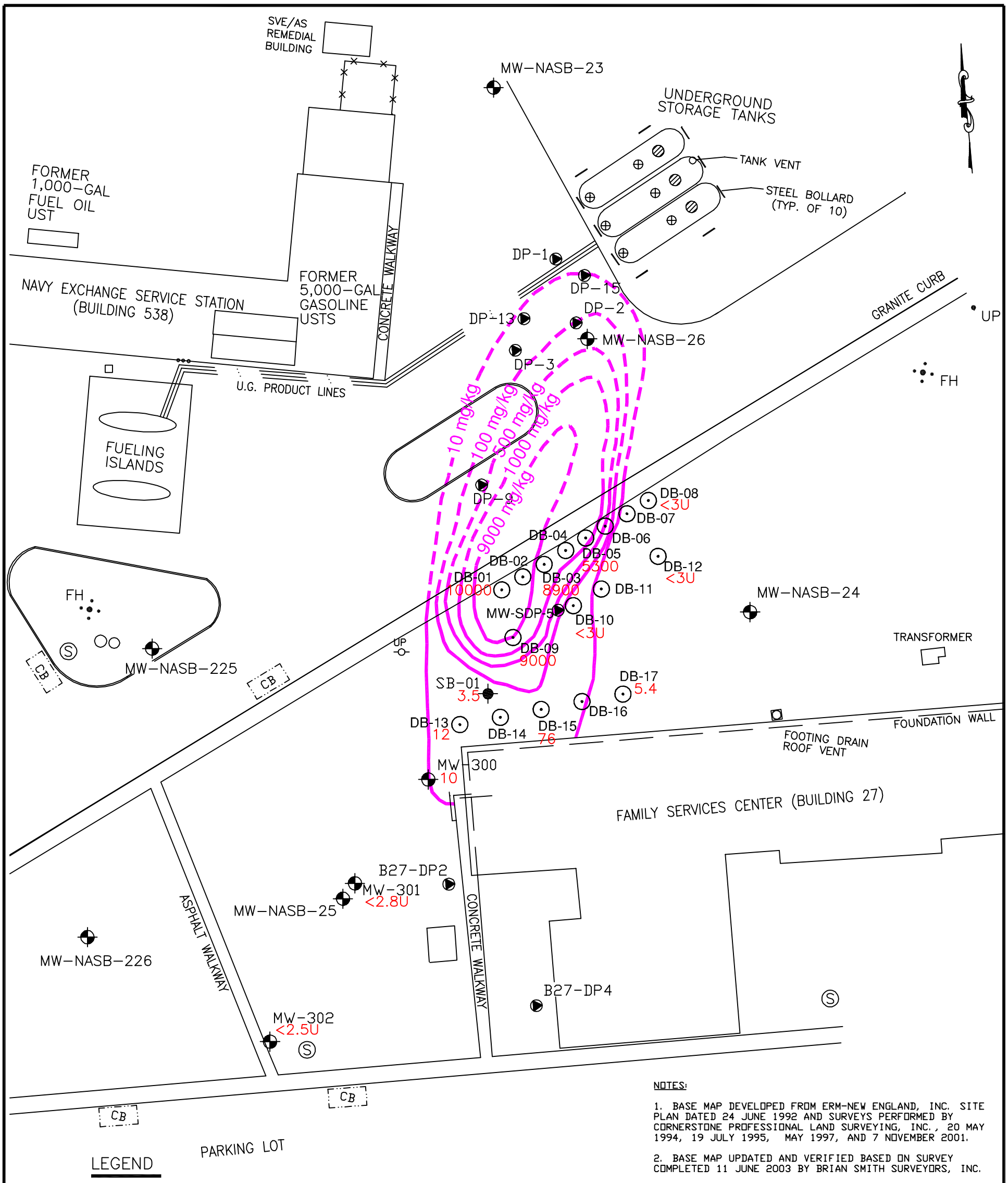


NOTES:

1. BASE MAP DEVELOPED FROM ERM-NEW ENGLAND, INC. SITE PLAN DATED 24 JUNE 1992 AND SURVEYS PERFORMED BY CORNERSTONE PROFESSIONAL LAND SURVEYING, INC., 20 MAY 1994, 19 JULY 1995, MAY 1997, AND 7 NOVEMBER 2001.

2. BASE MAP UPDATED AND VERIFIED BASED ON SURVEY COMPLETED 11 JUNE 2003 BY BRIAN SMITH SURVEYORS, INC.

3. LOCATIONS NAD ELEVATIONS FOR ADDITION WELLS (DB-01 TO DB-17) AND NEW MONITORING WELLS (MW-300, -301, -302) SURVEYED BY DEST ASSOCIATES, INC. ON NOVEMBER 2, 2004.

SOURCE:

CORRECTIVE ACTION PLAN, NAVY EXCHANGE SERVIE STATION, NAVAL AIR STATION, BRUNSWICK, MAINE; EA ENGINEERING, SCIENCE, AND TECHNOLOGY, INC. MARCH 2004.

LEGEND

- MW-NASB-24 — MONITORING WELL (2-INCH OR 4-INCH INSIDE DIAMETER)
- DB-01 — DIRECT-PUSH N-BLEND ADDITION WELL (2004)
- B27-DP2 — DIRECT-PUSH MONITORING WELL
- SB-01 — DIRECT-PUSH SOIL BORING (2004)
- FH — FIRE HYDRANT WITH BOLLARDS
- UP — UTILITY POLE
- CB — STORM WATER CATCH BASIN
- S — SEWER MANHOLE
- EXISTING CHAIN LINK FENCE
- UNDERGROUND STRUCTURE
- LINE OF EQUAL GRO CONCENTRATION IN SOIL (mg/kg) – DASHED WHERE ESTIMATED

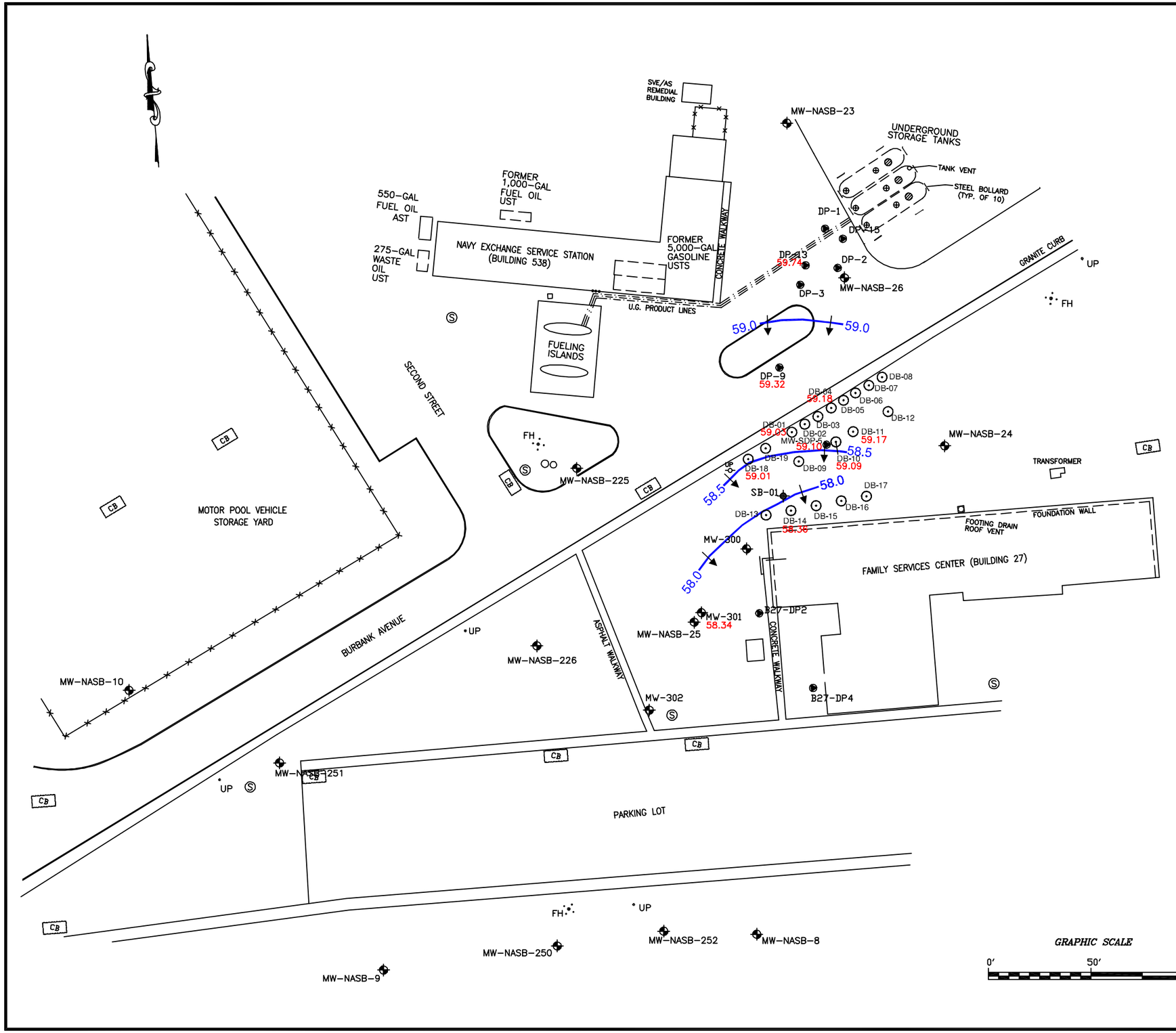
GRAPHIC SCALE
0' 30' 60'

TETRA TECH NUS, INC.

2004 SOIL GRO CONCENTRATIONS
UPPER SATURATED ZONE
NAVAL EXCHANGE SERVICE STATION
US NAVY NAVFAC EFANE
NAVAL AIR STATION, BRUNSWICK, MAINE

FILE	SCALE
DWG\4590\W5205342D\FIG_1-7.DWG	AS NOTED

FIGURE NUMBER	REV	DATE
1-7	0	04/27/05



LEGEND

MW-NASB-24	MONITORING WELL (2-INCH OR 4-INCH INSIDE DIAMETER)
DB-01	DIRECT-PUSH N-BLEND ADDITION WELL
B27-DP2	DIRECT-PUSH MONITORING WELL
SB-01	DIRECT-PUSH SOIL BORING (2004)
FH	FIRE HYDRANT WITH BOLLARDS
UP	UTILITY POLE
CB	STORM WATER CATCH BASIN
S	SEWER MANHOLE
	EXISTING CHAIN LINK FENCE
	UNDERGROUND STRUCTURE
59.0	LINE OF EQUAL WATER TABLE ELEVATION IN FEET NGVD, MARCH 2005. ARROWS POINT IN DIRECTION OF GROUNDWATER FLOW, INFERRED FROM THE GROUNDWATER CONTOURS.

NOTES:

1. BASE MAP DEVELOPED FROM ERM-NEW ENGLAND, INC. SITE PLAN DATED 24 JUNE 1992 AND SURVEYS PERFORMED BY CORNERSTONE PROFESSIONAL LAND SURVEYING, INC., 20 MAY 1994, 19 JULY 1995, MAY 1997, AND 7 NOVEMBER 2001.

2. BASE MAP UPDATED AND VERIFIED BASED ON SURVEY COMPLETED 11 JUNE 2003 BY BRIAN SMITH SURVEYORS, INC.

3. LOCATIONS NAD ELEVATIONS FOR ADDITION WELLS (DB-01 TO DB-17) AND NEW MONITORING WELLS (MW-300,-301,-302) SURVEYED BY OEST ASSOCIATES, INC. ON NOVEMBER 2, 2004.

SOURCE:

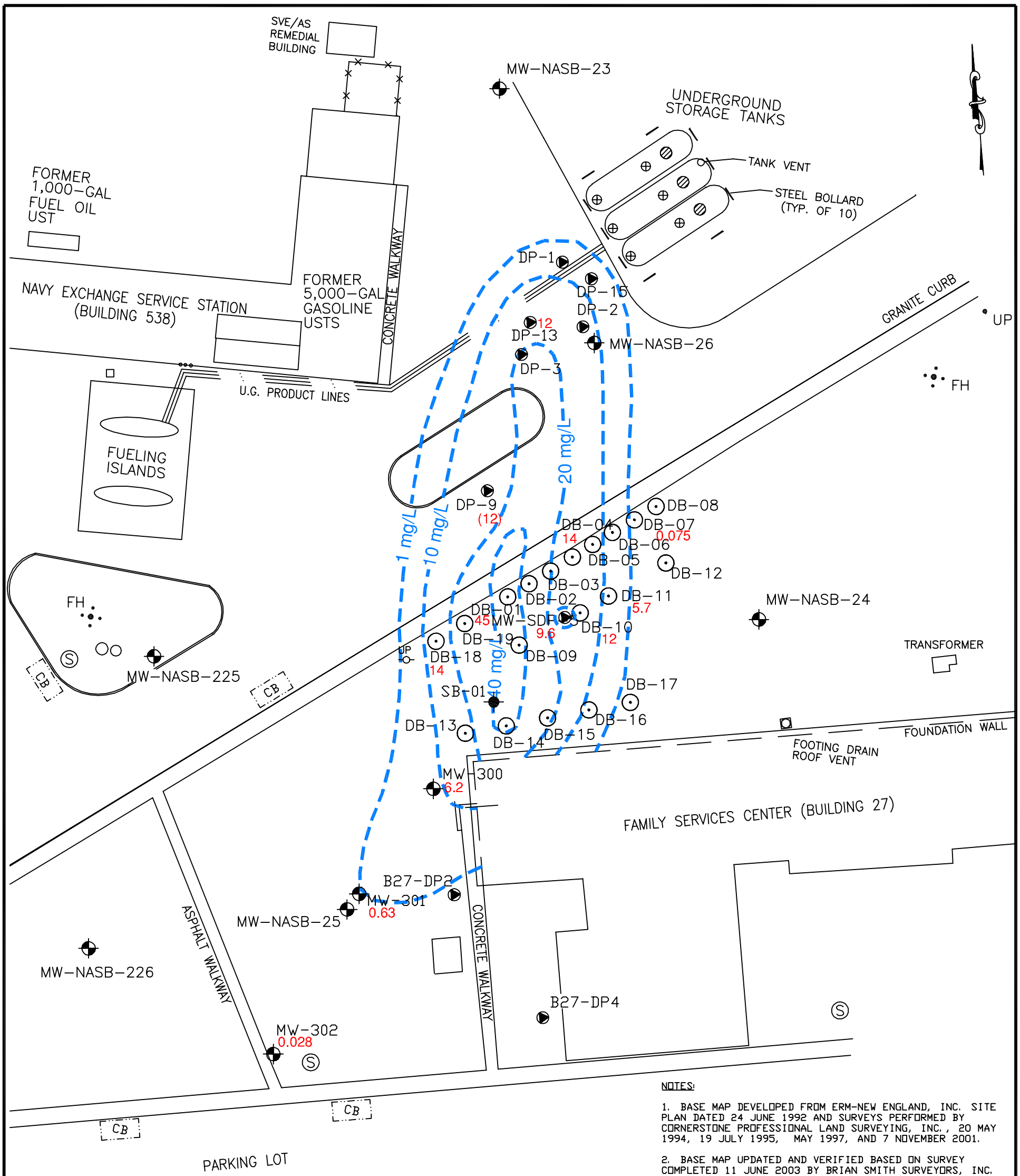
CORRECTIVE ACTION PLAN, NAVY EXCHANGE SERVICE STATION, NAVAL AIR STATION, BRUNSWICK, MAINE; EA ENGINEERING, SCIENCE, AND TECHNOLOGY, INC. MARCH 2004.

TETRA TECH NUS, INC.

WATER TABLE SURFACE – MARCH 2005
NAVAL EXCHANGE SERVICE STATION
US NAVY NAVFAC EFANE
NAVAL AIR STATION, BRUNSWICK, MAINE

FILE	SCALE
DWG\4590\W5205342D\FIG_2-1.DWG	AS NOTED

FIGURE NUMBER	REV	DATE
2-1	0	04/27/05



NOTES:

1. BASE MAP DEVELOPED FROM ERM-NEW ENGLAND, INC. SITE PLAN DATED 24 JUNE 1992 AND SURVEYS PERFORMED BY CORNERSTONE PROFESSIONAL LAND SURVEYING, INC., 20 MAY 1994, 19 JULY 1995, MAY 1997, AND 7 NOVEMBER 2001.

2. BASE MAP UPDATED AND VERIFIED BASED ON SURVEY COMPLETED 11 JUNE 2003 BY BRIAN SMITH SURVEYORS, INC.

3. LOCATIONS NAD ELEVATIONS FOR ADDITION WELLS (DB-01 TO DB-17) AND NEW MONITORING WELLS (MW-300, -301, -302) SURVEYED BY DEST ASSOCIATES, INC. ON NOVEMBER 2, 2004.

4. ADDITIONAL WELLS DB-18 AND DB-19 LOCATIONS APPROXIMATE.

SOURCE:

CORRECTIVE ACTION PLAN, NAVY EXCHANGE SERVIE STATION, NAVAL AIR STATION, BRUNSWICK, MAINE; EA ENGINEERING, SCIENCE, AND TECHNOLOGY, INC. MARCH 2004.

LEGEND

MW-NASB-24	MONITORING WELL (2-INCH OR 4-INCH INSIDE DIAMETER)
DB-01	DIRECT-PUSH N-BLEND ADDITION WELL (2004/2005)
B27-DP2	DIRECT-PUSH MONITORING WELL
SB-01	DIRECT-PUSH SOIL BORING (2004)
FH	FIRE HYDRANT WITH BOLLARDS
UP	UTILITY POLE
CB	STORM WATER CATCH BASIN
S	SEWER MANHOLE
	UNDERGROUND STRUCTURE
	LINE OF EQUAL GRO CONCENTRATION IN GROUNDWATER (mg/L) – DASHED WHERE ESTIMATED

GRAPHIC SCALE

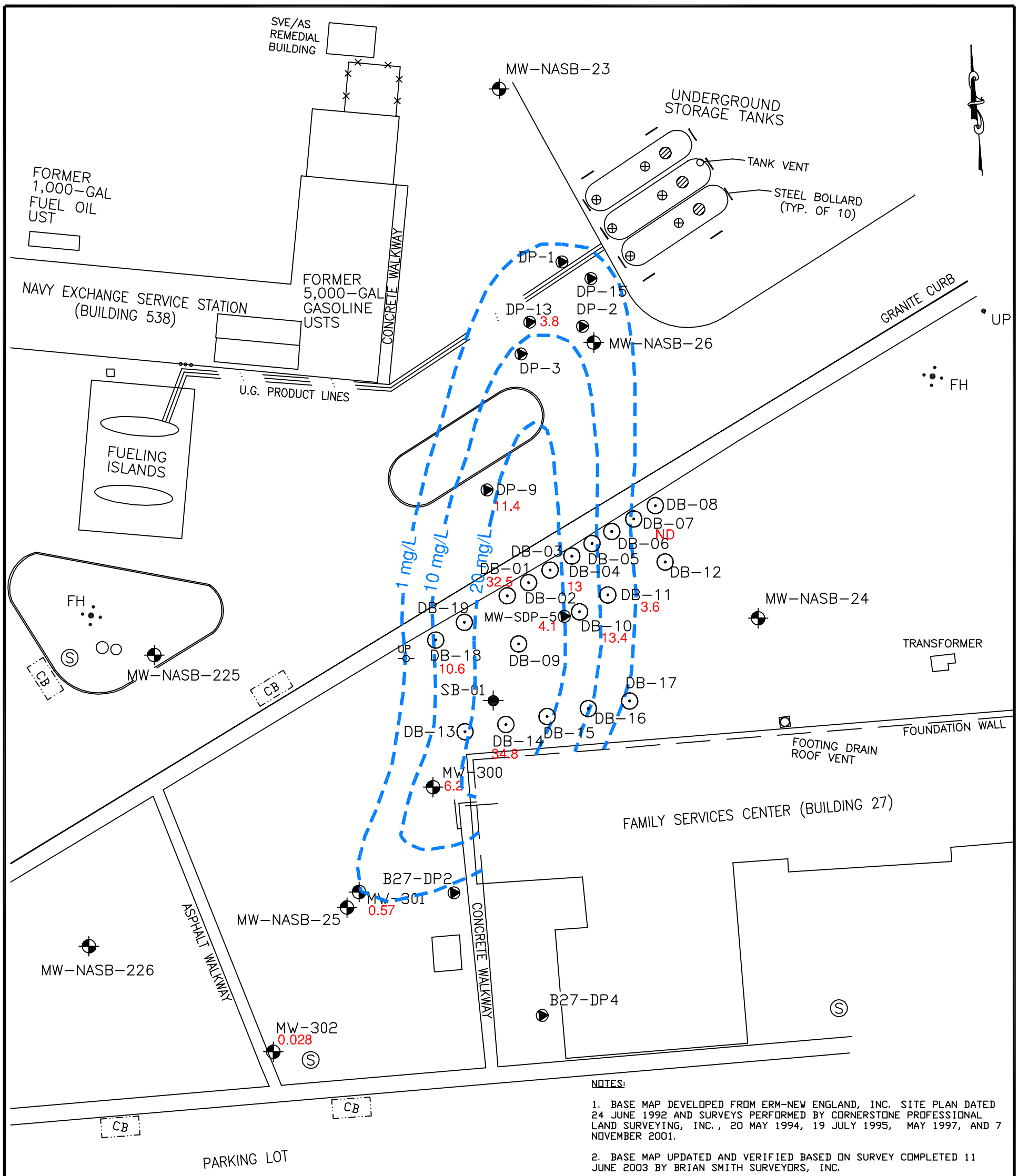
0' 30' 60'

TETRA TECH NUS, INC.

MARCH 2005 GROUNDWATER
GRO CONCENTRATIONS
NAVAL EXCHANGE SERVICE STATION
US NAVY NAVFAC EFANE
NAVAL AIR STATION, BRUNSWICK, MAINE

FILE	SCALE
DWG\4590\W5205342D\FIG_3-1.DWG	AS NOTED

FIGURE NUMBER	REV	DATE
3-1	0	05/03/05



NOTES:

1. BASE MAP DEVELOPED FROM ERM-NEW ENGLAND, INC. SITE PLAN DATED 24 JUNE 1992 AND SURVEYS PERFORMED BY CORNERSTONE PROFESSIONAL LAND SURVEYING, INC., 20 MAY 1994, 19 JULY 1995, MAY 1997, AND 7 NOVEMBER 2001.

2. BASE MAP UPDATED AND VERIFIED BASED ON SURVEY COMPLETED 11 JUNE 2003 BY BRIAN SMITH SURVEYORS, INC.

3. LOCATIONS NAD ELEVATIONS FOR ADDITION WELLS (DB-01 TO DB-17) AND NEW MONITORING WELLS (MW-300,-301,-302) SURVEYED BY DEST ASSOCIATES, INC. ON NOVEMBER 2, 2004.

4. ADDITIONAL WELLS DB-18 AND DB-19 LOCATIONS APPROXIMATE.

5. VPH - MASSACHUSETTS VOLATILE PETROLEUM HYDROCARBON METHOD

SOURCE:

CORRECTIVE ACTION PLAN, NAVY EXCHANGE SERVIE STATION, NAVAL AIR STATION, BRUNSWICK, MAINE; EA ENGINEERING, SCIENCE, AND TECHNOLOGY, INC. MARCH 2004.

LEGEND

- MW-NASB-24 — MONITORING WELL (2-INCH OR 4-INCH INSIDE DIAMETER)
- DB-01 — DIRECT-PUSH N-BLEND ADDITION WELL (2004/2005)
- B27-DP2 — DIRECT-PUSH MONITORING WELL
- SB-01 — DIRECT-PUSH SOIL BORING (2004)
- FH — FIRE HYDRANT WITH BOLLARDS
- UP — UTILITY POLE
- CB — STORM WATER CATCH BASIN
- S — SEWER MANHOLE
- UNDERGROUND STRUCTURE
- LINE OF EQUAL VPH AROMATICS CONCENTRATION IN GROUNDWATER (mg/L) – DASHED WHERE ESTIMATED

GRAPHIC SCALE

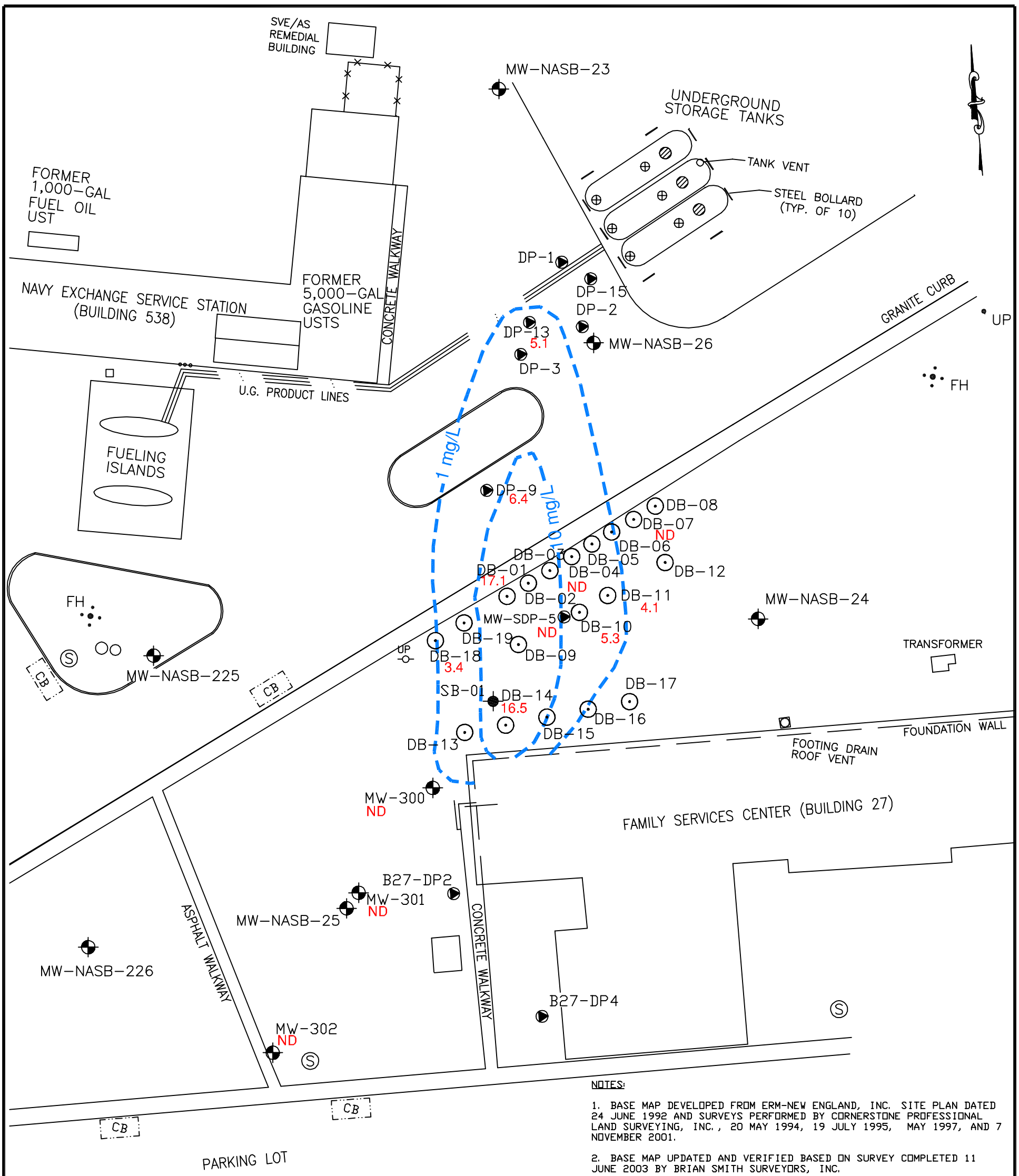
0' 30' 60'

TETRA TECH NUS, INC.

MARCH 2005 GROUNDWATER
VPH AROMATIC HYDROCARBON CONCENTRATIONS
NAVAL EXCHANGE SERVICE STATION
US NAVY NAVFAC EFANE
NAVAL AIR STATION, BRUNSWICK, MAINE

FILE	SCALE
DWG\4590\W5205342D\FIG_3-2.DWG	AS NOTED

FIGURE NUMBER	REV	DATE
3-2	0	04/27/05



NOTES:

1. BASE MAP DEVELOPED FROM ERM-NEW ENGLAND, INC. SITE PLAN DATED 24 JUNE 1992 AND SURVEYS PERFORMED BY CORNERSTONE PROFESSIONAL LAND SURVEYING, INC., 20 MAY 1994, 19 JULY 1995, MAY 1997, AND 7 NOVEMBER 2001.

2. BASE MAP UPDATED AND VERIFIED BASED ON SURVEY COMPLETED 11 JUNE 2003 BY BRIAN SMITH SURVEYORS, INC.

3. LOCATIONS NAD ELEVATIONS FOR ADDITION WELLS (DB-01 TO DB-17) AND NEW MONITORING WELLS (MW-300,-301,-302) SURVEYED BY DEST ASSOCIATES, INC. ON NOVEMBER 2, 2004.

4. ADDITIONAL WELLS DB-18 AND DB-19 LOCATIONS APPROXIMATE.

5. VPH - MASSACHUSETTS VOLATILE PETROLEUM HYDROCARBON METHOD

SOURCE:

CORRECTIVE ACTION PLAN, NAVY EXCHANGE SERVIE STATION, NAVAL AIR STATION, BRUNSWICK, MAINE; EA ENGINEERING, SCIENCE, AND TECHNOLOGY, INC. MARCH 2004.

LEGEND

MW-NASB-24	MONITORING WELL (2-INCH OR 4-INCH INSIDE DIAMETER)
DB-01	DIRECT-PUSH N-BLEND ADDITION WELL (2004/2005)
B27-DP2	DIRECT-PUSH MONITORING WELL
SB-01	DIRECT-PUSH SOIL BORING (2004)
FH	FIRE HYDRANT WITH BOLLARDS
UP	UTILITY POLE
CB	STORM WATER CATCH BASIN
S	SEWER MANHOLE
	UNDERGROUND STRUCTURE
	LINE OF EQUAL VPH ALIPHATIC (C5-C8,C9-C12) CONCENTRATION IN GROUNDWATER (mg/L) - DASHED WHERE ESTIMATED

GRAPHIC SCALE

0' 30' 60'

TETRA TECH NUS, INC.

MARCH 2005 GROUNDWATER
VPH ALIPHATIC HYDROCARBON CONCENTRATIONS
NAVAL EXCHANGE SERVICE STATION
US NAVY NAVFAC EFANE
NAVAL AIR STATION, BRUNSWICK, MAINE

FILE	SCALE
DWG\4590\W5205342D\FIG_3-3.DWG	AS NOTED

FIGURE NUMBER	REV	DATE
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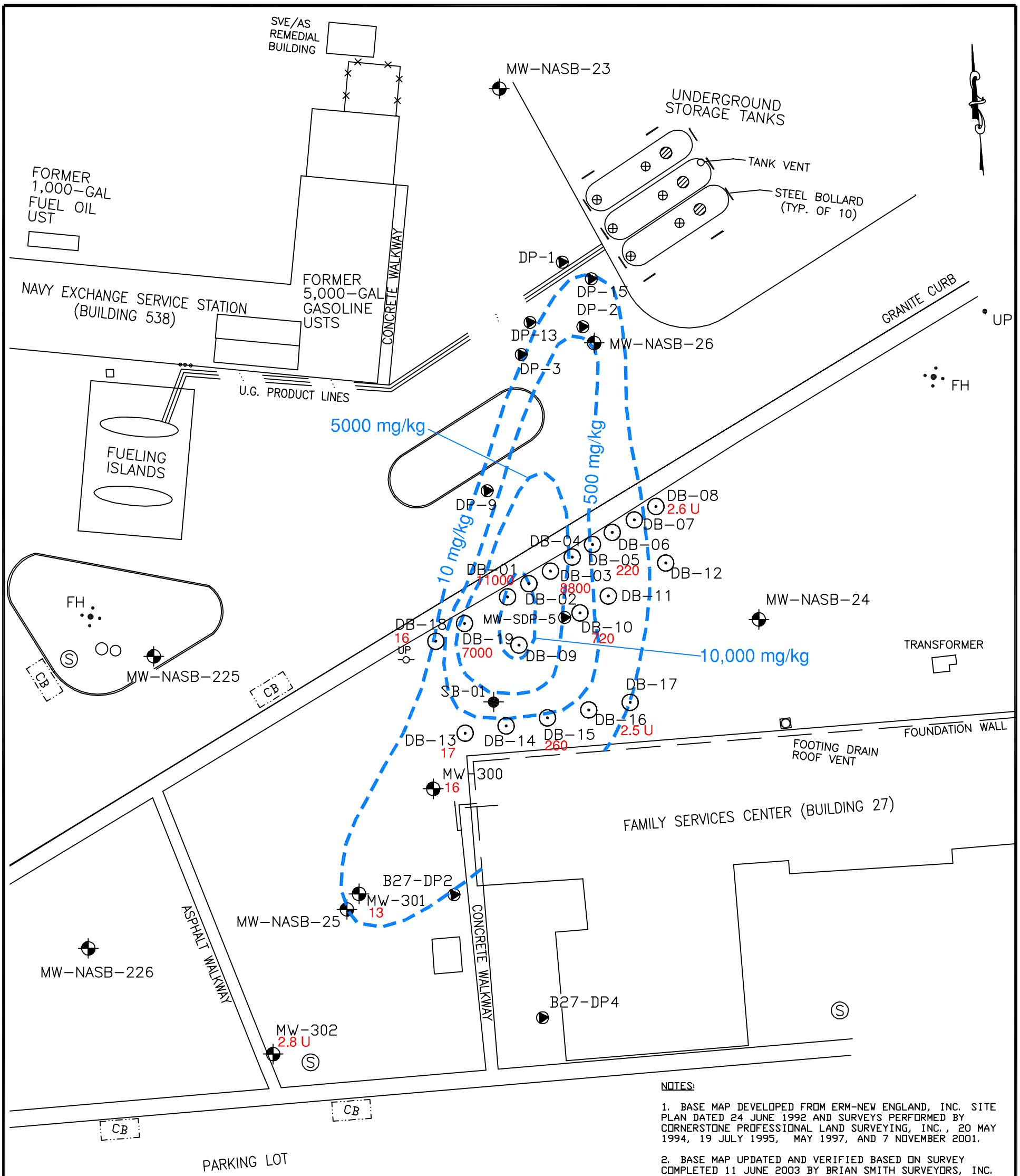

NOTES:

1. BASE MAP DEVELOPED FROM ERM-NEW ENGLAND, INC. SITE PLAN DATED 24 JUNE 1992 AND SURVEYS PERFORMED BY CORNERSTONE PROFESSIONAL LAND SURVEYING, INC., 20 MAY 1994, 19 JULY 1995, MAY 1997, AND 7 NOVEMBER 2001.

2. BASE MAP UPDATED AND VERIFIED BASED ON SURVEY COMPLETED 11 JUNE 2003 BY BRIAN SMITH SURVEYORS, INC.

3. LOCATIONS NAD ELEVATIONS FOR ADDITION WELLS (DB-01 TO DB-17) AND NEW MONITORING WELLS (MW-300, -301, -302) SURVEYED BY OEST ASSOCIATES, INC. ON NOVEMBER 2, 2004.

4. ADDITIONAL WELLS DB-18 AND DB-19 LOCATIONS APPROXIMATE.

SOURCE:

CORRECTIVE ACTION PLAN, NAVY EXCHANGE SERVIE STATION, NAVAL AIR STATION, BRUNSWICK, MAINE; EA ENGINEERING, SCIENCE, AND TECHNOLOGY, INC. MARCH 2004.

LEGEND

MW-NASB-24	MONITORING WELL (2-INCH OR 4-INCH INSIDE DIAMETER)
DB-01	DIRECT-PUSH N-BLEND ADDITION WELL (2004/2005)
B27-DP2	DIRECT-PUSH MONITORING WELL
SB-01	DIRECT-PUSH SOIL BORING (2004)
FH	FIRE HYDRANT WITH BOLLARDS
UP	UTILITY POLE
CB	STORM WATER CATCH BASIN
S	SEWER MANHOLE
	UNDERGROUND STRUCTURE
	LINE OF EQUAL GRO CONCENTRATION IN SOIL (mg/kg) – DASHED WHERE ESTIMATED

GRAPHIC SCALE

0′ 30′ 60′

TETRA TECH NUS, INC.

MARCH 2005 SOIL
GRO CONCENTRATIONS
NAVAL EXCHANGE SERVICE STATION
US NAVY NAVFAC EFANE
NAVAL AIR STATION, BRUNSWICK, MAINE

FILE	SCALE
DWG\4590\W5205342D\FIG_3-4.DWG	AS NOTED

FIGURE NUMBER	REV	DATE
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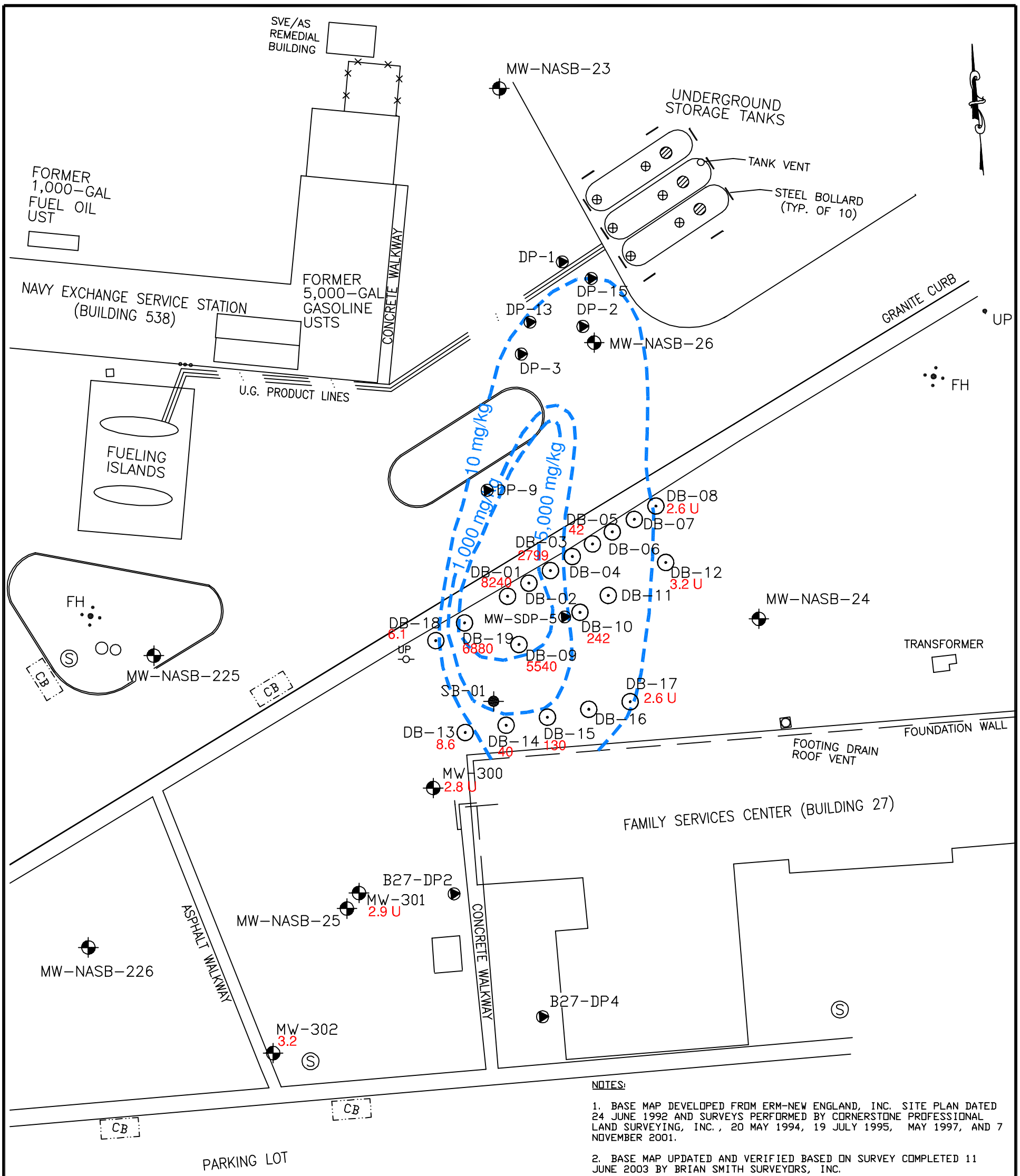

NOTES:

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4. ADDITIONAL WELLS DB-18 AND DB-19 LOCATIONS APPROXIMATE.

5. VPH - MASSACHUSETTS VOLATILE PETROLEUM HYDROCARBON METHOD

SOURCE:

CORRECTIVE ACTION PLAN, NAVY EXCHANGE SERVIE STATION, NAVAL AIR STATION, BRUNSWICK, MAINE; EA ENGINEERING, SCIENCE, AND TECHNOLOGY, INC. MARCH 2004.

LEGEND

MW-NASB-24	MONITORING WELL (2-INCH OR 4-INCH INSIDE DIAMETER)
DB-01	DIRECT-PUSH N-BLEND ADDITION WELL (2004/2005)
B27-DP2	DIRECT-PUSH MONITORING WELL
SB-01	DIRECT-PUSH SOIL BORING (2004)
FH	FIRE HYDRANT WITH BOLLARDS
UP	UTILITY POLE
CB	STORM WATER CATCH BASIN
S	SEWER MANHOLE
	UNDERGROUND STRUCTURE
	LINE OF EQUAL VPH AROMATICS CONCENTRATION IN SOIL (mg/kg) - DASHED WHERE ESTIMATED

GRAPHIC SCALE

0' 30' 60'

TETRA TECH NUS, INC.

MARCH 2005 SOIL
VPH AROMATIC HYDROCARBON CONCENTRATIONS
NAVAL EXCHANGE SERVICE STATION
US NAVY NAVFAC EFANE
NAVAL AIR STATION, BRUNSWICK, MAINE

FILE	SCALE
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FIGURE NUMBER	REV	DATE
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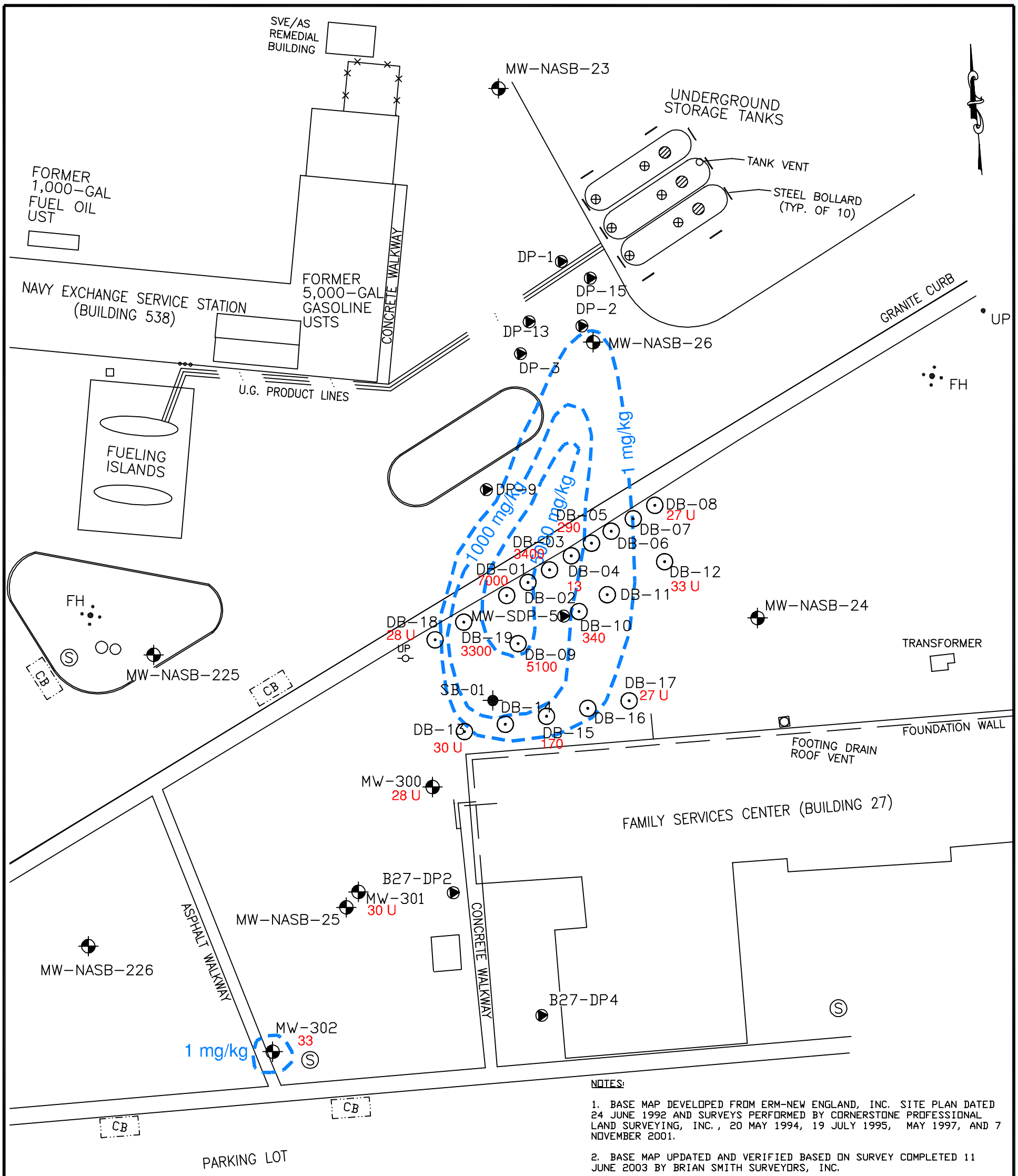

NOTES:

1. BASE MAP DEVELOPED FROM ERM-NEW ENGLAND, INC. SITE PLAN DATED 24 JUNE 1992 AND SURVEYS PERFORMED BY CORNERSTONE PROFESSIONAL LAND SURVEYING, INC., 20 MAY 1994, 19 JULY 1995, MAY 1997, AND 7 NOVEMBER 2001.

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4. ADDITIONAL WELLS DB-18 AND DB-19 LOCATIONS APPROXIMATE.

5. VPH - MASSACHUSETTS VOLATILE PETROLEUM HYDROCARBON METHOD

SOURCE:

CORRECTIVE ACTION PLAN, NAVY EXCHANGE SERVIE STATION, NAVAL AIR STATION, BRUNSWICK, MAINE; EA ENGINEERING, SCIENCE, AND TECHNOLOGY, INC. MARCH 2004.

LEGEND

MW-NASB-24	MONITORING WELL (2-INCH OR 4-INCH INSIDE DIAMETER)
DB-01	DIRECT-PUSH N-BLEND ADDITION WELL (2004/2005)
B27-DP2	DIRECT-PUSH MONITORING WELL
SB-01	DIRECT-PUSH SOIL BORING (2004)
FH	FIRE HYDRANT WITH BOLLARDS
UP	UTILITY POLE
CB	STORM WATER CATCH BASIN
S	SEWER MANHOLE
—— ——	UNDERGROUND STRUCTURE
——	LINE OF EQUAL VPH ALIPHATIC (C5-C8,C9-C12) CONCENTRATION IN SOIL (mg/kg) - DASHED WHERE ESTIMATED

GRAPHIC SCALE

0' 30' 60'

TETRA TECH NUS, INC.

MARCH 2005 SOIL
VPH ALIPHATIC HYDROCARBON CONCENTRATIONS
NAVAL EXCHANGE SERVICE STATION
US NAVY NAVFAC EFANE
NAVAL AIR STATION, BRUNSWICK, MAINE

FILE	SCALE
DWG\4590\W5205342D\FIG_3-6.DWG	AS NOTED

FIGURE NUMBER	REV	DATE
3-6	0	04/27/05

APPENDIX A

MINI-WELLS DESIGN LETTER REPORT

TETRA TECH NUS, INC.
55 Jonspin Road • Wilmington, MA 01887-1020
Tel 978.658.7899 • Fax 978.658.7870 • www.tetratech.com

C-NAVY-09-04-1749W

September 15, 2004

Project Number N4590

Ms. Claudia Sait
Bureau of Remediation and Waste Management
Maine Department of Environmental Protection
17 State House Station
Augusta, Maine 04333-0017

Reference: CLEAN Contract No. N62472-03-D-0057
Contract Task Order No. 014

Subject: Mini-Wells Design Letter Report
For Denitrification-Based Biodegradation Pilot Test
Navy Exchange Service Station
Naval Air Station, Brunswick, Maine

Dear Ms. Sait:

As requested by Mr. Brian Helland of the Engineering Field Activity Northeast (EFANE), please find enclosed two paper copies of the Mini-Wells Design Letter Report for the DBB pilot test to be performed at the Navy Exchange Service Station for the Department of Environmental Protection's (DEP) review. Electronic versions of the response to comments will be sent separately.

Should you have any questions, please do not hesitate to contact me. Comments should be forwarded to Mr. Brian Helland.

Very truly yours,

Liyang Chu
Project Manager

LC/

Enclosures

c: B. Helland, EFANE (w/enc.)
T. Williams, NASB (w/enc.)
J. Trepanowski/G. Glenn, TtNUS (w/enc.)
C. Race, TtNUS (w/enc.)
File: N4590-3.2 (w/enc.)

MINI-WELLS DESIGN LETTER REPORT
DBB PILOT TEST
NAVAL EXCHANGE SERVICE STATION
NAVAL AIR STATION, BRUNSWICK, MAINE
September 15, 2004

1.0 INTRODUCTION

Tetra Tech NUS, Inc. (TtNUS) has prepared this letter report for the Navy Exchange (NEX) Service Station Site located at the Naval Air Station (NAS) in Brunswick, Maine. This report was prepared for Engineering Field Activity Northeast Naval Facilities Engineering Command under Contract Number N62472-03-D-0057, Contract Task Order 014. The purpose of this letter report is to summarize the results of field activities completed during August 2004 and to provide the conceptual design of the application wells array to be used during the pilot test. The field activities were performed in accordance with the *Draft Work Plan for Denitrification-Based Biodegradation Pilot Test* (TtNUS, July 2004) and changes are noted in this report.

2.0 HYDRAULIC CONDUCTIVITY (IN-SITU PERMEABILITY) TESTING

Hydraulic conductivity testing (K) was performed using the slug test method on August 18, 2004. Slug test graphs and calculations are provided as Attachment 1. Slug-in tests using water were performed in 0.75-inch ID wells: MW-B27-DP2, MW-B27-DP4, MW-SDP-5, and MW-DP9. Slug-out tests could not be performed due to the lack of clearance around the transducer cable in these 0.75-inch ID wells. MW-DP-19 was unusable because there was at least two feet of soil in the well. Monitoring well MW-NASB-225 was dry and was replaced by MW-NASB-226, a 2-inch inner diameter (ID) well, where both slug-in and slug-out tests were performed using a solid cylinder. Groundwater levels at both MW-NASB-24 and MW-NASB-25 did not recover after installing the slug. These well are screened into the underlying silt/clay and it is likely the borehole walls are smeared with silt and clay.

All slug test time recovery data was recorded at 1 second intervals using an In-Situ Troll® 5 pounds per square inch (psi) pressure transducer with an accuracy of 0.003 feet (ft). Each test was started a few seconds prior to installation of the slug. The data was downloaded to a spreadsheet and elapsed time and head (H)/max slug displacement (H^o) calculated. The corrected elapsed time and H/H^o data were graphed and a best-fit line drawn through the points. K values were calculated using Hvorslev's method. The Bouwer and Rice method was not applicable because the top of the well screens extend above the water table.

The K values ranged from 1 ft/day (3.57×10^{-4} cm/sec) at MW-SPD5 to approximately 62 ft/day (2.17×10^{-02} cm/sec) at MW-NASB-226; most of the K values were in the 10^{-3} to 10^{-2} cm/sec range. The geometric mean was 11.8 ft/day (4.1×10^{-3} cm/sec). The geometric mean K compares favorably to that reported in the *Final Supplemental Remedial Investigation Report for NAS Brunswick* (E.C.Jordan, 1991), which was estimated to be 6.3×10^{-3} cm/sec. The hydraulic gradient (i) across the pilot test area is approximately 0.01 (ft/ft) measured perpendicular to the 58.5 and 59 ft potentiometric contours (Figure 2-9 – *Draft Work Plan*). Using the geometric mean K and the effective porosity as 0.25, the groundwater seepage velocity, calculated using V = Ki/n, is estimated to be 0.5 ft/day.

3.0 UTILITY SURVEY

Underground utilities at the Site south of Burbank Avenue were surveyed on August 19, 2004 by a TtNUS subcontractor, Hager-Richter Geoscience (Salem, New Hampshire). The survey determined the horizontal locations of subsurface utilities in the pilot test area, which are depicted in Figure 1. The pilot test area is bounded by Burbank Street to the north, Building 27 and its parking lot to the south, the

asphalt path between the parking lot and Burbank Street to the west, and the transformer along the north side of Building 27. The utility location survey was conducted using two complementary geophysical methods: precision utility location (PUL) and ground penetrating radar (GPR). The PUL survey was conducted using a precision electromagnetic pipe and cable locator, Radiodetection RD400 series. The GPR survey was conducted using a Sensors & Software Smart Cart Noggin Plus digital subsurface imaging radar system. The system includes a survey wheel that triggers the recording of the data at fixed intervals, thereby increasing the accuracy of the locations of features detected along the survey lines. A 250 MHz antenna was used for this project.

Apparent GPR signal penetrations in areas surveyed was approximately 5-7 feet. The utility location survey detected all of the expected utilities although their locations differed somewhat from plans prepared by previous contractors. The location of the soil vapor extraction trench segment immediately west of Building 27 detected using GPR deviated from that shown on previous plans. In addition, two subsurface utility lines not shown in previous plans were detected. A 4-inch PVC drain line that extends from Building 27 to a catch basin in the parking lot southwest of Building 27 was detected and an unknown utility that runs parallel to the LAN communication line parallel to Burbank Avenue was also detected.

4.0 PILOT TEST APPLICATION WELLS CONFIGURATION

Information developed by the hydraulic conductivity testing and the utility survey were reviewed and used by Geovation Technologies, Inc. (Geovation) to refine the distribution of application wells required for the Denitrification-Based Bioremediation (DBB) pilot test. Given hydraulic conductivity values (10^{-2} to 10^{-3} cm/sec) and estimated groundwater velocities in the 0.5 ft/day range, it was determined that a grid array of addition wells was no longer appropriate. Geovation's past experience at other DBB treatment sites with relatively fast-moving ground water was that downgradient dispersion of N-blend tended to be much greater and lateral dispersion much less pronounced relative to less permeable geologic media. Another factor considered in the design of the well array was the numerous subsurface utility lines present in the pilot test area.

The new proposed array will consist of three lines of application wells within the pilot test area. The application wells are labeled with the "DB-" prefix on Figure 1. Seventeen (17) new 1-in. diameter PVC mini-wells will be installed to facilitate applications of the "N-Blend" nitrate and nutrient solution for the DBB pilot test. Three lines of application wells are planned as shown on Figure 1. Line 1 will consist of eight (8) closely-spaced wells parallel to Burbank Avenue. Line 2 will be located further south and will consist of four (4) new mini-wells installed between existing air sparging wells AS-6 and AS-8 (two each on either side of AS-7). Line 3 will consist of five (5) new mini-wells spaced 10-15-ft apart in a line oriented roughly parallel to the west face of Building 27.

Review of the construction logs for existing air sparging wells AS-6, AS-7 and AS-8 indicates that they are suitable for use in applying the N-Blend. Accordingly, AS-6, AS-7 and AS-8 will be incorporated in the DBB pilot test as part of treatment Line 2.

In addition, Geovation proposes to apply N-Blend into existing mini-wells DP-1, DP-2, and DP-15, which are located upgradient of the pilot test area and north of Burbank Avenue (Figure 2). It is expected that a significant subsurface bloom of motile denitrifyers (e.g., *Pseudomonas* spp.) will develop in response to the N-Blend applications. Using these upgradient wells in the DBB pilot program will help to establish a steady flux of adapted denitrifiers into the pilot test area to treat the sorbed mass upgradient of and within the pilot test zone. This should enhance the overall cost/benefit of the pilot program as well.

The layout of the tightly spaced linear arrays of points (e.g., ±7.5-ft for Line 1) and the overall configuration of the three linear rows of treatment wells was selected to provide for greater overlap of the lateral dispersion of N-blend so as to create a moving "curtain" of DBB-nutrient rich groundwater through the treatment zone. In general, grid patterns of evenly spaced treatment points are preferred in relatively low-permeability, fine-grained formations whereas linear arrays of tightly spaced points oriented roughly orthogonal to the plume axis are preferred in relatively high-permeability, coarse-grained formations. In addition, the presence of numerous utilities, including sensitive telecommunications line, would make the installation of an idealized grid pattern difficult if not impractical at the site. The presence of the utilities also presents restrictions on the orientations of the lines of treatment points such that they are not ideally oriented orthogonal to the plume axis.

The next phase of the DBB design will involve (a) the selection of the vertical screened intervals and (b) the determination of the amounts and concentrations of N-blend to be applied into each treatment point. Geovation plans to modify 5-in. diameter flush mount casings so as to allow the installation of plastic tubing to facilitate a wider range of N-blend application methods. Efforts will be made to enable the application of N-blend over longer time periods (several hours to days versus minutes) so as to slow down the rate of downgradient N-blend dispersion given the rapid groundwater flow rates in the pilot test area. As described in the *Draft Work Plan*, the delayed distribution of N-Blend may utilize either manually operated or automated liquid dispensing systems that include 5-gallon stainless-steel canisters that are plumbed so as to dispense N-Blend by controlled volume displacement with compressed inert gas (argon).

The volume and concentration of N-Blend additions will be designed to correlate with the horizontal and vertical distribution of petroleum hydrocarbons. Data from the existing boring logs, geologic cross-sections and the observed PID readings and sorbed-phase GRO data from prior direct-push sampling will be used to determine the N-Blend loadings. Given the rapid ground-water flow rates at the site, the treatment points located furthest upgradient (i.e., Line 1) will receive a greater proportion of the N-Blend reagent than the wells located further downgradient.

5.0 SUPPLEMENTAL MONITORING WELLS

Three new monitoring wells are also proposed. MW-300 will be located near the northwestern corner of Building 27, which is the approximate location of boring B-27-DP1. This boring previously had the highest detected soil GRO concentration (8,830 mg/Kg). MW-301 will be used to replace MW-NASB-25, which was determined to be poor communication with the aquifer during the August 2004 hydraulic conductivity testing and would be unsuitable for long-term monitoring and sampling. MW-302 will be installed downgradient of MW-NASB-25 and MW-301, and will be used to monitor for potential nitrate and GRO migration outside the pilot test area. During the August 2004 groundwater sampling event, strong gasoline-like odors were noted in MW-NASB-25, which may be an indicator that the GRO plume has expanded since 2003. Therefore, MW-302 will be used to assess this situation.

These new wells will also be sampled prior to the start of the N-Blend addition to provide supplemental baseline groundwater data. These wells will be sampled for GRO, BTEX/MBTE, and nitrate/nitrite.

6.0 BASELINE AND PERIODIC SOIL SAMPLING

Based on the new distribution of mini-wells (lines vs. grid), the baseline soil sampling program has been modified. Soil samples will be collected from 4 borings in Line 1, 4 borings in line 2, and 3 borings in Line

3 (totaling 11 sets of samples) for GRO analysis. It is anticipated that there will be two sample intervals per borehole, and one sample per interval shall be collected (consistent with the *Draft Work Plan*).

As previously discussed with the Maine Department of Environmental Protection (DEP) representatives, additional soil samples will also be collected to address DEP comments and concerns. Soil samples will be collected from two locations (DB-11 and MW-300) adjacent to GRO hot spots delineated previously for volatile petroleum hydrocarbon (VPH) analysis. Top of clay samples will also be acquired from DB-11 and MW-300 to assess potential permeation of GRO into the low-permeability zone.

During the Rounds 1, 2, and 3 events, soil samples will be obtained from the three lines (11 locations) and from MW-300 and will be analyzed for GRO. VPH analysis will also be performed for samples obtained from DB-11 and MW-300. The need to collect the top of clay samples for periodic GRO analysis will be assessed after the evaluation of the baseline soil sampling results.

6.0 TENTATIVE SCHEDULE

TtNUS and the DPT drilling subcontractor, Yarmouth Environmental Service of Yarmouth, Maine, are scheduled to perform the baseline DP soil sampling and mini-well installations during the week of September 27, 2004. Geovation will apply the first dose of N-Blend during the week of October 4, 2004.

NAVY EXCHANGE SERVICE STATION
NAVAL AIR STATION, BRUNSWICK, MAINE

MINI-WELLS LETTER REPORT

ATTACHMENT 1

TABLE 1 - INSITU HYDRAULIC CONDUCTIVITY CALCULATION WORKSHEET

CLIENT: NAVFAC - Naval Air Station Brunswick - NEX Service Station Site PROJECT NO N4590-0513
SUBJECT: Hydraulic Conductivity Test Calculations
BY: CDR **CHECKED BY:** cdr DATE: 8/24/2004

OBJECTIVE: Estimate hydraulic conductivity of unconfined sandy aquifer

ASSUMPTIONS: Homogeneous and infinite aquifer. Steady-state groundwater flow.
Instantaneous response to removal or addition of slug.

EQUATION: $K = [r^2 \ln(L_e/R)] / (2L_eT_0)$

DEFINITIONS: K = hydraulic conductivity of porous media surrounding the well (ft/s)
r = radius of well casing (ft);
R = radius of well screen and gravel pack (ft);
L_e = length of saturated well screen in an unconfined aquifer under static conditions (ft);

DATA/CALCULATIONS:

Well ID	Well Casing Inside Dia. (in)	Borehole Dia. (in)	MP	MP Stickup (1) (ft)	Depth to Ground Water (1) (ft-BMP)	Depth to Ground Water (1) (ft-BGS)	Depth to confining layer (2) (ft-BGS)	Depth to top of well screen (2) (ft-BGS)	Depth to bottom of well screen (2) (ft-BGS)	Comments
MW-B27-DP2	0.75	2.5	TPVC	-0.05	4.04	4.09	9.00	2.70	8.70	No geologic log. Likely to be fine sand.
MW-B27-DP4	0.75	2.5	TPVC	-0.03	3.15	3.18	6.00	1.70	5.70	No geologic log. Likely to be fine sand.
MW-SDP-5	0.75	2.5	TPVC	-0.10	7.65	7.75	13.00	2.70	12.70	No geologic log. Likely to be fine sand.
MW-DP-9	0.75	2.5	TPVC	0.00	7.95	7.95	15.00	5.00	15.00	Fine sand
MW-NASB-24	4	10	TPVC	0.00	7.75	7.75	8.00	4.00	14.00	Fine-med sand to 8 ft; silt/clay from 8 to 14 ft. BGS. Well screened into silt/clay confining unit. Well did not recover sufficiently during slug-in test, indicating borehole probably smeared with silt/clay.
MW-NASB-25	4	10	TPVC	-0.53	6.92	7.45	11.00	5.00	15.00	Fine-med sand to 11.0 ft; silt clay from 11 to 15 ft. BGS. Well screened into silt/clay confining unit. Well did not recover sufficiently during slug-in test, indicating borehole probably smeared with silt/clay.
MW-NASB-226	2	4.5	TPVC	-0.38	5.08	5.46	14.00	8.00	13.00	Fine sand to 14 ft; silt/clay from 14 to 15 ft. BGS.

Notes:
1) Measured on-site on August 18, 2004
2) Data from geologic log and/or well construction log. Corrected for total depth measured at site.

MP = measuring point.
TOWC = Top of well casing.

BMP = below measuring point.
BGS = below ground surface.

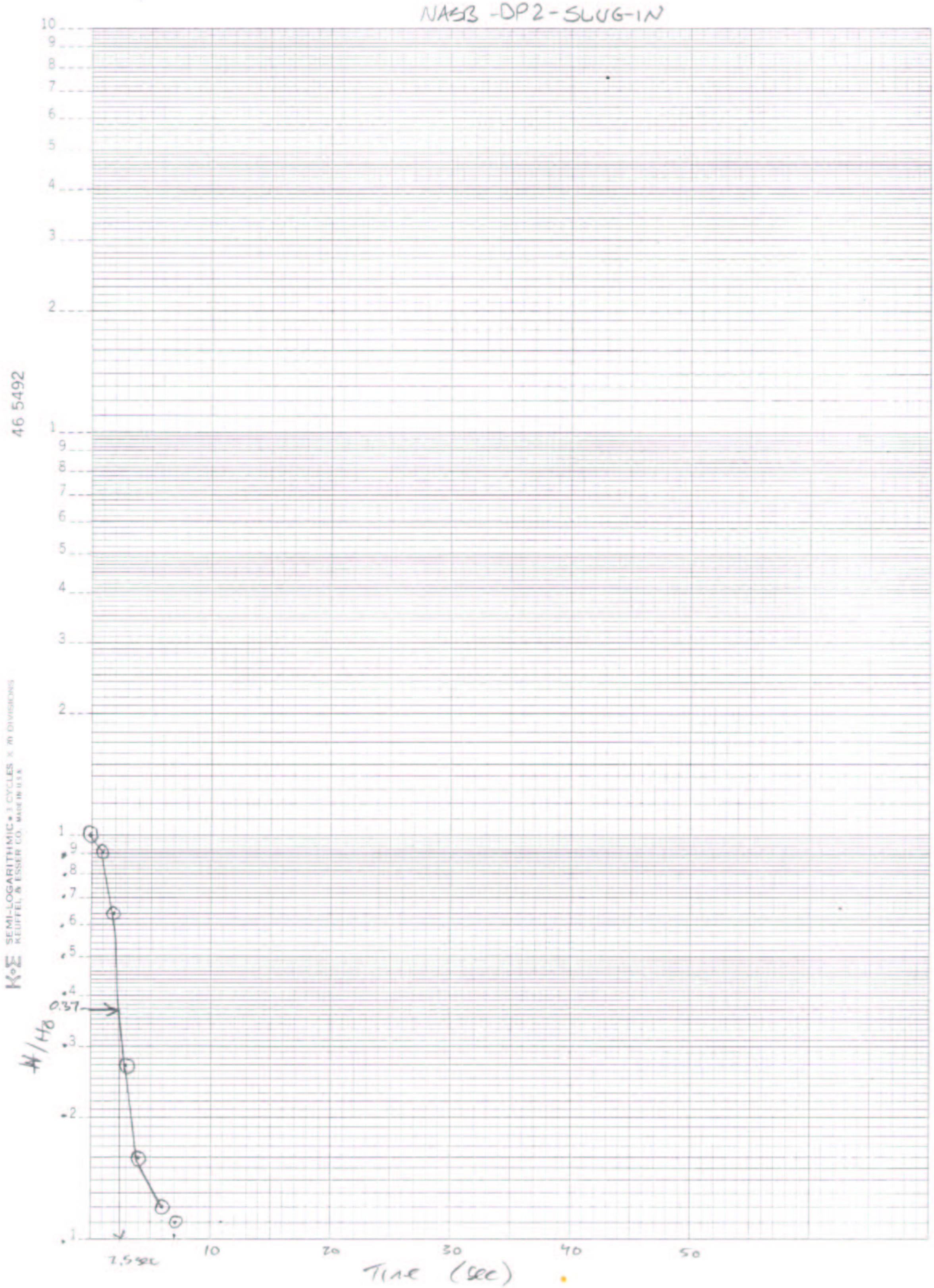
HYDRAULIC CONDUCTIVITY CALCULATIONS

Parameters Units	r (ft)	R (ft)	L_e (ft)	T_0 (sec)	K (ft/sec)	K (ft/day)
MW-B27-DP2-SLUG-IN	**0.031**	**0.104**	**4.61**	**2.50**	**1.58E-04**	**13.7**
MW-B27-DP4-SLUG-IN	**0.031**	**0.104**	**2.52**	**6.50**	**9.35E-05**	**8.1**
MW-SDP-5-SLUG-IN	**0.031**	**0.104**	**4.95**	**32.00**	**1.17E-05**	**1.0**
MW-DP-9-SLUG-IN	**0.031**	**0.104**	**7.05**	**0.75**	**3.83E-04**	**33.1**
MW-NASB-226-SLUG-IN	**0.083**	**0.208**	**7.54**	**2.30**	**7.13E-04**	**61.6**
MW-NASB-226-SLUG-OUT	**0.083**	**0.208**	**5.00**	**3.35**	**6.54E-04**	**56.5**

GEOMETRIC MEAN CALCULATION

K (ft/day)	Ln (K)	
13.7	2.617	
8.1	2.092	
1.0	0.000	
33.1	3.500	
61.6	4.121	
Mean Ln(K)	2.466	
exp [mean ln(K)]	**11.8**	**Geometric Mean K (ft/day)**

References:
Fetter, C. W., 1994. Applied Hydrogeology. Prentice-Hall, Inc., pp. 101-102; 243-255.
Hvorslev, M.J., 1951, Time Lag and Soil Permeability in Ground-Wate Observations. Army Corps of Engineers Bulletin No. 36.


NASB -DP2-SLUG-IN
46 5492
K+E SEMI-LOGARITHMIC • 3 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
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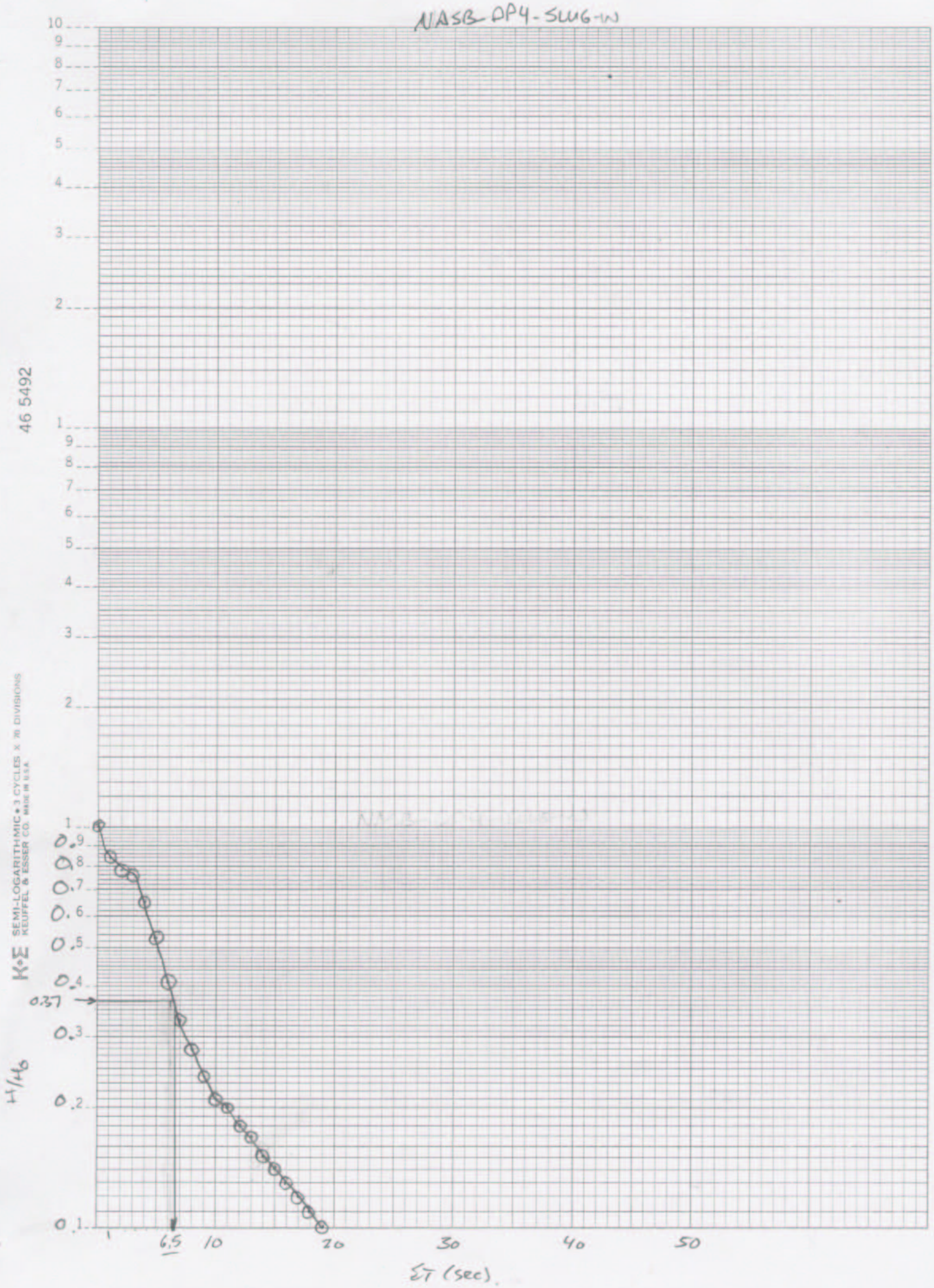
NASB-DP4-SLUG-W
46 5492
K+E SEMI-LOGARITHMIC • 3 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
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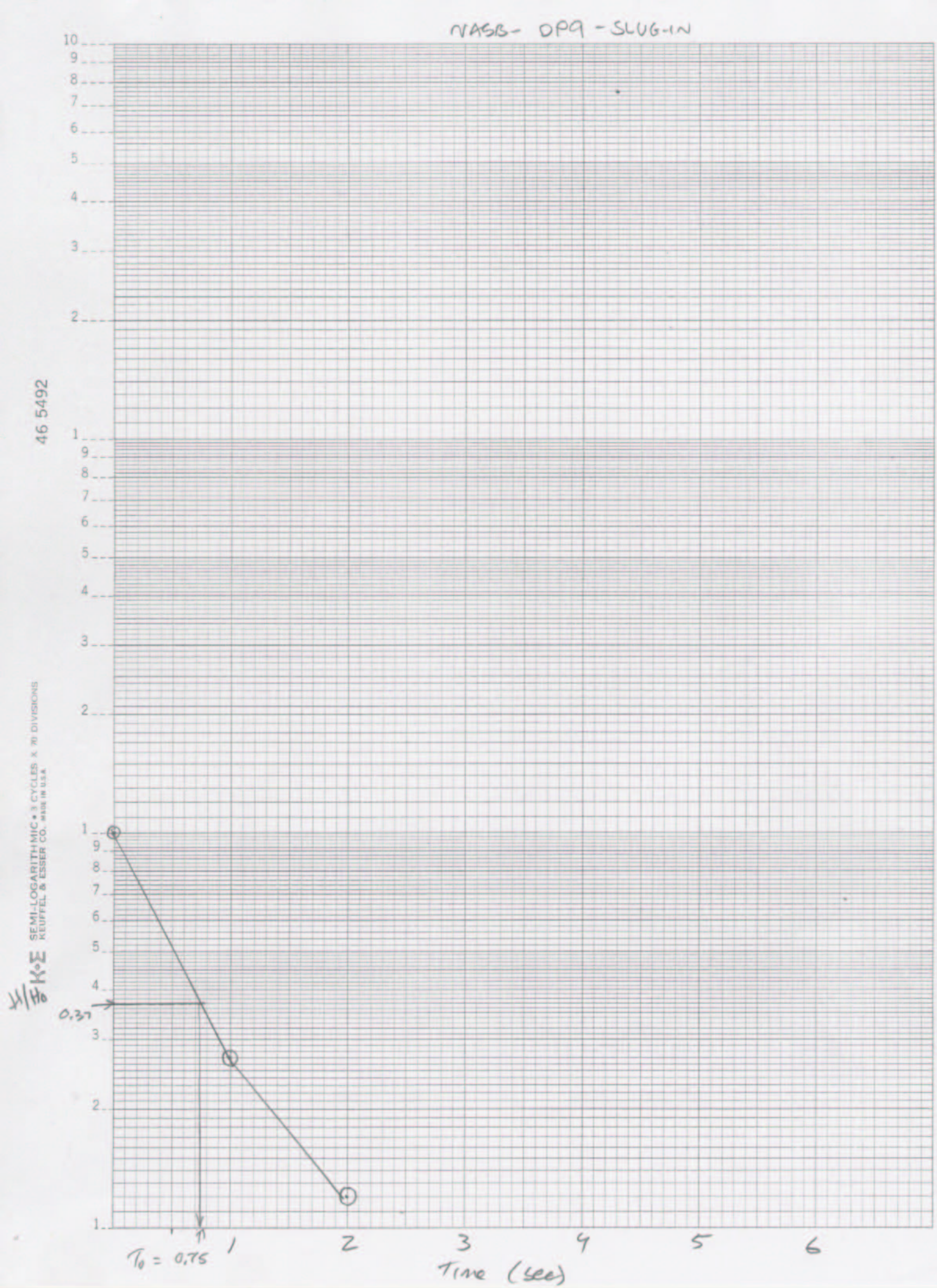
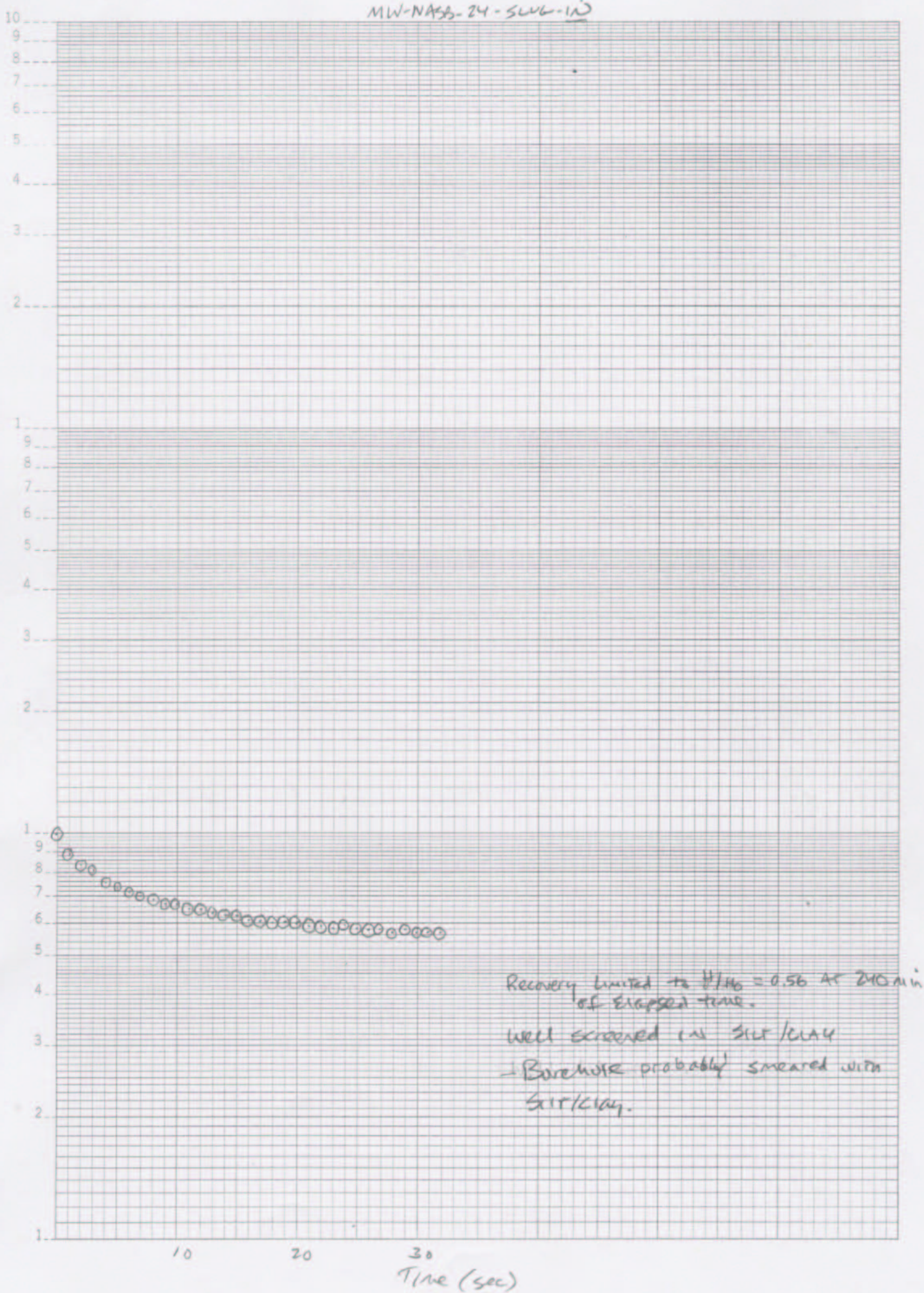
1
9
8
7
6
5
4
3
2
1
0.9
0.8
0.7
0.6
0.5
0.4
0.37
0.3
0.2
0.1
H/H0
1
6.5
10
20
30
40
50
ΣT (sec)

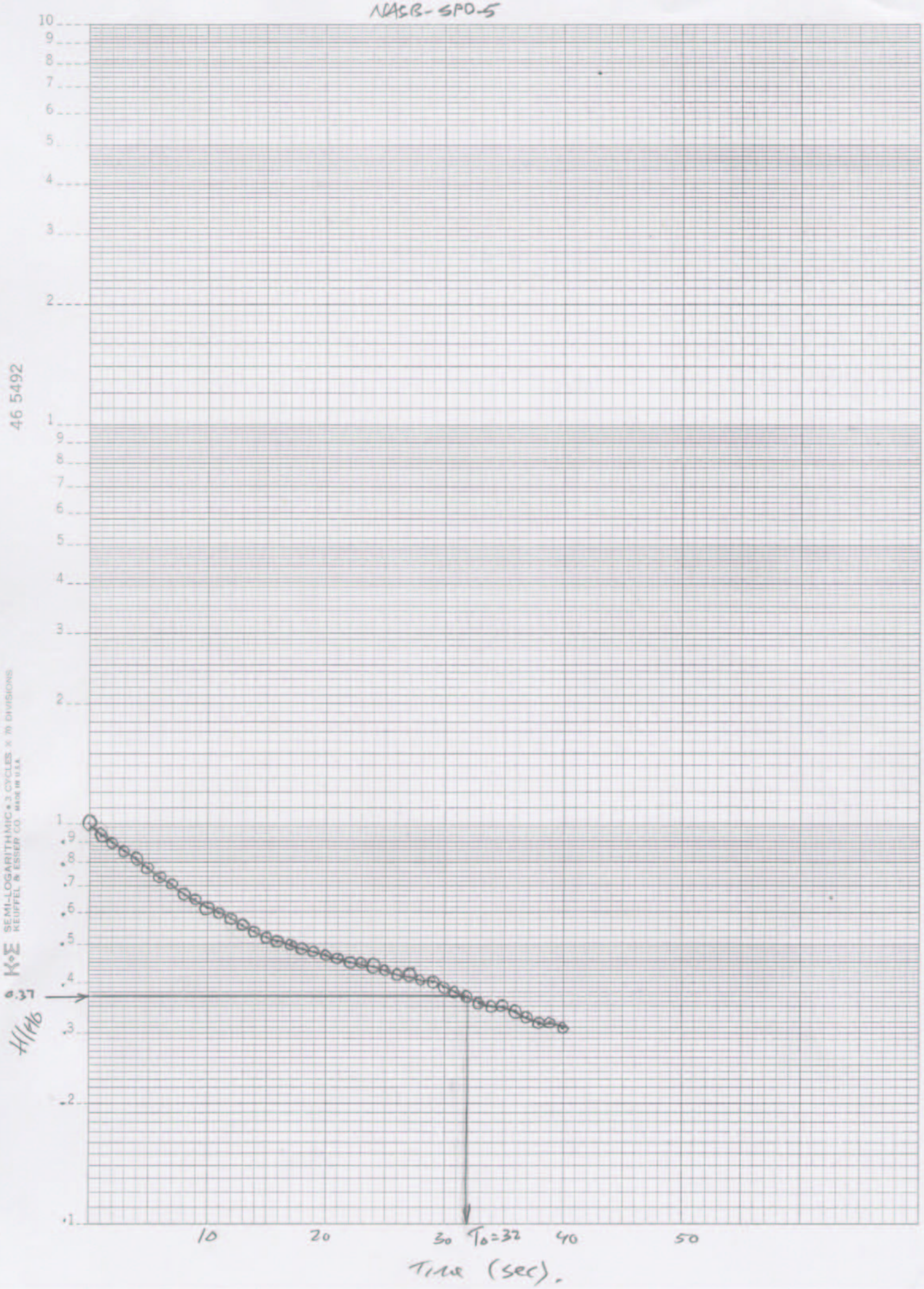

NASB- DP9 - SLUG-IN
46 5492
SEMI-LOGARITHMIC • 3 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
K&E
0.37
T_0 = 0.75
Time (sec)

MW-NASB-24-SLUG-IN

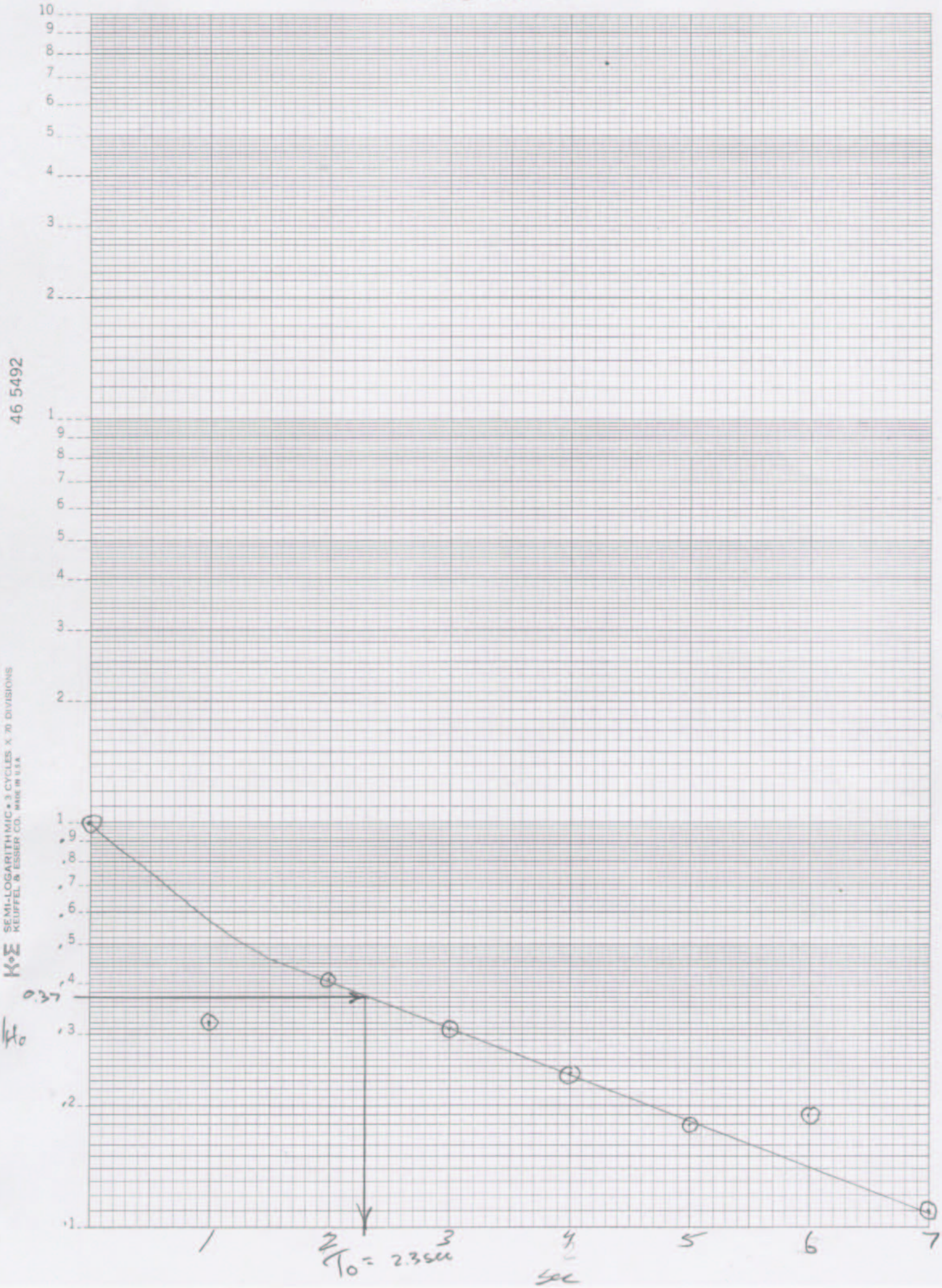


46 5492
K+E SEMI-LOGARITHMIC • 3 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

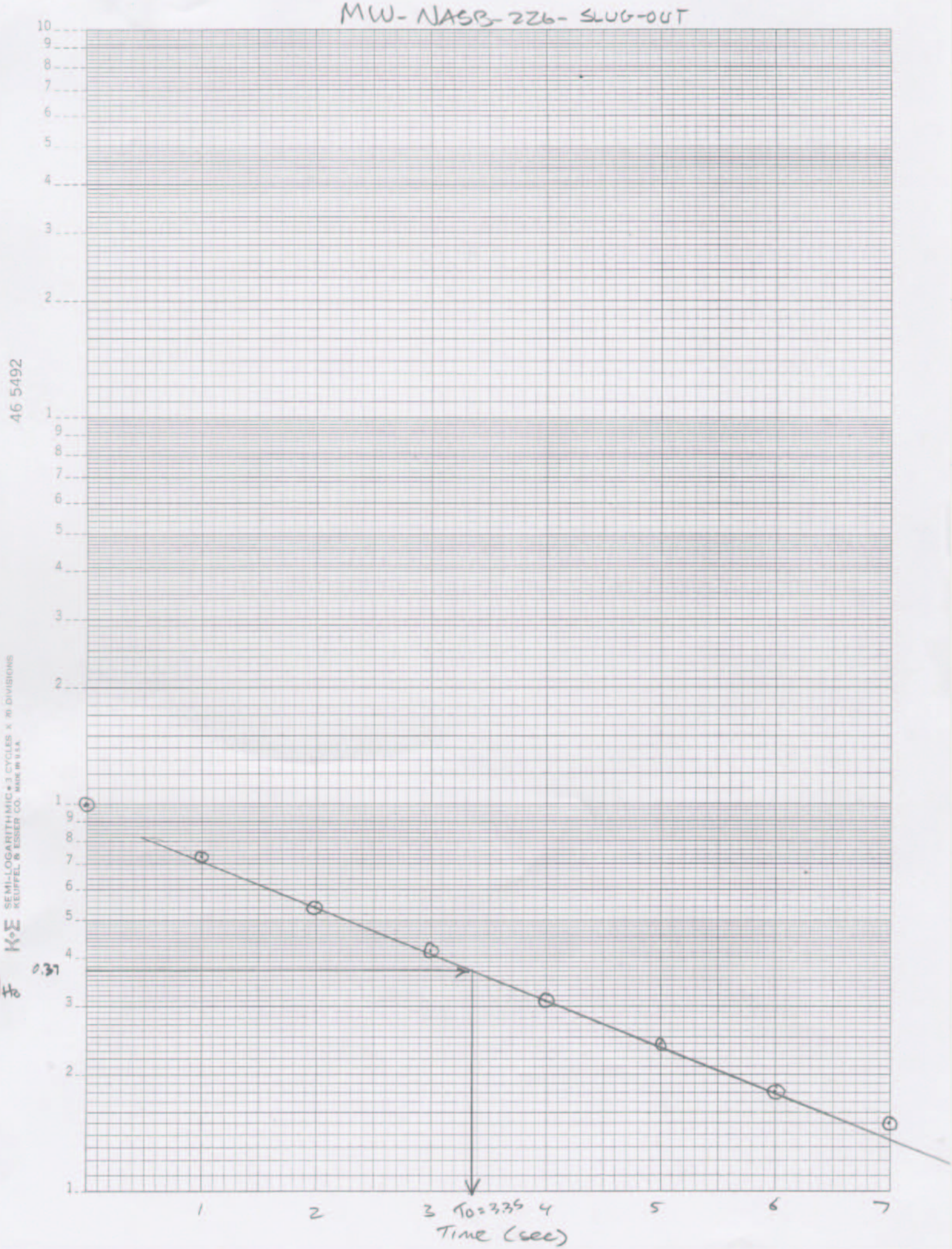
NASB-SPD-5

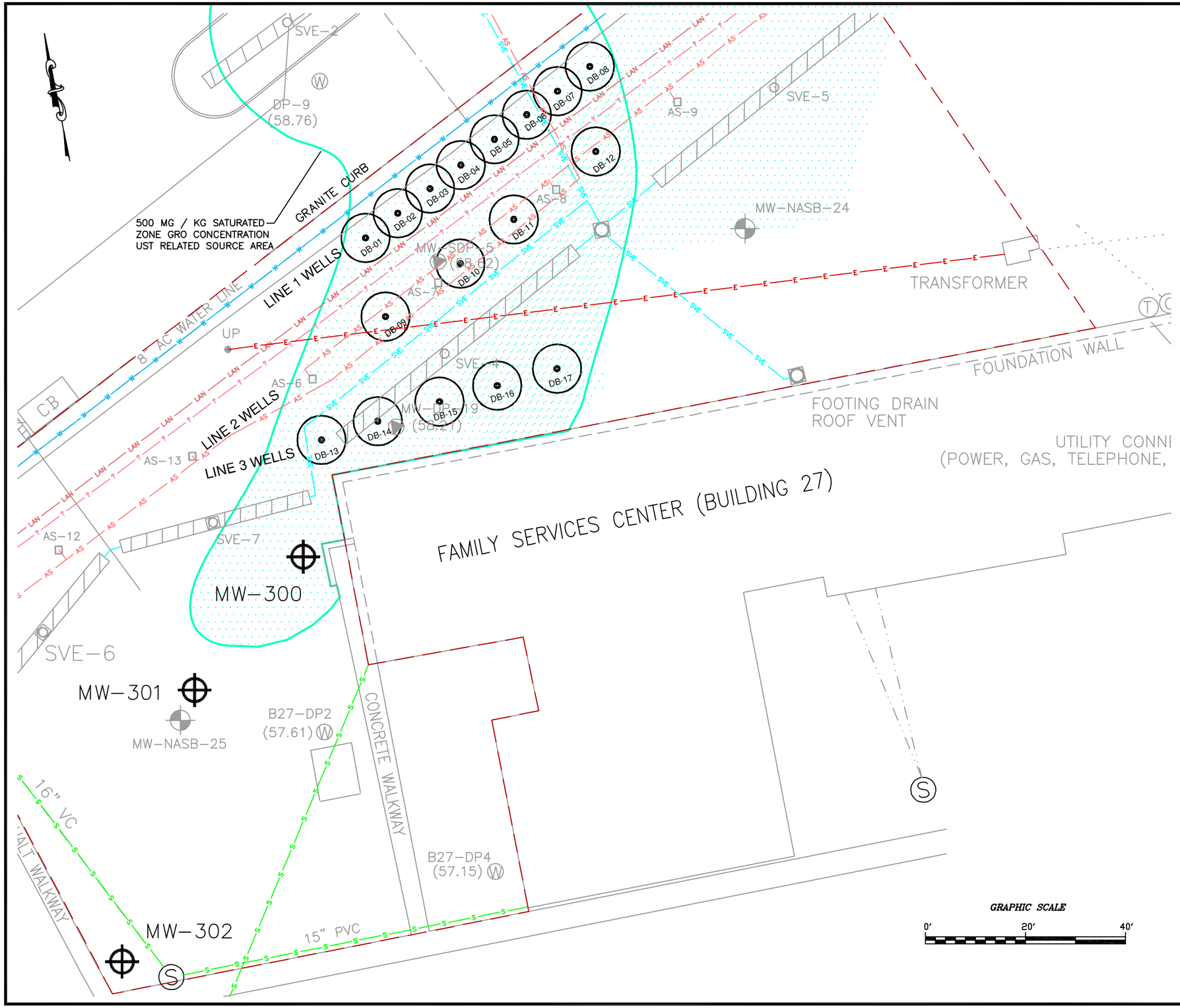

46 5492
K+E SEMI-LOGARITHMIC • 3 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
10
9
8
7
6
5
4
3
2
1
9
8
7
6
5
4
3
2
1
.9
.8
.7
.6
.5
.4
0.37
.3
.2
.1
10
20
30
$T_0 = 32$
40
50
Time (sec).

MW-NASB-226- SLUG-IN



MW-NASB-226-SLUG-OUT





LEGEND

- MONITORING WELL
- FIRE HYDRANT WITH BOLLARDS
- UTILITY POLE
- STORM WATER CATCH BASIN
- MANHOLE
- EXISTING CHAIN LINK FENCE
- UNDERGROUND STRUCTURE
- APPROXIMATE AREA OF INTEREST
- ELECTRIC LINE
- WATER LINE
- SEWER LINE
- SVE SYSTEM
- LAN LINE
- AIR SPARGE LINE
- UNKNOWN LINE
- PROPOSED NBLEND APPLICATION WELL DB SERIES
- PROPOSED MONITORING WELL
- DBB PILOT TEST AREA

NOTES:

1. BASE MAP DEVELOPED FROM ERM-NEW ENGLAND, INC. SITE PLAN DATED 24 JUNE 1992 AND SURVEYS PERFORMED BY CORNERSTONE PROFESSIONAL LAND SURVEYING, INC., 20 MAY 1994, 19 JULY 1995, MAY 1997, AND 7 NOVEMBER 2001.
2. BASE MAP UPDATED AND VERIFIED BASED ON SURVEY COMPLETED 11 JUNE 2003 BY BRIAN SMITH SURVEYORS, INC.
3. SOIL VAPOR EXTRACTION/AIR SPARGING SYSTEM COMPONENTS NOT SHOWN.
4. UTILITIES SHOWN FOR REFERENCE PURPOSE ONLY. ACTUAL LOCATIONS MUST BE FIELD VERIFIED.
5. PROPOSED WELL LOCATIONS TO BE IN SUBSTANTIAL COMPLIANCE WITH PLAN BUT LOCATIONS MAY CHANGE DUE TO ACTUAL UTILITY AND/OR OTHER OBSTRUCTIONS FOUND IN THE FIELD.

SOURCE:

FOCUSED FEASIBILITY STUDY, NAVY EXCHANGE SERVIE STATION, NAVAL AIR STATION, BRUNSWICK, MAINE; EA ENGINEERING, SCIENCE, AND TECHNOLOGY, INC. APRIL 2004.

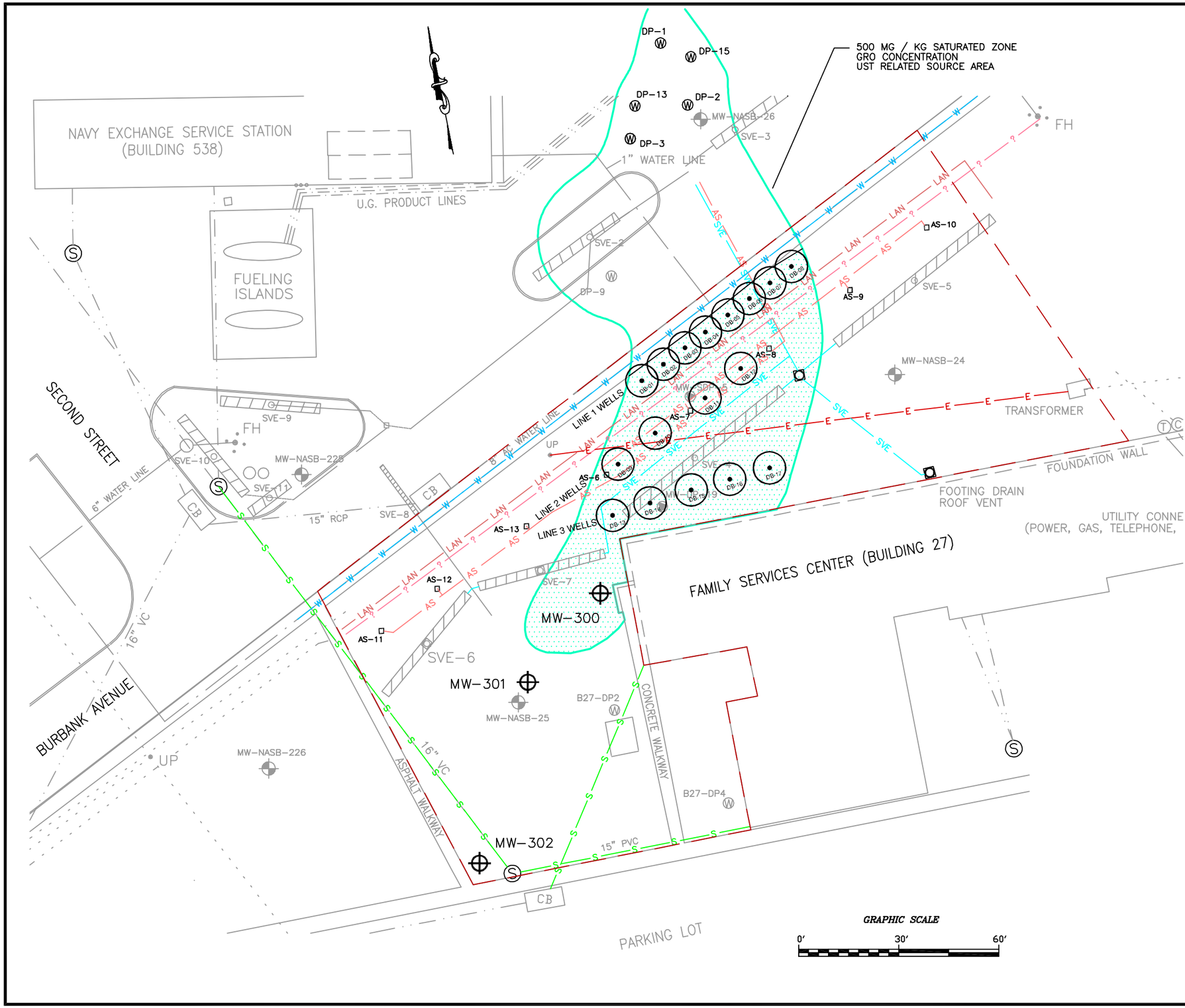
GEOPHYSICAL SURVEY, HAGER-RICHTER GEOSCIENCE, INC., SALEM, NEW HAMPSHIRE, AUGUST 2004.

TETRA TECH NUS, INC.

PROPOSED WELL LOCATIONS
NAVAL EXCHANGE SERVICE STATION
US NAVY NAVFAC EFANE
NAVAL AIR STATION, BRUNSWICK, MAINE

FILE	SCALE
DWG\4590\3511\WELL_LOC_PROP.DWG	AS NOTED

FIGURE NUMBER	REV	DATE
1	1	09/23/04



LEGEND

- MONITORING WELL
- FIRE HYDRANT WITH BOLLARDS
- UTILITY POLE
- STORM WATER CATCH BASIN
- MANHOLE
- EXISTING CHAIN LINK FENCE
- UNDERGROUND STRUCTURE
- APPROXIMATE AREA OF INTEREST
- ELECTRIC LINE
- WATER LINE
- SEWER LINE
- SVE SYSTEM
- LAN LINE
- AIR SPARGE LINE
- UNKNOWN LINE
- PROPOSED NBLEND APPLICATION WELL DB SERIES
- PROPOSED MONITORING WELL
- DBB PILOT TEST AREA

NOTES:

1. BASE MAP DEVELOPED FROM ERM-NEW ENGLAND, INC. SITE PLAN DATED 24 JUNE 1992 AND SURVEYS PERFORMED BY CORNERSTONE PROFESSIONAL LAND SURVEYING, INC., 20 MAY 1994, 19 JULY 1995, MAY 1997, AND 7 NOVEMBER 2001.
2. BASE MAP UPDATED AND VERIFIED BASED ON SURVEY COMPLETED 11 JUNE 2003 BY BRIAN SMITH SURVEYORS, INC.
3. SOIL VAPOR EXTRACTION/AIR SPARGING SYSTEM COMPONENTS NOT SHOWN.
4. UTILITIES SHOWN FOR REFERENCE PURPOSE ONLY. ACTUAL LOCATIONS MUST BE FIELD VERIFIED.
5. PROPOSED SAMPLE LOCATIONS TO BE IN SUBSTANTIAL COMPLIANCE WITH PLAN BUT LOCATIONS MAY CHANGE DUE TO ACTUAL UTILITY AND/OR OTHER OBSTRUCTIONS FOUND IN THE FIELD.

SOURCE:

FOCUSED FEASIBILITY STUDY, NAVY EXCHANGE SERVIE STATION, NAVAL AIR STATION, BRUNSWICK, MAINE; EA ENGINEERING, SCIENCE, AND TECHNOLOGY, INC. APRIL 2004.

GEOPHYSICAL SURVEY, HAGER-RICHTER GEOSCIENCE, INC., SALEM, NEW HAMPSHIRE, AUGUST 2004.

TETRA TECH NUS, INC.

SITE PLAN OF KNOWN UTILITY LOCATIONS
NAVAL EXCHANGE SERVICE STATION
US NAVY NAVFAC EFANE
NAVAL AIR STATION, BRUNSWICK, MAINE

FILE	SCALE
DWG\4590\3511\SITE_PLAN.DWG	AS NOTED
FIGURE NUMBER 2	REV 0 / DATE 09/14/04

APPENDIX B

GROUNDWATER SAMPLE COLLECTION LOGS

TETRA TECH NUS, INC.

SAMPLE LOG SHEET - "LOW FLOW" GROUNDWATER

Site Name: Navy Exchange Service Station
Sample ID: NEX-gw-DB01

Tetra Tech NUS Job No./PMS N4590-0515
QC: NA (If applicable)

Sample Method: Low Flow
Depth Sampled: _____ Feet Screened Interval Depth _____ feet
Sample Date & Time: 3 / 30 / 5 1610 hours _____ /Dup
Sampler(s): _____
Data Recorded By: C. Sanchez Signature: Craig Sulz
Notes:
∇_0 = 7.03

H&S Survey Meter _____ PPM Field Instrument Group A/B/C/D
Pre-pump insertion WL _____ ft Post - pump insertion WL _____ ft

Analysis	Bottle Lot#	Analysis	Bottle Lot #	Analysis	Bottle Lot #
VPH					
gro					
Nitrate	Nitrite				

Clock Time 24hr	Water Depth below MP ft	Pump Dial 1	Purge Rate ml/min	Cum. Volume Purged liters	Temp °C	Spec. Cond. 2 mS/cm	pH	ORP/Eh3 mv	DO mg/L	Turbidity NTU	Comments
1540	7.03		200		8.9	2.4	6.7	-153	2.0	45	
1545	7.03		200		8.8	1.5	6.7	-145	1.7	40	
1550	7.03		200		8.8	1.3	6.8	-146	1.6	9.6	
1555	7.03		200		8.8	1.2	6.9	-147	1.6	4.9	
1600	7.03		200		8.8	1.1	6.8	-145	1.6	3.0	
1605	7.03		200		8.9	1.2	6.8	-146	1.5	2.7	

1. Pump dial setting (for example: hertz, cycle/min, etc.)
2. Siemens per cm (same as umhos/cm) at 25 °C.
3. Oxidation reduction potential (stand in for Eh).

Tt NUS Form 0009

TETRA TECH NUS, INC.

SAMPLE LOG SHEET - "LOW FLOW" GROUNDWATER

Site Name: Navy Exchange Service Station
Sample ID: NEX - GW - OB4

Tetra Tech NUS Job No./PMS N4590-0515
QC: NA (If applicable)

Sample Method: Low Flow
Depth Sampled: _____ Feet Screened Interval Depth _____ feet
Sample Date & Time: 3/30/5 1525 hours _____/Dup
Sampler(s): C. Sanchez
Data Recorded By: C. Sanchez Signature: [signature]
Notes:
∇_0 = 7.40

H&S Survey Meter _____ PPM Field Instrument Group A/B/C/D
Pre-pump insertion WL _____ ft Post - pump insertion WL _____ ft

Analysis	Bottle Lot#	Analysis	Bottle Lot #	Analysis	Bottle Lot #
VOH	Nutrients				
TOC	~~[illegible]~~	Microscopy			
~~Nitrate~~	Nitrate				

Clock Time 24hr	Water Depth below MP ft	Pump Dial 1	Purge Rate ml/min	Cum. Volume Purged liters	Temp °C	Spec. Cond. 2 mS/cm	pH	ORP/Eh3 mv	DO mg/L	Turbidity NTU	Comments
1415	7.40		200		8.1	10.1	6.5	100	9.8	210	
1420					7.9	9.1	6.4	87	8.1	175	
1425					7.8	5.7	6.4	61	7.6	160	
1430					7.9	3.1	6.5	43	7.1	135	
1435					7.8	2.9	6.4	31	6.0	110	
1440					7.9	2.5	6.5	28	5.0	105	
1445	7.40		200		7.9	2.7	6.5	23	3.1	100	
1450	7.4		200		7.8	2.3	6.4	19	2.2	65	
1455	7.4		200		7.9	1.9	6.5	7	2.0	55	
1500	7.4		200		7.9	1.9	6.5	5	1.9	60	
1505	7.4		200		8.0	1.9	6.4	3	1.7	50	
1510	7.4		200		8.0	1.8	6.4	1	1.6	45	
1515	7.4		200		8.0	1.8	6.4	2	1.5	47	
1520	7.4		200		7.9	1.8	6.4	1	1.6	43	
1525	parameters stable / collect sample										

1. Pump dial setting (for example: hertz, cycle/min, etc.)
2. Siemens per cm (same as umhos/cm) at 25 °C.
3. Oxidation reduction potential (stand in for Eh).

Tt NUS Form 0009

[signature]

TETRA TECH NUS, INC.

SAMPLE LOG SHEET - "LOW FLOW" GROUNDWATER

Site Name: Navy Exchange Service Station
Sample ID: NEX-gw-DB7

Tetra Tech NUS Job No./PMS N4590-0515
QC: NA (If applicable)

Sample Method: Low Flow
Depth Sampled: _____ Feet Screened Interval Depth _____ feet
Sample Date & Time: 3 / 30 / 5 1330 hours _____ /Dup
Sampler(s): C. Sandy
Data Recorded By: C. Sandy Signature: Craig Sandy
Notes:
$\nabla_1 = 6.7$ (*)

H&S Survey Meter _____ PPM Field Instrument Group A/B/C/D
Pre-pump insertion WL _____ ft Post - pump insertion WL _____ ft

Analysis	Bottle Lot#	Analysis	Bottle Lot #	Analysis	Bottle Lot #
VOA					
gro					
Nitrate	Nitrate				

Clock Time 24hr	Water Depth below MP ft	Pump Dial 1	Purge Rate ml/min	Cum. Volume Purged liters	Temp °C	Spec. Cond. 2 uS/cm	pH	ORP/Eh3 mv	DO mg/L	Turbidity NTU	Comments
1300	6.7 (*)		200		8.9	34.1	6.4	-16	2.3	210	cloudy
1305			200		8.8	27.3	6.5	-27	3.7	209	
1310			200		8.7	25.2	6.6	-47	4.7	207	
1315			well	went	dry	while	purging				
			will	let	recovery	&	grab	sample			
1330	collect	sample									

1. Pump dial setting (for example: hertz, cycle/min, etc.)
2. Siemens per cm (same as umhos/cm) at 25 °C.
3. Oxidation reduction potential (stand in for Eh).

Tt NUS Form 0009

(*) probe appears to be malfuctioning - can not establish reading

Note: In the next well DB04 H_2O level worked fine - suspect possible

TETRA TECH NUS, INC.

SAMPLE LOG SHEET - "LOW FLOW" GROUNDWATER

Site Name: Navy Exchange Service Station
Sample ID: NEX-GW-DB9

Tetra Tech NUS Charge No. _____
QC: NA (If applicable)

Sample Method: Low Flow
Depth Sampled: _____ Feet Screened Interval Depth _____ feet
Sample Date & Time: 3/31/5 0935 hours _____ /Dup
Sampler(s): C. Sanchez
Data Recorded By: C. Sanchez Signature: Craig Sanchez
Notes:
V_0 = 6.83

H&S Survey Meter _____ PPM Field Instrument Group A/B/C/D
Pre-pump insertion WL _____ ft Post - pump insertion WL _____ ft

Analysis	Bottle Lot #	Analysis	Bottle Lot #	Analysis	Bottle Lot #
~~VOH(CS)~~	9.0	Nutrients			
~~EPH~~	VOH	Microscopy			
	Nitrate	Nitrite			

Clock Time 24hr	Water Depth below MP ft	Pump Dial 1	Purge Rate ml/min	Cumm. Volume Purged liters	Temp °C	Spec. Cond. 2 mS/cm	pH	ORP/Eh3 mv	DO mg/L	Turbidity NTU	Comments
0900	6.83		200		8.8	1.3	6.9	-18	4.0	19	
0905	6.87		200		8.8	1.4	6.9	-43	3.5	15	
0910	6.85		150		9.0	1.4	7.0	-54	3.3	11	
0915	6.83		150		9.1	1.4	7.0	-51	3.5	7.1	
0920	6.83		150		9.0	1.4	7.0	-51	3.6	5.0	
0925	6.83		150		9.1	1.4	7.0	-52	3.7	3.1	
0930	6.83		150		9.1	1.4	7.0	-53	3.7	2.7	
0935											

TtNUS Form 0009

1. Pump dial setting (for example: hertz, cycle/min, etc.)
2. Siemens per cm (same as umhos/cm) at 25 °C.
3. Oxidation reduction potential (stand in for Eh).

TETRA TECH NUS, INC.

SAMPLE LOG SHEET - "LOW FLOW" GROUNDWATER

Site Name: Navy Exchange Service Station
Sample ID: NEX-gw-DB10

Tetra Tech NUS Job No./PMS N4590-0515
QC: NA (If applicable)

Sample Method: Low Flow
Depth Sampled: _____ Feet Screened Interval Depth _____ feet
Sample Date & Time: 3 / 30 / 5 1130 hours _____ /Dup
Sampler(s): C. Sanchez
Data Recorded By: C. Sanchez Signature: Craig
Notes:

H&S Survey Meter _____ PPM Field Instrument Group A/B/C/D
Pre-pump insertion WL 6.83 ft Post - pump insertion WL _____ ft

Analysis	Bottle Lot#	Analysis	Bottle Lot #	Analysis	Bottle Lot #
VPH	Nutrients				
gro	Microscopy				
Nitrate	Nitrite				

Clock Time 24hr	Water Depth below MP ft	Pump Dial 1	Purge Rate ml/min	Cum. Volume Purged liters	Temp °C	Spec. Cond. 2 mS/cm	pH	ORP/Eh3 mv	DO mg/L	Turbidity NTU	Comments
1055	6.83	begin purge									
1100	6.85		200		7.0	8.5	6.13	57	5.7	7.1	
1105	6.86		200		7.0	5.7	6.1	87	3.0	6.7	
1110	6.85		200		7.1	5.3	6.1	56	3.1	5.5	
1115	6.83		200		7.0	5.1	6.0	56	2.9	5.4	
1120	6.83		200		7.0	5.1	6.0	57	2.7	5.3	
1125	6.83		200		6.9	4.9	6.0	56	2.7	5.2	
1130		parameters	stable	collect sample							

1. Pump dial setting (for example: hertz, cycle/min, etc.)
2. Siemens per cm (same as umhos/cm) at 25 °C.
3. Oxidation reduction potential (stand in for Eh).

Tt NUS Form 0009

TETRA TECH NUS, INC.

SAMPLE LOG SHEET - "LOW FLOW" GROUNDWATER

Site Name: Navy Exchange Service Station
Sample ID: NEX-gw-DB11

Tetra Tech NUS Job No./PMS N4590-0515
QC: NA (If applicable)

Sample Method: Low Flow
Depth Sampled: _____ Feet Screened Interval Depth _____ feet
Sample Date & Time: 3 / 30 / 5 1220 hours _____ /Dup
Sampler(s): C. Sanchez
Data Recorded By: C. Sanchez Signature: Craig Sanchez
Notes:

T_w = 6.99

H&S Survey Meter _____ PPM Field Instrument Group A/B/C/D
Pre-pump insertion WL _____ ft Post - pump insertion WL _____ ft

Analysis	Bottle Lot#	Analysis	Bottle Lot #	Analysis	Bottle Lot #
VOH	Nutrients				
gcu	Microscopy				
Nitrate	Nitrite				

Clock Time 24hr	Water Depth below MP ft	Pump Dial 1	Purge Rate ml/min	Cum. Volume Purged liters	Temp °C	Spec. Cond. 2 uS/cm	pH	ORP/Eh3 mv	DO mg/L	Turbidity NTU	Comments
1145	6.99		200		6.7	2.7	6.3	101	13.1	9.9	Clear
1150	6.99				7.6	2.4	6.2	100	5.9	7.1	
1155					7.3	2.0	6.2	98	6.0	6.0	
1200					7.1	1.4	6.1	100	5.5	5.1	
1205					7.1	1.4	6.1	100	5.4	3.9	
1210					7.1	1.5	6.1	99	5.4	2.1	
1215	6.99		200		7.0	1.4	6.1	101	5.4	2.0	
1220	Parameters stable / Start sampling										

1. Pump dial setting (for example: hertz, cycle/min, etc.)
2. Siemens per cm (same as umhos/cm) at 25 °C.
3. Oxidation reduction potential (stand in for Eh).

Tt NUS Form 0009

TETRA TECH NUS, INC.

SAMPLE LOG SHEET - "LOW FLOW" GROUNDWATER

Site Name: Navy Exchange Service Station
Sample ID: NEX-gw-DB14

Tetra Tech NUS Job No./PMS N4590-0515
QC: MS/MSD / LAB QC (If applicable)

Sample Method: Low Flow
Depth Sampled: _____ Feet Screened Interval Depth _____ feet
Sample Date & Time: 3/29/5 1350 5 hours NA /Dup
Sampler(s): C. Sanchez
Data Recorded By: C. Sanchez Signature: Cara Sanchez
Notes:

∇_0 = 7.75

time start = 1515
sample time = 1550 CS 3-29-5

H&S Survey Meter _____ PPM Field Instrument Group A/B/C/D
Pre-pump insertion WL _____ ft Post - pump insertion WL _____ ft

Analysis	Bottle Lot#	Analysis	Bottle Lot #	Analysis	Bottle Lot #
VPH	Nutrients				
GRO	Microscopy				
Nitrate	Nitrite				

Clock Time 24hr 5	Water Depth below MP ft	Pump Dial 1	Purge Rate ml/min	Cum. Volume Purged liters	Temp °C	Spec. Cond. 2 µS/cm	pH	ORP/Eh3 mv	DO mg/L	Turbidity NTU	Comments
1315	7.75		200		7.4	0.72	6.6	57	6.0	10	clear
1320	7.75		200		7.5	2.56	6.3	13	2.5	7.3	
1325	7.75		200		7.5	2.59	6.3	10	2.5	5.1	
1330	7.75		200		7.6	2.60	6.3	8	2.4	4.7	
1335	7.75		200		7.6	2.59	6.3	7	2.4	4.5	
1340	7.75		200		7.6	2.60	6.3	6	2.4	4.1	
1345	7.75		200		7.6	2.60	6.3	5	2.4	3.9	
1350 5	parameters		stable /	start sampling							

1. Pump dial setting (for example: hertz, cycle/min, etc.)
2. Siemens per cm (same as umhos/cm) at 25 °C.
3. Oxidation reduction potential (stand in for Eh).

Tt NUS Form 0009

TETRA TECH NUS, INC.

SAMPLE LOG SHEET - "LOW FLOW" GROUNDWATER

Site Name: NASB-NEX
Sample ID: NEX-GW1-DB18

Tetra Tech NUS Charge No. 4590-0515
QC: NEX-GW-DUP02 (If applicable)

Sample Method: low-flow → peri pump
Depth Sampled: 14' Feet Screened Interval Depth 5-16 feet
Sample Date & Time: 3/31/05 1130 hours 1135 N/A /Dup
Sampler(s): J. Lambert
Data Recorded By: J. Lambert Signature: J. Lambert
Notes: start initial purge without hariba → well has not been developed yet.

H&S Survey Meter 0.0 PPM Field Instrument Group A/B/C/D
Pre-pump insertion WL / ft Post - pump insertion WL 7.09 ft

Analysis	Bottle Lot #	Analysis	Bottle Lot #	Analysis	Bottle Lot #
VPH					
GRO					

Clock Time 24hr	Water Depth below MP ft	Pump Dial 1	Purge Rate ml/min	Cumm. Volume Purged liters ~~gal~~	Temp °C	Spec. Cond. 2 uS/cm	pH	ORP/Eh3 mv	DO mg/L	Turbidity NTU	Comments
1035	7.09		begin purge - water is ex. cloudy - will purge a few min to see if it clears up.*								
1045	7.11		water clear; begin filling flow-through cell								
1050	7.12		250		9.43	0.820	7.23	-92	4.57	11.3	
1055	7.12		250		9.35	0.808	7.29	-101	2.57	5.07	
1100	7.12		250		9.29	0.808	7.32	-107	2.37	3.86	
1105	7.13		250		9.35	0.809	7.32	-108	2.38	3.12	
1110	7.13		250		9.33	0.808	7.33	-111	2.41	2.99	water has yellow tinge
1115	7.13		250		9.36	0.809	7.34	-112	2.42	2.33	**
1120	7.13		250		9.39	0.809	7.34	-113	2.44	1.84	
1125	7.13		250	4.5	9.31	0.805	7.34	-114	2.52	2.16	
→ turb. is hovering around 2NTU; all other parameters have been stable for 25 min											

TtNUS Form 0009

1. Pump dial setting (for example: hertz, cycle/min, etc.)
2. Siemens per cm (same as umhos/cm) at 25 °C.
3. Oxidation reduction potential (stand in for Eh).

* strong petroleum odor on purge water.
* water still has faint jet. odor

TETRA TECH NUS, INC.

SAMPLE LOG SHEET - "LOW FLOW" GROUNDWATER

Site Name: Navy Exchange Service Station
Sample ID: NEX-gw-MW300

Tetra Tech NUS Job No./PMS N4590-0515
QC: DUP01 (If applicable)

Sample Method: Low Flow
Depth Sampled: _____ Feet Screened Interval Depth _____ feet
Sample Date & Time: 3/29/5 1435 hours 1440 /Dup
Sampler(s):
Data Recorded By: C. Sanchez Signature: Craig Sanchez
Notes:
Well is frozen - cannot get H_2O level probe down hole. Only H_2O out.

H&S Survey Meter _____ PPM Field Instrument Group A/B/C/D
Pre-pump insertion WL NA ft Post - pump insertion WL NA ft

Analysis	Bottle Lot#	Analysis	Bottle Lot #	Analysis	Bottle Lot #
gro	Metals				
VOH	Microscopy				
Nitrate	Nitrite				

Clock Time 24hr	Water Depth below MP ft	Pump Dial 1	Purge Rate ml/min	Cum. Volume Purged liters	Temp °C	Spec. Cond. 2 uS/cm	pH	ORP/Eh3 mv	DO mg/L	Turbidity NTU	Comments
1400	N.R.		200		7.5	0.97	6.7	-12	4.5	9.0	
1405			200		7.4	0.96	6.6	-10	4.3	7.6	
1410			200		7.4	0.95	6.5	-9	4.1	6.0	
1415			200		7.3	0.95	6.3	-9	4.2	5.1	
1420			200		7.3	0.95	6.2	-8	4.0	4.9	
1425			200		7.4	0.95	6.1	-9	4.1	4.7	
1430	N.R.		200		7.3	0.95	6.1	-9	4.2	4.5	
1435		parameters stable / begin sampling									

1. Pump dial setting (for example: hertz, cycle/min, etc.)
2. Siemens per cm (same as umhos/cm) at 25 °C.
3. Oxidation reduction potential (stand in for Eh).

Tt NUS Form 0009

TETRA TECH NUS, INC.

SAMPLE LOG SHEET - "LOW FLOW" GROUNDWATER

Site Name: Navy Exchange Service Station
Sample ID: NEX-gw-MW301

Tetra Tech NUS Job No./PMS N4590-0515
QC: NA (If applicable)

Sample Method: Low Flow
Depth Sampled: _____ Feet Screened Interval Depth _____ feet
Sample Date & Time: 3/29/5 1335 hours NA /Dup
Sampler(s): C. Sanchez
Data Recorded By: C. Sanchez Signature: Craig Sanchez
Notes:

T_0 = 6.15

H&S Survey Meter 0.0 PPM Field Instrument Group A/B/C/D
Pre-pump insertion WL NA ft Post - pump insertion WL NA ft

Analysis	Bottle Lot#	Analysis	Bottle Lot #	Analysis	Bottle Lot #
gro	Nutrients				
vpH	Microscopy				
Nitrate	Nitrite				

Clock Time 24hr	Water Depth below MP ft	Pump Dial 1	Purge Rate ml/min	Cum. Volume Purged liters	Temp °C	Spec. Cond. 2 mS/cm	pH	ORP/Eh3 mv	DO mg/L	Turbidity NTU	Comments
1300	6.15		175		7.6	0.49	6.3	174	7.3	9.6	
1305	6.15		175		7.6	0.50	6.2	175	1.7	7.1	
1310	6.15		177		7.7	0.51	6.1	178	1.4	5.1	
1315	6.15		175		7.8	0.53	6.1	179	1.2	2.7	
1320	6.15		175		7.8	0.53	6.1	177	1.2	2.1	
1325	6.15		175		7.8	0.53	6.1	178	1.3	2.0	
1330	6.15		175		7.8	0.53	6.1	178	1.3	1.9	
1335	6.15		parameters stable/ collect sample								

1. Pump dial setting (for example: hertz, cycle/min, etc.)
2. Siemens per cm (same as umhos/cm) at 25 °C.
3. Oxidation reduction potential (stand in for Eh).

Tt NUS Form 0009

TETRA TECH NUS, INC.

SAMPLE LOG SHEET - "LOW FLOW" GROUNDWATER

Site Name: Navy Exchange Service Station
Sample ID: NEX-gw-mw302

Tetra Tech NUS Job No./PMS N4590-0515
QC: NA (If applicable)

Sample Method: Low Flow
Depth Sampled: _____ Feet Screened Interval Depth _____ feet
Sample Date & Time: 3 / 29 / 5 1145 hours NA /Dup
Sampler(s): Craig Sanchez
Data Recorded By: Craig Sanchez Signature: _____
Notes:

V_o = 5.5

H&S Survey Meter 0.0 PPM Field Instrument Group A/B/C/D
Pre-pump insertion WL NA ft Post - pump insertion WL NA ft

Analysis	Bottle Lot#	Analysis	Bottle Lot #	Analysis	Bottle Lot #
gro	Nutrients				
voh	~~Microbiol~~	Microscopy			
Nitrate/Nitrite					

Clock Time 24hr	Water Depth below MP ft	Pump Dial 1	Purge Rate ml/min	Cum. Volume Purged liters	Temp °C	Spec. Cond. 2 mS/cm	pH	ORP/Eh3 mv	DO mg/L	Turbidity NTU	Comments
1100	5.5		200		6.3	0.33	6.2	247	6.9	140	Slight yellow color
1105	5.5		200		6.2	0.30	6.2	245	5.1	130	
1110	5.5		200		6.1	0.28	6.3	243	4.5	90	clear
1115	5.5		200		6.0	0.27	6.3	243	3.2	36	
1120	5.5		200		6.0	0.27	6.2	239	2.9	25	
1125	5.5		200		6.2	0.27	6.2	237	2.4	20	
1130	5.5		200		6.0	0.27	6.2	235	2.2	15	
1135	5.5		200		6.1	0.27	6.1	234	2.1	13	
1140	5.5		200		6.1	0.27	6.1	235	2.0	11	
1145	parameters stable - sample										

1. Pump dial setting (for example: hertz, cycle/min, etc.)
2. Siemens per cm (same as umhos/cm) at 25 °C.
3. Oxidation reduction potential (stand in for Eh).

Tt NUS Form 0009

TETRA TECH NUS, INC.

SAMPLE LOG SHEET - "LOW FLOW" GROUNDWATER

Site Name: Navy Exchange Service Station
Sample ID: NEx-GW-DP13

Tetra Tech NUS Job No./PMS
QC: NA (If applicable)

Sample Method: Low Flow
Depth Sampled: Feet Screened Interval Depth feet
Sample Date & Time: 3/31/5 1100 hours /Dup
Sampler(s): C. Sanchez
Data Recorded By: Signature:
Notes:

V_o = 7.15

H&S Survey Meter PPM Field Instrument Group A/B/C/D
Pre-pump insertion WL ft Post - pump insertion WL ft

Analysis	Bottle Lot#	Analysis	Bottle Lot #	Analysis	Bottle Lot #
gro	Microscopy				
vph	Nutrients				
Nitrate	Nitrate				

Clock Time 24hr	Water Depth below MP ft	Pump Dial 1	Purge Rate ml/min	Cum. Volume Purged liters	Temp °C	Spec. Cond. 2 uS/cm	pH	ORP/Eh3 mv	DO mg/L	Turbidity NTU	Comments
1020	7.15		200		8.2	0.57	6.3	36	0.6	17	
1025	7.19		200		8.2	0.56	6.4	42	0.6	15	
1030	7.20		150		7.1	0.56	6.4	55	0.6	13	
1035	7.19		150		8.0	0.56	6.4	61	0.6	12	
1040	7.17		150		8.3	0.56	6.3	76	0.8	10	
1045	7.15		150		8.2	0.56	6.3	78	0.7	7.1	
1050	7.15		150		8.1	0.56	6.3	82	0.7	6.9	
1055	7.15		150		8.0	0.56	6.3	84	0.7	6.7	
1100		parameters	stable	/ collect	sample						

1. Pump dial setting (for example: hertz, cycle/min, etc.)
2. Siemens per cm (same as umhos/cm) at 25 °C.
3. Oxidation reduction potential (stand in for Eh).

Tt NUS Form 0009

TETRA TECH NUS, INC.

SAMPLE LOG SHEET - "LOW FLOW" GROUNDWATER

Site Name: NEX - Navy Exchange Service Station
Sample ID: NEX-GW-5QP5

Tetra Tech NUS Job No./PMS N4590-05 15
QC: NA (If applicable)

Sample Method: Low Flow
Depth Sampled: _____ Feet Screened Interval Depth _____ feet
Sample Date & Time: 3 / 30 / 5 1005 hours _____ /Dup
Sampler(s): C. Sanchez
Data Recorded By: C. Sanchez Signature: Craig Sanchez
Notes:

H&S Survey Meter _____ PPM Field Instrument Group A/B/C/D
Pre-pump insertion WL _____ ft Post - pump insertion WL _____ ft

Analysis	Bottle Lot#	Analysis	Bottle Lot #	Analysis	Bottle Lot #
VOH	Nutrients				
GRO	Microscopy				
Nitrate	Nitrite				

Clock Time 24hr	Water Depth below MP ft	Pump Dial 1	Purge Rate ml/min	Cum. Volume Purged liters	Temp °C	Spec. Cond. 2 mμS/cm	pH	ORP/Eh3 mv	DO mg/L	Turbidity NTU	Comments
0930	6.83		200		6.5	3.00	6.06	140	2.25	9.0	Clear
0935	6.85				6.5	3.0	6.1	137	2.1	8.0	
0940	6.87				6.5	2.98	6.6	135	1.9	4.6	
0945	6.85				6.4	2.95	6.0	135	1.7	4.1	
0950	6.83				6.5	2.94	6.1	134	1.7	3.7	
0955	6.83				6.6	2.94	6.0	135	1.8	3.5	
1000	6.83		200		6.6	2.94	6.0	134	1.7	3.1	
1005		parameters stable / start sampling									

1. Pump dial setting (for example: hertz, cycle/min, etc.)
2. Siemens per cm (same as umhos/cm) at 25 °C.
3. Oxidation reduction potential (stand in for Eh).

Tt NUS Form 0009

APPENDIX C

SOIL BORING LOGS

BORING LOG FOR: NEX- NASB
PROJECT NO.: 4590-0516
LOGGED BY: J. Lambert
DRILLED BY (Company/Driller): Yarmouth Env / E. Thomas
GRD. SURFACE ELEVATION:

TRANSCRIBED BY:
ELEVATION FROM:

BORING NO.: MW300- S01
START DATE: 3/30/05
COMPLETION: DATE: 3/30/05
MON. WELL NO.: NA
CHECKED BY:

DEPTH (FEET) 0	BLOWS PER 6" N/A	SAMP REC. / SAMP LENG.	SAMPLING TIME & SAMPLE NO. (QA/QC STATUS)	DEPTH MAT'L CHG./ WELL PROF'L	SOIL DENSITY/ CONSIS. or ROCK HARD.	CLR	MATERIAL CLASSIFICATION	USCS or ROCK BRKN	REMARKS (moisture condition; odors; geological classification; rock weathering; etc.)	FIELD SCREENING DATA METHOD = [FID, (PPM)]
8			no soil samples collected from 0-8' bgs							PID=
9		2.1/4			loose	gray	8-9.5' = ~~fine~~ SAND, fine-medium, sl. odor - sample 9-9.5'	SP		
10			NEX-S01-MW300-0910 1510		sl. loose	tan	9.5-10.2' = SAND, fine-medium - JH		sl. odor when broken up	103
11						gray	10.2-11.5 - SAND, medium, some fine sand			
12						orange	11.5-12 - SAND, fine-medium, oxidized			
13		2.0/2	NEX-S01-MW300-1213 1520		loose	lt brown	12-12.5 - SAND, fine-medium			
					sl. loose		12.5-13.5 - SILT, trace fine sand - JH	ML		0.0
14					loose	blue-gray	13.5-14 = CLAY, some silt,	SC		

TYPE OF DRILLING RIG: Geoprobe
METHOD OF ADVANCING BORING: DPT
METHOD OF SOIL SAMPLING: 1.5" acetate liner
METHOD OF ROCK CORING: NA
GROUNDWATER LEVELS:
OTHER OBSERVATIONS: sample target depth = 9-9.5' 12-12.5'
material / observations = gray-stained F-M sand sand above silt

Tetra Tech NUS, Inc.

BORING NO. MW300-S01

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Ttnus Form 0018

BORING LOG FOR: NEX- NASB
PROJECT NO.: 4590-0516
LOGGED BY: J. Lambert
DRILLED BY (Company/Driller): Yarmouth Env / E. Thomas
GRD. SURFACE ELEVATION:

TRANSCRIBED BY:
ELEVATION FROM:

BORING NO.: MW302 - 501
START DATE: 3/30/05
COMPLETION: DATE: 3/30/05
MON. WELL NO.: NA
CHECKED BY:

DEPTH (FEET)	BLOWS PER 6"	SAMP REC. / SAMP LENG.	SAMPLING TIME & SAMPLE NO. (QA/QC STATUS)	DEPTH MAT'L CHG./ WELL PROF'L	SOIL DENSITY/ CONSIS. or ROCK HARD.	CLR	MATERIAL CLASSIFICATION	USCS or ROCK BRKN	REMARKS (moisture condition; odors; geological classification; rock weathering; etc.)	FIELD SCREENING DATA METHOD = [FID, (PPM)]
0	N/A									
			no samples 0-6' bgs							PID=
6										
		2.5/4	NEX-501-MW301-0708 1600		sl. loose	lt brown	6-6.8 = SAND, fine-medium	SP	wet	0.0
7						tan	6.8 - 9' = ~~color c~~ SAND, medium, some fine sand			
						orange	8-9' = similar to above; color change only - dark orange band top 0.5"			
8									no odor noted	
9										
		2.0/2	NEX-501-MW301-0910 1610			~~dk brown~~ orange	9-10 - SAND, medium, some fine sand			0.6
10										

TYPE OF DRILLING RIG: Geoprobe
METHOD OF ADVANCING BORING: DPT
METHOD OF SOIL SAMPLING: 1.5" acetate liner
METHOD OF ROCK CORING: NA
GROUNDWATER LEVELS:
OTHER OBSERVATIONS: sample target depth = 6-8' 9-10
material/observations = ~~bottom~~ above orange dk orange over

Tetra Tech NUS, Inc.

BORING NO.: MW301-502 PAGE: 1 OF 1

Tnus Form 0018

BORING 3 FOR: NEX-NASB
PROJECT NO.: 4590-0516
LOGGED BY: J. Lambert
DRILLED BY (Company/Driller): Yarmouth Env / E. Thomas
GRD. SURFACE ELEVATION:

TRANSCRIBED BY:
ELEVATION FROM:

BORING NO.: MW-302A -SO1
START DATE: 3/29/05
COMPLETION: DATE: 3/29/05
MON. WELL NO.: NA
CHECKED BY:

DEPTH (FEET)	BLOWS PER 6" N/A	SAMP REC. / SAMP LENG.	SAMPLING TIME & SAMPLE NO. (QA/QC STATUS)	DEPTH MAT'L CHG./ WELL PROF'L	SOIL DENSITY/ CONSIS. or ROCK HARD.	CLR	MATERIAL CLASSIFICATION	USCS or ROCK BRKN	REMARKS (moisture condition; odors; geological classification; rock weathering; etc.)	FIELD SCREENING DATA METHOD = [FID, (PPM)]
0				0-2' no sample collected						PID=
2										
		2.6/4	4		Sl. loose	orange-brn,	2-2.4'=SAND, med, some fine sand	SP	JH=2'	OS
3						tan comp	2.4-4' SAND, fine-medium			
			NEX-S01-MW302-0304 1000				4-4.5 - sim. to above; band of iron staining → sample			
4										
							4.5-6=SAND, fine, some medium			
5			NEX-S01-MW302-0506 1015				micaceous fragments at 5.5-6'			
6										

TYPE OF DRILLING RIG: Geoprobe
METHOD OF ADVANCING BORING: DPT
METHOD OF SOIL SAMPLING: 1.5" acetate liner
METHOD OF ROCK CORING: NA
GROUNDWATER LEVELS:
OTHER OBSERVATIONS: sample target depth = 2.3-4, 4.5-6
material / observations = SAND, iron staining, tan SAND (f-m)

BORING NO.: MW-302A -S01

Tetra Tech NUS, Inc.

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Ttnus Form 0018

BORING LOG FOR: NEX- NASB
PROJECT NO.: 4590-0516
LOGGED BY: J. Lambert
DRILLED BY (Company/Driller): Yarmouth Env / E. Thomas
GRD. SURFACE ELEVATION:

TRANSCRIBED BY:
ELEVATION FROM:

BORING NO.: DB1-S01
START DATE: 3/29/05
COMPLETION: DATE: 3/29/05
MON. WELL NO.: N/A
CHECKED BY:

DEPTH (FEET)	BLOWS PER 6"	SAMP REC. / SAMP LENG.	SAMPLING TIME & SAMPLE NO. (QA/QC STATUS)	DEPTH MAT'L CHG./ WELL PROF'L	SOIL DENSITY/ CONSIS. or ROCK HARD.	CLR	MATERIAL CLASSIFICATION	USCS or ROCK BRKN	REMARKS (moisture condition; odors; geological classification; rock weathering; etc.)	FIELD SCREENING DATA METHOD = [FID, (PPM)]
0	N/A		no samples collected 0-8' bgs							PID=
8										
9		3.5/4	NEX-S01DB01-0809 1245		Sl. loose	tan-brown	8-8.5 - SAND, fine, some medium sand	SP	moderate odor when sleeve opened	
						tan	8.5-9 - similar to above - color change only			
10						black	9-9.5 - similar to above, stained		← SH	20cot
						tan	9.5-11.5 - SAND, fine			
11										
12						gray	11.5-12 - similar to above; gray staining - will collect part of sample here			
13		1.8/2	NEX-S01-DB01-1213 1305			gray-tan	12-14 - SAND, fine, some medium sand → SH at 14'		Sl. odor throughout 12-14' interval	JH=67
14										
15										

TYPE OF DRILLING RIG: Geoprobe
METHOD OF ADVANCING BORING: DPT
METHOD OF SOIL SAMPLING: 1½" acetate liner
METHOD OF ROCK CORING: NA
GROUNDWATER LEVELS:
OTHER OBSERVATIONS: sample target depth = 8.5-9' 12-13.5'
material / observations = stained F-M sand fine sand, odor

BORING NO.: DB1-S01

Tetra Tech NUS, Inc.

PAGE: 1 OF 1

Ttnus Form 0018

BORING LOG FOR: NEX-NASB
PROJECT NO.: 4590-0516
LOGGED BY: J. Lambert
DRILLED BY (Company/Driller): Yarmouth Env / E. Thomas
GRD. SURFACE ELEVATION:

TRANSCRIBED BY:
ELEVATION FROM:

BORING NO.: DB-03-501
START DATE: 3/29/05
COMPLETION: DATE: 3/29/05
MON. WELL NO.: NA
CHECKED BY:

DEPTH (FEET)	BLOWS PER 6"	SAMP REC. / SAMP LENG.	SAMPLING TIME & SAMPLE NO. (QA/QC STATUS)	DEPTH MAT'L CHG./ WELL PROF'L	SOIL DENSITY/ CONSIS. or ROCK HARD.	CLR	MATERIAL CLASSIFICATION	USCS or ROCK BRKN	REMARKS (moisture condition; odors; geological classification; rock weathering; etc.)	FIELD SCREENING DATA METHOD = [FID, (PPM)]
8	N/A		no samples taken to 10'							PID=
10										
11		2.5/4	1150 NEX-SO-DB03-1011 = MS/MSD		sl. loose	brown	10-12 SAND, fine, some medium. no discrete zones of staining	SP	strong odor upon opening sleeve	1406
12										
13		2.5/4	1200 NEX-SO-DB03-1213		sl. dense		12.5-13.8 sandy SILT; trace very fine sand.	SM		
14					loose	gray-blue	13.8-14 - trace silty CLAY at end of liner.	SC		

TYPE OF DRILLING RIG: Geoprobe
METHOD OF ADVANCING BORING: DPT
METHOD OF SOIL SAMPLING: 1½" acetate liner
METHOD OF ROCK CORING: NA
GROUNDWATER LEVELS:
OTHER OBSERVATIONS: sample target depth = 10.5-11' 12-13'
material / observations = F+M sand, black staining tan sandy silt

Tetra Tech NUS, Inc.

BORING NO. DB03-501

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BORING LOG FOR: NEX- NASB
PROJECT NO.: 4590-0516
LOGGED BY: J. Lambert
DRILLED BY (Company/Driller): Yarmouth Env / E. Thomas
GRD. SURFACE ELEVATION:

TRANSCRIBED BY:
ELEVATION FROM:

BORING NO.: DB-5-S01
START DATE: 3/29/05
COMPLETION: DATE: 3/29/05
MON. WELL NO.: NA
CHECKED BY:

DEPTH (FEET)	BLOWS PER 6" N/A	SAMP REC. / SAMP LENG.	SAMPLING TIME & SAMPLE NO. (QA/QC STATUS)	DEPTH MAT'L CHG./ WELL PROF'L	SOIL DENSITY/ CONSIS. or ROCK HARD.	CLR	MATERIAL CLASSIFICATION	USCS or ROCK BRKN	REMARKS (moisture condition; odors; geological classification; rock weathering; etc.)	FIELD SCREENING DATA METHOD = [FID, (PPM)]
8			no samples taken 0-8' bgs							PID=
9		30/4	NEX-S01-DB5-0809 1120		loose	brown	8-9' - SAND, fine, ~~med~~ some medium	SP	sl. pet. odor top 0.5' no sheen noted	787
10					sl. dense		9-10.6' - SILT, some fine sand, has thin laminations ~~last~~ bottom 1.6'	ML		
11		2.4/4	NEX-S01-DB5-0910 1130		sl. loose	blue-gray	10.6 - SILTY CLAY, trace fine sand	SC		
12		NV								

TYPE OF DRILLING RIG: Geoprobe
METHOD OF ADVANCING BORING: DPT
METHOD OF SOIL SAMPLING: 1.5" acetate liner
METHOD OF ROCK CORING: NA
GROUNDWATER LEVELS:
OTHER OBSERVATIONS: sample target depth = 8-9'
material / observations = f-M sand, sheen on sample → 9-10.5' tan silt, some fine sand

BORING NO.: DB5-S01

Tetra Tech NUS, Inc.

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BORING LOG FOR: NEX-NASB
PROJECT NO.: 4590-0516
LOGGED BY: J. Lambert
DRILLED BY (Company/Driller): Yarmouth Env / E. Thomas
GRD. SURFACE ELEVATION:

TRANSCRIBED BY:
ELEVATION FROM:

BORING NO.: DB-08-S01
START DATE: 3/29/05
COMPLETION: DATE: 3/29/05
MON. WELL NO.: NA
CHECKED BY:

DEPTH (FEET)	BLOWS PER 6" N/A	SAMP REC. / SAMP LENG.	SAMPLING TIME & SAMPLE NO. (QA/QC STATUS)	DEPTH MAT'L CHG./ WELL PROF'L	SOIL DENSITY/ CONSIS. or ROCK HARD.	CLR	MATERIAL CLASSIFICATION	USCS or ROCK BRKN	REMARKS (moisture condition; odors; geological classification; rock weathering; etc.)	FIELD SCREENING DATA METHOD = [FID, (PPM)]
			no samples collected 0-8'							PID=
8										
		3/4	1650 NEX-S01-DB08-0804		sl. loose	brown	8-8.4 - SAND, fine-medium, some mottling of dark brown	SP	~~3H~~	~~0.9~~
9					sl. dense		8.4-9 - SILT, trace fine sand	ML		
			~~1055 - NEX-S01-DUP01~~			olive gray	9-9.3' = similar to above - color change only			0.9
10						brown	9.3-~~9.5~~ 10 SILT, trace fine sand		no odor noted	
		~~2/6~~ 4	1110 NEX-S01-DB08-1011		sl. loose	gray-blue	~~9.5-12~~ 10-12 = SILTY CLAY	SC		
11										
			NEX-S01-DUP01 1115 ~~1075~~							
12									← SC	1.0

TYPE OF DRILLING RIG: Geoprobe
METHOD OF ADVANCING BORING: DPT
METHOD OF SOIL SAMPLING: 1.5" acetate liner
METHOD OF ROCK CORING: NA
GROUNDWATER LEVELS:
OTHER OBSERVATIONS: sample target depth = 8-8.8' 9.7-11.5
material / observations = F-M sand tan-orange SILT, some fine sand

BORING NO.: DB08-S01

Tetra Tech NUS, Inc.

PAGE: 1 OF 1

Ttnus Form 0018

BORING LOG FOR: NEX- NASB
PROJECT NO.: 4590-0516
LOGGED BY: J. Lambert
DRILLED BY (Company/Driller): Yarmouth Env / E. Thomas
GRD. SURFACE ELEVATION:

TRANSCRIBED BY:
ELEVATION FROM:

BORING NO.: DB9-S01
START DATE: 3/29/05
COMPLETION: DATE: 3/29/05
MON. WELL NO.: NA
CHECKED BY:

DEPTH (FEET)	BLOWS PER 6"	SAMP REC. / SAMP LENG.	SAMPLING TIME & SAMPLE NO. (QA/QC STATUS)	DEPTH MAT'L CHG./ WELL PROF'L	SOIL DENSITY/ CONSIS. or ROCK HARD.	CLR	MATERIAL CLASSIFICATION	USCS or ROCK BRKN	REMARKS (moisture condition; odors; geological classification; rock weathering; etc.)	FIELD SCREENING DATA METHOD = [FID, (PPM)]
0	N/A									PID=
			no samples 0-8' bgs							
8'										
		3.0/4	NEX-S01-DB09-0809 1400		sl loose	tan	8-8.8' = SAND, fine, some medium sand	SP	JH moderate odor throughout upper 2' (8-10')	2000+
9						black	8.8-9' - small band of black staining			
			NEX-S01-DUP02 1405			tan	9-11 SAND, fine, some medium. grades to fine and medium sand in 2 feet			
10										
11										
		3.1/4	NEX-S01-DB09-1112 1410		sl loose	black	11-11.2 - heavy staining, some mat.		JH 11.=11.5	125
12						olive gray	11.2-12 = SILT, some clay	ML		

TYPE OF DRILLING RIG: Geoprobe
METHOD OF ADVANCING BORING: DPT
METHOD OF SOIL SAMPLING: 1.5" acetate liner
METHOD OF ROCK CORING: NA
GROUNDWATER LEVELS:
OTHER OBSERVATIONS: sample target depth = 8.4-8.6' 8.6-9 11-11.2
material / observations = Black F-M sand - some stains. F-M sand stained

attempt 3 DB9
attempt 2
attempt 1

Tetra Tech NUS, Inc.

BORING NO.: DB09-S01
PAGE: 1 OF 1

Ttnus Form 00

note - obstructions in 2 locations - had to move NW of well to get below 9'

BORING LOG FOR: NEX- NASB
PROJECT NO.: 4590-0516
LOGGED BY: J. Lambert
DRILLED BY (Company/Driller): Yarmouth Env / E. Thomas
GRD. SURFACE ELEVATION:

TRANSCRIBED BY:
ELEVATION FROM:

BORING NO.: DB-10 — SO1
START DATE: 3/29/05
COMPLETION: DATE: 3/29/05
MON. WELL NO.: NA
CHECKED BY:

DEPTH (FEET)	BLOWS PER 6" N/A	SAMP REC. / SAMP LENG.	SAMPLING TIME & SAMPLE NO. (QA/QC STATUS)	DEPTH MAT'L CHG./ WELL PROF'L	SOIL DENSITY/ CONSIS. or ROCK HARD.	CLR	MATERIAL CLASSIFICATION	USCS or ROCK BRKN	REMARKS (moisture condition; odors; geological classification; rock weathering; etc.)	FIELD SCREENING DATA METHOD = [FID, (PPM)]
			no sample 0-8'							PID=
8										
		3,6/4	1430 NEX-SO1-DB10-0910		sl. loose	tan	8.9'-SAND, fine, some medium sand -SP	SP		657
~~10~~ 9						olive gray	9-10.5' SILT, some fine sand		sample	
									3' odor top 3'	
10										
			NEX-SO1-DB10-1212 1440		sl. dense	orange	10.5-11'-SILT, some fine sand, some ~~orange~~ iron staining (CL/mn layers) laminated	ML		
11									sample	
					sl. loose	olive gray	11-11.5'-CLAYEY SILT, trace fine sand	SL		
12					loose		11.5-12 - SILTY CLAY - v. soft + sticky			

TYPE OF DRILLING RIG: Geoprobe
METHOD OF ADVANCING BORING: DPT
METHOD OF SOIL SAMPLING: 1.5" acetate liner
METHOD OF ROCK CORING: NA
GROUNDWATER LEVELS:
OTHER OBSERVATIONS: sample target depth = 9.5-10'
material/observations = sandy SILT, tan
11.5-12 gray-blue silty fine sand

Tetra Tech NUS, Inc.

BORING NO.: DB10-SO1 PAGE: 1 OF 1

Tnus Form 0018

BORING LOG FOR: NEX - NASB
PROJECT NO.: 4590-0516
LOGGED BY: J. Lambert
DRILLED BY (Company/Driller): Yarmouth Env / E. Thomas
GRD. SURFACE ELEVATION:

TRANSCRIBED BY:
ELEVATION FROM:

BORING NO.: DB12- 501
START DATE: 3/29/05
COMPLETION: DATE: 3/29/05
MON. WELL NO.: NA
CHECKED BY:

DEPTH (FEET)	BLOWS PER 6"	SAMP REC. / SAMP LENG.	SAMPLING TIME & SAMPLE NO. (QA/QC STATUS)	DEPTH MAT'L CHG./ WELL PROF'L	SOIL DENSITY/ CONSIS. or ROCK HARD.	CLR	MATERIAL CLASSIFICATION	USCS or ROCK BRKN	REMARKS (moisture condition; odors; geological classification; rock weathering; etc.)	FIELD SCREENING DATA METHOD = [FID, (PPM)]
0	N/A									
			no samples 0-8'							PID=
8										
		3.5/4	NEX-501-DB12-0910 1515 → 9.5-10's sample depth		v. loose	brown	8-~~10~~ 9.5 = SILT, some fine sand; material is v. loose & may have been shifted during transport	ML	no odor / stains noted	
9					↓	↓		↓		
10					sl. loose	blue gray	9.5-10.5 - CLAY, some silt, very plastic	SC		
11							10.5-11 = SILT, trace clay, trace fine sand			
							11-12 - CLAY, trace silt			13.4
12					↓	↓		↓		

TYPE OF DRILLING RIG: Geoprobe
METHOD OF ADVANCING BORING: DPT
METHOD OF SOIL SAMPLING: 1.5" acetate liner
METHOD OF ROCK CORING: NA
GROUNDWATER LEVELS:
OTHER OBSERVATIONS: sample target depth = 8.2-~~10~~ 8.5' 9-10
material / observations = SILT, some F sand SILT just above blue clay

BORING NO.: DB12-501

Tetra Tech NUS, Inc.

PAGE: 1 OF 1

Tinus Form 0018

BORING LOG FOR: NEX-NASB
PROJECT NO.: 4590-0516
LOGGED BY: J. Lambert
DRILLED BY (Company/Driller): Yarmouth Env / E. Thomas
GRD. SURFACE ELEVATION:

TRANSCRIBED BY:
ELEVATION FROM:

BORING NO.: DB-13-S01
START DATE: 3/30/05
COMPLETION: DATE: 3/30/05
MON. WELL NO.: NA
CHECKED BY:

DEPTH (FEET)	BLOWS PER 6"	SAMP REC. / SAMP LENG.	SAMPLING TIME & SAMPLE NO. (QA/QC STATUS)	DEPTH MAT'L CHG./ WELL PROF'L	SOIL DENSITY/ CONSIS. or ROCK HARD.	CLR	MATERIAL CLASSIFICATION	USCS or ROCK BRKN	REMARKS (moisture condition; odors; geological classification; rock weathering; etc.)	FIELD SCREENING DATA METHOD = [FID, (PPM)]
0	N/A									
		-	no samples 0-8' bgs							PID=
8										
		3.1/4			sl. loose	tan		SP		
9										
			NEX-S01-DB13- 0910 1426		5'	tan	8-9.5' = SAND, fine-medium	SP	wet	
10						gray	9.5-10' = similar to above; stained			488
						tan-gray	10-11.2' = SAND, fine-medium		sl. odor	
11							11.2			
						dk gray	11.2-12 - SAND, fine medium, stained, trace micaceous fragments, coarse sand-sized)		→ JH	
12										
		2.5/24	NEX-S01-DB13- 1213 1430			olive gray	12-13' = SAND, fine-medium → JH			85.8
13										
		0.5' slough	DUP03=1435			tan	13-14 = SILTY SAND (fine sand)	SM		
14							→ JH			1.1

TYPE OF DRILLING RIG: Geoprobe
METHOD OF ADVANCING BORING: DPT
METHOD OF SOIL SAMPLING: 1.5" acetate liner
METHOD OF ROCK CORING: NA
GROUNDWATER LEVELS:
OTHER OBSERVATIONS: sample target depth = 9-9.8 / 12-13
material / observations = gray stained F-M sand / gray F-M sand

BORING NO.: DB13-S01

Tetra Tech NUS, Inc.

PAGE: 1 OF 1

Ttnus Form 0018

BORING LOG FOR: NEX-NASB
PROJECT NO.: 4590-0516
LOGGED BY: J. Lambert
DRILLED BY (Company/Driller): Yarmouth Env / E. Thomas
GRD. SURFACE ELEVATION:

TRANSCRIBED BY:
ELEVATION FROM:

BORING NO.: DB-15 S01
START DATE: 3/30/05
COMPLETION: DATE: 3/30/05
MON. WELL NO.: NA
CHECKED BY:

DEPTH (FEET)	BLOWS PER 6"	SAMP REC. / SAMP LENG.	SAMPLING TIME & SAMPLE NO. (QA/QC STATUS)	DEPTH MAT'L CHG./ WELL PROF'L	SOIL DENSITY/ CONSIS. or ROCK HARD.	CLR	MATERIAL CLASSIFICATION	USCS or ROCK BRKN	REMARKS (moisture condition; odors; geological classification; rock weathering; etc.)	FIELD SCREENING DATA METHOD = [FID, (PPM)]
0	N/A									
			sample not collected from 0-8' bgs							PID=
6										
		3.0/4	NEX-S01-DB15-0809		Sl. loose	tan olive gray	8-9.5': SAND, fine medium	SP	no odor noted; MOIST	
9			1400				9.5-9.8': sim. to above, color change only —JH			166
			MS/MSD							
10							9.8-11.5': SILT, some fine sand	SM		
			NEX-S01-DB15-1011							
11			1415							
12						gray-blue	11.5-12': SILT, some clay, trace fine sand —JH	ML		4.6

TYPE OF DRILLING RIG: Geoprobe
METHOD OF ADVANCING BORING: DPT
METHOD OF SOIL SAMPLING: 1.5" line
METHOD OF ROCK CORING: NA
GROUNDWATER LEVELS:
OTHER OBSERVATIONS: sample target depth = 8-9.4 material/observations = tan f-m sand; 9.8-11.5 gray SILT, some fine sand

DB-15
⊗ X → sample location
× ← refusal

Tetra Tech NUS, Inc.

BORING NO.: DB15-S01

Ttnus Form 0018

BORING LOG FOR: NEX- NASB
PROJECT NO.: 4590-0516
LOGGED BY: J. Lambert
DRILLED BY (Company/Driller): Yarmouth Env / E. Thomas
GRD. SURFACE ELEVATION:

TRANSCRIBED BY:
ELEVATION FROM:

BORING NO.: DB-17 -SO1
START DATE: ~~9~~ 3/29/05
COMPLETION: DATE: 3/29/05
MON. WELL NO.: NA
CHECKED BY:

DEPTH (FEET)	BLOWS PER 6" N/A	SAMP REC. / SAMP LENG.	SAMPLING TIME & SAMPLE NO. (QA/QC STATUS)	DEPTH MAT'L CHG./ WELL PROF'L	SOIL DENSITY/ CONSIS. or ROCK HARD.	CLR	MATERIAL CLASSIFICATION	USCS or ROCK BRKN	REMARKS (moisture condition; odors; geological classification; rock weathering; etc.)	FIELD SCREENING DATA METHOD = [FID, (PPM)]
			0-8' = no sample collected							PID=
8										
		3.2/4			sl loose	brown	8-8.5 = SAND fine some medium sand -JH	SP	no odor	10.9
9						tan-orange	8.5-9.5 = SILT some fine sand oxidation staining in layers	SM		
			NEX-SO1-DB17-0809 1545							
10						blue gray	9.5-10.5 = SILT some clay, trace fine sand	ML		
			NEX-SO1-DB17-0910 1555							
11							10.5-12 = CLAY, trace silt	SC		
12										

TYPE OF DRILLING RIG: Geoprobe
METHOD OF ADVANCING BORING: DPT
METHOD OF SOIL SAMPLING: 1.5" acetate liner
METHOD OF ROCK CORING: NA
GROUNDWATER LEVELS:
OTHER OBSERVATIONS: sample target depth = 8-8.5 9-9.5
material / observations = Tan F-M sand silt just below sand

BORING NO.: DB17-SO1

Tetra Tech NUS, Inc.

PAGE: 1 OF 1

Titus Form 0018

BORING LOG FOR: NEX-NASB
PROJECT NO.: 4590-0516
LOGGED BY: J. Lambert
DRILLED BY (Company/Driller): Yarmouth Env / E. Thomas
GRD. SURFACE ELEVATION:

TRANSCRIBED BY:
ELEVATION FROM:

BORING NO.: DB-18
START DATE: 3/30/05
COMPLETION: DATE: 3/30/05
MON. WELL NO.: ~~NA~~ DB-18
CHECKED BY:

DEPTH (FEET)	BLOWS PER 6"	SAMP REC. / SAMP LENG.	SAMPLING TIME & SAMPLE NO. (QA/QC STATUS)	DEPTH MAT'L CHG./ WELL PROF'L	SOIL DENSITY/ CONSIS. or ROCK HARD.	CLR	MATERIAL CLASSIFICATION	USCS or ROCK BRKN	REMARKS (moisture condition; odors; geological classification; rock weathering; etc.)	FIELD SCREENING DATA METHOD = [FID, (PPM)]
0	N/A									
		3.0/4	NA		loose	lt brown	0-0.5'=topsoil, roots/grass	—		PID=
					sl. loose		0.5-1.2'=SAND fine-medium,	SW		
2						↓	trace coarse sand, trace fine subangular gravel	↓	no odor, moist	
						brown	1.2-2.5'=SAND, fine, some coarse sand, trace silt	SP		
4						yellow-brown	2.5-3'=sim. to above, thinly bedded			
						dk. brown	3-4-SAND fine trace silt, trace coarse sand → SG 3.5'			6.0
		2.6/4	NA			orange-brown	4-5'-SAND, fine, trace med sand			
6			will take sample at top of				5-7'-SAND ~~medium~~ fine-medium			
						lt. tan	band of orange iron staining (1cm) at 5.5'			
						tan	7-7.5'=SAND, fine, some medium sand			
8						gray	7.5-8'=SAND, fine-medium → SG		wet @ 7.5'	2000+
		2.4/4	1250			olive-gray	8-9'=SAND, fine-medium			
						gray	9-9.5-sim. to above; stained		strong odor when opened	
10			NEX-SO1-DB18-0910			olive-gray	9.5-9.8'-SAND, fine-medium			
						gray-	9.8-10.5'-sim. to above, goobs			
						black	from gray to black → SAMPLE			
						olive gray	10.5-11'-SAND, fine-medium			
12						dk. gray	11-11.3'=sim. to above; stained - SH			207
						olive gray	11.3-12=SAND, fine-medium			
		3.8/4	1305 NEX-SO1-DB18-1415			dk gray	12-14.5=SAND, fine-medium, larger micaceous flakes throughout			
14							14.5=SH			52.9
						black	14.5-14.8-similar to above; darker ~.7 sample			
16				EOB		orange	14.5-16-SAND, fine-medium - SH - clay at tip (fell out)			0.1

TYPE OF DRILLING RIG: Geoprobe
METHOD OF ADVANCING BORING: DPT
METHOD OF SOIL SAMPLING: 1.5" acetate liner
METHOD OF ROCK CORING: NA
GROUNDWATER LEVELS:
OTHER OBSERVATIONS: sample target depth = top of blue clay
material / observations = NA

refusal at 4'-
move up ~1' and try again.

Tetra Tech NUS, Inc.

BORING NO.: DB-18 PAGE: 1 OF 1

Ttnus Form 0018

BORING LOG FOR: NEX-NASB
PROJECT NO.: 4590-0516
LOGGED BY: J. Lambert
DRILLED BY (Company/Driller): Yarmouth Env / E. Thomas
GRD. SURFACE ELEVATION:

TRANSCRIBED BY:
ELEVATION FROM:

BORING NO.: DB-19
START DATE: 3/30/05
COMPLETION: DATE: 3/30/05
MON. WELL NO.: NA
CHECKED BY:

DEPTH (FEET)	BLOWS PER 6" N/A	SAMP REC. / SAMP LENG.	SAMPLING TIME & SAMPLE NO. (QA/QC STATUS)	DEPTH MAT'L CHG./ WELL PROF'L	SOIL DENSITY/ CONSIS. or ROCK HARD.	CLR	MATERIAL CLASSIFICATION	USCS or ROCK BRKN	REMARKS (moisture condition; odors; geological classification; rock weathering; etc.)	FIELD SCREENING DATA METHOD = [FID, (PPM)]
		2.5/4	NA		sl. loose	brown / lt brown	0-0.5' = topsoil, roots/grass; 0.5-1.5' = fine-medium SAND	SP	No odor, dry	PID=
2					lt brown	dk brown	1.5-1.8' = SAND, fine, trace medium sand			
						~~dk brown~~	1.8-2.5' = SAND fine-medium, trace fine gravel			
4					sl. dense	dk brown	2.5-4 = SAND fine, trace medium sand, trace silt - SM			0.0
		2.4/4	NA				4-5.5' SAND, fine, trace silt; mottled dk brown, lt brown, reddish - SM		wet	0.0
6					sl. loose	lt brown	5.5-6' SAND, fine, trace med sand		moist	
							6-7' SAND, medium-coarse, trace fine sand	SW		
8						tan	7-8' SAND, fine, trace medium sand, trace silt - SM	SP	moist-wet	250
		2.8/4	DB19 NEX-SO-~~DB18~~-0809 0850			dk gray	8-9.5 - SAND, fine-med; stained; strong odor → SM		wet → v. strong odor	2000+
10						olive gray	9.5-10.5 - similar material to above			
						dk gray	10.5 - ~~SAND~~ similar material to 12 above, sl. less odor → SM			446
12										
		1.5/4*	DB19 NEX-SO-~~DB15~~-1213 0915				12-14' SAND, fine-medium, stained; moderate odor - SM			101
14										
							~~fill~~			
16					* note - last 2' fell out of liner → gray-blue clay material					

TYPE OF DRILLING RIG: Geoprobe
METHOD OF ADVANCING BORING: DPT
METHOD OF SOIL SAMPLING: 1.5" acetate liner
METHOD OF ROCK CORING: NA
GROUNDWATER LEVELS:
OTHER OBSERVATIONS: sample target depth = top of blue clay material / observations = NA

Tetra Tech NUS, Inc.

BORING NO.: DB-19

PAGE: 1 OF 1

Ttnus Form 0018

APPENDIX D

MINI-WELLS CONSTRUCTION LOGS

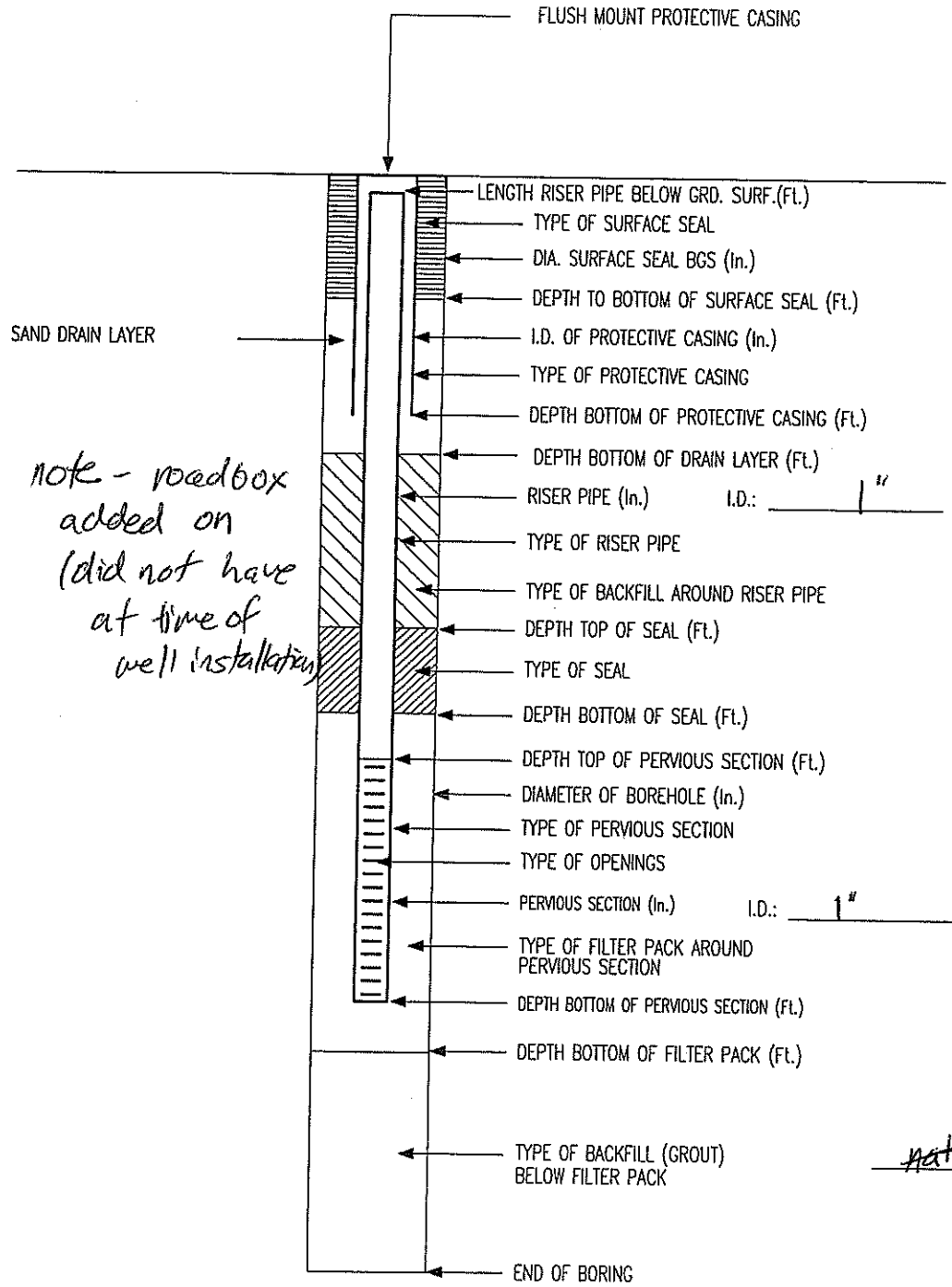
FLUSH MOUNT MONITORING WELL CONSTRUCTION LOG

TETRA TECH NUS INC.

PROJECT NAME:	NEX-NASB	PROJECT NO:	4590-0516
PROJECT LOCATION:	Brunswick, ME	WELL NO:	DB-18
CLIENT:	NAVY	BORING NO:	DB-18
CONTRACTOR:	Yarmouth Env.	DRILLER:	E. Thomas
LOGGED BY:	J. Lambert	DATE:	3/30/05
CHECKED BY:		DATE:	

BORING LOCATION: 10' W of ~~DB-01~~ DB-19

PAGE: 1 OF 1



LENGTH RISER PIPE BELOW GRD. SURF.(Ft.)	
TYPE OF SURFACE SEAL	
DIA. SURFACE SEAL BGS (In.)	
DEPTH TO BOTTOM OF SURFACE SEAL (Ft.)	
I.D. OF PROTECTIVE CASING (In.)	4.5"
TYPE OF PROTECTIVE CASING	modified roadbox
DEPTH BOTTOM OF PROTECTIVE CASING (Ft.)	10"
DEPTH BOTTOM OF DRAIN LAYER (Ft.)	2.0'
RISER PIPE (In.) I.D.: 1" O.D.:	
TYPE OF RISER PIPE	PVC
TYPE OF BACKFILL AROUND RISER PIPE	NA
DEPTH TOP OF SEAL (Ft.)	2.0'
TYPE OF SEAL	bentonite chips
DEPTH BOTTOM OF SEAL (Ft.)	3.7'
DEPTH TOP OF PERVIOUS SECTION (Ft.)	4.7'
DIAMETER OF BOREHOLE (In.)	3.25"
TYPE OF PERVIOUS SECTION	PVC
TYPE OF OPENINGS	0.010
PERVIOUS SECTION (In.) I.D.: 1" O.D.:	
TYPE OF FILTER PACK AROUND PERVIOUS SECTION	med-coarse sand
DEPTH BOTTOM OF PERVIOUS SECTION (Ft.)	15.7'
DEPTH BOTTOM OF FILTER PACK (Ft.)	~~15.7'~~ 16.6
TYPE OF BACKFILL (GROUT) BELOW FILTER PACK	~~NATH~~ NA
END OF BORING	16'

GENERAL NOTE:

1. Entry of 0.00 for Ground Elevation indicates that Surveyed Ground Elevation is NOT Available.

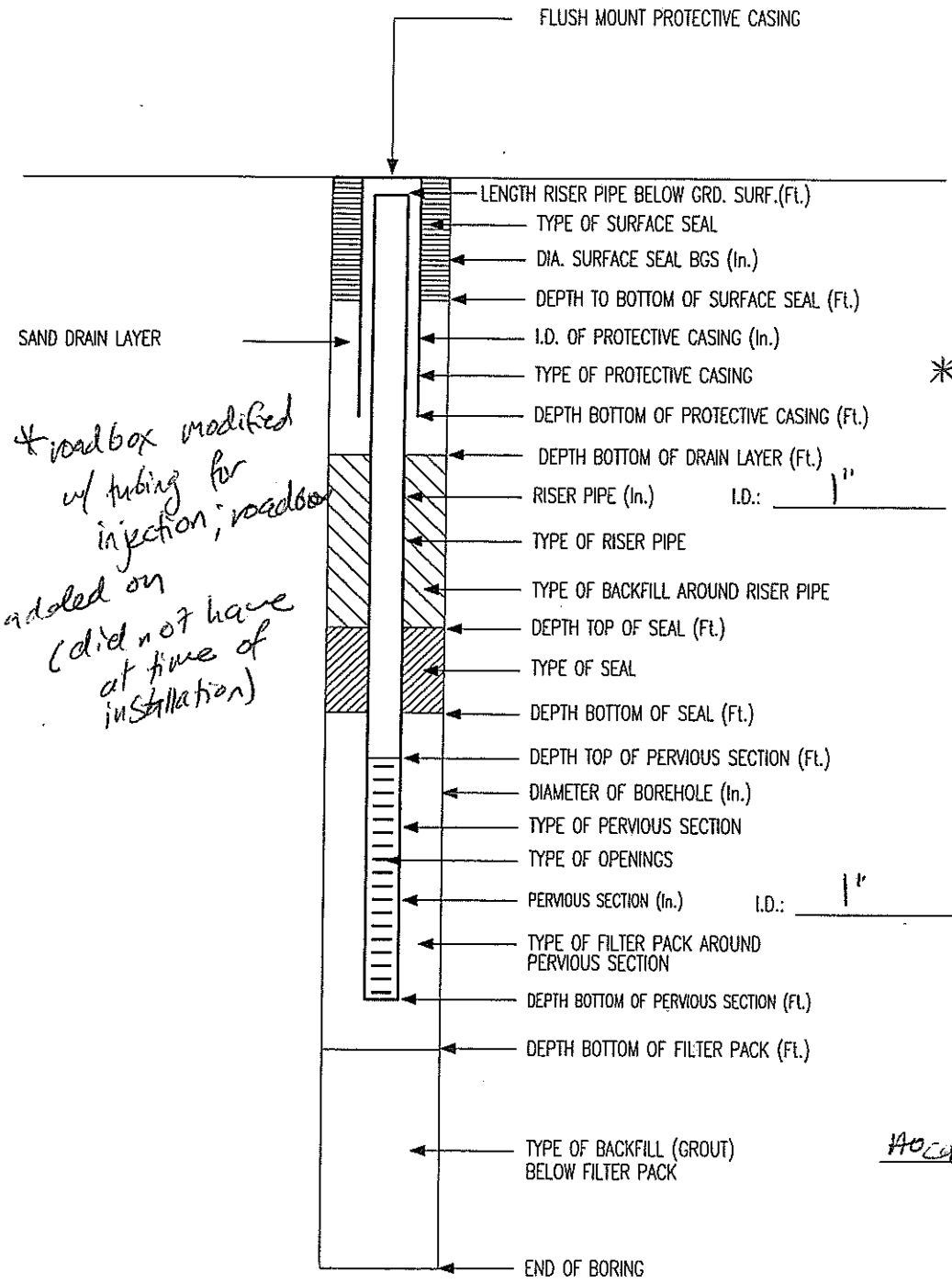
TtNUS Form 0058

FLUSH MOUNT MONITORING WELL CONSTRUCTION LOG

TETRA TECH NUS INC.

PROJECT NAME:	NASB-NEX	PROJECT NO:	4590-0516
PROJECT LOCATION:	Brunswick, ME	WELL NO:	DB-~~18~~ 19
CLIENT:	EFANE	BORING NO:	DB-~~18~~ 19
CONTRACTOR:	Yarmouth Env.	DRILLER:	E. Thomas
LOGGED BY:	J. Lambert	DATE:	3/30/05
CHECKED BY:		DATE:	
BORING LOCATION:	15' W of DB-1		

PAGE: 1 OF 1



LENGTH RISER PIPE BELOW GRD. SURF.(Ft.)	
TYPE OF SURFACE SEAL	
DIA. SURFACE SEAL BGS (In.)	~~14"~~
DEPTH TO BOTTOM OF SURFACE SEAL (Ft.)	
I.D. OF PROTECTIVE CASING (In.)	4.5"
TYPE OF PROTECTIVE CASING	* modified roadbox
DEPTH BOTTOM OF PROTECTIVE CASING (Ft.)	10"
DEPTH BOTTOM OF DRAIN LAYER (Ft.)	2.0'
RISER PIPE (In.) I.D.: 1" O.D.:	
TYPE OF RISER PIPE	PVC
TYPE OF BACKFILL AROUND RISER PIPE	NA
DEPTH TOP OF SEAL (Ft.)	2.0'
TYPE OF SEAL	bentonite chips
DEPTH BOTTOM OF SEAL (Ft.)	3.7'
DEPTH TOP OF PERVIOUS SECTION (Ft.)	~~5~~ 4.6'
DIAMETER OF BOREHOLE (In.)	3 1/2"
TYPE OF PERVIOUS SECTION	PVC
TYPE OF OPENINGS	0.010
PERVIOUS SECTION (In.) I.D.: 1" O.D.:	
TYPE OF FILTER PACK AROUND PERVIOUS SECTION	med-course sand
DEPTH BOTTOM OF PERVIOUS SECTION (Ft.)	~~14~~ 13.6'
DEPTH BOTTOM OF FILTER PACK (Ft.)	14'
TYPE OF BACKFILL (GROUT) BELOW FILTER PACK	no cave-in from DPT
END OF BORING	~~14~~ 16'

GENERAL NOTE:

1. Entry of 0.00 for Ground Elevation Indicates that Surveyed Ground Elevation is NOT Available.

TtNUS Form 0058