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Year 3 Annual Groundwater Monitoring Report for Defense Reutilization and Marketing Office (DRMO)

Naval Submarine Base - New London

Groton, Connecticut

Engineering Field Activity Northeast
Naval Facilities Engineering Command

Contract Number N62467-94-D-0888
Contract Task Order 0816

March 2002

TETRA TECH NUS, INC.

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YEAR 3 ANNUAL GROUNDWATER MONITORING REPORT FOR DEFENSE REUTILIZATION AND MARKETING OFFICE (DRMO)

NAVAL SUBMARINE BASE - NEW LONDON
GROTON, CONNECTICUT

COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

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1.0 INTRODUCTION

This third annual groundwater monitoring report for the Defense Reutilization and Marketing Office (DRMO) at the Naval Submarine Base New London (NSB-NLON) in Groton, Connecticut, was prepared for the U.S. Department of the Navy (Navy) by Tetra Tech NUS, Inc. (TtNUS) under the Comprehensive Long-Term Environmental Action Navy (CLEAN), Contract Number N62467-94-D-0888, Contract Task Order (CTO) 0816. All field activities were performed in accordance with the approved work plan for the DRMO (B&R Environmental, 1998).

1.1 PURPOSE

The purpose of this groundwater monitoring report is to present and evaluate the results of the third year of analytical data collected from monitoring wells located in the vicinity of the DRMO. The sampling was performed from July 2000 through June 2001. Trend evaluations for the first 3 years of monitoring data are also included in this report.

Due to the presence of elevated levels of lead, Polychlorinated Biphenyls (PCBs), and Polycyclic Aromatic Hydrocarbons (PAHs) in the soil at the DRMO, a time-critical removal action was performed by OHM Remediation Services Corporation, the Navy's Remedial Action Contractor, during the course of the Phase II Remedial Investigation (B&R Environmental, March 1997). After removal of contaminated soil from the northern half of the site, an asphalt/geosynthetic clay liner (GCL) cap was installed to reduce precipitation infiltration and leaching of contaminants to the groundwater. This groundwater monitoring is part of the post-closure associated with the DRMO cap.

The groundwater monitoring is designed to determine the effectiveness of the existing cap at the DRMO in preventing further migration of constituents to the groundwater and ultimately to the Thames River; the effectiveness of the remediation taken to eliminate health risks; whether the criteria used for evaluating the data have been met; and whether the groundwater plume interferes with any existing use of the groundwater. The ultimate goal of the monitoring program is to determine whether surface water protection criteria have been attained for those contaminants migrating from the site.

1.2 SCOPE AND OBJECTIVES

The objective of the groundwater monitoring program is to provide long-term monitoring to evaluate the effectiveness of the cap and to confirm that unacceptable levels of contamination are not migrating through the soil, into the groundwater, and ultimately discharging to the Thames River. To meet this objective, groundwater monitoring is being conducted at ten monitoring wells. The monitoring well

network includes seven monitoring wells that were installed during the Phase I and Phase II remedial investigations and three monitoring wells that were installed prior to initiating the current monitoring program. Monitoring wells 6MW6S, 6MW6D, and 6MW9S are located immediately upgradient of the site. These wells provide data to establish the quality of groundwater prior to flowing through the capped area of the DRMO site. Monitoring wells 6MW1S, 6MW2S, 6MW2D, 6MW10S, 6MW10D, 6MW11S, and 6MW11D are located downgradient of the site. These wells were selected to monitor groundwater quality prior to discharge into the Thames River. A comparison of the monitoring results from the upgradient and downgradient wells should show the impacts, if any, of the site on groundwater quality. All of the wells were screened to monitor either shallow or deep groundwater in the overburden. Chemical analyses were selected based on an evaluation of site history and previous analytical results.

1.3 REPORT ORGANIZATION

This report consists of five sections. Section 1.0 provides a brief introduction and describes the scope, objectives, and purpose of the report. Section 2.0 provides a description of the DRMO including site characteristics. Additionally, descriptions of previous investigations are included in Section 2.0. Section 3.0 provides the methodologies used to perform the groundwater sampling. Section 4.0 presents the findings of the groundwater monitoring as well as a statistical evaluation of the data. Finally, Section 5.0 provides conclusions for the third annual monitoring period and recommendations for future monitoring.

2.0 BACKGROUND INFORMATION

The following subsections describe the DRMO site at NSB-NLON, which is the focus of this groundwater monitoring program.

2.1 SITE DESCRIPTION

The DRMO is located adjacent to the Thames River in the northwestern section of NSB-NLON. The DRMO was used as a major base landfill and burning ground from 1950 to 1969. The materials burned and landfilled included construction materials, combustible scrap, and other non-salvageable waste items. These materials were burned on the Thames River shoreline adjacent to the current location of the DRMO. The residue was pushed to the shoreline and partially covered. In the past, the southern half of the DRMO was covered with asphalt, most of which was deteriorated, while the northern portion was unpaved and had a gravel surface.

A soil removal action was completed at the site in 1995 and an asphalt/GCL cap was constructed over a majority of the central and northern portions of the site (OHM, September 1995). Bituminous concrete pavement was then placed over the entire area of the composite cap. Currently, the DRMO is used as a storage and collection facility for items to be sold at auctions and sales held periodically throughout the year. Figure 2-1 displays the location of NSB-NLON. Figure 2-2 shows the location of the DRMO within NSB-NLON, and Figure 2-3 shows the general site plan.

2.2 SITE CHARACTERISTICS

2.2.1 Topography and Surface Features

The DRMO topography is illustrated in Figure 2-3. An exposed, bedrock highpoint, located to the east of the DRMO, slopes steeply to the west towards the site. The ground surface within the DRMO site boundaries gently slopes westward from an elevation of 8 feet mean sea level (msl) along the eastern boundary of the site to 4 feet msl at the Thames River. The land is relatively flat, low lying, and prone to flooding by the Thames River. A majority of the site is currently paved with asphalt.

2.2.2 Surface Water Features

All surface runoff from the site flows to the Thames River that is located along the western edge of the DRMO. Two storm sewer systems located along the southern boundary of the site transfer runoff from the eastern side of the Providence and Worcester Railroad to the Thames River.

2.2.3 Soil Characteristics

The SCS Soils Map (SCS, 1983) classifies the soil at the DRMO as Udorthents-Urban land complex. This classification is defined as being excessively drained to moderately drained soil that has been disturbed by cutting and filling.

To the north of the site, the soil is classified as the Hinkley Loam. This soil is found on stream terraces and outwash plains and consists of a dark, gravelly sand loam. Native materials at the DRMO were most likely of this type.

Northwest and upslope of the site, along the exposed bedrock highpoint, the soil is classified as Hollis-Charlton-Rock complex. This classification is defined as stones and boulders intermingled with a dark, fine, sandy loam. Bedrock outcrops are prevalent.

2.2.4 Geology

Geologic conditions at the DRMO consist of a westward-thickening wedge of overburden materials (fill and natural deposits) overlying fractured metamorphic bedrock. The DRMO is underlain by an upper layer of 2 to 20 feet of fill material. The fill consists primarily of sand and gravel but also contains metal and wood. The fill is thickest along the Thames River and becomes thinner to the east of the site. There was no evidence of fill in the southeast corner of the site or at the 6MW6 well cluster (offsite) (B&R Environmental, March 1997).

In most cases, the fill is underlain by clayey silt, which thickens from 2 feet along the eastern portion of the DRMO to a maximum observed thickness of 46 feet along the Thames River. The silt layer is underlain by sand and gravel, except at 6MW2D where the silt lies directly on bedrock. Upslope of the DRMO at the 6MW5 and 6MW6 well clusters, the clayey silt is missing and 20 feet of sand and gravel rest on bedrock. The sand and gravel are generally mapped as terrace deposits along the Thames River (USGS, 1960). These terrace deposits are stratified drift of former glacial meltwater streams. At the DRMO, the coarse-grained terrace deposits are overlain by the clayey silt, which are finer-grained river bottom sediments (B&R Environmental, March 1997).

Bedrock in the northern portion of the DRMO has been mapped as the Granite Gneiss. Bedrock in the southern portion of the DRMO has been mapped as the Mamacoke Formation (USGS, 1967). These mapped formations were detected during drilling: the Granite Gneiss was encountered at 6MW5D and the Mamacoke Formation was encountered at 6MW6D. The Westerly Granite has been mapped along the eastern portion of the site, but it was not detected during drilling (Phase I RI). A bedrock high exists to the east of the DRMO and is an extension of the large bedrock high that borders the north part of NSB-

NLON. The bedrock underlying the DRMO slopes westward toward the Thames River. The slope of the bedrock surface across the DRMO is approximately 25 percent (B&R Environmental, March 1997).

2.2.5 Hydrogeology

Groundwater is present within the overburden and bedrock underlying the DRMO. The water table is generally encountered within the fill materials at the site (between 2.5 and 10.5 feet below ground surface), with the underlying clayey silt and terrace deposits also under saturated conditions. Based on the expected relative permeability of these three units (the coarse-grained fill and terrace deposits are expected to be significantly more permeable than the intervening clayey silt layer), the three deposits are considered to be separate hydrostratigraphic units. The clayey silt may function as an aquitard relative to the overlying and underlying coarser grained units.

Groundwater flow is generally from east to west, following topographic and bedrock surface slope to the Thames River. The Thames River is tidally influenced with a mean tidal range at NSB-NLON of 2.2 feet, which creates reversals in groundwater flow directions and causes water levels to fluctuate. Based on a tidal study conducted as part of an Action Memorandum for Building 31 at the Lower Base, monitoring well water levels at a distance of approximately 100 feet from the Thames River were noted to fluctuate by 1.19 feet. Due to the proximity of the site to the river, and the demonstrated influence of tides on groundwater levels near the river at the Lower Base, it is expected that tidal fluctuations of the river locally affect groundwater levels, at least in the western portion of the DRMO.

During low tide, the hydraulic gradient of the groundwater table at NSB-NLON is towards the Thames River and will result in the highest discharge rate of groundwater to the river. During high tide, the hydraulic gradient of the groundwater is reversed and flow occurs from the river to the site, temporarily halting the discharge of groundwater from the base to the river (B&R Environmental, March 1997).

Since the underlying clayey silt layer likely acts to minimize groundwater impacts from the DRMO to the deep river bottom and alluvial deposits, the groundwater flux from the DRMO to the river was calculated from the fill only. The average hydraulic conductivity of the fill materials was calculated by taking the geometric mean of DRMO-specific hydraulic conductivities (both Phase I RI and Phase II RI) for two wells completed within the fill materials. Hydraulic conductivities from Phase I RI well 6MW2S (70 ft/day) and from Phase II RI well 6MW7S (1.9 ft/day), were used for this calculation. The average hydraulic conductivity calculated for the fill material is 11.5 feet/day. Using Darcy's equation, the associated hydraulic discharge rate was calculated to be 1,666 cubic feet/day. The actual discharge rate is likely to be substantially lower than this calculated rate, as tidal effects were not considered. During periods of high tide, groundwater discharge to the river is expected to be halted as gradients reverse and the river recharges the groundwater.

The groundwater is classified as GB. This classification applies to groundwater within a historically highly urbanized area or an area of intense industrial activity and where public water supply service is available. Such groundwater may not be suitable for human consumption without treatment due to waste discharges, spills, or leaks of chemicals or land use impacts.

2.3 PREVIOUS INVESTIGATIONS

2.3.1 Phase I Remedial Investigation

The Phase I RI for this site included test borings and monitoring well installation, as well as, soil, surface water, and groundwater sampling (Atlantic, August 1992). Twelve shallow subsurface (less than 2 feet deep) soil samples plus one field duplicate and 12 subsurface (greater than 2 feet deep) soil samples plus one field duplicate were collected from seven test borings and five monitoring well borings. Four surface soil samples (two composite and two grab samples) plus one field duplicate were collected and analyzed. Six groundwater samples plus one field duplicate were collected from five shallow wells and one deep well. Additionally, one surface water sample was collected from the Thames River at the north end of this site (B&R Environmental, March 1997). The soil samples were analyzed for Target Compound List (TCL) volatile organic compounds (VOCs); semivolatile organic compounds (SVOCs), pesticides and polychlorinated biphenyls (PCBs); Target Analyte List (TAL) metals; and Toxicity Characteristics Leaching Procedure (TCLP) metals. The groundwater and surface water samples were analyzed for TCL VOCs, SVOCs, pesticides and PCBs; TAL metals; and radiological analyses.

Concentrations of VOCs in the soil were generally low. However, the following VOCs were found in 6TB4 (6-8 feet): vinyl chloride detected at 1,300 µg/kg, trichloroethene detected at 20,000 µg/kg, and tetrachloroethene detected at 210 µg/kg. SVOCs were present in most soil samples collected in the former landfill area. They were predominately comprised of PAHs, many of which were detected at elevated levels (maximum of 931,000 µg/kg). A PCB, Aroclor 1260, was detected at almost all soil sample locations with concentrations ranging from 52 µg/kg to 12,000 µg/kg. Pesticides were detected in one soil sample at elevated concentrations. The total pesticide concentration was 57,800 µg/kg, consisting of 4,4' DDT, 4,4' DDD, and 4,4' DDE.

Out of the 24 soil samples analyzed for TCLP metals, 21 contained one or more metals exceeding "To Be Considered" values (TBCs). TBC values were exceeded for barium, cadmium, chromium, lead, mercury and silver. TCLP values for lead ranged from 6.2 to 52 milligrams per liter (mg/L) at three locations, which exceeded the hazardous waste characteristic value of 5 mg/L.

Trichloroethene and 1,2-dichloroethene were present in three downgradient wells (6MW2S, 6MW3S, and 6MW4S). No SVOCs, including polcyclic aromatic hydrocarbons (PAHs), pesticides, petroleum hydrocarbons, or PCBs were detected in any wells at the DRMO site. Low levels of phthalates and benzoic acid were detected in the upgradient well 6MW5D. The inorganic groundwater analysis results indicated that selenium exceeded the primary drinking water standards at wells 6MW2S, 6MW3S, and 6MW4S.

No VOCs, SVOCs, pesticides, or PCBs were detected in the upgradient surface water sample. Comparison of the inorganic results for this sample with the downgradient water sample (Goss Cove) did not suggest any detectable impact on the Thames River from NSB-NLON based on this limited data set.

2.3.2 Draft Focused Feasibility Study Field Investigation

A field investigation in support of the draft Focused Feasibility Study (FFS) was performed at the DRMO site in October 1993 to better define the extent of soil contamination. Split-spoon samples were collected from 17 borings. One or more samples were collected from each boring based on visual evidence of contamination, field-measured organic vapor readings, and field-measured lead contamination (using X-Ray Fluorescence). Twelve surface (less than 2 feet deep) soil samples and twelve subsurface (greater than 2 feet deep) soil samples were collected. One surface and two subsurface field duplicates were also collected. The samples were analyzed for TCL VOCs, SVOCs, pesticides and PCBs; TAL metals; dioxins; and TCLP VOCs SVOCs, pesticides, and metals. One of the borings was completed as a monitoring well (B&R Environmental, March 1997).

The highest concentrations of VOCs were present in soil samples 6TB17, 6TB19, and 6TB16 where values ranged from 9,600 to 4,840 µg/kg for total VOCs. The TBC value was exceeded for trichloroethene at two locations where values were reported at 3,900 and 40 µg/kg. The TBC value for 1,2-dichloroethane was exceeded at 6TB20 (79 µg/kg) and toluene at 6TB19 (2,900 µg/kg). SVOCs, predominately PAHs with concentrations ranging from non-detected to 931,000 µg/kg, were detected in soil across the site. PCBs (Aroclor 1254, Aroclor 1260, and Aroclor 1242) were detected at nearly all boring locations at low to high concentrations, ranging from 76 to 34,700 µg/kg. Pesticides (4,4' DDE, 4,4' DDD, 4,4' DDT) were detected at many locations across the site, primarily at low concentrations; however, several locations were found to have elevated levels. Inorganic compound levels were above background at all locations. Of primary concern at the site, were the levels of lead, which ranged from 5.7 to 12,400 µg/kg.

Two soil samples were collected and analyzed for full TCLP parameters. There were no SVOCs, or pesticides values above the Connecticut Department of Environmental Protection (CTDEP) TBC values. Cadmium and 1,2-dichloroethane were detected in one sample above TCLP TBC values at

concentrations of 0.028 and 10 micrograms per liter (µg/L), respectively. Both samples contained lead above the TCLP TBC value at concentrations of 904 and 525 µg/L (Atlantic, March 1995).

2.3.3 Phase II Remedial Investigation

Five new groundwater monitoring wells (two shallow and three deep) were installed and sampled during the Phase II RI (B&R Environmental, March 1997). Additionally, four previously installed shallow wells were sampled. Two rounds of groundwater sampling were completed and ten samples (including one field duplicate sample) were collected during each sampling round. Three subsurface soil samples were collected during the installation of three of the new wells. The soil samples were analyzed for TCL VOCs, SVOCs, pesticides and PCBs and TAL metals. The groundwater samples were analyzed for TCL VOCs, SVOCs, and TAL metals.

Relatively high concentrations of multiple organic and inorganic compounds were detected in the soil matrix at the DRMO. Organic chemicals detected at high concentrations include various halogenated aliphatic compounds, PAHs, phthalate esters, Aroclor-1254, and Aroclor-1260. The maximum observed concentration of the water insoluble organic compounds in groundwater was bis(2-ethylhexyl)phthalate at 20 µg/L.

In spite of the fact that relatively high concentrations of some VOCs were detected in the subsurface soil, it does not appear that substantial impact on the groundwater has occurred to date. For example, although halogenated organic compounds such as 1,2-dichloroethene and trichloroethene were detected in soil samples at concentrations up to 16,000 µg/kg and 7,100 µg/kg, respectively, no evidence of substantial impact on groundwater quality has been noted. The maximum concentration of a halogenated organic compound in groundwater samples was 8 µg/L (1,2-dichloroethene and trichloroethene).

In addition to the various organic chemicals detected in soil at the DRMO, concentrations of lead still remained in soil after the Time-Critical Removal Action was conducted. Maximum concentrations of lead in surface and subsurface soil were 4,980 mg/kg and 2,140 mg/kg, respectively. In spite of the lead concentrations in soil, only limited evidence of lead migration to the water table is evidenced by the groundwater analytical results. Although lead was detected as high as 52.7 µg/L in one unfiltered sample, lead concentrations in filtered groundwater samples ranged no higher than 2.4 µg/L. Furthermore, the cap will effectively minimize infiltration of precipitation through the lead-contaminated soil to the groundwater.

2.3.4 Time-Critical Removal Action

A Time-Critical Removal Action was performed at the DRMO by OHM Remediation Services Corporation during the course of the Phase II RI (OHM, September 1995). Construction aspects of the removal action were completed in January 1995. The removal action focused on the removal of soil contaminated with lead, PAHs, and PCBs from the northern half of the DRMO. The excavation extended to a maximum depth of approximately 3 feet below the ground surface or to the water table. Approximately 4,700 tons of soils were excavated and transported to a RCRA landfill located in Grand View, Idaho for disposal. Additionally, a steel-walled spent-acid-storage tank was excavated, cut into manageable pieces, and disposed of offsite with the contaminated soil.

After the completion of removal activities, the excavated area was backfilled with clean borrow material from an offsite location. A cap consisting of a woven geotextile liner, a geosynthetic clay liner, and a nonwoven geotextile liner was installed. Approximately 12 inches of crushed stone and 3 inches of asphalt were placed over the clay/geotextile cover. The remaining (paved) portion of the DRMO was also upgraded via placement of an asphalt layer.

2.3.5 Year One of the Monitoring Program

The groundwater monitoring program for the DRMO was initiated to confirm that the interim remedial action completed at the site (i.e., soil removal action and installation of an asphalt/GCL cap) was successful and no contaminants were continuing to migrate from the site via groundwater. The Year 1 Annual Groundwater Monitoring Report for DRMO (TtNUS, November 1999) summarized the groundwater analytical data collected from the monitoring well network during Rounds 1 through 4. The analytical results were compared to primary criteria [i.e., site-specific Surface Water Protection Criteria (SWPCs) and Volatilization Criteria], as well as secondary monitoring criteria [i.e., Federal Ambient Water Quality Criteria (AWQCs) and Connecticut Water Quality Standards (WQSs)].

The results obtained for the initial four rounds of groundwater monitoring for VOCs, SVOCs, and inorganic compounds indicated no exceedances of any primary criteria. Bis(2-ethylhexyl)phthalate (BEHP) exceeded the secondary monitoring criteria in several samples; however, the results were similar to positive detections noted in samples collected from upgradient monitoring wells. Several PAHs detected in groundwater samples were also noted to exceed secondary monitoring criteria. Arsenic, copper, silver, and zinc were detected in groundwater samples in excess of the secondary monitoring criteria.

A statistical evaluation of the data indicated that upgradient and downgradient concentrations of both organic and inorganic COCs were found to be similar except for arsenic. The statistical evaluation

established that arsenic concentrations were higher in downgradient wells than in upgradient wells. The average arsenic concentrations for all downgradient monitoring wells for each round were plotted as a function of round to determine the trend of the concentrations. The regression line fit to the average arsenic concentrations showed a decreasing trend. The confidence in the regression line fit to the data was low and it is likely the line did not represent the true trend in the data.

The average concentrations of arsenic for each round in the downgradient wells were also compared to the site-specific and Connecticut SWPC. Only the average total arsenic concentration for Round 1 exceeded the CTDEP SWPC. None of the concentrations exceeded the site-specific SWPC.

The analytical results for the first year of groundwater monitoring indicate no exceedances of the primary criteria, although several contaminants were detected in excess of the secondary monitoring criteria. Because of the various exceedances of secondary monitoring criteria, it was recommended that groundwater monitoring be continued through year two to further evaluate these chemical concentrations. It was also recommended that the Navy, EPA, and CTDEP consider the following:

- Reduce the number of analytical parameters at the completion of Year 2 of the monitoring program.
- Reduce the sampling frequency after the completion of Year 2 of the monitoring program.
- Continue to maintain the monitoring wells in the monitoring program.
- Discuss the endpoint for the groundwater monitoring if current trends continue.

2.3.6 Year Two of the Monitoring Program

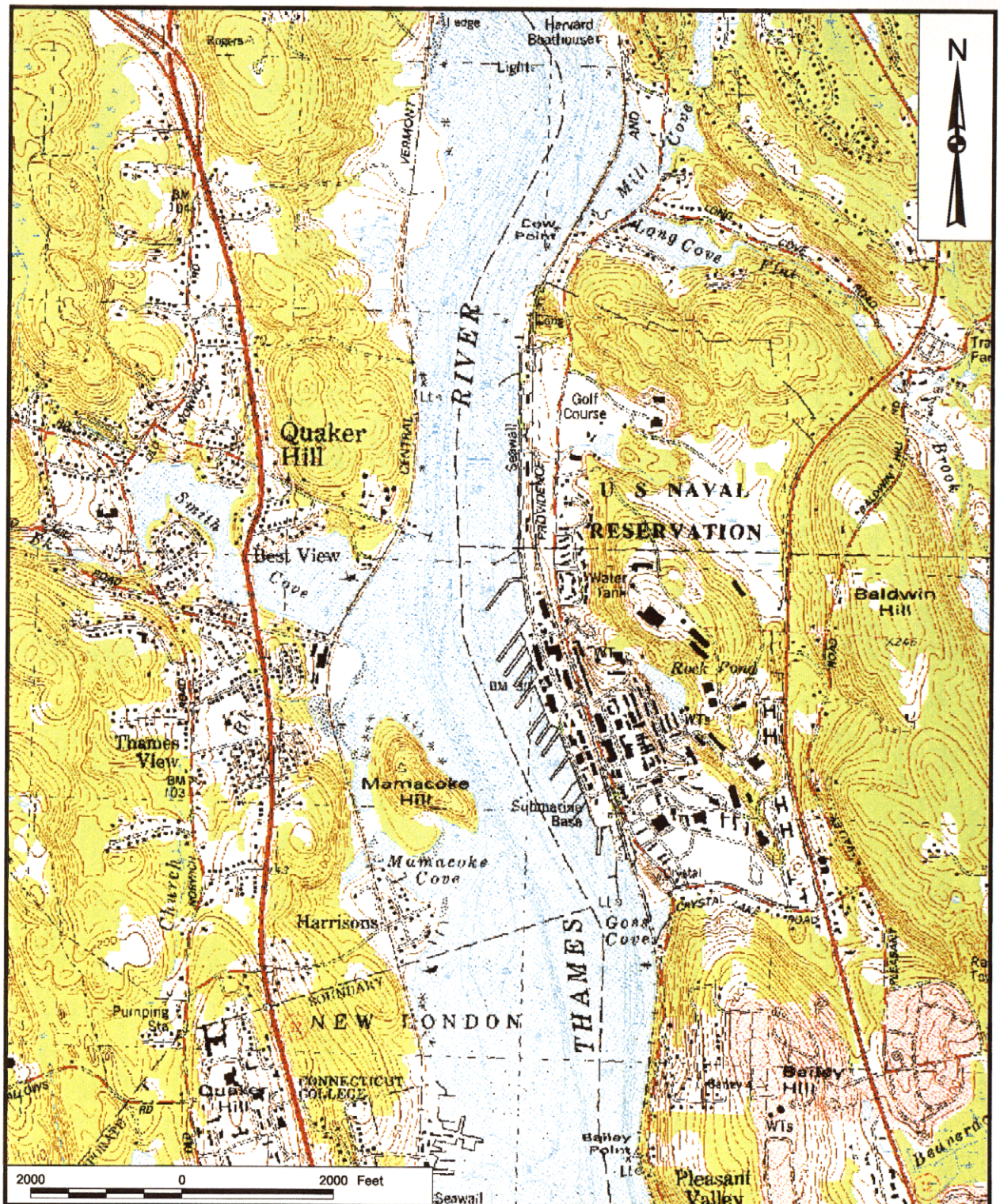
The Year 2 Annual Groundwater Monitoring Report for DRMO (TtNUS, October 2000) summarized the groundwater analytical data collected from the monitoring well network during Rounds 5 through 8. The results obtained for the second year of groundwater monitoring for VOCs, SVOCs, and inorganics indicated no exceedances of the primary criteria. Concentrations of BEHP detected in several samples exceeded the secondary monitoring criteria; however, it is likely that the low concentrations detected may be attributable to the laboratory as no clear pattern has been exhibited in any monitoring well. Arsenic, copper, lead, and zinc were detected in groundwater samples in excess of the secondary monitoring criteria.

A statistical evaluation of the data indicated that upgradient and downgradient concentrations of both organic and inorganic COCs were found to be similar except for total barium. The average barium

concentrations for the downgradient wells for each round were plotted as a function of round to determine the trend of the concentrations. The regression line fit to the average barium concentrations showed a slight increasing trend, which correlated with the results of the statistical evaluation. It was noted however that "no change" was also within the 95 percent confidence limits for the regression analysis. Therefore, the true trend of the average barium concentrations in the downgradient wells was uncertain. No primary or secondary screening criteria were available for comparison with the average barium concentrations to determine if the concentrations were significant.

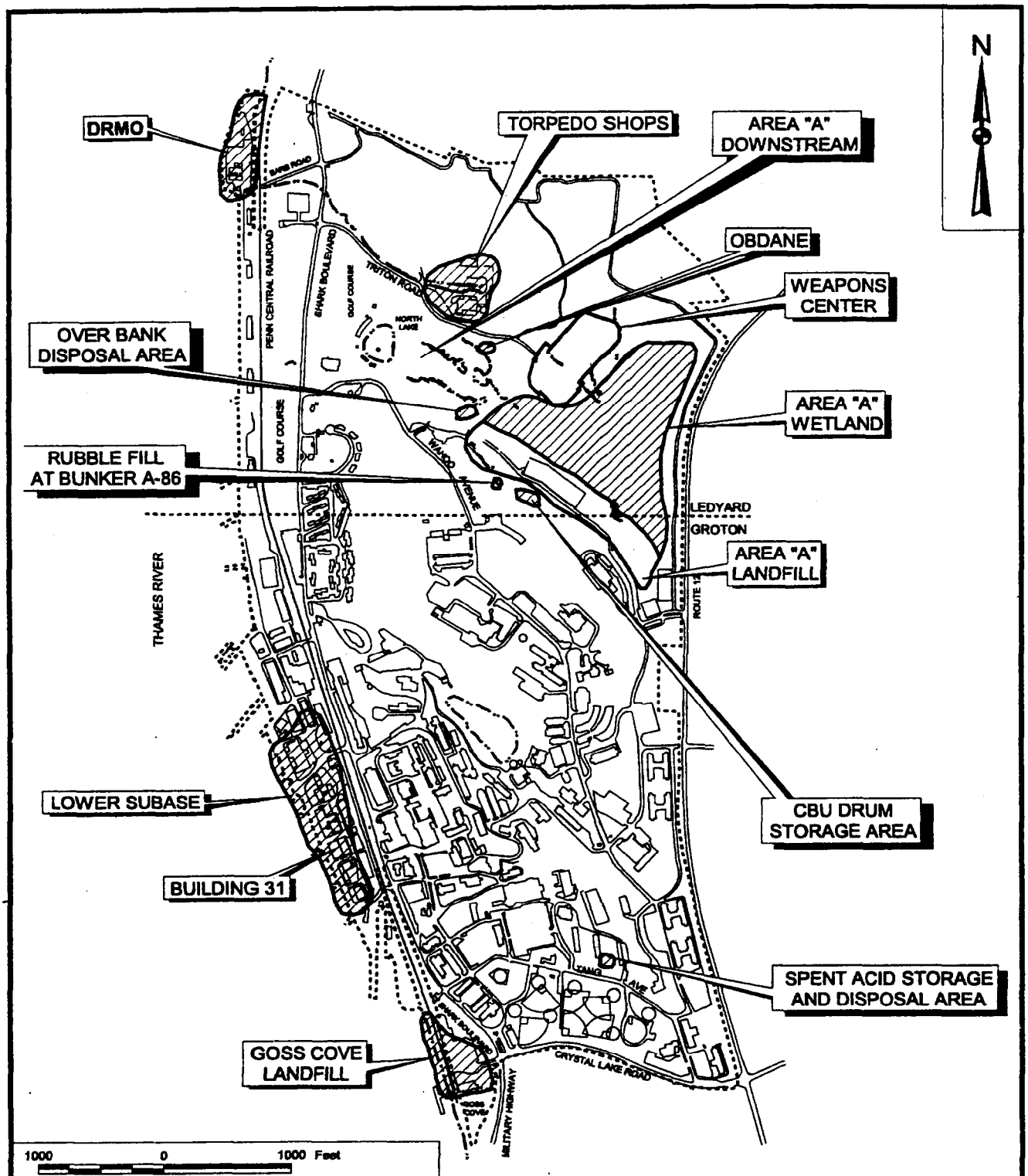
The analytical results for the second year of groundwater monitoring indicated no exceedances of the primary criteria, although several contaminants were detected in excess of the secondary monitoring criteria. Because of the various exceedances of secondary monitoring criteria, it was recommended that groundwater monitoring be continued through year three to further evaluate these chemical concentrations. It was also recommended that the Navy, EPA, and CTDEP consider the following:

- Eliminate VOCs from the analytical suite.
- Reduce the sampling frequency for SVOCs from quarterly to biannual.
- Continue to maintain the monitoring wells in the monitoring program.
- Discuss the endpoint for the groundwater monitoring if current trends continue.



DRAWN BY	DATE	Tetra Tech NUS, Inc.	CONTRACT NUMBER	OWNER NO.
J. BELLONE	10/1/99		7363	
CHECKED BY	DATE	LOCATION MAP NSB - NLON GROTON, CONNECTICUT	APPROVED BY	DATE
MLM	10/25/00		Mark L. Mengel	10/25/00
COST/SCHEDULE-AREA			APPROVED BY	DATE
			—	—
SCALE			DRAWING NO.	REV
AS NOTED			FIGURE 2-1	0

P:\GIS\NLON\7363ANNUAL.APR 10/1/99 JCB LOCATION MAP LAYOUT



DRAWN BY J. BELLONE	DATE 10/3/99	Tetra Tech NUS, Inc.	CONTRACT NUMBER 7363 / OWNER NO. —
CHECKED BY MLM	DATE 10/20/99	SITE MAP NSB NLON GROTON, CONNECTICUT	APPROVED BY Mark L Mengel / DATE 10/20/99
COST/SCHEDULE-AREA			APPROVED BY — / DATE —
SCALE AS NOTED			DRAWING NO. FIGURE 2-2 / REV 0

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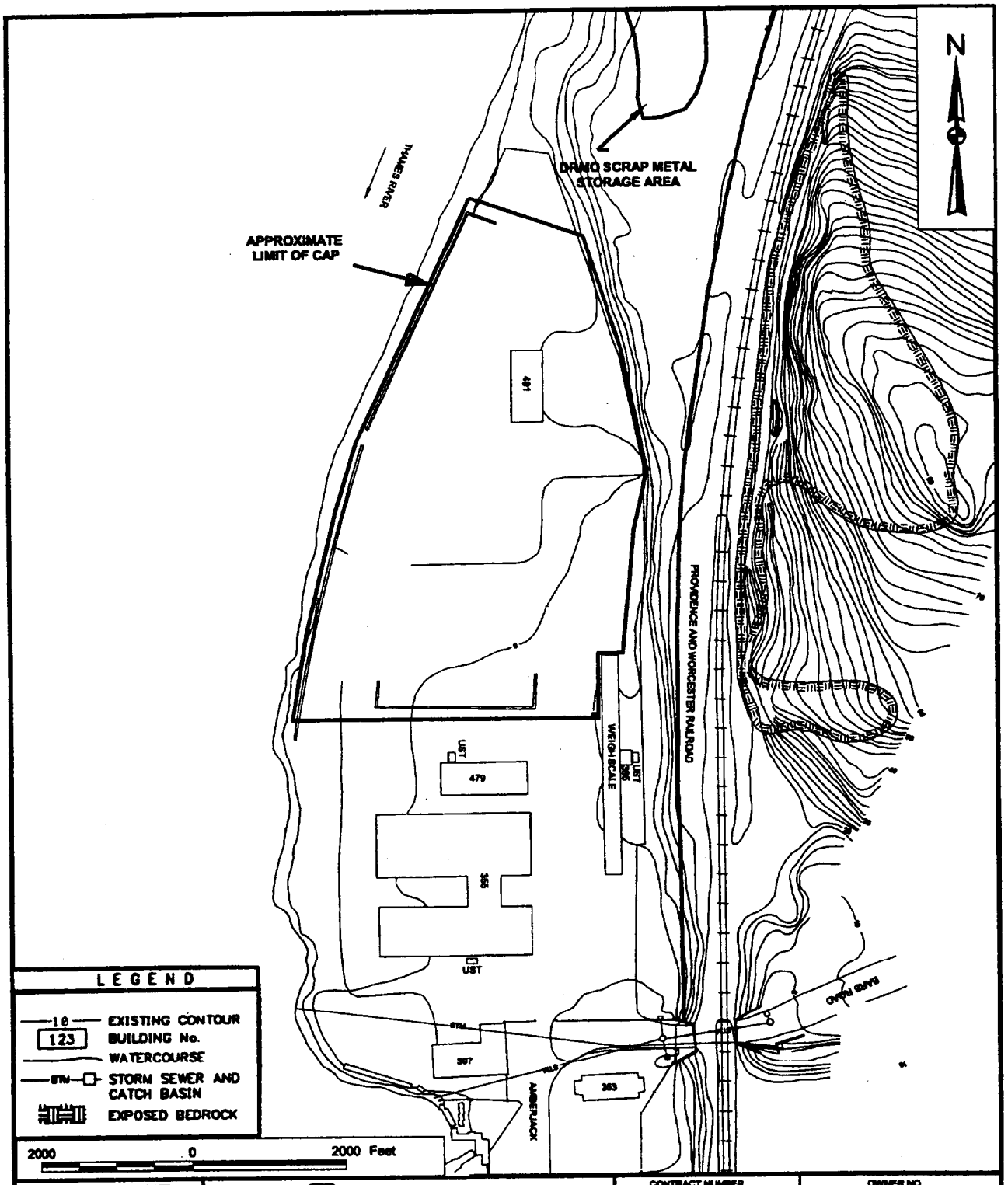

DRAWN BY J. BELLONE	DATE 10/1/99	Tetra Tech NUS, Inc.	CONTRACT NUMBER 7363 / OWNER NO.
CHECKED BY MLM	DATE 10/20/99	DRMO SITE PLAN NSB - NLON GROTON, CONNECTICUT	APPROVED BY Mark K. Mengel / DATE 10/20/99
COST/SCHEDULE-AREA			APPROVED BY — / DATE —
SCALE AS NOTED			DRAWING NO. FIGURE 2-3 / REV 0

P:\GIS\NLON\7363\ANNUAL.APR 10/1/99 JCB DRMO SITE PLAN LAYOUT

3.0 FIELD ACTIVITIES

This section provides a discussion of the sampling procedures used to conduct the groundwater monitoring, as well as a discussion and presentation of the physical data collected during the sampling.

3.1 SAMPLING LOCATIONS AND ANALYTICAL METHODS

Ten monitoring wells were sampled during the third year of monitoring. The wells were sampled during the months of July 2000 (Rd. 9), December 2000 (Rd. 10), March 2001 (Rd. 11), and June 2001 (Rd. 12). Monitoring well locations are shown on Figure 3-1. Monitoring well construction details are shown on Table 3-1.

Each of the samples collected from the monitoring wells were analyzed for TCL organics and TAL inorganics. Monitoring focused on the following organic and inorganic Contaminants of Potential Concern (COPCs), as identified in the Groundwater Monitoring Plan (B&R Environmental, 1998):

- 1,1,2,2-Tetrachloroethane
- 1,2-Dichloroethane
- 1,2-Dichloroethene (total)
- Trichloroethene
- Vinyl Chloride
- Benzo(a)anthracene
- Benzo(a)pyrene
- Benzo(b)fluoranthene
- Benzo(k)fluoranthene
- Benzoic Acid
- Bis(2-ethylhexyl)phthalate
- Fluoranthene
- Fluorene
- Naphthalene
- Phenantrene
- Pyrene
- Heptachlor Epoxide
- Aroclors 1254 & 1260
- Hexachlorobiphenyl
- 4,4'-DDD
- Arsenic
- Barium
- Cadmium
- Chromium
- Copper
- Lead
- Silver
- Zinc

These contaminants were previously detected in soil either at concentrations that could result in exceedances of site-specific SWPCs or at concentrations that exceed Connecticut's Pollutant Mobility Criteria for GB groundwater.

3.2 SAMPLE COLLECTION PROCEDURES

The ten monitoring wells shown on Figure 3-1 were sampled during each of the four sampling rounds using low-flow purging and sampling techniques, in accordance with the Tetra Tech NUS SOP SA-1.1 (Groundwater Sample Acquisition) and the USEPA Region I Low- Flow Purging and Sampling Procedure (GW-001). Low-flow purging and sampling was implemented because this method provides the least disturbance to the surrounding formation (less turbulence while purging and sampling and hence lower turbidity), allowing for a more representative sample to be obtained.

Prior to purging, and during and before obtaining groundwater samples, water levels were measured using an electronic water-level indicator (M-Scope) capable of 0.01-foot accuracy. Water levels were monitored and recorded every 5 to 10 minutes during the purging. Each of the monitoring wells were purged prior to sampling using dedicated bladder pumps and dedicated teflon or teflon-lined polyethylene tubing with bottled nitrogen gas as the air source. Each pump was installed so that the pump intake was placed at the midpoint of the low tide saturated well screen and if possible, no less than 2 feet above the bottom of the well so as to not disturb any sediment located near the bottom of the well.

During the purging, water quality parameters (e.g., pH, specific conductivity, temperature, dissolved oxygen, salinity, and Eh) were typically measured every 5 to 10 minutes using a QED FC4000 Water Analyzer equipped with a flow-through cell. Water quality parameters were measured until all of the parameters had stabilized and the minimum purge volume was removed (stabilized purge volume plus the extraction tubing volume). Stabilization of the above parameters is defined as follows:

- pH ± standard units
- Turbidity ± 10 percent for the value greater than 1 NTU
- Specific conductance ± 3 percent
- Temperature ± 3 percent
- Eh ± 10 millivolts
- Dissolved oxygen ± 10 percent

Turbidity was also measured using a Lamotte 2020 Turbidimeter. Water quality parameters obtained at the time of sample collection for each of the sampling rounds are shown on sample logs sheets in Appendix A. Table A-1 in Appendix A summarizes the water quality parameters for Rounds 1 through 12. As noted on the table, several suspect specific conductivity, dissolved oxygen, and oxidation-reduction potential measurements were recorded for several monitoring wells. It is likely that these suspect measurements are the result of faulty probes in the water quality meter.

Calibration and standards checks were conducted on the flow-through cell in accordance with the manufacturers' requirements. The cell was cleaned at each well prior to purging and during purging, as necessary (e.g., when fluctuating turbidity readings were observed and confirmed by collection of a turbidity sample before the cell for comparison). A "T" connector with a valve was inserted into the pump's discharge tubing prior to the cell for collection of a turbidity sample. If the cell required cleaning during purging activities, pumping continued and the cell was disconnected for cleaning. When completed, the cell was reconnected and monitoring activities continued. The cell was cleaned by thoroughly rinsing with deionized water.

Precautions were taken to prevent air entrapment and/or air leaks in the purging system so that potential problems with stabilizing dissolved oxygen were minimized. Precautions included: 1) taking care to fill the entire cell with water while minimizing air entrapment, prior to initiating purging and 2) maintaining a full cell of water by pinching the discharge line shut and elevating the discharge at the end of the tubing from the pump, above the cell. After purging was complete, the flow-through cell was disconnected and samples were collected directly from the pump discharge.

Purge water derived from the groundwater monitoring at the DRMO was extensively tested for COPCs during the first two years of quarterly monitoring. The purge water was determined to be non-hazardous. During the first two rounds of Year 3 (Rounds 9 and 10) purge water was containerized, labeled, and turned over to NSB-NLON for disposal. For the next two rounds (Rounds 11 and 12) the purge water was disposed directly to the OT-10 wastewater processing facility in compliance with the SUBASE NLON Pre-Treatment Permit from the Connecticut DEP.

All sample containers were filled by allowing the pump discharge to flow gently down the inside of the container with minimal turbulence. Samples analyzed for volatile constituents were collected first and immediately sealed in a pre-preserved container so that no head space existed. For filtered inorganic samples, an in-line 0.45 micron filter was used. The filter was pre-rinsed with approximately 400 ml of deionized water and attached to the discharge end of the pump tubing.

TABLE 3-1

MONITORING WELL CONSTRUCTION DETAILS
NSB-NLON, GROTON, CONNECTICUT

Well I.D.	Material of Construction	Top of Riser Elevation (ft)	Top/Bottom of Screen (ft BGS)	Screened Formation[a]	Total Depth (ft BGS)	Depth to Bedrock (ft BGS)
6MW1S	PVC	8.63	4.0-14.0	Shallow OB	14.0	NA
6MW2S	PVC	7.30	3.0-13.0	Shallow OB	13.0	NA
6MW2D	PVC	7.85	77.0-87.0	Deep OB	88.5	88.5
6MW6S	PVC	12.16	6.0-16.0	Shallow OB	16.0	NA
6MW6D	PVC	12.50	28.0	Bedrock	42.0	22.0
6MW9S	PVC	7.52	4.0-12.0	Shallow OB	12.0	NA
6MW10S	PVC	5.19	4.0-14.0	Shallow OB	14.0	NA
6MW10D	PVC	5.01	43.4-53.4	Deep OB	53.4	59.0
6MW11S	PVC	4.92	3.5-13.5	Shallow OB	14.0	NA
6MW11D	PVC	5.31	75.0-85.0	Deep OB	85.0	85.0

a OB = Overburden

Notes:
Reference elevation is top of well casing (1982 Base Traverse System).
BGS means below ground surface.
NA means information is not available.

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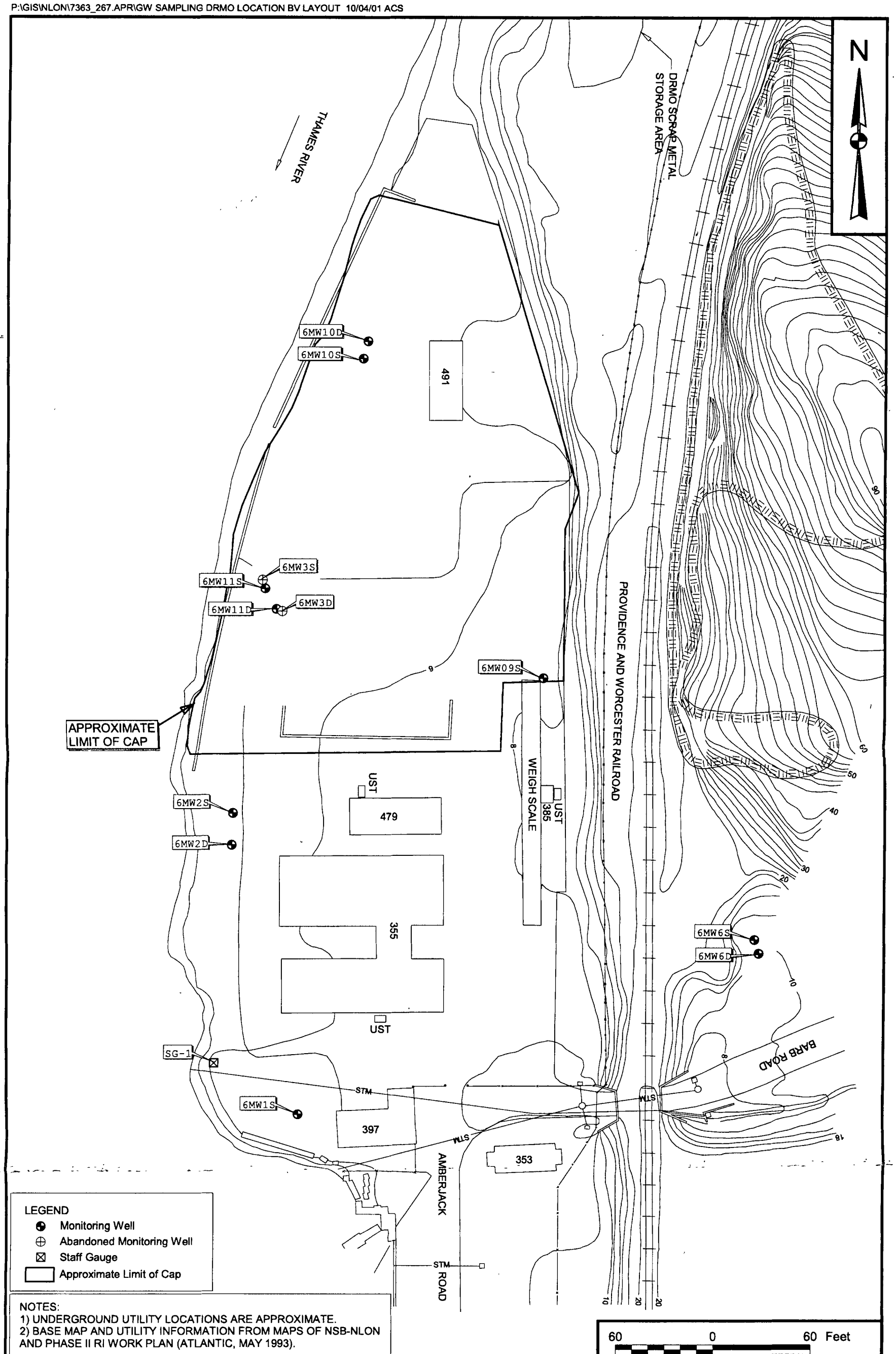


DRAWN BY M. Spangenberg — DATE 2-28-01	Tetra Tech NUS, Inc.	CONTRACT NUMBER 7091	OWNER NUMBER —
CHECKED BY — DATE —	DRMO MONITORING WELL LOCATIONS GROUNDWATER MONITORING PROGRAM NSB-NLON, GROTON, CONNECTICUT	APPROVED BY C. RICH — DATE 10/5/01	
COST/SCHEDULE-AREA		APPROVED BY —	DATE —
SCALE AS NOTED		DRAWING NO FIGURE 3-1	REV 0

4.0 DATA EVALUATION

This section presents a discussion of the analytical data as well as hydrogeological data obtained during groundwater monitoring activities performed at the DRMO from July 2000 through June 2001. The results of a detailed statistical analysis of the analytical data is also discussed in this section.

4.1 CHEMICAL DATA EVALUATION

Four rounds of groundwater samples were collected from each monitoring well as part of the third year of monitoring. Four field duplicate samples were also collected during the monitoring. Samples were not analyzed for dissolved metals during the third year of monitoring as agreed upon with the regulators, since total and dissolved metals results did not show any discernable differences over the first 6 rounds of monitoring. The analytical results are summarized in Table 4-1. The data validation letters for the Round 12 data are provided in Appendix B. The validation letters for Rounds 9 through 11 data were previously provided in the quarterly reports.

As described in the Groundwater Monitoring Plan (B&R Environmental, 1998), the Connecticut Remediation Standard Regulations (RSRs) require that all groundwater plumes be remediated to attain either a.) the SWPCs and Volatilization Criteria, or b.) the background concentration for each substance in the plume (CTDEP, January 1996). Accordingly, the primary monitoring criteria used to evaluate the analytical data were the site-specific SWPCs developed for the DRMO (B&R Environmental, September 1997) for SVOCs, pesticides/PCBs, and inorganics and the Volatilization Criteria for the VOCs. In addition, the groundwater analytical results were compared to secondary monitoring criteria. The criteria were selected from the Federal AWQCs and the Connecticut WQSs [i.e., aquatic life criteria developed for chronic (long-term) exposure of aquatic receptors in saltwater and human health criteria for consumption of organisms]. The human health criteria were included because recreational fishing may occur in the Thames River.

A comparison of the analytical data against the primary and secondary criteria and background concentrations (inorganics only) is provided in Table 4-1. Figure 4-1 depicts the chemicals that were detected at concentrations in excess of monitoring criteria for each well in the monitoring network. The following data discussion is limited to only those compounds designated as COPCs as stated in Section 3.0.

Cis-1,2-dichloroethene, trans-1,2-dichloroethene, trichloroethene, and vinyl chloride were all detected in the groundwater samples. None of the concentrations of VOCs detected in any of the samples were in

excess of the primary screening criteria during any of the sampling rounds. Additionally, VOCs were not detected in excess of any secondary screening criteria.

Six SVOCs [i.e., benzo(a)pyrene, benzo(k)fluoranthene, bis(2-ethylhexyl)phthalate (BEHP), fluoranthene, phenanthrene, and pyrene] were detected in the groundwater samples. None of the concentrations of SVOCs detected in any samples were in excess of the primary screening criteria. BEHP was detected in excess of the secondary monitoring criteria (5.9 µg/L) in nine of 40 samples. The concentrations in excess of the criteria ranged from 6.9 µg/L to 40 µg/L. BEHP was detected in excess of the criteria in every round in monitoring well 6MW1S; twice each respectively, in wells 6MW2D (Rounds 9 and 12) and 6MW6D (Rounds 9 and 11); and once in well 6MW10S during Round 11. Benzo(a)pyrene (0.24 µg/L) and benzo(k)fluoranthene (0.27 µg/L) were detected at concentrations in excess of their respective secondary monitoring criteria in the sample collected from 6MW9S during Round 12. No other SVOCs were detected in excess of any of the secondary monitoring criteria.

No pesticides or PCBs were detected in any of the groundwater samples collected during Year 3.

As noted previously, the groundwater samples were only analyzed for total metals. Arsenic, barium, cadmium, chromium, copper, lead, silver, and zinc were detected in the groundwater samples. None of the detections exceeded the primary screening criteria. Arsenic (11 of 40 samples), copper (5 of 40 samples), lead (1 of 40 samples), silver (3 of 40 samples), and zinc (13 of 40 samples) were detected at concentrations in excess of the secondary monitoring criteria. Arsenic was detected above secondary criteria once in monitoring well 6MW2S (Round 9) and well 6MW11S (Round 12); twice in well 6MW2D (Rounds 9 and 11); three times in well 6MW10D (Rounds 9, 10, and 11); and during every round in well 6MW11D. The detection limits for all samples analyzed for arsenic exceeded the secondary monitoring criterion (0.14 µg/L). These limits are the lowest levels achievable by the laboratory using currently available technology and equipment. Therefore, it is technically infeasible to detect arsenic levels as low as the secondary criterion. In addition the background concentration of arsenic at NSB-NLON was estimated to be 1.92 µg/L, which is above the secondary monitoring criterion. Arsenic concentrations ranged from 2.6 µg/L to 26.1 µg/L. Of note, the arsenic concentration of 12.6 µg/L detected in well 6MW11S was unexpectedly high as compared to non-detected concentrations for the previous 11 rounds. Field and laboratory information related to this sample were reviewed to determine if there was a reason for the anomaly; however, the review did not provide any insight into the anomaly. Future monitoring will help to determine the significance of this anomaly.

Copper was detected above secondary criteria once in monitoring wells 6MW2S (Round 12), 6MW2D (Round 9), 6MW9S (Round 10), 6MW11S (Round 10), and 6MW11D (Round 9). Copper concentrations ranged from 4.6 µg/L to 32 µg/L. Lead was detected in the sample collected from well 6MW11D and its

duplicate in Round 9 at concentrations of 10.5 µg/L and 8.9 µg/L, respectively. Silver was detected above secondary criteria once each in the samples collected from 6MW2S (Round 9), 6MW11S (Round 12), and 6MW11D (Round 12) at concentrations ranging from 6.9 µg/L to 20.5 µg/L. Zinc was detected above secondary criteria in all four rounds in well 6MW9S; once in well 6MW10S (Round 11); twice in well 6MW10D (Round 9 and 11), and three times in wells 6MW11S (Rounds 10, 11, and 12) and 6MW11D (Rounds 9, 10, and 11). Concentrations of zinc ranged from 86.8 µg/L to 756 µg/L. No other concentrations of total metals exceeded any primary or secondary monitoring criteria.

4.2 HYDROLOGIC DATA EVALUATION

Static groundwater levels were measured during each of the four quarterly rounds of groundwater sampling. Groundwater levels were measured approximately one hour before the low tide. The tides were approximated from tide tables acquired from the National Oceanic and Atmospheric Administration (NOAA) on July 27, 2000; December 16 and 17, 2000; March 10, 2001; and June 21 and 24, 2001. Groundwater levels were also measured at high tide during each of the respective quarterly sampling rounds. Potentiometric surface maps were prepared for each round of water level measurements and are depicted on Figures 4-2 through 4-9. The contours were drawn from the groundwater elevations of the shallow overburden monitoring wells (6MW1S, 6MW2S, 6MW6S, 6MW9S, 6MW10S, and 6MW11S).

Groundwater flow directions essentially mimic the ground surface contours and have done so over the past three years. A comparison of these maps illustrate that groundwater flow patterns are similar throughout the year. Potentiometric surface maps prepared during times of low tide conditions were generally similar and indicate a westerly flow direction toward the Thames River. Potentiometric surface maps prepared during times of high tide illustrate a similar flow pattern toward the Thames River. A slight reverse gradient is shown on Figure 4-7, likely because the tide rises faster than the opposing hydraulic gradient can respond. A comparison of groundwater elevations is summarized on Table 4-2.

4.3 STATISTICAL ANALYSIS

A statistical analysis was performed on the results from the groundwater monitoring effort to determine if contaminants associated with past activities at the DRMO are having an impact on groundwater at the site. The Year 3 groundwater monitoring program employed three upgradient wells (6MW6S, 6MW6D, and 6MW9S) and seven downgradient wells (6MW1S, 6MW2S, 6MW2D, 6MW10S, 6MW10D, 6MW11S, and 6MW11D) sampled over four quarters. Filtered metals were dropped from the analysis prior to Year 3 of the monitoring program.

The specific tests performed on data collected at the DRMO site are identified and described in the next section.

The statistical methods proposed to evaluate the groundwater data are employed in order to:

- Develop summary statistics that describe environmental contaminant concentrations at the DRMO.
- Allow comparisons of upgradient concentrations to those detected in environmental samples (i.e., samples collected in areas potentially contaminated by waste disposal) at the DRMO.

4.3.1 Comparison of Downgradient Wells to Upgradient Wells

Downgradient data was compared to upgradient data using various statistical methods. No correction for seasonal variability was required since all wells at the facility should be effected similarly. The statistical methods described in the following paragraphs were used to determine if parameter concentrations detected in downgradient wells are significantly different from those detected in samples from the upgradient wells.

The Analysis of Variance (ANOVA) technique is the preferred method to compare data from upgradient and downgradient monitoring well locations. The ANOVA technique is used to test whether there is statistically significant evidence of contamination. There are two types of ANOVA tests: parametric and non-parametric. The parametric ANOVA method makes two important assumptions: 1) the upgradient and downgradient data sets are both normally (or both lognormally) distributed, and 2) the group variances of the upgradient and downgradient data sets are homogeneous. If either of these crucial assumptions to the parametric ANOVA are violated, a non-parametric test can be conducted using the ranks of the observations rather than the original observations themselves. These assumptions can be checked using the Shapiro-Wilk Test of Normality and Levene's test of Homogeneity of Variance, respectively. If the analysis of the data demonstrated that these assumptions, critical to the parametric ANOVA, were violated, non-parametric ANOVA techniques were conducted using the ranks of the observations rather than the observations themselves. The Wilcoxon Rank-Sum test (also known as the Mann-Whitney U test) was employed as the non-parametric ANOVA technique for comparing the downgradient results to the upgradient results.

According to USEPA guidance (USEPA, 1992), parametric ANOVA tests should not be used in the event that nondetects exceed 50% of the data set. In addition, for analyses using the Wilcoxon Rank Sum Test, several environmental statistics guidance documents limit the percent of nondetects allowable in the test data sets to 50% (US Navy, 1998) or even 40% (US DD, US DOE, USEPA, USNRC 2000). Therefore, a Two-Sample Test of Proportions was performed on all data where nondetects exceed 50% of the data set.

4.3.1.1 Limit of Detection

During the chemical analysis of environmental samples, some analytes may be present at concentrations that are below the sample quantitation limit (SQL) for the analytical procedure. The results are generally reported as not detected (rather than zero), and the appropriate limit of detection is given. The amount of data that are below the detection limit play an important role in selecting the statistical method of addressing the detection limit problem. The non-detects found at the DRMO site were replaced with the SQL and divided by two, prior to the statistical analysis. Clearly, if all the observations were non-detectable results, no statistical analysis was warranted. In addition, field duplicate results were averaged and counted as one sample for use in statistical analysis.

4.3.2 Parametric and Nonparametric Analysis of Variance (ANOVA)

ANOVA is widely used in the examination of environmental data sets. A one-way classification ANOVA is used to determine whether or not the difference between average concentrations of a parameter detected in downgradient wells and upgradient wells is statistically significant. Since only two means are compared, an ANOVA test will give the same result as the t-test for independent samples. The data residuals are the values resulting from subtracting each measured value from the arithmetic mean. The assumptions that the residuals are drawn from an underlying normal (or lognormal) distribution must be examined prior to employing a parametric ANOVA.

4.3.2.1 The Shapiro and Wilk "W-test" of Normality ($n \leq 50$)

As stated above, the data must be analyzed to determine whether they were drawn from an underlying normal or lognormal distribution. A number of statistical evaluations may be used to determine which, if either, of the distributions are exhibited by a given data set. As recommended by the EPA, the Shapiro and Wilk "W-test" (for sample sets <50) and the Shapiro-Francia "W-test" (for sample sets >50) will be used to determine whether the data are normally or lognormally distributed (EPA, 1992). If the test is inconclusive, lognormality is assumed.

The Shapiro and Wilk W-test (Gilbert, 1987) is an effective method for determining whether a data set has been drawn from an underlying normal (or lognormal) distribution. By conducting the Shapiro and Wilk W-test on the log-transformed data, the test may be used to determine whether the data have been drawn from an underlying lognormal distribution. The null hypothesis (H_0) that is tested is:

H_O - The population has a normal (or lognormal when the data is log-transformed) distribution.

The alternate hypothesis (H_A) is:

H_A. The population does not have a normal (or lognormal when the data is log-transformed) distribution.

A 'W' statistic (W_{calc}) is computed and compared to a test statistic (W_{test}) for both the normal and log transformed data set. If both the normal and lognormal W_{calc} are greater than or equal to the W_{test}, then the underlying distribution is considered to be the producing the highest W_{calc} value. If only one W_{calc} value exceeds the W_{test} value the underlying distribution is the one the exceeds the W_{test} value. If neither 'W' statistic is greater than or equal to the test statistic or if W_{calc} is equal for normal and lognormal, the underlying distribution is defaulted to lognormal. This is because "EPA's experience with environmental concentration data, and groundwater data in particular, suggests that the Lognormal distribution is generally more appropriate as a default statistical model than the Normal distribution... " (EPA, 1992).

The following equations present a step-by-step procedure for conducting the W-test on the residuals.

- Step 1. Group all of the data from each of the individual (K) wells.

- Step 2. Calculate the mean for each of the *k* wells $\overline{x_j}$ by the equation:

$$\overline{x_j} = \frac{\sum_{i=1}^{n} x_i}{n}$$

where *n* is the total number of samples in each well.

- Step 3. Calculate the residuals for each ith well and j^{th} sampling round by:

$$R_{ij} = x_{ij} - \overline{x_i}$$

The equation for conducting the W-Test is:

$$W_{calc} = \left[\frac{b}{S_R\sqrt{n-1}}\right]^2$$

where:

$$b = \sum_{i=1}^{k} a_i \left(R_{[n-i+1]} - R_i\right) = \sum_{i=1}^{k} b_i$$

and n is the total number of sampling rounds.

- Step 4. Order the n residuals from smallest to largest:

$$x_1 \leq x_2 \leq x_3 \leq \ldots \leq x_n$$

- Step 5. Compute the standard deviation by:

$$S_R = \sqrt{\sum_{i=1}^{n} \frac{\left(R_{ij} - \overline{R}\right)^2}{(n-1)}}$$

- Step 6. Determine the coefficients $a_1, a_2, a_3, .., a_k$ for the sample size n using Table C-1 in Appendix C, where:

$$k = \frac{n}{2} \quad if\, n\ is\ even\text{; and}$$

$$k = \frac{n-1}{2} \quad if\, n\ is\ odd$$

- Step 7. Determine b by the formula:

$$b = \sum_{i=1}^{k} a_i \left(R_{[n-i+1]} - R_i\right) = \sum_{i=1}^{k} b_i$$

- Step 8. Calculate W_{calc} using b from above, where:

$$W_{calc} = \left[\frac{b}{S_R\sqrt{n-1}}\right]^2$$

- Step 9. Determine W_{test} at the 5% significance level from Table C-2.

- Step 10. Reject H_O at the 5% significance level if W_{calc} is less than W_{test}.

To test the null hypothesis for a data set drawn from an underlying lognormal distribution, transform the data to $y_{1j}, y_{2j}, y_{3j}, \ldots, y_{km}$ where $y_{ij} = ln\ R_{ij}$. Repeat steps 1 through 10 as described in the preceding paragraphs.

4.3.2.2 Homogeneity of Variance

An important assumption in ANOVA is that the variances in the different groups are equal (homogeneous). A powerful and commonly used test of this assumption is the Levene test. This test has practically replaced the older and less robust Bartlett's test and Chi-square test.

Levene's test (homogeneity of variances): For each dependent variable, an analysis of variance is performed on the absolute deviations of values from the respective group means. If the Levene test is statistically significant, then the hypothesis of homogeneous variances should be rejected.

To conduct Levene's test first compute the absolute value of the residuals:

$$Zij = \left| Xij - \overline{Xi} \right|$$

where Xij represents the jth value from the ith well. Then run a standard one-way ANOVA on the variable Zij (see Section 4.3.2.3). If the F test is significant, reject the hypothesis of equal group variances. Otherwise, proceed with the analysis of Xij's as planned.

4.3.2.3 Parametric ANOVA

Assume that a site has k wells and that n_i data points (analyte concentrations) are available for the ith well. The following presents a step-by-step procedure for conducting the parametric ANOVA.

- Step 1 Compute the sums and means of each well (i) using the following equations as follows:

$$X_i = \sum_{j=1}^{n_i} X_{ij}, \Sigma\ of\ all\ n_i\ observations\ at\ well\ i$$

$$\overline{X_i} = \frac{X_i}{n_i}, average\ of\ all\ n_i\ observations\ at\ well\ i$$

$$X = \sum_{i=1}^{k} \sum_{j=1}^{n_i} X_{ij}, grand\ total\ of\ all\ n_i\ observations$$

$$N = \sum_{i=1}^{k} n_i \text{, total number of observations}$$

$$\overline{X} = \frac{X}{N}\text{, grand mean of all observations}$$

- Step 2. Compute the sum of squares of differences between the individual well means and the grand mean by the formula:

$$SS_{sample} = \sum_{i=1}^{k} n_i \left(\overline{X}_i - \overline{X}\right)^2 = \sum_{i=1}^{k} \left[\frac{X_i^2}{n_i}\right] - \frac{X^2}{N}$$

This sum of squares has (*k-1*) degrees of freedom associated with it and is a measure of the variability between wells.

- Step 3. Compute the corrected total sum of squares by the formula:

$$SS_{total} = \sum_{i=1}^{k}\sum_{j=1}^{n_i}\left(X_{ij} - \overline{X}\right)^2 = \sum_{i=1}^{k}\sum_{j=1}^{n_i}\left[\left(X_{ij}\right)^2\right] - \frac{X^2}{N}$$

This sum of squares has (*N-1*) degrees of freedom associated with it and is a measure of variability in the whole data set.

- Step 4. Compute the sum of squares of differences of observations within wells from the well means. This value is the sum of squares due to error and is obtained by simple subtraction:

$$SS_{Error} = SS_{Total} - SS_{Well}$$

The sum of squares due to error has associated with it (*N-k*) degrees of freedom and is a measure of the variability within wells.

- Step 5. Set up an ANOVA table as shown below. The sums of squares and their degree of freedom were obtained from Steps 2 through 4. The mean square quantities are simply obtained by dividing each sum of squares by its corresponding degrees of freedom.

ONE-WAY PARAMETRIC ANOVA TABLE

Source of Variation	Sums of Squares	Degrees of Freedom	Mean Squares	F
Between Wells	SS_{Well}	k-1	$MS_{Well}=SS_{Well}/(k-1)$	$F=MS_{Well}/MS_{Error}$
Error (within Wells)	SS_{Error}	N-k	$MS_{Error}=SS_{Error}/(N-k)$	
Total	SS_{Total}	N-1		

- Step 6. To test the hypothesis of equal means for all *k* wells, compute $F = MS_{Well}/MS_{Error}$ (last column in above table). Compare this statistic to the tabulated F statistic with (*k-1*) and (*N-k*) degrees of freedom (Table C-3) at the 5% significance level. If the calculated *F* value does not exceeds the tabulated value, conclude that there is no significant difference between the concentrations of the *k* wells. If the calculated *F* value exceeds the tabulated value, reject the hypothesis of equal well means. Check the downgradient mean concentration relative to the upgradient mean concentration. If the downgradient mean is lower than the upgradient mean, there is no evidence of contamination. If the upgradient mean is lower is lower than the downgradient mean, the downgradient concentration is statistically higher than the upgradient concentration at a 95% confidence level.

4.3.2.4 Nonparametric ANOVA

The parametric ANOVA technique is the preferred approach for comparing environmental measurements from downgradient monitoring wells to upgradient well data. However, parametric ANOVA methods make two key assumptions: 1) the data are both normally (or both lognormally) distributed, and 2) the group variances are homogenous. If this assumption is violated, non-parametric tests (i.e. Kruskal-Wallis or Wilcoxon Rank-Sum tests) may be used to determine if constituent concentrations present in the downgradient areas significantly exceed those present in the upgradient well.

The Kruskal-Wallis (EPA, 1989) test should be employed when comparing three or more data sets. However, it is not amenable to two data set comparisons. In these situations, the Wilcoxon Rank-Sum test (EPA, 1992) (also known as the Mann-Whitney U test) should be employed.

Non-parametric tests are conducted using the ranks of the analytical results rather than the analytical results themselves. Therefore, the data sets are inspected for extremely high values that may be underestimated as a result of the ranking process.

4.3.2.5 The Wilcoxon Rank-Sum Test

The Wilcoxon Rank-Sum test is described in the following paragraphs.

- Step 1. Combine the upgradient and downgradient data and rank the ordered values from 1 to *N*. Assume there are *n* downgradient samples and m upgradient samples so that $N = m + n$.

- Step 2. Compute the Wilcoxon statistic *W*:

$$W = \sum_{i=1}^{n} E_i - \frac{1}{2}n(n+1)$$

where E_i are the ranks of the downgradient samples large values of the statistic *W* give evidence of contamination in downgradient wells.

- Step 3. Compute an approximate *Z-score*. To find the critical value of *W*, a normal approximation to its distribution is used. The expected value and standard deviation of *W* under the null hypothesis (i.e., no contamination exists) are given by the formulas

$$E(W) = \frac{1}{2}mn; \qquad SD(W) = \sqrt{\frac{1}{12}mn(N+1)}$$

An approximate *Z-score* for the Wilcoxon Rank-Sum test may be calculated by the following equations:

$$Z = \frac{W - E(W) - \frac{1}{2}}{SD(W)}$$

The factor of 1/2 in the numerator serves as a continuity correction since the discrete distribution of the statistic W is being approximated by the continuous normal distribution. If $n,m > 10$ and ties are present, an adjustment to the approximate *Z-score* must be made as follows:

$$Z_{RS} = \frac{W - E(W) - \frac{1}{2}}{SD'(W)}$$

where: $SD'(W) = \left(\frac{mn}{12} \left[N + 1 - \frac{\sum_{j=1}^{g} t_j (t_j^2 - 1)}{N(N-1)} \right] \right)^{\frac{1}{2}}$

g = the number of tied groups and t_j is the number of tied data in the jth group.

- Step 4. For a one-tailed 0.05 significance level test for H_0 versus H_A (i.e. the measurements from population 1 tend to exceed those from population 2), reject H_0 and accept H_A if $Z_{RS} > Z_{0.95} = +1.645$.

4.3.2.6 Two-Sample Test of Proportions

When more than 50% of the data for a constituent are non-detects, it is difficult to conduct a valid statistical test of whether the average downgradient concentration is significantly higher than the average upgradient concentration. The Two-Sample Test of Proportions is suitable for this situation.

The null and alternative hypotheses are:

$H_0: P_d \leq P_u$

$H_A: P_d > P_u$

Where P_d and are P_u the true proportion of the downgradient and upgradient distributions of potential measurement that exceed a specified concentration C. The value of the concentration C should be just slightly greater than the largest upgradient non-detect value.

- Step 1. Let K_d and K_u be the number of downgradient and upgradient measurements that exceed C.

- Step 2. Compute $P_d = K_d / n$ and $P_u = K_u / m$ where there are n downgradient samples and m upgradient samples so that $N = m + n$..

- Step 3. Compute $P = (K_d + K_u) / N$.

- Step 4. Compute the Test Statistic: $Z_p = (P_d - P_u) / [P(1-P)(1/n+1/m)]^{1/2}$

- Step 5. At 95% confidence, reject H_0 and accept H_A if $Z_p > Z_{0.95} = +1.645$.

4.3.3 Statistical Findings

The following tables summarize the results of the statistical analysis that was completed with the DRMO groundwater monitoring data.

- Table 4-3: Detection statistics for downgradient groundwater results for Rounds 9 through 12. Includes results from wells 6MW1S, 6MW2S, 6MW2D, 6MW10S, 6MW10D, 6MW11S, and 6MW11D. Includes Shapiro-Wilk Test of Normality results.

- Table 4-4: Detection statistics for upgradient groundwater results for Rounds 9 through 12. Includes results from wells 6MW6S, 6MW6D, and 6MW9S. Includes Shapiro-Wilk Test of Normality results.

- Table 4-5: Summary of statistical test results for comparison of downgradient results with upgradient results.

- Table 4-6: Summary of Parametric ANOVA comparison of downgradient results with upgradient results.

- Table 4-7: Summary of Levene's Test of Homogeneity of Variance results.

- Table 4-8: Summary of Wilcoxon-Rank Sum Non-Parametric ANOVA comparison of downgradient results with upgradient results.

- Table 4-9: Summary of Test of Proportions comparison of downgradient results with upgradient results.

- Table 4-10: Comparisons of average and maximum concentrations by round for downgradient and upgradient results to site-specific background and monitoring criteria.

The thirteen COPCs that were not detected in downgradient wells during Rounds 9 through 12 include: 1,1,2,2-tetrachloroethane, 1,2-dichloroethene, benzo(a)anthracene, benzo(a)pyrene,

benzo(b)fluoranthene, benzo(k)fluoranthene, benzoic acid, fluorene, naphthalene, 4,4'-DDD, Aroclor-1254, Aroclor-1260, and heptachlor epoxide. Since these compounds were not detected, no statistical comparisons were run for them. None of these potential COCs have been detected during the three years of groundwater monitoring. It does not appear that these compounds are a concern at the DRMO site.

The following sixteen COPCs were detected in the downgradient wells at least once during the most recent four sampling rounds (Rounds 9 through 12):

Volatile Organics (4)

Cis-1,2-Dichloroethene	Trans-1,2-Dichloroethene
Trichloroethene	Vinyl Chloride

Semivolatile Organics (4)

Bis(2-ethylhexyl)phthalate	Fluoranthene
Phenanthrene	Pyrene

Total Metals (8)

Arsenic	Barium
Cadmium	Chromium
Copper	Lead
Silver	Zinc

All COPCs detected in the downgradient wells at least once during Rounds 5 through 8 were detected during Rounds 9 through 12. Five contaminants were detected in the downgradient wells during Rounds 9 through 12 that were not detected during Rounds 5 through 8. Those were fluoranthene, phenanthrene, cadmium, chromium, and silver. However, four of these five contaminants were detected in downgradient wells during Rounds 1 through 4. Cadmium was the only contaminant that was not previously detected during Rounds 1 through 8.

The five COPCs that were detected in downgradient wells but not in upgradient wells in Rounds 9 through 12 include: trans-1,2-dichloroethene, vinyl chloride, arsenic, lead, and silver. No statistical comparisons were run on these potential COCs. Downgradient concentrations are considered to be statistically higher than upgradient concentrations for these potential COCs by default.

The eleven COPCs that were detected in the upgradient wells as well as downgradient wells during Rounds 9 through 12 include cis-1,2-dichloroethene, trichloroethene, bis(2-ethylhexyl)phthalate,

fluoranthene, phenanthrene, pyrene, barium, cadmium, chromium, copper and zinc. The data sets for these COPCs were examined for total percent non-detects. It was found that data sets for all of them except cis-1,2-dichloroethene, barium, and zinc had greater than 50% non-detects, so a test of proportions was used to compare downgradient and upgradient concentrations for these COPCs. Two-Sample Tests of Proportions were performed for these COPCs. Results of the Two-Sample Tests of Proportions are presented in Table 4-9 for the eight COPCs with greater than 50% non-detects. Only chromium failed this test which indicates downgradient concentrations are higher than upgradient concentrations.

Because cis-1,2-dichloroethene, barium, and zinc met the assumption of less than or equal to 50% non-detects, ANOVA were performed on these COPCs. Shapiro-Wilk W tests results (performed as part of detection statistics and presented in Tables 4-3 and 4-4 for downgradient and upgradient results, respectively) were examined, and both downgradient and upgradient distributions were determined to be lognormal for cis-1,2-dichloroethene and zinc. Barium had different underlying distributions for upgradient and downgradient results so a non-parametric ANOVA (Wilcoxon Rank-Sum) test was performed at a 95% level of confidence to compare these data sets. Results of this non-parametric ANOVA (Wilcoxon Rank-Sum) are presented in Table 4-8. Barium failed this test which indicates downgradient concentrations are higher than upgradient concentrations. Since upgradient and downgradient results demonstrated the same underlying distribution for cis-1,2-dichloroethene and zinc Levene's Test of Homogeneity of Variance was performed for these COPCs. Results of this test (as shown on Table 4-7) indicate homogeneous variances. Since these COPCs passed the tests of positive detections, underlying distribution, and homogeneous variances parametric ANOVA were performed at a 95% level of confidence to compare these data sets. Both cis-1,2-dichloroethene and zinc passed the ANOVA test which indicates downgradient concentrations are not higher than upgradient concentrations.

Seven COPCs were judged to have downgradient concentrations that are higher than upgradient concentrations. Five COPCs that were detected in downgradient wells but not in upgradient wells (trans-1,2-dichloroethene, vinyl chloride, arsenic, lead, and silver), one by test of proportions (chromium), and one by non-Parametric ANOVA (barium). A comparison of these seven COPCs to established background groundwater concentrations established in the Basewide Groundwater Operable Unit Remedial Investigation (TtNUS, January 2002) and primary monitoring criteria is shown in Table 4-10. No results were found to be in exceedance of both background and the primary monitoring criteria.

Downgradient total barium concentrations were statistically higher than upgradient concentrations during Years 2 and 3 (Rounds 5 through 12). They were not statistically higher before. There are no primary or secondary monitoring criterion for barium. The average concentration of barium plotted as a function of time over Rounds 1 through 12 is shown on Figure 4-11. The least-squared linear regression line shows

a downward trend of - 4.5 (± 9.3) µg/L/year. It should be noted that since the 95% confidence interval for this trend contains the 'no trend' line, this is not a significant trend at a 95% level of significance.

Downgradient total arsenic concentrations were statistically higher than upgradient concentrations during Years 1 and 3 (Rounds 1 through 4 and Rounds 9 through 12). They were not statistically higher in Year 2. The average concentration of arsenic plotted as a function of time over Rounds 1 through 12 are shown on Figure 4-12. The least-squared linear regression line shows an upward trend of + 0.3 (± 1.1) µg/L/year. It should be noted that since the 95% confidence interval for this trend contains the 'no trend' line, this is not a significant trend at a 95% level of significance. It should also be noted that there were a significant number of nondetects in the arsenic data set and the attempts to identify the time trend in downgradient arsenic data is strongly influenced by the detection limits achieved by the laboratory. Further review of the arsenic analytical data for Rounds 9 through 12 (Table 4-1) shows that a majority of the positive detections of arsenic and the most significant concentrations were found in the deep overburden downgradient wells. The water level data (Table 4-2) collected during Year 3 show that upward vertical gradients consistently occur in the downgradient monitoring well pairs 6MW2S/6MW2D, 6MW10S/6MW10D, and 6MW11S/6MW11D. Together, the chemical and hydrogelogic data indicate that the arsenic present in the deep overburden groundwater is not attributable to the DRMO site.

In past sampling rounds, it has been noted that oxidation-reduction potential (ORP) tends to be lower in downgradient wells in comparison to upgradient wells. The ORP data collected during Year 3 (Table A-1 in Appendix A) shows a similar tendency. Specifically at downgradient locations, there are strongly reducing conditions beneath the cap and weaker to oxidizing conditions south of the cap. Reducing conditions beneath the cap may be the result of the cap inhibiting recharge of oxygenated water to the shallow aquifer, the influence of landfill leachate, or groundwater passing through a domain of organic-rich, estuarine sediments beneath the cap.

It was previously hypothesized that reducing conditions could be influencing the mobility of metals in the groundwater. However, contrary to Year 1 and Year 2 data sets, the Year 3 metals detections in downgradient monitoring wells were not statistically different from the concentrations detected at upgradient wells. This suggests that the mobility of metals beneath the cap is not influenced by the reducing conditions to an extent that can be observed in the data.

As a final test of the relationship between metals concentrations in downgradient monitoring wells and ORP, the Pearson's correlation coefficient (r) was calculated for those metals detected above background concentrations. The Pearson's correlation coefficient is a statistical procedure that assesses the strength and direction of the relationship between two phenomena. This procedure yields a single number that can have an absolute value in the range from 0.0 to 1.0. The closer the absolute value is to 1.0 the

stronger the relationship. The closer the absolute value is to 0.0 the weaker the relationship. The following is a common ranking that may be used to determine the strength of association suggested by the absolute value of the correlation coefficient:

0.80-1.00 Strong association between variables
0.60-0.79 Strong to moderate association
0.40-0.59 Moderate association
0.30-0.39 Moderate to weak association
0.20-0.29 Weak association
0.00-0.19 Little, if any association

A negative sign (referred to as a negative or inverse correlation) means that an upward change in one variable is accompanied by a downward change in the other variable, or vice versa.

A comparison of metals concentrations to ORP shows that only arsenic and barium have more than a weak correlation (i.e., absolute value of the Pearson r greater than 0.29) between concentration and ORP. Five of the field-measured ORP values were removed from the data set before completing the analysis because they were of questionable validity. Pearson r values between metal concentrations and ORP are shown in Table 4-11. The correlations for arsenic and barium were moderate at best and are not indicative of a significant cause/effect relationship between metals concentrations and the low ORP detected in downgradient wells. Therefore, the low ORP values in the downgradient wells, whether caused by natural or anthropogenic influences, do not seem to be enhancing the mobility of metals or the migration of them from the site.

TABLE 4-1

ROUNDS 9 THROUGH 12 ANALYTICAL RESULTS SUMMARY
DRMO, NSB-NLON, GROTON, CONNECTICUT

Chemical	Primary Monitoring Criterion [1]	Secondary Monitoring Criterion	NSB-NLON Background Concentration[6]	6MW1S ROUND 9 7/27/2000	6MW1S ROUND 10 12/19/2000	6MW1S ROUND 11 3/10/2001	6MW1S ROUND 12 6/23/2001
VOCs (ug/L)							
1,1,2,2-TETRACHLOROETHANE	100 [2]	11 [4][5]	--	1 U	1 U	1 UJ	1 U
1,2-DICHLOROETHANE	90 [2]	99 [4][5]	--	1 U	1 U	1 U	1 U
CIS-1,2-DICHLOROETHENE	NA	NA	--	1 U	1 U	1 U	1 U
TRANS-1,2-DICHLOROETHENE	NA	NA	--	1 U	1 U	1 U	1 U
TRICHLOROETHENE	540 [2]	81 [4][5]	--	1 J	0.34 J	0.27 J	1 U
VINYL CHLORIDE	2 [2]	525 [4][5]	--	1 U	1 U	1 U	1 U
SVOCs (ug/L)							
BENZO(A)ANTHRACENE	3.0	0.049 [4]	--	2 U	0.2 U	0.2 UJ	0.012 U
BENZO(A)PYRENE	3.0	0.049 [4]	--	2 U	0.2 U	0.2 UJ	0.021 U
BENZO(B)FLUORANTHENE	3.0	0.049 [4]	--	2 U	0.2 U	0.2 UJ	0.02 U
BENZO(K)FLUORANTHENE	3.0	0.049 [4]	--	2 U	0.2 U	0.2 UJ	0.02 U
BENZOIC ACID	NA	NA	--		50 UJ	50 U	5 UJ
BIS(2-ETHYLHEXYL)PHTHALATE	590	5.9 [4][5]	--	17.1	25	11	19 J
FLUORANTHENE	37,000	370 [4][5]	--	2 U	0.078 J	0.2 UJ	0.009 U
FLUORENE	1,400,000	14,000 [4][5]	--	2 U	0.2 U	0.2 UJ	0.007 U
NAPHTHALENE	NA	NA	--	2 U	1 U	1 UJ	0.008 U
PHENANTHRENE	0.77	NA	--	2 U	0.26	0.2 UJ	0.004 U
PYRENE	1,100,000	11,000 [4][5]	--	2 U	0.038 J	0.2 UJ	0.008 U
Pesticides/PCBs (ug/L)							
4,4'-DDD	NA	0.00084 [4][5]	--	0.02 U	0.02 U	0.02 U	0.02 U
AROCLOR-1254	5.0	0.00017 [4]	--	0.2 U	0.2 U	0.2 U	0.2 U
AROCLOR-1260	5.0	0.00017 [4]	--	0.2 U	0.2 U	0.2 U	0.2 U
HEPTACHLOR EPOXIDE	0.5	0.00011 [4][5]	--	0.01 U	0.01 U	0.01 U	0.01 U
Inorganics (total) (ug/L)							
ARSENIC	40	0.14 [4][5]	1.92	2.7 U	2.2 U	2.6 U	5 U
BARIUM	NA	NA	227	17 U	6.4	5.1 U	2 J
CADMIUM	60	9.3 [3]	ND	0.32 U	0.2 U	2.6 UJ	3 U
CHROMIUM	1,100	50 [3]	49.9	1.3 U	0.5 U	2.6 U	5 U
COPPER	480	2.4 [3]	107	0.87 U	1.5 U	2 U	2.2 U
LEAD	130	8.1 [3]	6.63	1.9 U	1 U	2 U	3 U
SILVER	120	1.9 [3]	ND	1.1 U	0.9 U	2.1 U	5 U
ZINC	1,230	81 [3]	131	25.3 J	39.7 U	18.7 U	16.2 J

TABLE 4-1

ROUNDS 9 THROUGH 12 ANALYTICAL RESULTS SUMMARY
DRMO, NSB-NLON, GROTON, CONNECTICUT

Chemical	Primary Monitoring Criterion [1]	Secondary Monitoring Criterion	NSB-NLON Background Concentration[6]	6MW2S ROUND 9 7/27/2000	6MW2S ROUND 10 12/18/2000	6MW2S ROUND 11 3/7/2001	6MW2S ROUND 12 6/21/2001
VOCs (ug/L)							
1,1,2,2-TETRACHLOROETHANE	100 [2]	11 [4][5]	--	1 U	1 U	1 U	1 U
1,2-DICHLOROETHANE	90 [2]	99 [4][5]	--	1 U	1 U	1 U	1 U
CIS-1,2-DICHLOROETHENE	NA	NA	--	1 U	0.12 J	1 U	1 U
TRANS-1,2-DICHLOROETHENE	NA	NA	--	1 U	1 U	1 U	1 U
TRICHLOROETHENE	540 [2]	81 [4][5]	--	1 U	0.2 J	0.13 J	1 U
VINYL CHLORIDE	2 [2]	525 [4][5]	--	1 U	1 U	1 U	1 U
SVOCs (ug/L)							
BENZO(A)ANTHRACENE	3.0	0.049 [4]	--	2 U	0.2 U	0.2 UJ	0.012 U
BENZO(A)PYRENE	3.0	0.049 [4]	--	2 U	0.2 U	0.2 UJ	0.021 U
BENZO(B)FLUORANTHENE	3.0	0.049 [4]	--	2 U	0.2 U	0.2 UJ	0.02 U
BENZO(K)FLUORANTHENE	3.0	0.049 [4]	--	2 U	0.2 U	0.2 UJ	0.02 U
BENZOIC ACID	NA	NA	--		50 U	50 UJ	5 U
BIS(2-ETHYLHEXYL)PHTHALATE	590	5.9 [4][5]	--	2 U	3.7 J	10 U	1.7 J
FLUORANTHENE	37,000	370 [4][5]	--	2 U	0.2 U	0.2 UJ	0.009 U
FLUORENE	1,400,000	14,000 [4][5]	--	2 U	0.2 U	0.2 UJ	0.007 U
NAPHTHALENE	NA	NA	--	2 U	1 U	1 UJ	0.008 U
PHENANTHRENE	0.77	NA	--	2 U	0.2 U	0.2 UJ	0.004 U
PYRENE	1,100,000	11,000 [4][5]	--	2 U	0.2 U	0.2 UJ	0.008 U
Pesticides/PCBs (ug/L)							
4,4'-DDD	NA	0.00084 [4][5]	--	0.02 U	0.02 U	0.02 U	0.02 U
AROCLOR-1254	5.0	0.00017 [4]	--	0.2 U	0.2 U	0.2 U	0.2 U
AROCLOR-1260	5.0	0.00017 [4]	--	0.2 U	0.2 U	0.2 U	0.2 U
HEPTACHLOR EPOXIDE	0.5	0.00011 [4][5]	--	0.01 U	0.01 U	0.01 U	0.01 U
Inorganics (total) (ug/L)							
ARSENIC	40	0.14 [3][5]	1.92	3.4 J	2.2 U	2.6 U	5 U
BARIUM	NA	NA	227	29.9 J	34.7	22.7 U	19.3
CADMIUM	60	9.3 [3]	ND	0.32 UJ	0.56 U	2.6 UJ	3 U
CHROMIUM	1,100	50 [3]	49.9	1.3 U	0.5 UJ	2.6 U	5 U
COPPER	480	2.4 [3]	107	6.6 U	5.6 U	8.6 U	4.6
LEAD	130	8.1 [3]	6.63	1.9 UJ	1 UJ	4.4	3 U
SILVER	120	1.9 [3]	ND	20.5	0.9 U	2.1 UJ	5 U
ZINC	1,230	81 [3]	131	15.4 J	38.9 U	17.8 U	10.8 J

TABLE 4-1

ROUNDS 9 THROUGH 12 ANALYTICAL RESULTS SUMMARY
DRMO, NSB-NLON, GROTON, CONNECTICUT

Chemical	Primary Monitoring Criterion [1]	Secondary Monitoring Criterion	NSB-NLON Background Concentration[6]	6MW2D ROUND 9 7/26/2000	6MW2D ROUND 10 12/19/2000	6MW2D ROUND 11 3/7/2001	6MW2D ROUND 12 6/21/2001
VOCs (ug/L)							
1,1,2,2-TETRACHLOROETHANE	100 [2]	11 [4][5]	--	1 U	1 U	1 U	1 U
1,2-DICHLOROETHANE	90 [2]	99 [4][5]	--	1 U	1 U	1 U	1 U
CIS-1,2-DICHLOROETHENE	NA	NA	--	1 U	0.12 J	1 U	1 U
TRANS-1,2-DICHLOROETHENE	NA	NA	--	1 U	1 U	1 U	1 U
TRICHLOROETHENE	540 [2]	81 [4][5]	--	1 U	1 U	1 U	1 U
VINYL CHLORIDE	2 [2]	525 [4][5]	--	1 U	1 U	0.17 J	1 U
SVOCs (ug/L)							
BENZO(A)ANTHRACENE	3.0	0.049 [4]	--	2 U	0.2 UJ	0.2 UJ	0.012 U
BENZO(A)PYRENE	3.0	0.049 [4]	--	2 U	0.2 UJ	0.2 UJ	0.021 U
BENZO(B)FLUORANTHENE	3.0	0.049 [4]	--	2 U	0.2 UJ	0.2 UJ	0.02 U
BENZO(K)FLUORANTHENE	3.0	0.049 [4]	--	2 U	0.2 UJ	0.2 UJ	0.02 U
BENZOIC ACID	NA	NA	--		50 UJ	50 UJ	5 U
BIS(2-ETHYLHEXYL)PHTHALATE	590	5.9 [4][5]	--	10.3	3.4 J	5.6 J	40
FLUORANTHENE	37,000	370 [4][5]	--	2 U	0.029 J	0.2 UJ	0.009 U
FLUORENE	1,400,000	14,000 [4][5]	--	2 U	0.2 UJ	0.2 UJ	0.007 U
NAPHTHALENE	NA	NA	--	2 U	1 UJ	1 UJ	0.008 U
PHENANTHRENE	0.77	NA	--	2 U	0.023 J	0.2 UJ	0.004 U
PYRENE	1,100,000	11,000 [4][5]	--	2 U	0.2 UJ	0.2 UJ	0.008 U
Pesticides/PCBs (ug/L)							
4,4'-DDD	NA	0.00084 [4][5]	--	0.021 U	0.02 U	0.02 UJ	0.02 U
AROCLOR-1254	5.0	0.00017 [4]	--	0.21 U	0.2 U	0.2 UJ	0.2 U
AROCLOR-1260	5.0	0.00017 [4]	--	0.21 U	0.2 U	0.2 UJ	0.2 U
HEPTACHLOR EPOXIDE	0.5	0.00011 [4][5]	--	0.01 U	0.01 U	0.01 UJ	0.01 U
Inorganics (total) (ug/L)							
ARSENIC	40	0.14 [4][5]	1.92	3.4 J	2.2 U	2.6 J	5 U
BARIUM	NA	NA	227	148	172	144	111
CADMIUM	60	9.3 [3]	ND	0.32 UJ	0.51 U	5.2 UJ	3 U
CHROMIUM	1,100	50 [3]	49.9	1.3 U	1.9 U	2.6 U	5 U
COPPER	480	2.4 [3]	107	7.8 J	3.6 U	2 U	2.2 U
LEAD	130	8.1 [3]	6.63	1.9 J	1 UJ	2 U	3 U
SILVER	120	1.9 [3]	ND	1.1 U	0.9 U	2.1 UJ	5 U
ZINC	1,230	81 [3]	131	9.3 J	21.7 U	12.9 U	8.5 U

TABLE 4-1

ROUNDS 9 THROUGH 12 ANALYTICAL RESULTS SUMMARY
DRMO, NSB-NLON, GROTON, CONNECTICUT

Chemical	Primary Monitoring Criterion [1]	Secondary Monitoring Criterion	NSB-NLON Background Concentration[6]	6MW6S ROUND 9 7/23/2000	6MW6S ROUND 10 12/15/2000	6MW6S (DUP) ROUND 10 12/15/2000	6MW6S ROUND 11 3/6/2001	6MW6S ROUND 12 6/25/2001	6MW6S (DUP) ROUND 12 6/25/2001
VOCs (ug/L)									
1,1,2,2-TETRACHLOROETHANE	100 [2]	11 [4][5]	--	1 U	1 U	1 U	1 U	1 U	1 U
1,2-DICHLOROETHANE	90 [2]	99 [4][5]	--	1 U	1 U	1 U	1 U	1 U	1 U
CIS-1,2-DICHLOROETHENE	NA	NA	--	1 U	0.18 J	0.19 J	1 U	1 U	1 U
TRANS-1,2-DICHLOROETHENE	NA	NA	--	1 U	1 U	1 U	1 U	1 U	1 U
TRICHLOROETHENE	540 [2]	81 [4][5]	--	0.5 J	0.79 J	0.77 J	0.25 J	1 U	1 U
VINYL CHLORIDE	2 [2]	525 [4][5]	--	1 U	1 U	1 U	1 U	1 U	1 U
SVOCs (ug/L)									
BENZO(A)ANTHRACENE	3.0	0.049 [4]	--	0.2 UJ	0.2 UJ	0.2 UJ	0.2 U	0.012 U	0.012 U
BENZO(A)PYRENE	3.0	0.049 [4]	--	0.2 UJ	0.2 UJ	0.2 UJ	0.2 U	0.021 U	0.021 U
BENZO(B)FLUORANTHENE	3.0	0.049 [4]	--	0.2 UJ	0.2 UJ	0.2 UJ	0.2 U	0.02 U	0.02 U
BENZO(K)FLUORANTHENE	3.0	0.049 [4]	--	0.2 UJ	0.2 UJ	0.2 UJ	0.2 U	0.02 U	0.02 U
BENZOIC ACID	NA	NA	--		50 UJ	50 UJ	50 UJ	5 UJ	5 UJ
BIS(2-ETHYLHEXYL)PHTHALATE	590	5.9 [4][5]	--	2.3	10 U	10 U	10 U	1.9 J	1.5 J
FLUORANTHENE	37,000	370 [4][5]	--	0.2 UJ	0.2 UJ	0.2 UJ	0.2 U	0.009 U	0.009 U
FLUORENE	1,400,000	14,000 [4][5]	--	0.2 UJ	0.2 UJ	0.2 UJ	0.2 U	0.007 U	0.007 U
NAPHTHALENE	NA	NA	--	0.2 UJ	1 UJ	1 UJ	1 U	0.008 U	0.008 U
PHENANTHRENE	0.77	NA	--	0.2 UJ	0.2 UJ	0.2 UJ	0.2 U	0.004 U	0.004 U
PYRENE	1,100,000	11,000 [4][5]	--	0.2 UJ	0.2 UJ	0.2 UJ	0.2 U	0.008 U	0.008 U
Pesticides/PCBs (ug/L)									
4,4'-DDD	NA	0.00084 [4][5]	--	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
AROCLOR-1254	5.0	0.00017 [4]	--	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
AROCLOR-1260	5.0	0.00017 [4]	--	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
HEPTACHLOR EPOXIDE	0.5	0.00011 [4][5]	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Inorganics (total) (ug/L)									
ARSENIC	40	0.14 [4][5]	1.92	2.7 U	2.2 U	2.2 U	2.6 U	5 U	5 U
BARIUM	NA	NA	227	30.1 J	38.5	39.6	32.3 U	43.8	35.6
CADMIUM	60	9.3 [3]	ND	0.40 U	0.2 U	0.2 U	2.6 UJ	3 U	3 U
CHROMIUM	1,100	50 [3]	49.9	1.3 U	0.5 U	0.5 U	2.6 U	5 U	5 U
COPPER	480	2.4 [3]	107	0.87 U	1.8 U	1.8 U	2 U	5.8 U	3.3 U
LEAD	130	8.1 [3]	6.63	1.9 U	1 U	1 U	2 U	3 U	3 U
SILVER	120	1.9 [3]	ND	1.1 U	0.9 U	0.9 U	2.1 U	5 U	5 U
ZINC	1,230	81 [3]	131	6.9 U	20.4 U	18.5 U	2 U	27	29

TABLE 4-1

ROUNDS 9 THROUGH 12 ANALYTICAL RESULTS SUMMARY
DRMO, NSB-NLON, GROTON, CONNECTICUT

Chemical	Primary Monitoring Criterion [1]	Secondary Monitoring Criterion	NSB-NLON Background Concentration[6]	6MW6D ROUND 9 7/23/2000	6MW6D ROUND 10 12/15/2000	6MW6D ROUND 11 3/6/2001	6MW6D (DUP) ROUND 11 3/6/2001	6MW6D ROUND 12 6/25/2001
VOCs (ug/L)								
1,1,2,2-TETRACHLOROETHANE	100 [2]	11 [4][5]	--	1 U	1 U	1 U	1 U	1 U
1,2-DICHLOROETHANE	90 [2]	99 [4][5]	--	1 U	1 U	1 U	1 U	1 U
CIS-1,2-DICHLOROETHENE	NA	NA	--	7	5.3	3.5	3.2	5.5
TRANS-1,2-DICHLOROETHENE	NA	NA	--	1 U	1 U	1 U	1 U	1 U
TRICHLOROETHENE	540 [2]	81 [4][5]	--	10	10	6.1	5.5	7.6
VINYL CHLORIDE	2 [2]	525 [4][5]	--	1 U	1 U	1 U	1 U	1 U
SVOCs (ug/L)								
BENZO(A)ANTHRACENE	3.0	0.049 [4]	--	0.2 UJ	0.2 UJ	0.2 UJ	0.2 U	0.012 U
BENZO(A)PYRENE	3.0	0.049 [4]	--	0.2 UJ	0.2 UJ	0.2 UJ	0.2 U	0.021 U
BENZO(B)FLUORANTHENE	3.0	0.049 [4]	--	0.2 UJ	0.2 UJ	0.2 UJ	0.2 U	0.02 U
BENZO(K)FLUORANTHENE	3.0	0.049 [4]	--	0.2 UJ	0.2 UJ	0.2 UJ	0.2 U	0.02 U
BENZOIC ACID	NA	NA	--		50 UJ	50 UJ	50 UJ	5 UJ
BIS(2-ETHYLHEXYL)PHTHALATE	590	5.9 [illegible]	--	18.1	10 U	10 U	6.9 J	3.1 J
FLUORANTHENE	37,000	370 [4][5]	--	0.2 UJ	0.2 UJ	0.2 UJ	0.2 U	0.009 U
FLUORENE	1,400,000	14,000 [4][5]	--	0.2 UJ	0.2 UJ	0.2 UJ	0.2 U	0.007 U
NAPHTHALENE	NA	NA	--	0.2 UJ	1 UJ	1 UJ	1 U	0.008 U
PHENANTHRENE	0.77	NA	--	0.2 UJ	0.2 UJ	0.2 UJ	0.2 U	0.004 U
PYRENE	1,100,000	11,000 [4][5]	--	0.2 UJ	0.2 UJ	0.2 UJ	0.2 U	0.008 U
Pesticides/PCBs (ug/L)								
4,4'-DDD	NA	0.00084 [4][5]	--	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
AROCLOR-1254	5.0	0.00017 [4]	--	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
AROCLOR-1260	5.0	0.00017 [4]	--	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
HEPTACHLOR EPOXIDE	0.5	0.00011 [4][5]	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Inorganics (total) (ug/L)								
ARSENIC	40	0.14 [4][5]	1.92	2.7 U	2.2 U	2.6 U	2.6 U	5 U
BARIUM	NA	NA	227	48.0	40.4	46.5	46.5	69.1
CADMIUM	60	9.3 [3]	ND	0.63 U	2.3	2.6 UJ	2.6 UJ	3 U
CHROMIUM	1,100	50 [3]	49.9	1.3 U	10.1	2.6 U	2.6 U	5 U
COPPER	480	2.4 [3]	107	0.87 U	1 U	2 U	2 U	8.6 U
LEAD	130	8.1 [3]	6.63	1.9 U	1 U	2 U	2 U	3 U
SILVER	120	1.9 [3]	ND	1.1 U	0.9 U	2.1 U	2.1 U	5 U
ZINC	1,230	81 [3]	131	10.6	16 U	6.5 U	8.2 U	28.5

TABLE 4-1

ROUNDS 9 THROUGH 12 ANALYTICAL RESULTS SUMMARY
DRMO, NSB-NLON, GROTON, CONNECTICUT

Chemical	Primary Monitoring Criterion [1]	Secondary Monitoring Criterion	NSB-NLON Background Concentration[6]	6MW9S ROUND 9 7/25/2000	6MW9S ROUND 10 12/18/2000	6MW9S ROUND 11 3/10/2001	6MW9S ROUND 12 6/23/2001
VOCs (ug/L)							
1,1,2,2-TETRACHLOROETHANE	100 [2]	11 [4][5]	--	1 U	1 U	1 UJ	1 U
1,2-DICHLOROETHANE	90 [2]	99 [4][5]	--	1 U	1 U	1 U	1 U
CIS-1,2-DICHLOROETHENE	NA	NA	--	1 U	1 U	1 U	1 U
TRANS-1,2-DICHLOROETHENE	NA	NA	--	1 U	1 U	1 U	1 U
TRICHLOROETHENE	540 [2]	81 [4][5]	--	1 U	0.47 J	0.26 J	1 U
VINYL CHLORIDE	2 [2]	525 [4][5]	--	1 U	1 U	1 U	1 U
SVOCs (ug/L)							
BENZO(A)ANTHRACENE	3.0	0.049 [4]	--	0.2 UJ	0.2 UJ	0.2 U	0.012 U
BENZO(A)PYRENE	3.0	0.049 [4]	--	0.2 UJ	0.2 UJ	0.2 U	0.24
BENZO(B)FLUORANTHENE	3.0	0.049 [4]	--	0.2 UJ	0.2 UJ	0.2 U	0.02 U
BENZO(K)FLUORANTHENE	3.0	0.049 [4]	--	0.2 UJ	0.2 UJ	0.2 U	0.27
BENZOIC ACID	NA	NA	--		50 U	50 U	5 UJ
BIS(2-ETHYLHEXYL)PHTHALATE	590	5.9 [4][5]	--	2 U	4.2 J	10 U	5 UJ
FLUORANTHENE	37,000	370 [4][5]	--	0.2 UJ	0.2 UJ	0.2 U	0.15
FLUORENE	1,400,000	14,000 [4][5]	--	0.2 UJ	0.2 UJ	0.2 U	0.007 U
NAPHTHALENE	NA	NA	--	0.2 UJ	1 UJ	1 U	0.008 U
PHENANTHRENE	0.77	NA	--	0.2 UJ	0.2 UJ	0.2 U	0.004 U
PYRENE	1,100,000	11,000 [4][5]	--	0.2 UJ	0.2 UJ	0.2 U	0.17
Pesticides/PCBs (ug/L)							
4,4'-DDD	NA	0.00084 [4][5]	--	0.02 U	0.02 U	0.02 U	0.02 U
AROCLOR-1254	5.0	0.00017 [4]	--	0.2 U	0.2 U	0.2 U	0.2 U
AROCLOR-1260	5.0	0.00017 [4]	--	0.2 U	0.2 U	0.2 U	0.2 U
HEPTACHLOR EPOXIDE	0.5	0.00011 [4][5]	--	0.01 U	0.01 U	0.01 U	0.01 U
Inorganics (total) (ug/L)							
ARSENIC	40	0.14 [4][5]	1.92	2.7 U	2.2 U	2.6 U	5 U
BARIUM	NA	NA	227	17 U	12.7	19 U	14.7
CADMIUM	60	9.3 [3]	ND	0.37 U	0.42 U	2.6 UJ	3 U
CHROMIUM	1,100	50 [3]	49.9	1.3 U	0.5 U	2.6 U	5 U
COPPER	480	2.4 [3]	107	2 U	19	2 U	6 U
LEAD	130	8.1 [3]	6.63	1.9 U	3.9 U	2 U	3 U
SILVER	120	1.9 [3]	ND	1.1 U	0.9 U	2.1 U	5 U
ZINC	1,230	81 [3]	131	94.6 J	151 J	91.7	133

TABLE 4-1

ROUNDS 9 THROUGH 12 ANALYTICAL RESULTS SUMMARY
DRMO, NSB-NLON, GROTON, CONNECTICUT

Chemical	Primary Monitoring Criterion [1]	Secondary Monitoring Criterion	NSB-NLON Background Concentration[6]	6MW10S ROUND 9 7/24/2000	6MW10S ROUND 10 12/16/2000	6MW10S ROUND 11 3/9/2001	6MW10S ROUND 12 6/24/2001
VOCs (ug/L)							
1,1,2,2-TETRACHLOROETHANE	100 [2]	11 [4][5]	--	1 U	1 U	1 U	1 U
1,2-DICHLOROETHANE	90 [2]	99 [4][5]	--	1 U	1 U	1 U	1 U
CIS-1,2-DICHLOROETHENE	NA	NA	--	2	0.84 J	0.3 J	1.1
TRANS-1,2-DICHLOROETHENE	NA	NA	--	1 U	1 U	1 U	1 U
TRICHLOROETHENE	540 [2]	81 [4][5]	--	1 U	0.14 J	1 U	1 U
VINYL CHLORIDE	2 [2]	525 [4][5]	--	1 U	1 U	1 U	1 U
SVOCs (ug/L)							
BENZO(A)ANTHRACENE	3.0	0.049 [4]	--	0.21 UJ	0.2 U	0.2 U	0.012 U
BENZO(A)PYRENE	3.0	0.049 [4]	--	0.21 UJ	0.2 U	0.2 U	0.021 U
BENZO(B)FLUORANTHENE	3.0	0.049 [4]	--	0.21 UJ	0.2 U	0.2 U	0.02 U
BENZO(K)FLUORANTHENE	3.0	0.049 [4]	--	0.21 UJ	0.2 U	0.2 U	0.02 U
BENZOIC ACID	NA	NA	--		50 U	50 UJ	5 UJ
BIS(2-ETHYLHEXYL)PHTHALATE	590	5.9 [4][5]	--	5.4	10 U	8 J	1.5 J
FLUORANTHENE	37,000	370 [4][5]	--	0.21 UJ	0.13 J	0.12 J	0.009 U
FLUORENE	1,400,000	14,000 [4][5]	--	0.21 UJ	0.2 U	0.2 U	0.007 U
NAPHTHALENE	NA	NA	--	0.21 UJ	1 U	1 U	0.008 U
PHENANTHRENE	0.77	NA	--	0.21 UJ	0.2 U	0.2 U	0.004 U
PYRENE	1,100,000	11,000 [4][5]	--	0.21 UJ	0.15 J	0.16 J	0.008 U
Pesticides/PCBs (ug/L)							
4,4'-DDD	NA	0.00084 [4][5]	--	0.02 U	0.02 U	0.02 U	0.02 U
AROCLOR-1254	5.0	0.00017 [4]	--	0.2 U	0.2 U	0.2 U	0.2 U
AROCLOR-1260	5.0	0.00017 [4]	--	0.2 U	0.2 U	0.2 U	0.2 U
HEPTACHLOR EPOXIDE	0.5	0.00011 [4][5]	--	0.01 U	0.01 U	0.01 U	0.01 U
Inorganics (total) (ug/L)							
ARSENIC	40	0.14 [4][5]	1.92	2.7 U	2.2 U	2.6 U	5 U
BARIUM	NA	NA	227	103	174	66.4	48.4
CADMIUM	60	9.3 [3]	ND	0.32 U	0.28 U	2.6 UJ	3 U
CHROMIUM	1,100	50 [3]	49.9	1.3 U	0.5 UJ	2.6 U	5 U
COPPER	480	2.4 [3]	107	3.7 U	5.9 U	8.8 U	10.9 U
LEAD	130	8.1 [3]	6.63	1.9 U	1 UJ	2 U	3 U
SILVER	120	1.9 [3]	ND	1.1 U	0.9 U	2.1 U	5 U
ZINC	1,230	81 [3]	131	21 J	52.8 U	261	47.7

TABLE 4-1

ROUNDS 9 THROUGH 12 ANALYTICAL RESULTS SUMMARY
DRMO, NSB-NLON, GROTON, CONNECTICUT

Chemical	Primary Monitoring Criterion [1]	Secondary Monitoring Criterion	NSB-NLON Background Concentration[6]	6MW10D ROUND 9 7/24/2000	6MW10D ROUND 10 12/16/2000	6MW10D ROUND 11 3/9/2001	6MW10D ROUND 12 6/24/2001
VOCs (ug/L)							
1,1,2,2-TETRACHLOROETHANE	100 [2]	11 [4][5]	--	1 U	1 U	1 U	1 U
1,2-DICHLOROETHANE	90 [2]	99 [4][5]	--	1 U	1 U	1 U	1 U
CIS-1,2-DICHLOROETHENE	NA	NA	--	14	17	3.3	12
TRANS-1,2-DICHLOROETHENE	NA	NA	--	1 U	0.21 J	1 U	1 U
TRICHLOROETHENE	540 [2]	81 [4][5]	--	4	2.8	1	2.8
VINYL CHLORIDE	2 [2]	525 [4][5]	--	1	1 U	1 U	0.7 J
SVOCs (ug/L)							
BENZO(A)ANTHRACENE	3.0	0.049 [4]	--	0.2 UJ	0.2 U	0.2 UJ	0.012 U
BENZO(A)PYRENE	3.0	0.049 [4]	--	0.2 UJ	0.2 U	0.2 UJ	0.021 U
BENZO(B)FLUORANTHENE	3.0	0.049 [4]	--	0.2 UJ	0.2 U	0.2 UJ	0.02 U
BENZO(K)FLUORANTHENE	3.0	0.049 [4]	--	0.2 UJ	0.2 U	0.2 UJ	0.02 U
BENZOIC ACID	NA	NA	--		50 U	50 UJ	5 UJ
BIS(2-ETHYLHEXYL)PHTHALATE	590	5.9 [4][5]	--	2 U	10 U	10 U	5 UJ
FLUORANTHENE	37,000	370 [4][5]	--	0.2 UJ	0.027 J	0.02 J	0.009 U
FLUORENE	1,400,000	14,000 [4][5]	--	0.2 UJ	0.2 U	0.2 UJ	0.007 U
NAPHTHALENE	NA	NA	--	0.2 UJ	1 U	1 UJ	0.008 U
PHENANTHRENE	0.77	NA	--	0.2 UJ	0.027 J	0.2 UJ	0.004 U
PYRENE	1,100,000	11,000 [4][5]	--	0.2 UJ	0.2 U	0.2 UJ	0.008 U
Pesticides/PCBs (ug/L)							
4,4'-DDD	NA	0.00084 [4][5]	--	0.02 U	0.02 U	0.02 U	0.02 U
AROCLOR-1254	5.0	0.00017 [4]	--	0.2 U	0.2 U	0.2 U	0.2 U
AROCLOR-1260	5.0	0.00017 [4]	--	0.2 U	0.2 U	0.2 U	0.2 U
HEPTACHLOR EPOXIDE	0.5	0.00011 [4][5]	--	0.01 U	0.01 U	0.01 U	0.01 U
Inorganics (total) (ug/L)							
ARSENIC	40	0.14 [4][5]	1.92	6.5 J	7.1	3.2 J	5 U
BARIUM	NA	NA	227	34.9	36.7	97.3	40.6
CADMIUM	60	9.3 [3]	ND	0.32 UJ	0.37 U	9.3 J	3 U
CHROMIUM	1,100	50 [3]	49.9	1.3 U	0.5 UJ	2.6 U	5 U
COPPER	480	2.4 [3]	107	0.87 U	1.7 U	2 U	2.2 U
LEAD	130	8.1 [3]	6.63	1.9 UJ	1 UJ	2 U	3 U
SILVER	120	1.9 [3]	ND	1.1 U	0.9 U	2.1 UJ	5 U
ZINC	1,230	81 [3]	131	99.2 J	59.1 U	756	63.1

TABLE 4-1

ROUNDS 9 THROUGH 12 ANALYTICAL RESULTS SUMMARY
DRMO, NSB-NLON, GROTON, CONNECTICUT

Chemical	Primary Monitoring Criterion [1]	Secondary Monitoring Criterion	NSB-NLON Background Concentration[6]	6MW11S ROUND 9 7/25/2000	6MW11S ROUND 10 12/17/2000	6MW11S ROUND 11 3/8/2001	6MW11S ROUND 12 6/22/2001
VOCs (ug/L)							
1,1,2,2-TETRACHLOROETHANE	100 [2]	11 [4][5]	--	1 U	1 U	1 U	1 U
1,2-DICHLOROETHANE	90 [2]	99 [4][5]	--	1 U	1 U	1 U	1 U
CIS-1,2-DICHLOROETHENE	NA	NA	--	2	0.79 J	0.5 J	1.6
TRANS-1,2-DICHLOROETHENE	NA	NA	--	1 U	0.12 J	1 U	1 U
TRICHLOROETHENE	540 [2]	81 [4][5]	--	1 U	0.1 J	1 U	1 U
VINYL CHLORIDE	2 [2]	525 [4][5]	--	1 U	0.56 J	1 U	0.6 J
SVOCs (ug/L)							
BENZO(A)ANTHRACENE	3.0	0.049 [4]	--	0.2 UJ	0.2 U	0.2 U	0.012 UJ
BENZO(A)PYRENE	3.0	0.049 [4]	--	0.2 UJ	0.2 U	0.2 U	0.021 UJ
BENZO(B)FLUORANTHENE	3.0	0.049 [4]	--	0.2 UJ	0.2 U	0.2 U	0.02 UJ
BENZO(K)FLUORANTHENE	3.0	0.049 [4]	--	0.2 UJ	0.2 U	0.2 U	0.02 UJ
BENZOIC ACID	NA	NA	--		50 U	50 UJ	5 UJ
BIS(2-ETHYLHEXYL)PHTHALATE	590	5.9 [4][5]	--	2 U	3.8 J	10 U	5 UJ
FLUORANTHENE	37,000	370 [4][5]	--	0.2 UJ	0.14 J	0.1 J	0.009 UJ
FLUORENE	1,400,000	14,000 [4][5]	--	0.2 UJ	0.2 U	0.2 U	0.007 UJ
NAPHTHALENE	NA	NA	--	0.2 UJ	1 U	1 U	0.008 UJ
PHENANTHRENE	0.77	NA	--	0.2 UJ	0.029 J	0.2 U	0.004 UJ
PYRENE	1,100,000	11,000 [4][5]	--	0.2 UJ	0.15 J	0.11 J	0.008 UJ
Pesticides/PCBs (ug/L)							
4,4'-DDD	NA	0.00084 [4][5]	--	0.02 U	0.02 U	0.02 U	0.02 U
AROCLOR-1254	5.0	0.00017 [4]	--	0.2 U	0.2 U	0.2 U	0.2 U
AROCLOR-1260	5.0	0.00017 [4]	--	0.2 U	0.2 U	0.2 U	0.2 U
HEPTACHLOR EPOXIDE	0.5	0.00011 [4][5]	--	0.01 U	0.01 U	0.01 U	0.01 U
Inorganics (total) (ug/L)							
ARSENIC	40	0.14 [4][5]	1.92	2.7 U	2.2 U	2.6 U	12.6
BARIUM	NA	NA	227	107	133	60.3	39.2
CADMIUM	60	9.3 [3]	ND	0.32 U	1.1 U	2.6 UJ	3 U
CHROMIUM	1,100	50 [3]	49.9	1.3 U	0.5 UJ	2.6 U	5 U
COPPER	480	2.4 [3]	107	1.4 U	12.7	10.3 U	2.9 U
LEAD	130	8.1 [3]	6.63	1.9 U	4.9 U	2 U	3 U
SILVER	120	1.9 [3]	ND	1.1 U	0.9 U	2.1 U	17.1
ZINC	1,230	81 [3]	131	16.9 J	299 J	150	143

TABLE 4-1

ROUNDS 9 THROUGH 12 ANALYTICAL RESULTS SUMMARY
DRMO, NSB-NLON, GROTON, CONNECTICUT

Chemical	Primary Monitoring Criterion [1]	Secondary Monitoring Criterion	NSB-NLON Background Concentration[6]	6MW11D ROUND 9 7/25/2000	6MW11D (DUP) ROUND 9 7/25/2000	6MW11D ROUND 10 12/17/2000	6MW11D ROUND 11 3/8/2001	6MW11D ROUND 12 6/22/2001
VOCs (ug/L)								
1,1,2,2-TETRACHLOROETHANE	100 [2]	11 [4][5]	--	1 U	1 U	1 U	1 U	1 U
1,2-DICHLOROETHANE	90 [2]	99 [4][5]	--	1 U	1 U	1 U	1 U	1 U
CIS-1,2-DICHLOROETHENE	NA	NA	--	3	3	1.5	1.2	2.6
TRANS-1,2-DICHLOROETHENE	NA	NA	--	1 U	1 U	1 U	1 U	1 U
TRICHLOROETHENE	540 [2]	81 [4][5]	--	1 U	1 U	1 U	1 U	1 U
VINYL CHLORIDE	2 [2]	525 [4][5]	--	1 U	1 U	1 U	1 U	1 U
SVOCs (ug/L)								
BENZO(A)ANTHRACENE	3.0	0.049 [4]	--	0.22 UJ	0.21 UJ	0.2 UJ	0.2 UJ	0.012 UJ
BENZO(A)PYRENE	3.0	0.049 [4]	--	0.22 UJ	0.21 UJ	0.2 UJ	0.2 UJ	0.021 UJ
BENZO(B)FLUORANTHENE	3.0	0.049 [4]	--	0.22 UJ	0.21 UJ	0.2 UJ	0.2 UJ	0.02 UJ
BENZO(K)FLUORANTHENE	3.0	0.049 [4]	--	0.22 UJ	0.21 UJ	0.2 UJ	0.2 UJ	0.02 UJ
BENZOIC ACID	NA	NA	--			50 U	50 UJ	5 UJ
BIS(2-ETHYLHEXYL)PHTHALATE	590	5.9 [4][5]	--	2.2 U	2.1 U	3.9 J	10 U	2.4 J
FLUORANTHENE	37,000	370 [4][5]	--	0.22 UJ	0.21 UJ	0.023 J	0.014 J	0.009 UJ
FLUORENE	1,400,000	14,000 [4][5]	--	0.22 UJ	0.21 UJ	0.2 UJ	0.2 UJ	0.007 UJ
NAPHTHALENE	NA	NA	--	0.22 UJ	0.21 UJ	1 UJ	1 UJ	0.008 UJ
PHENANTHRENE	0.77	NA	--	0.22 UJ	0.21 UJ	0.032 J	0.2 UJ	0.004 UJ
PYRENE	1,100,000	11,000 [4][5]	--	0.22 UJ	0.21 UJ	0.2 UJ	0.2 UJ	0.21 J
Pesticides/PCBs (ug/L)								
4,4'-DDD	NA	0.00084 [4][5]	--	0.021 U	0.021 U	0.02 U	0.02 U	0.02 U
AROCLOR-1254	5.0	0.00017 [4]	--	0.21 U	0.21 U	0.2 U	0.2 U	0.2 U
AROCLOR-1260	5.0	0.00017 [4]	--	0.21 U	0.21 U	0.2 U	0.2 U	0.2 U
HEPTACHLOR EPOXIDE	0.5	0.00011 [4][5]	--	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Inorganics (total) (ug/L)								
ARSENIC	40	0.14 [4][5]	1.92	26.1 J	21.5 J	8.2	10.9	12.7
BARIUM	NA	NA	227	265	264	162	152	197
CADMIUM	60	9.3 [3]	ND	1.1 U	0.9 U	0.5 U	2.6 UJ	3 U
CHROMIUM	1,100	50 [3]	49.9	7 J	5.8 J	1.2 U	2.6 U	9.8 J
COPPER	480	2.4 [3]	107	32 J	24.6 J	6.6 U	5.5 U	10.8 U
LEAD	130	8.1 [3]	6.63	10.5 J	8.9 J	1.1 U	4.4	3 U
SILVER	120	1.9 [3]	ND	1.1 U	1.1 U	0.9 U	2.1 UJ	6.9 J
ZINC	1,230	81 [3]	131	108 J	92.6 J	86.8 J	277	8.5 U

NOTES:
Bold numbers denote exceedance of secondary monitoring criterion or background concentration. There are no exceedances of primary monitoring criteria.
1 Surface Water Protection Criteria for substances in groundwater, using a site-specific dilution factor of 100, except as noted.
2 Connecticut Volatilization Criteria
3 Federal Ambient Water Quality Criteria for protection of aquatic life (chronic, saltwater).
4 Federal Ambient Water Quality Criteria for protection of human health from consumption of organisms.
5 Connecticut Water Quality Criteria for protection of human health from consumption of organisms.
6 Background Concentrations taken from Basewide Groundwater Operable Unit Remedial Investigation Report (TtNUS, January 2002).
J Estimated Value
R Rejected Value
U Undetected
NA Not Available
ND Not Detected in background samples
-- Not analyzed for in background samples

TABLE 4-2

GROUNDWATER ELEVATIONS FOR ROUNDS 9 - 12
DRMO NSB-NLON, GROTON, CONNECTICUT

WELL	Jul-00	Dec-00	Mar-01	Jun-01
	HIGH TIDE / LOW TIDE	HIGH TIDE / LOW TIDE	HIGH TIDE / LOW TIDE	HIGH TIDE / LOW TIDE
6MW1S	1.19 / 3.38	1.4 / 3.43	0.02 / 3.42	1.08 / 2.95
6MW2S	1.34 / 3.32	1.61 / 3.72	0.30 / 3.45	0.82 / 3.01
6MW2D	2.38 / 3.00	2.18 / 3.81	2.11 / 3.82	2.31 / 3.65
6MW6S	3.23 / 3.46	3.14 / 3.11	3.60 / 3.74	3.60 / 3.77
6MW6D	3.25 / 3.33	3.15 / 3.08	3.62 / 3.77	3.79 / 3.76
6MW9S	3.21 / 3.57	2.96 / 3.35	3.60 / 4.26	3.05 / 3.94
6MW10S	1.48 / 3.29	1.99 / 3.07	0.68 / 3.49	0.99 / 3.14
6MW10D	2.82 / 3.76	2.67 / 3.93	2.52 / 4.51	2.66 / 4.11
6MW11S	1.42 / 3.47	2.19 / 3.29	0.53 / 3.58	0.93 / 3.18
6MW11D	3.38 / 4.48	3.09 / 4.36	3.06 / 4.95	3.31 / 4.65
SG-01	1.15 / 3.36	1.26 / 3.57	0.59 / 3.50	0.85 / 3.12

TABLE 4-3

DOWNGRADIENT GROUNDWATER RESULTS FOR COPCs DURING ROUNDS 9 THROUGH 12
DETECTION STATISTICS AND 95% UPPER CONFIDENCE LIMITS
DRMO, NSB-NLON, GROTON, CT

PARAMETER	FREQUENCY OF DETECTION	RANGE OF DETECTIONS	AVERAGE	SHAPIRO-WILK W NORMAL	SHAPIRO-WILK W LOGNORMAL	SHAPIRO-WILK W TEST	DISTRIBUTION	95% UCL NORMAL	95% UCL LOGNORMAL	MAXIMUM POSITIVE DETECTION	EPC (1)
Volatile Organics (mg/L)											
1,1,2,2-TETRACHLOROETHANE	0/28	---	0.50	---	---	---	---	---	---	---	---
1,2-DICHLOROETHANE	0/28	---	0.50	---	---	---	---	---	---	---	---
CIS-1,2-DICHLOROETHENE	18/28	0.12 - 17	2.46	0.5348	0.9019	0.924	LOGNORMAL	3.86	4.28	17	4.28
TRANS-1,2-DICHLOROETHENE	2/28	0.12 - 0.21	0.48	0.2971	0.2958	0.924	LOGNORMAL	0.50	0.54	0.21	0.21
TRICHLOROETHENE	11/28	0.1 - 4	0.76	0.5521	0.8256	0.924	LOGNORMAL	1.05	1.04	4.00	1.04
VINYL CHLORIDE	5/28	0.17 - 1	0.52	0.5191	0.4881	0.924	LOGNORMAL	0.56	0.57	1.00	0.57
Semivolatile Organics (mg/L)											
BENZO(A)ANTHRACENE	0/28	---	0.23	---	---	---	---	---	---	---	---
BENZO(A)PYRENE	0/28	---	0.23	---	---	---	---	---	---	---	---
BENZO(B)FLUORANTHENE	0/28	---	0.23	---	---	---	---	---	---	---	---
BENZO(K)FLUORANTHENE	0/28	---	0.23	---	---	---	---	---	---	---	---
BENZOIC ACID	0/14	---	25.0	---	---	---	---	---	---	---	---
BIS(2-ETHYLHEXYL)PHTHALATE	16/28	1.5 - 40	7.17	0.672	0.9516	0.924	LOGNORMAL	9.96	11.22	40.00	11.22
FLUORANTHENE	10/28	0.014 - 0.14	0.22	0.6019	0.9173	0.924	LOGNORMAL	0.31	0.40	0.14	0.14
FLUORENE	0/28	---	0.23	---	---	---	---	---	---	---	---
NAPHTHALENE	0/28	---	0.43	---	---	---	---	---	---	---	---
PHENANTHRENE	5/28	0.023 - 0.26	0.17	0.5116	0.832	0.924	LOGNORMAL	0.26	1.47	0.26	0.26
PYRENE	6/28	0.038 - 0.21	0.18	0.5171	0.7945	0.924	LOGNORMAL	0.28	0.82	0.21	0.21
Pesticides (mg/L)											
4,4'-DDD	0/28	---	0.010	---	---	---	---	---	---	---	---
AROCLOR-1254	0/28	---	0.10	---	---	---	---	---	---	---	---
AROCLOR-1260	0/28	---	0.10	---	---	---	---	---	---	---	---
HEPTACHLOR EPOXIDE	0/28	---	0.01	---	---	---	---	---	---	---	---
Total Metals (mg/L)											
ARSENIC	11/28	2.6 - 23.8	4.34	0.6642	0.8617	0.924	LOGNORMAL	6	6	24	6
BARIUM	25/28	2 - 264.5	85.9	0.9144	0.8934	0.924	LOGNORMAL	108.6	242.2	264.5	242.2
CADMIUM	1/28	9.3	1.15	0.5157	0.8722	0.924	LOGNORMAL	1.71	2.19	9.30	2.19
CHROMIUM	2/28	6.4 - 9.8	1.68	0.6328	0.9291	0.924	LOGNORMAL	2	3	10	3
COPPER	4/28	4.6 - 28.3	3.85	0.5733	0.9614	0.924	LOGNORMAL	5.618	6.019	28.30	6.019
LEAD	4/28	1.9 - 9.7	1.65	0.5639	0.8795	0.924	LOGNORMAL	2.2	2.1	9.7	2.1
SILVER	3/28	6.9 - 20.5	2.53	0.4683	0.7973	0.924	LOGNORMAL	4	3	21	3
ZINC	18/28	9.3 - 756	91	0.5825	0.9464	0.924	LOGNORMAL	140.8	201.1	756	201.1

(1) EPC is defined as Exposure Point Concentration and is the lesser of the distribution-appropriate 95% UCL and the maximum detection.
Includes samples from the following wells: 6MW1S, 6MW2S,
6MW2D,6MW10S, 6MW10D, 6MW11S, and 6MW11D.

Data sets which fail the W test for normality and lognormality are assumed to be lognormal.

TABLE 4-4

UPGRADIENT GROUNDWATER RESULTS FOR COPCs DURING ROUNDS 9 THROUGH 12
DETECTION STATISTICS AND 95% UPPER CONFIDENCE LIMITS
DRMO, NSB-NLON, GROTON, CT

PARAMETER	FREQUENCY OF DETECTION	RANGE OF DETECTIONS	AVERAGE	SHAPIRO-WILK W NORMAL	SHAPIRO-WILK W LOGNORMAL	SHAPIRO-WILK W TEST	DISTRIBUTION	95% UCL NORMAL	95% UCL LOGNORMAL	MAXIMUM POSITIVE DETECTION	EPC (1)
Volatile Organics (mg/L)											
1,1,2,2-TETRACHLOROETHANE	0/12	---	0.50	---	---	---	---	---	---	---	---
1,2-DICHLOROETHANE	0/12	---	0.50	---	---	---	---	---	---	---	---
CIS-1,2-DICHLOROETHENE	5/12	0.19 - 7	2.07	0.7047	0.7716	0.859	LOGNORMAL	3.3678	7.7333	7	7
TRANS-1,2-DICHLOROETHENE	0/12	---	0.50	---	---	---	---	---	---	---	---
TRICHLOROETHENE	9/12	0.25 - 10	3.10	0.6928	0.7819	0.859	LOGNORMAL	5.18	18.93	10	10.00
VINYL CHLORIDE	0/12	---	0.50	---	---	---	---	---	---	---	---
Semivolatile Organics (mg/L)											
BENZO(A)ANTHRACENE	0/12	---	0.14	---	---	---	---	---	---	---	---
BENZO(A)PYRENE	1/12	0.24	0.10	0.6805	0.6172	0.859	LOGNORMAL	0.13	0.26	0.24	0.24
BENZO(B)FLUORANTHENE	0/12	---	0.14	---	---	---	---	---	---	---	---
BENZO(K)FLUORANTHENE	1/12	0.27	0.10	0.6582	0.6289	0.859	LOGNORMAL	0.13	0.28	0.27	0.27
BENZOIC ACID	0/6	---	25.0	---	---	---	---	---	---	---	---
BIS(2-ETHYLHEXYL)PHTHALATE	6/12	1.7 - 18.1	4.98	0.6903	0.9541	0.859	LOGNORMAL	7.3	8.7	18.1	8.73
FLUORANTHENE	1/12	0.15	0.13	0.6505	0.5247	0.859	LOGNORMAL	0.1	0.5	0.15	0.15
FLUORENE	0/12	---	0.14	---	---	---	---	---	---	---	---
NAPHTHALENE	0/12	---	0.34	---	---	---	---	---	---	---	---
PHENANTHRENE	0/12	---	0.14	---	---	---	---	---	---	---	---
PYRENE	1/12	0.17	0.09	0.6827	0.5390	0.859	LOGNORMAL	0.11	0.53	0.17	0.17
Pesticides (mg/L)											
4,4'-DDD	0/12	---	0.01	---	---	---	---	---	---	---	---
AROCLOR-1254	0/12	---	0.10	---	---	---	---	---	---	---	---
AROCLOR-1260	0/12	---	0.10	---	---	---	---	---	---	---	---
HEPTACHLOR EPOXIDE	0/12	---	0.01	---	---	---	---	---	---	---	---
Total Metals (mg/L)											
ARSENIC	0/12	---	1.56	---	---	---	---	---	---	---	---
BARIUM	9/12	12.7 - 69.1	31.2	0.9115	0.9036	0.859	NORMAL	41.1	55.1	69.1	41.1
CADMIUM	1/12	2.3	0.98	0.8506	0.8264	0.859	LOGNORMAL	1.4	3.3	2.3	2.3
CHROMIUM	1/12	10.1	2.00	0.6044	0.9382	0.859	LOGNORMAL	3.4	5.3	10	5.3
COPPER	1/12	19	2.90	0.5040	0.8667	0.859	LOGNORMAL	5.60	7.08	19	7.08
LEAD	0/12	---	1.11	---	---	---	---	---	---	---	---
SILVER	0/12	---	1.14	---	---	---	---	---	---	---	---
ZINC	7/12	10.6 - 151	46.9	0.7883	0.9378	0.859	LOGNORMAL	75.4409	540.8703	151	151

(1) EPC is defined as Exposure Point Concentration and is the lesser of the distribution-appropriate 95% UCL and the maximum detection.
Includes samples from wells:
6MW6S, 6MW6D, and 6MW9S.

Bold indicate parameter has been identified as a potential COC.
Data sets which fail the W test for normality and lognormality are assumed to be lognormal.

TABLE 4-5

GROUNDWATER - ROUNDS 9 THROUGH 12
STATISTICAL TEST RESULTS FOR COPCs
COMPARISON OF DOWNGRADIENT RESULTS WITH UPGRADIENT RESULTS
DRMO, NSB-NLON, GROTON, CT

PARAMETER	FREQUENCY OF DETECTION - DOWNGRADIENT	FREQUENCY OF DETECTION - UPGRADIENT	FREQUENCY OF DETECTION - TOTAL	% NON-DETECTS?	LESS THAN 50% NON-DETECTS?	DOWNGRADIENT DISTRIBUTION	UPGRADIENT DISTRIBUTION	SHAPIRO-WILK TEST OF DISTRIBUTION	LEVENE'S TEST OF HOMOGENEITY OF VARIANCE	TYPE OF TEST (1)	F OR Z SCORE	P-LEVEL	DOWNGRADIENT ABOVE UPGRADIENT?
Volatile Organics (µg/L)													
1,1,2,2-TETRACHLOROETHANE	0/28	0/12	0/40	100.0%	FAIL	---	---	---	---	NO DOWNGRADIENT DETECTIONS	---	---	No
1,2-DICHLOROETHANE	0/28	0/12	0/40	100.0%	FAIL	---	---	---	---	NO DOWNGRADIENT DETECTIONS	---	---	No
CIS-1,2-DICHLOROETHENE	18/28	5/12	23/40	42.5%	PASS	LOGNORMAL	LOGNORMAL	PASS	PASS	PARAMETRIC	0.0%	98.5%	No
TRANS-1,2-DICHLOROETHENE	2/28	0/12	2/40	95.0%	FAIL	---	---	---	---	NO UPGRADIENT DETECTIONS	---	---	Yes
TRICHLOROETHENE	11/28	9/12	20/40	50.0%	FAIL	---	---	---	---	PROPORTIONS	-8.46	>1E-10	No
VINYL CHLORIDE	5/28	0/12	5/40	87.5%	FAIL	---	---	---	---	NO UPGRADIENT DETECTIONS	---	---	Yes
Semivolatile Organics (µg/L)													
BENZO(A)ANTHRACENE	0/28	0/12	0/40	100.0%	FAIL	---	---	---	---	NO DOWNGRADIENT DETECTIONS	---	---	No
BENZO(A)PYRENE	0/28	1/12	1/40	100.0%	FAIL	---	---	---	---	NO DOWNGRADIENT DETECTIONS	---	---	No
BENZO(B)FLUORANTHENE	0/28	0/12	0/40	100.0%	FAIL	---	---	---	---	NO DOWNGRADIENT DETECTIONS	---	---	No
BENZO(K)FLUORANTHENE	0/28	1/12	0/40	100.0%	FAIL	---	---	---	---	NO DOWNGRADIENT DETECTIONS	---	---	No
BENZOIC ACID	0/14	0/6	0/20	100.0%	FAIL	---	---	---	---	NO DOWNGRADIENT DETECTIONS	---	---	No
FLUORANTHENE	10/28	1/12	11/40	72.5%	FAIL	---	---	---	---	PROPORTIONS	-7.8	>1E-10	No
FLUORENE	0/28	0/12	0/40	100.0%	FAIL	---	---	---	---	NO DOWNGRADIENT DETECTIONS	---	---	No
BIS(2-ETHYLHEXYL)PHTHALATE	16/28	6/12	17/40	57.5%	FAIL	---	---	---	---	PROPORTIONS	0.00	0.50	No
NAPHTHALENE	0/28	0/12	0/40	100.0%	FAIL	---	---	---	---	NO DOWNGRADIENT DETECTIONS	---	---	No
PHENANTHRENE	5/28	0/12	6/40	85.0%	FAIL	---	---	---	---	PROPORTIONS	-4.27	>1E-10	No
PYRENE	6/28	1/12	7/40	82.5%	FAIL	---	---	---	---	PROPORTIONS	-6.47	>1E-10	No
Pesticides (µg/L)													
4,4'-DDD	0/28	0/12	0/40	100.0%	FAIL	---	---	---	---	NO DOWNGRADIENT DETECTIONS	---	---	No
AROCLOR-1254	0/28	0/12	0/40	100.0%	FAIL	---	---	---	---	NO DOWNGRADIENT DETECTIONS	---	---	No
AROCLOR-1260	0/28	0/12	0/40	100.0%	FAIL	---	---	---	---	NO DOWNGRADIENT DETECTIONS	---	---	No
HEPTACHLOR EPOXIDE	0/28	0/12	0/40	100.0%	FAIL	---	---	---	---	NO DOWNGRADIENT DETECTIONS	---	---	No
Total Metals (µg/L)													
ARSENIC	11/28	0/12	11/40	72.5%	FAIL	---	---	---	---	NO UPGRADIENT DETECTIONS	---	---	Yes
BARIUM	25/28	9/12	34/40	15.0%	PASS	LOGNORMAL	NORMAL	FAIL	---	NON-PARAMETRIC	1.96	0.05	Yes
CADMIUM	1/28	1/12	2/40	95.0%	FAIL	---	---	---	---	PROPORTIONS	-2.91	0.00	No
CHROMIUM	2/28	1/12	3/40	92.5%	FAIL	---	---	---	---	PROPORTIONS	1.94	0.03	Yes
COPPER	4/28	1/12	5/40	87.5%	FAIL	---	---	---	---	PROPORTIONS	-3.72	>1E-10	No
LEAD	4/28	0/12	4/40	90.0%	FAIL	---	---	---	---	NO UPGRADIENT DETECTIONS	---	---	Yes
SILVER	3/28	0/12	3/40	92.5%	FAIL	---	---	---	---	NO UPGRADIENT DETECTIONS	---	---	Yes
ZINC	18/28	7/12	25/40	37.5%	PASS	LOGNORMAL	LOGNORMAL	PASS	PASS	PARAMETRIC	1.47	0.23	No

Downgradient results are in statistically significant exceedance
of upgradient results when p level is less than 0 05
and Z score is greater than the critical value for that test.

1 Downgradient considered similar to upgradient if no detections in downgradient or upgradient;
Downgradient considered greater than upgradient if detections in downgradient, but no detctions in upgradient;
Test of Proportions run if > 50% non-detects in downgradient and upgradient combined;
Non-Parametric ANOVA run if <50% non-detects and fail Shapiro-Wilk Test or Levene's Test;
Parametric ANOVA run if <50% non-detects and pass Shapiro-Wilk Test and Levene's Test;

TABLE 4-6

GROUNDWATER - ROUNDS 9 THROUGH 12
PARAMETRIC ANOVA COMPARISON OF
DOWNGRADIENT RESULTS WITH UPGRADIENT RESULTS
DRMO, NSB-NLON, GROTON, CT

PARAMETER	DISTRIBUTION	DF EFFECT	MS EFFECT	DF ERROR	MS ERROR	F	p-level	ANOVA RESULT
Total Metals (ug/L)								
CIS-1,2-DICHLOROETHENE	LOGNORMAL	1	0.00	38	1.552	0.00	0.985	PASS
ZINC	LOGNORMAL	1	3.18	38	2.159	1.47	0.232	PASS

Downgradient variance is statistically different from
Upgradient variance when p level is less than 0.05.

TABLE 4-7

GROUNDWATER - ROUNDS 9 THROUGH 12
LEVENE'S TEST OF HOMOGENEITY OF VARIANCE
DOWNGRADIENT RESULTS WITH UPGRADIENT RESULTS
DRMO, NSB-NLON, GROTON, CT

PARAMETER	DISTRIBUTION	MS EFFECT	MS ERROR	F	p-level	LEVENE RESULT
Total Metals (ug/L)						
CIS-1,2-DICHLOROETHENE	LOGNORMAL	0.11	0.480	0.23	0.638	PASS
ZINC	LOGNORMAL	0.33	0.549	0.59	0.446	PASS

Downgradient variance is statistically different from
Upgradient variance when p level is less than 0.05.

TABLE 4-8

GROUNDWATER - ROUND 9 THROUGH 12
WILCOXON RANK-SUM RESULTS COMPARING COPC
DOWNGRADIENT RESULTS WITH UPGRADIENT RESULTS
DRMO, NSB-NLON, GROTON, CT

PARAMETER	Downgradient			Upgradient			Z Score	p-level	Adjusted Z Score (1)	Adjusted p-level (2)	ANOVA RESULT
	Total of Ranks	Number of Samples	Avg Rank	Total of Ranks	Number of Samples	Avg Rank					
Total Metals (ug/L)											
BARIUM	640.5	28	22.9	179.5	12	15.0	1.96	0.0497	1.96	0.0497	**FAIL**

(1) Adjusted for tied ranks.
(2) Downgradient results are in statistically significant exceedance of upgradient results when p-level is less than 0.05 and Z Score is positive.

TABLE 4-9

GROUNDWATER - ROUNDS 9 THROUGH 12
TEST OF PROPORTIONS RESULTS FOR COPCs
COMPARISON OF DOWNGRADIENT RESULTS WITH UPGRADIENT RESULTS
DRMO, NSB-NLON, GROTON CT

PARAMETER	HIGHEST UPGRADIENT NON-DETECT	C (1)	kd (2)	n (3)	pd(4)	ku (2)	m (3)	pu (5)	p (6)	Z SCORE (7)	P-LEVEL (8)	DOWNGRADIENT ABOVE UPGRADIENT?
Volatile Organics (ug/L)												
TRICHLOROETHENE	1	1.01	3	28	0.107	4	12	0.333	0.1750	-1.725	0.04	NO
Semivolatile Organics (ug/L)												
BIS(2-ETHYLHEXYL)PHTHALATE	10	10.01	6	28	0.214	1	12	0.083	0.1750	0.999	0.16	NO
FLUORANTHENE	0.5	0.51	3	28	0.107	0	12	0.000	0.0750	1.179	0.12	NO
PHENANTHRENE	0.5	0.51	3	28	0.107	0	12	0.000	0.0750	1.179	0.12	NO
PYRENE	0.5	0.51	3	28	0.107	0	12	0.000	0.0750	1.179	0.12	NO
Total Metals (ug/L)												
CADMIUM	3	3.01	2	28	0.071	0	12	0.000	0.0500	0.950	0.17	NO
CHROMIUM	5	5.01	2	28	0.071	1	12	0.083	0.0750	-0.131	0.45	NO
COPPER	8.6	8.61	6	28	0.214	1	12	0.083	0.1750	0.999	0.16	NO

*Downgradient results are in statistically significant exceedance of upgradient results when p level < 0.05 and Z score > +1.645.

(1) C = cut-off value (slightly larger than the highest upgradient non-detect)
(2) kd, ku = the number of downgradient and upgradient measurements, respectively that exceeds C
(3) n, m = the number of downgradient and upgradient results
(4) pd = Kd/n = proportion of downgradient samples that exceed C
(5) pu = ku/m = proportion of upgradient samples that exceed C
(6) p = (kd + ku) / (n + m) = proportion of upgradient samples that exceed C
(7) Zp = (pd-pu) / [p(1-p)(1/n+1/m)]1/2
(8) P-level = probability that upgradient and downgradient concentrations are similar

TABLE 4-10

GROUNDWATER - ROUNDS 9 THROUGH 12
COMPARISON OF COPCs ABOVE UPGRADIENT CONCENTRATIONS TO
SITE-SPECIFIC BACKGROUND AND PRIMARY MONITORING CRITERIA
DRMO, NSB-NLON, GROTON, CT

Downgradient Metals (ug/L)	Average (1)				Cummulative	Maximum (2)				Cummulative	Site-Specific	Primary (4)
	Round 9	Round 10	Round 11	Round 12	Average	Round 9	Round 10	Round 11	Round 12	Maximum	Background (3)	Monitoring Criteria
Volatile Organics (ug/L)												
TRANS-1,2-DICHLOROETHENE	ND	0.40	ND	ND	0.48	ND	0.21	ND	ND	0.21	---	NA
VINYL CHLORIDE	0.57	0.51	0.45	0.54	0.52	1.00	0.56	0.50	0.70	1.00	---	2
Total Metals (ug/L)												
ARSENIC	5.88	2.97	3.13	5.40	4.34	23.8	8.20	10.9	12.7	23.8	1.92	40
BARIUM	99.4	103	76.3	65.36	85.90	264.50	174.00	152.0	197.0	264.5	227	NA
CHROMIUM	1.47	0.40	ND	3.54	2	6.40	0.95	ND	9.8	9.8	49.9	1,100
LEAD	2.34	ND	1.97	ND	1.65	9.7	ND	4.4	ND	9.7	6.63	130
SILVER	3.40	ND	ND	5.21	2.53	20.50	ND	ND	17.10	20.5	NA	120

Upgradient Metals (ug/L)	Average (1)				Cummulative	Maximum (2)				Cummulative	Site-Specific	Primary (4)
	Round 9	Round 10	Round 11	Round 12	Average	Round 9	Round 10	Round 11	Round 12	Maximum	Background (3)	Monitoring Criteria
Volatile Organics (ug/L)												
TRANS-1,2-DICHLOROETHENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	NA
VINYL CHLORIDE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	2
Total Metals (ug/L)												
ARSENIC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.92	40
BARIUM	28.9	30.9	24.1	41.2	31.20	48.0	40.4	46.5	69.1	39.1	227	NA
CHROMIUM	ND	3.5	ND	ND	2	ND	10.1	ND	ND	10	49.9	1,100
LEAD	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	6.63	130
SILVER	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	120

(1) Average calculated using result for positive detections and 1/2 detection limit for non-detects in each round.
(2) Maximum positive detection in each round.
(3) Taken from Basewide Groundwater OU RI (TtNUS, January 2002)
(4) Taken from Groundwater Monitoring Plan for DRMO (B&R Environmental, February 1998)
No value exceeds both Site-Specific Background and Primary Monitoring Criteria.

TABLE 4-11

GROUNDWATER RESULTS FOR ROUNDS 9 THRU 12
PEARSON CORRELATION COEFFICIENTS (r) BETWEEN TOTAL METAL CONCENTRATIONS AND OXIDATION-REDUCTION POTENTIAL (ORP) FOR SELECTED METALS
DRMO, NSB-NLON, GROTON, CONNECTICUT

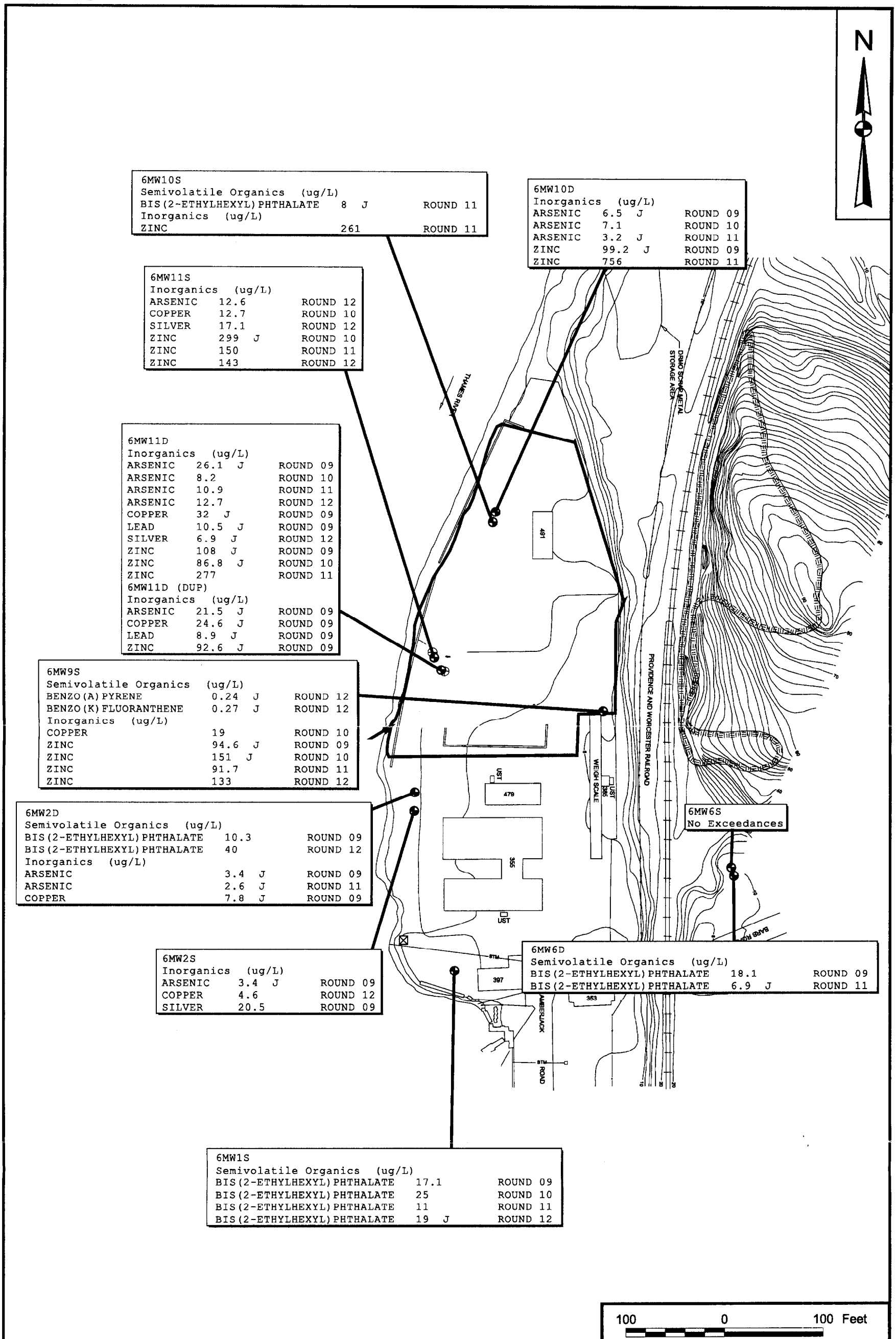
Metal	ORP
ARSENIC	**-0.35**
BARIUM	**-0.54**
CADMIUM	0.03
CHROMIUM	-0.15
COPPER	-0.23
LEAD	-0.15
SILVER	-0.29
ZINC	-0.19

Pearson's r is always between -1 and +1, where -1 means a perfect negative, +1 a perfect positive relationship and 0 means the perfect absence of a relationship.

Bold indicates significant correlation

For 40 samples, the minimum r, significant at p=0.05, is +/- 0.3120

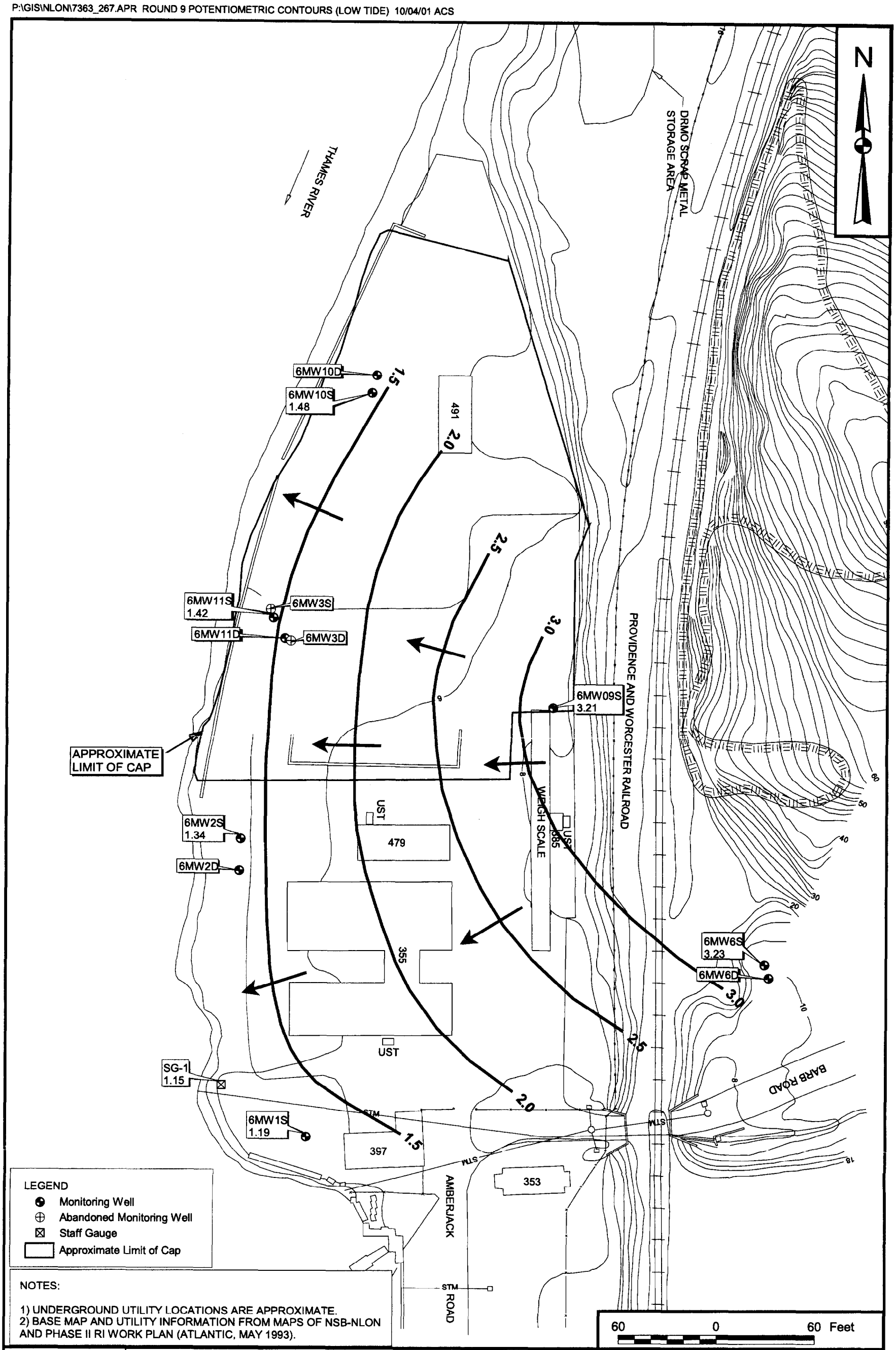
P:\GIS\NLON\7363_267.APR DRMO ROUNDS 9-12 TAGS 9/28/01 ACS



DRAWN BY A. SEAGER	DATE 9/28/01	Tetra Tech NUS, Inc.	CONTRACT NUMBER 7363	OWNER NUMBER —
CHECKED BY	DATE	EXCEEDANCES OF SECONDARY MONITORING CRITERIA IN GROUNDWATER ROUNDS 9 THROUGH 12 DRMO NSB-NLON, GRONTON, CONNECTICUT	APPROVED BY C. Rich	DATE 10/5/01
COST/SCHEDULE-AREA			APPROVED BY —	DATE —
SCALE AS NOTED			DRAWING NO. FIGURE 4-1	REV 0

!!!! D B 2 2

P:\GIS\NLON\7363_267.APR ROUND 9 POTENTIOMETRIC CONTOURS (LOW TIDE) 10/04/01 ACS

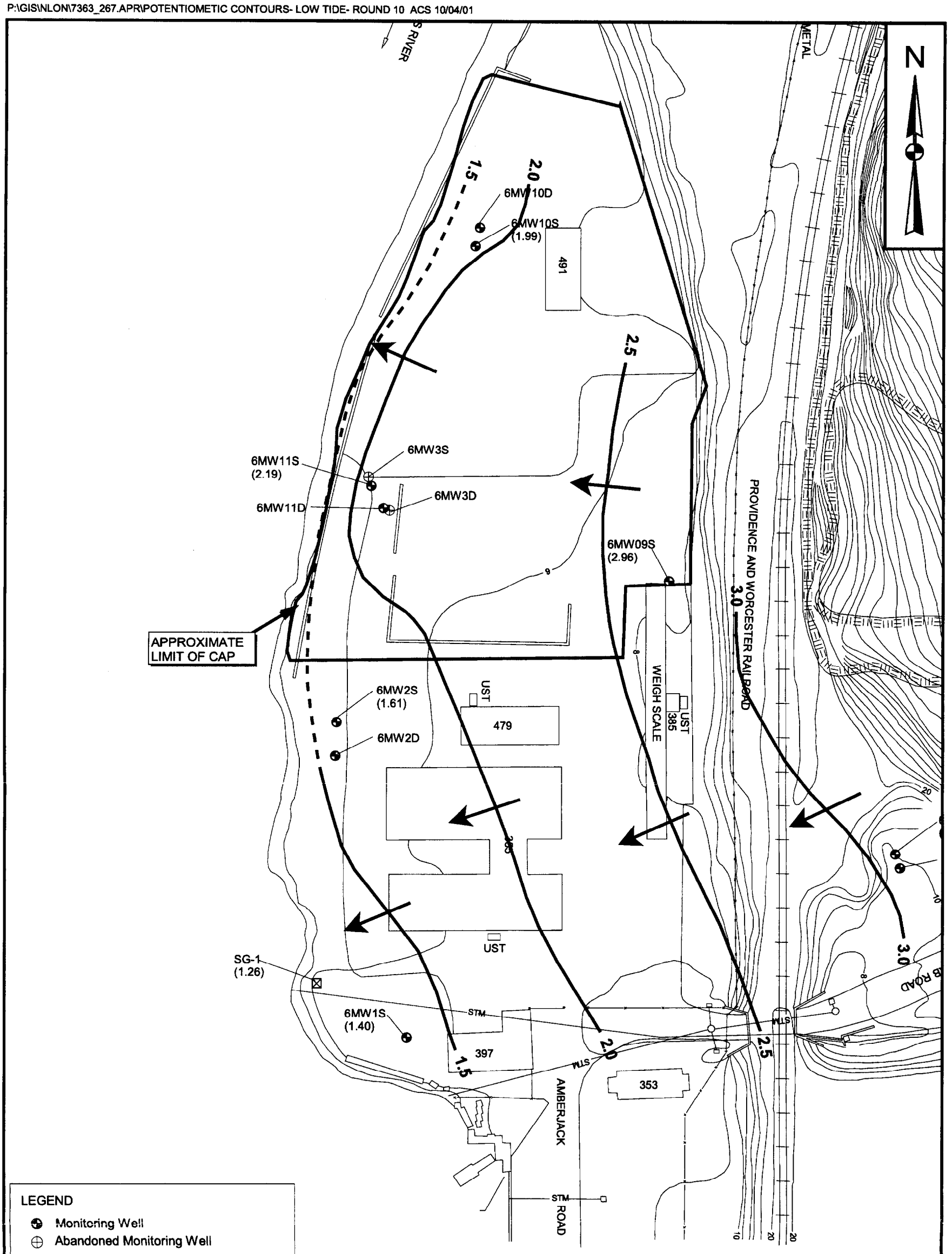


NOTES:

1) UNDERGROUND UTILITY LOCATIONS ARE APPROXIMATE.
2) BASE MAP AND UTILITY INFORMATION FROM MAPS OF NSB-NLON AND PHASE II RI WORK PLAN (ATLANTIC, MAY 1993).

DRAWN BY M. Spangenberg DATE 12/12/00	Tetra Tech NUS, Inc.	CONTRACT NUMBER 7363	OWNER NUMBER —
CHECKED BY — DATE —	LOW TIDE POTENTIOMETRIC SURFACE MAP ROUND 9 GROUNDWATER SAMPLING FOR DRMO NSB-NLON, GROTON, CONNECTICUT	APPROVED BY C. Rich	DATE 10/5/01
COST/SCHEDULE-AREA		APPROVED BY —	DATE —
SCALE AS NOTED		DRAWING NO. FIGURE 4-2	REV 0

P:\GIS\NLON\7363_267.APR\POTENTIOMETIC CONTOURS- LOW TIDE- ROUND 10 ACS 10/04/01



LEGEND

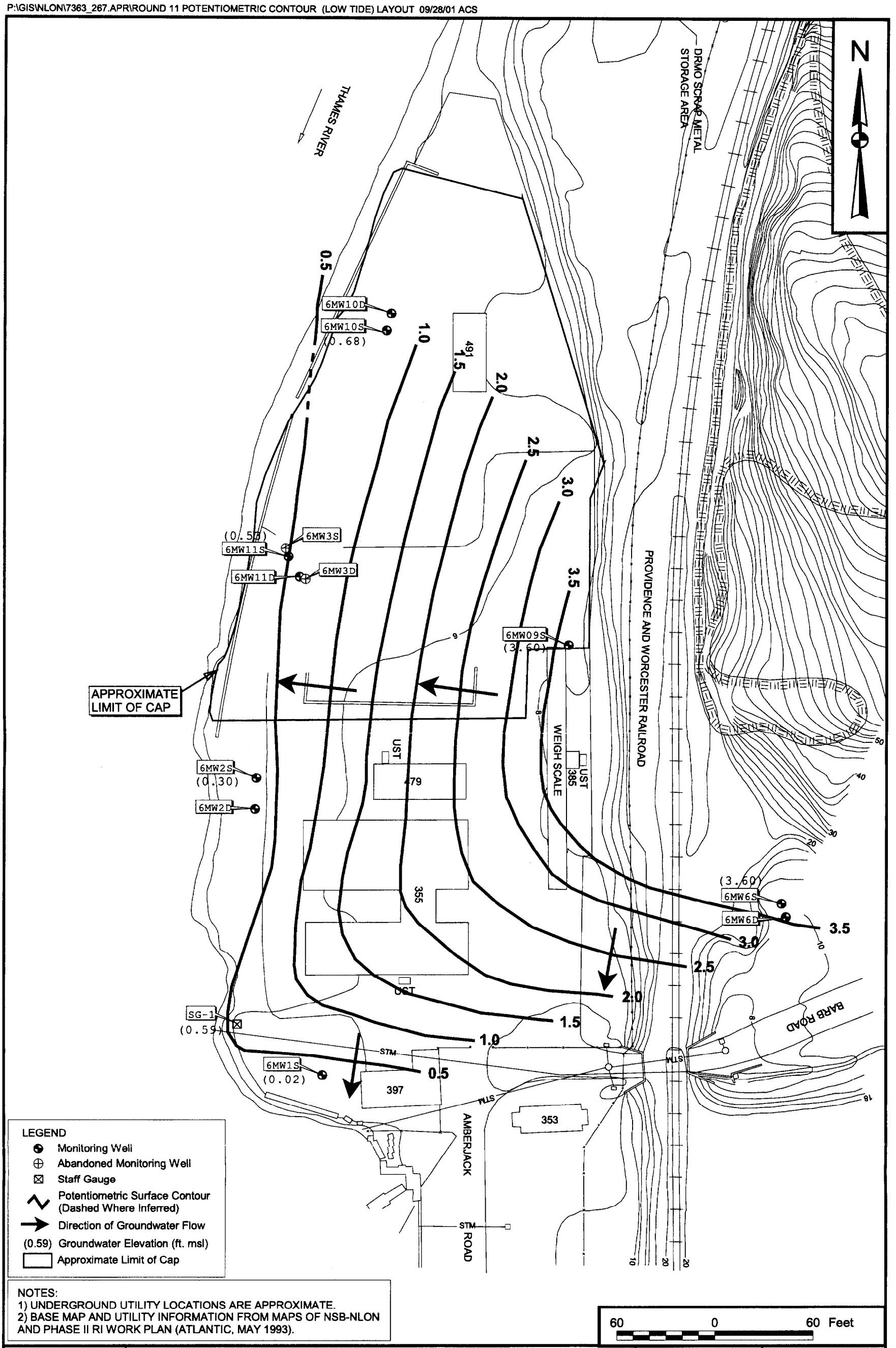
- Monitoring Well
- Abandoned Monitoring Well
- Staff Gauge
- Approximate Limit of Cap
- Ground Water Flow Direction
- Potentiometric Contour (Feet MSL)

Notes:
1.) Underground utility locations are approximate.
2.) Base map and utility information from maps of NSB-NLON and Phase II RI work plan (Atlantic, May 1993).

60 0 60 Feet

DRAWN BY M. Spangenberg	DATE 2-28-01	Tetra Tech NUS, Inc.	CONTRACT NUMBER 7901 / OWNER NUMBER —
CHECKED BY	DATE	LOW TIDE POTENTIOMETRIC SURFACE MAP ROUND 10 GROUNDWATER SAMPLING FOR DRMO NSB-NLON, GROTON, CONNECTICUT	APPROVED BY C. RICH / DATE 10/5/01
COST/SCHEDULE-AREA			APPROVED BY — / DATE —
SCALE AS NOTED			DRAWING NO. FIGURE 4-3 / REV 0

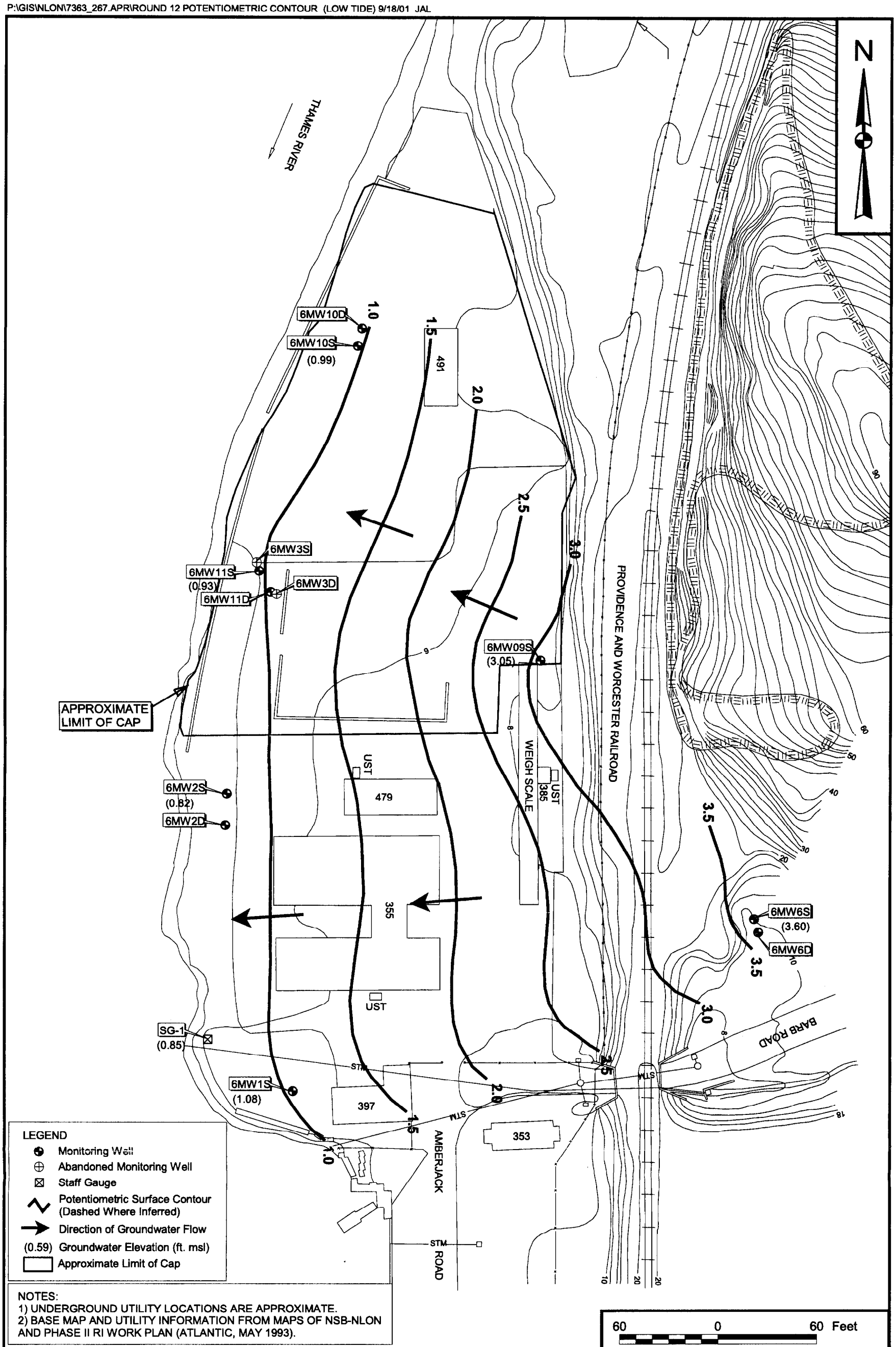
P:\GIS\NLON\7363_267.APR\ROUND 11 POTENTIOMETRIC CONTOUR (LOW TIDE) LAYOUT 09/28/01 ACS



NOTES:
1) UNDERGROUND UTILITY LOCATIONS ARE APPROXIMATE.
2) BASE MAP AND UTILITY INFORMATION FROM MAPS OF NSB-NLON AND PHASE II RI WORK PLAN (ATLANTIC, MAY 1993).

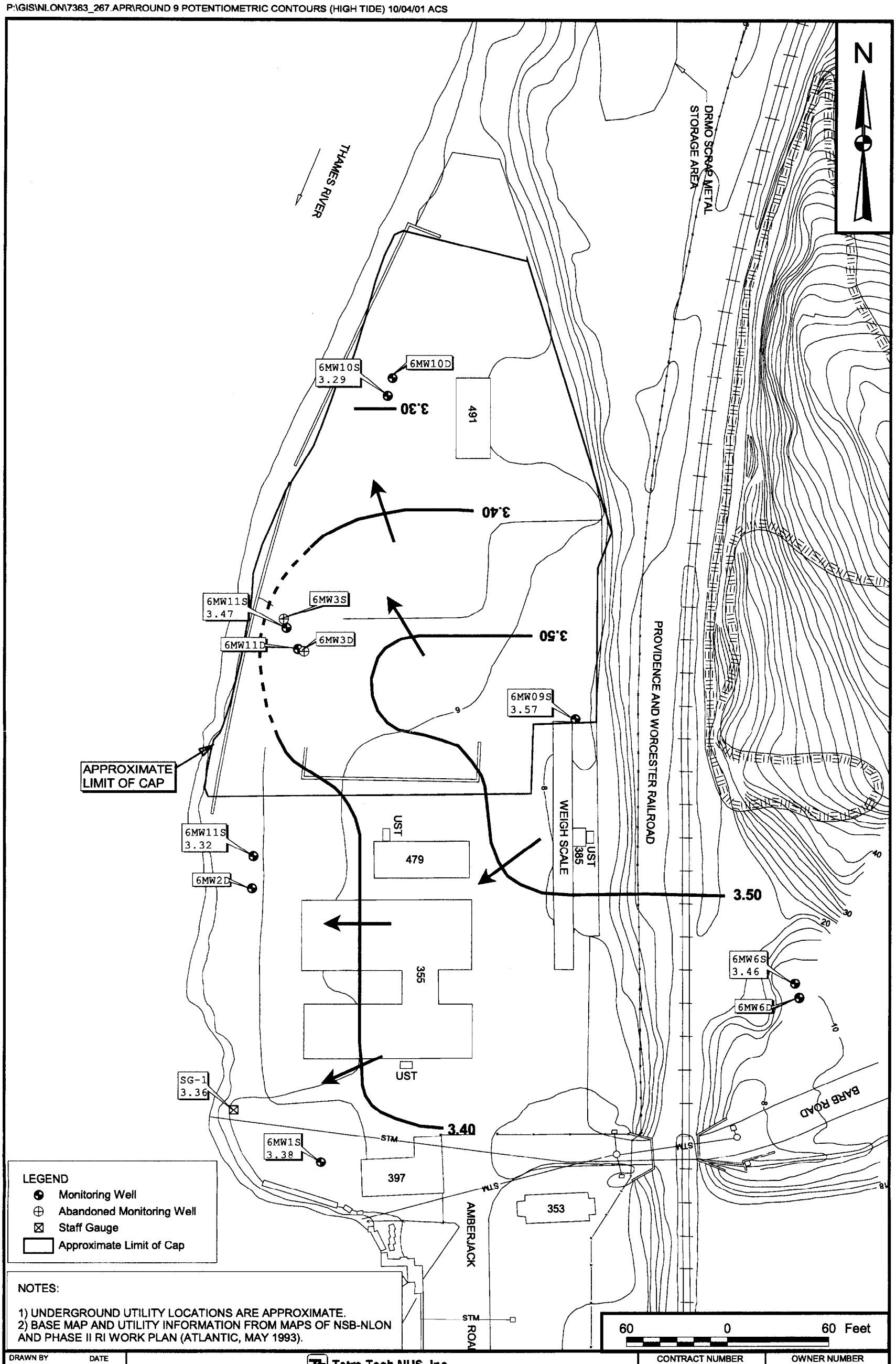
DRAWN BY M. Spangenberg — DATE 5-8-01	Tetra Tech NUS, Inc.	CONTRACT NUMBER 7091	OWNER NUMBER —
CHECKED BY — DATE —	LOW TIDE POTENTIOMETRIC SURFACE MAP ROUND 11 GROUNDWATER SAMPLING FOR DRMO NSB-NLON, GROTON, CONNECTICUT	APPROVED BY C. Rich — DATE 10/5/01	
COST/SCHEDULE-AREA		APPROVED BY —	DATE —
SCALE AS NOTED		DRAWING NO. FIGURE 4-4	REV 0

P:\GIS\NLON\7363_267.APR\ROUND 12 POTENTIOMETRIC CONTOUR (LOW TIDE) 9/18/01 JAL



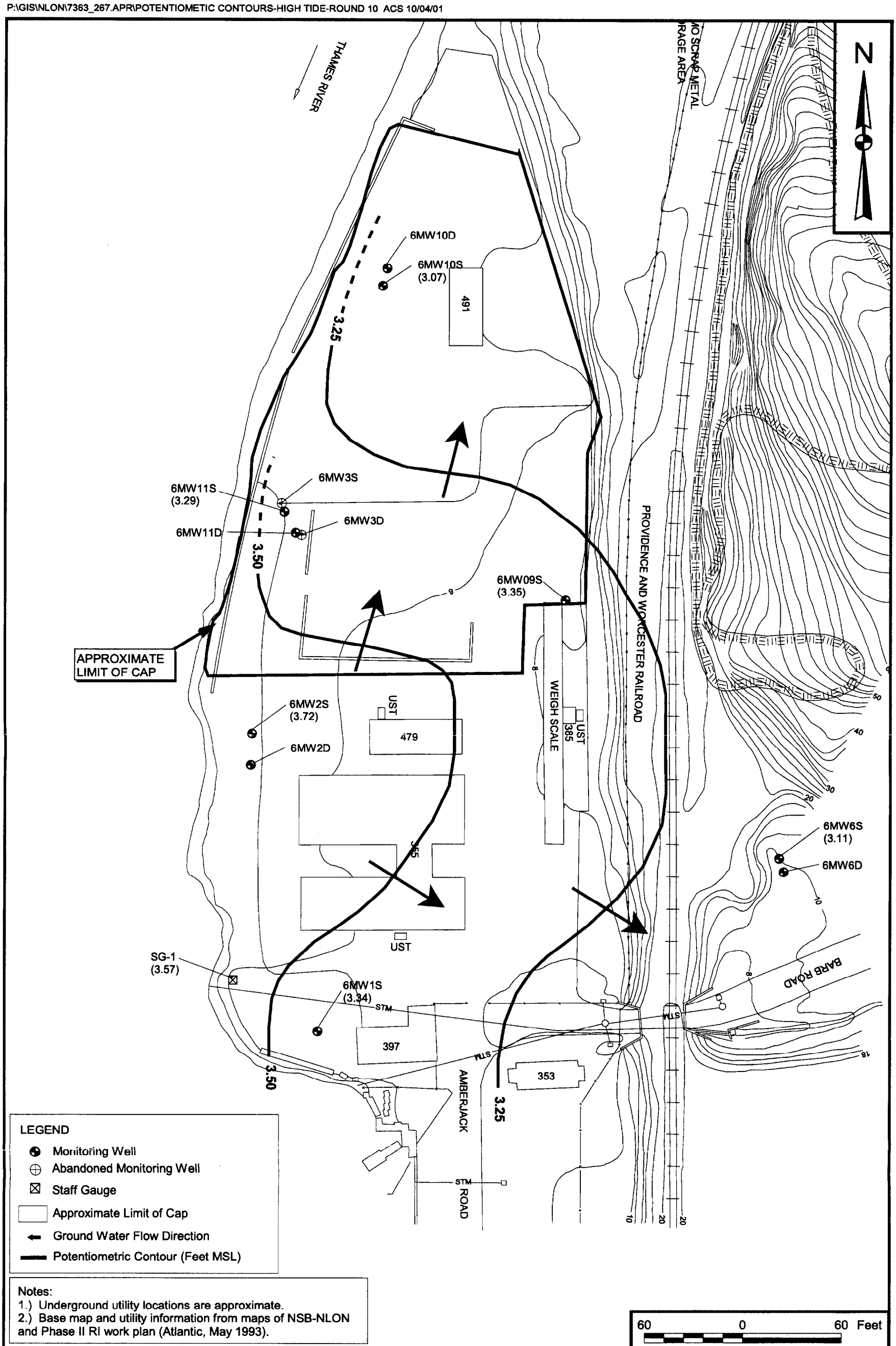
DRAWN BY J. LAMEY — DATE 8/13/01	Tetra Tech NUS, Inc.	CONTRACT NUMBER 7091	OWNER NUMBER —
CHECKED BY — DATE —	LOW TIDE POTENTIOMETRIC SURFACE MAP ROUND 12 GROUNDWATER SAMPLING FOR DRMO NSB-NLON, GROTON, CONNECTICUT	APPROVED BY C. RICH — DATE 10/5/01	
COST/SCHEDULE-AREA		APPROVED BY — — DATE —	
SCALE AS NOTED		DRAWING NO. FIGURE 4-5	REV 0

P:\GIS\NLON\7363_267.APR\ROUND 9 POTENTIOMETRIC CONTOURS (HIGH TIDE) 10/04/01 ACS



DRAWN BY M. Spangenberg DATE 12/12/00	Tetra Tech NUS, Inc.	CONTRACT NUMBER 7363	OWNER NUMBER —
CHECKED BY — DATE —	HIGH TIDE POTENTIOMETRIC SURFACE ROUND 9 GROUNDWATER SAMPLING FOR DRMO NSB-NLON, GROTON, CONNECTICUT	APPROVED BY C. RICH	DATE 10/5/01
COST/SCHEDULE-AREA		APPROVED BY —	DATE —
SCALE AS NOTED		DRAWING NO. FIGURE 4-6	REV 0

P:\GIS\NLON\7363_267.APR\POTENTIOMETIC CONTOURS-HIGH TIDE-ROUND 10 ACS 10/04/01

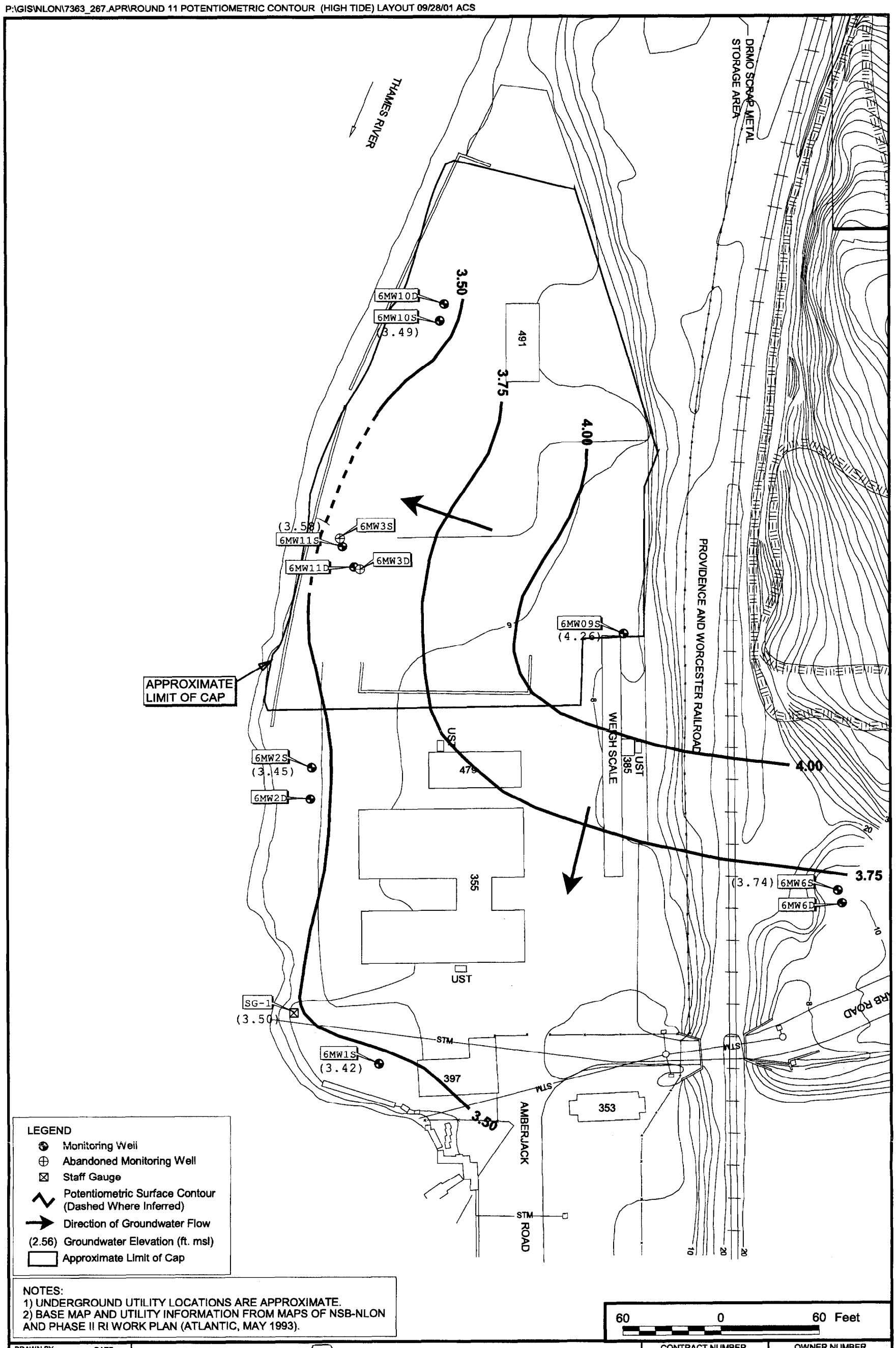


Notes:
1.) Underground utility locations are approximate.
2.) Base map and utility information from maps of NSB-NLON and Phase II RI work plan (Atlantic, May 1993).

60 0 60 Feet

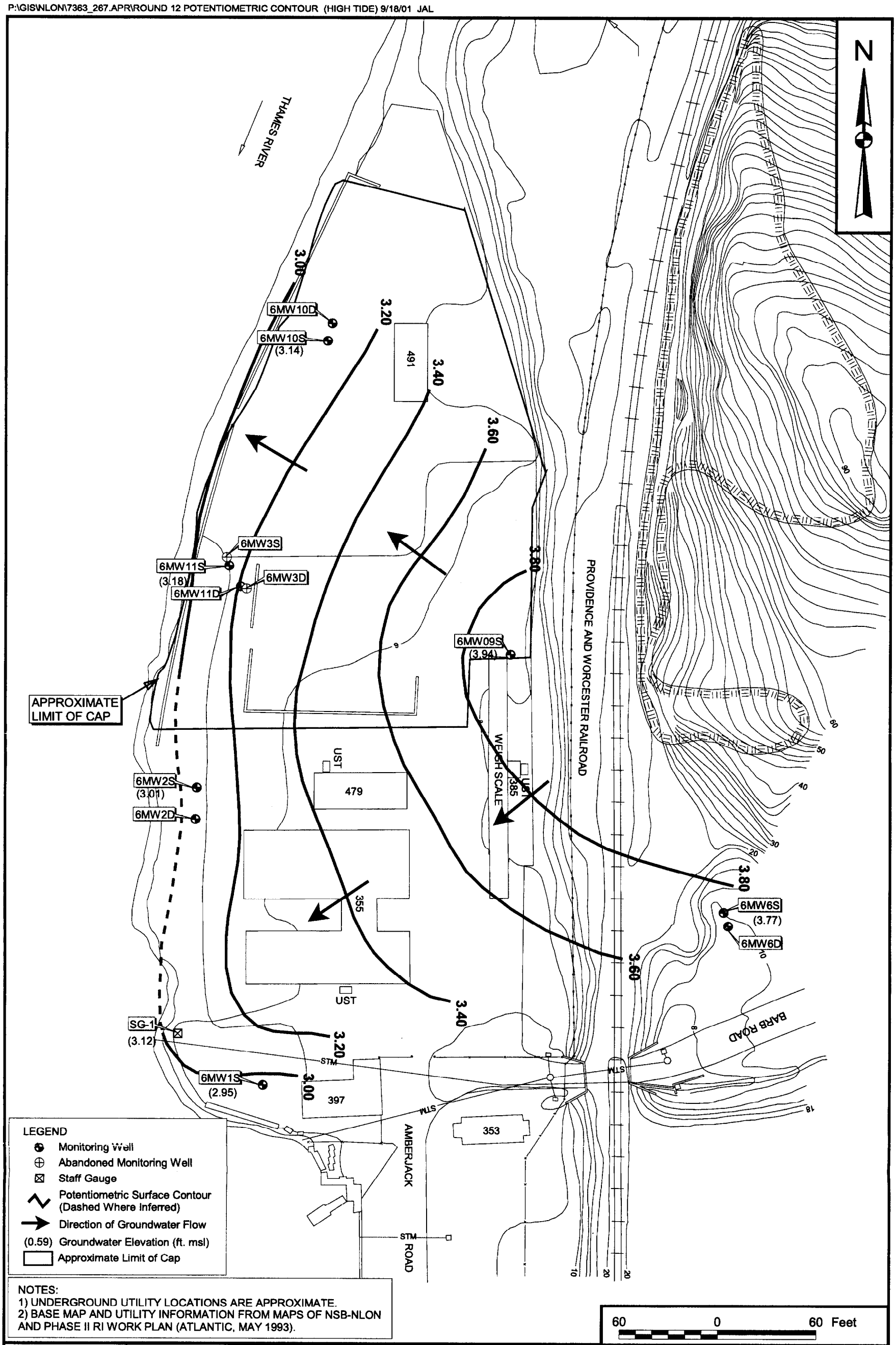
DRAWN BY M. Spangenberg DATE 2-28-01	Tetra Tech NUS, Inc.	CONTRACT NUMBER 7091	OWNER NUMBER —
CHECKED BY — DATE —	HIGH TIDE POTENTIOMETRIC SURFACE MAP ROUND 10 GROUNDWATER SAMPLING FOR DRMO NSB-NLON, GROTON, CONNECTICUT	APPROVED BY C. RICH	DATE 10/5/01
COST/SCHEDULE-AREA		APPROVED BY —	DATE —
SCALE AS NOTED		DRAWING NO. FIGURE 4-7	REV 0

P:\GIS\NLON\7363_267.APR\ROUND 11 POTENTIOMETRIC CONTOUR (HIGH TIDE) LAYOUT 09/28/01 ACS

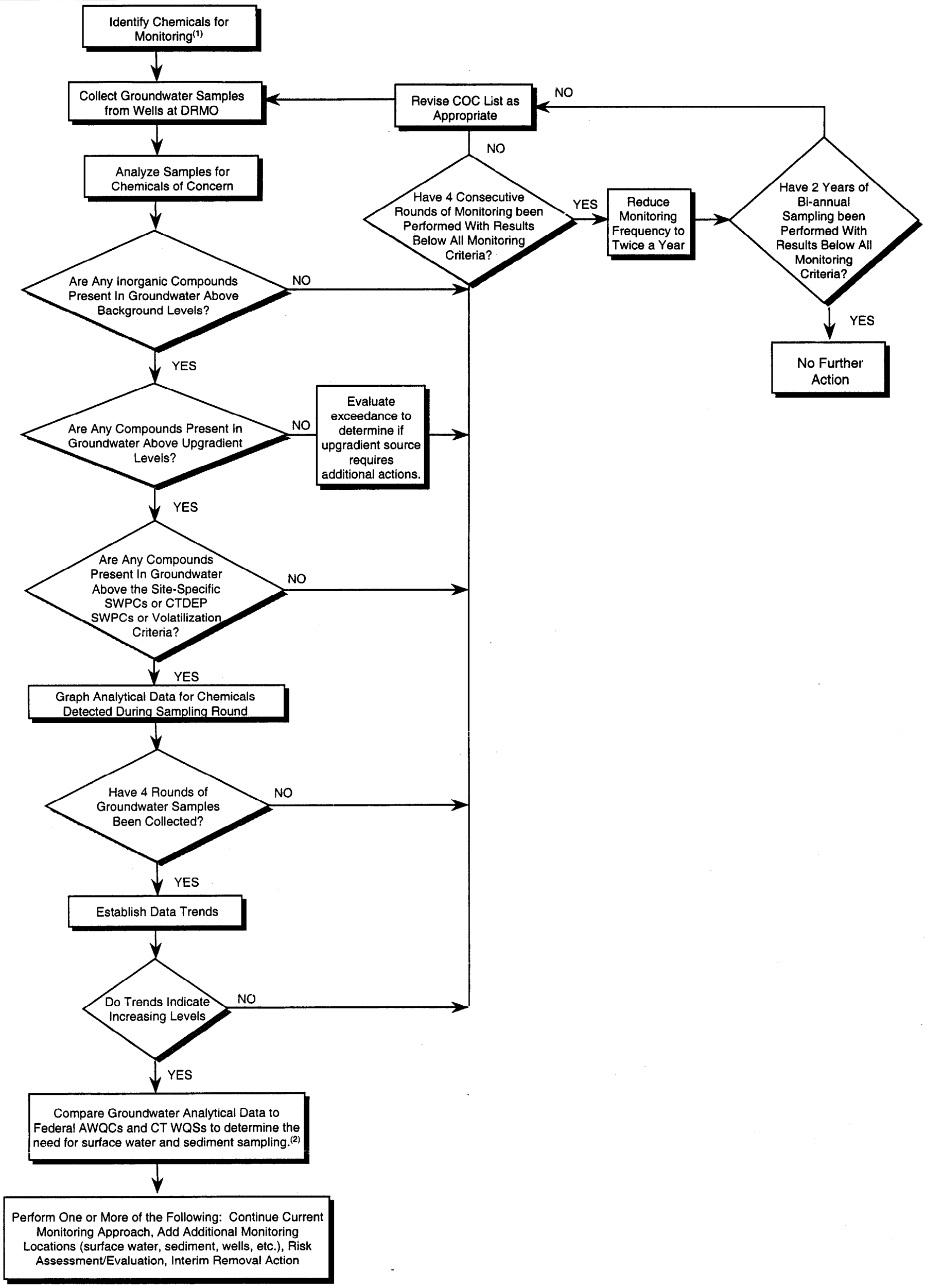


DRAWN BY M. Spangenberg DATE 5-6-01	Tetra Tech NUS, Inc.	CONTRACT NUMBER 7091	OWNER NUMBER —
CHECKED BY — DATE —	HIGH TIDE POTENTIOMETRIC SURFACE MAP ROUND 11 GROUNDWATER SAMPLING FOR DRMO NSB-NLON, GROTON, CONNECTICUT	APPROVED BY C. RICH	DATE 10/5/01
COST/SCHEDULE-AREA		APPROVED BY —	DATE —
SCALE AS NOTED		DRAWING NO. FIGURE 4-8	REV 0

P:\GIS\NLON\7363_267.APR\ROUND 12 POTENTIOMETRIC CONTOUR (HIGH TIDE) 9/18/01 JAL



DRAWN BY J. LAMEY	DATE 8/13/01	Tetra Tech NUS, Inc.	CONTRACT NUMBER 7091	OWNER NUMBER —
CHECKED BY	DATE	HIGH TIDE POTENTIOMETRIC SURFACE MAP ROUND 12 GROUNDWATER SAMPLING FOR DRMO NSB-NLON, GROTON, CONNECTICUT	APPROVED BY C. RICH	DATE 10/5/01
COST/SCHEDULE-AREA			APPROVED BY —	DATE —
SCALE AS NOTED			DRAWING NO. FIGURE 4-9	REV 0



(1) Initially evaluate soil contaminants which exceed the CTDEP Pollutant Mobility Criteria for GB classified groundwater. Evaluate chemicals in groundwater which exceed the site-specific Surface Water Protection Criteria (SWPCs) and Volatilization Criteria. Also include COCs identified in the Site 6 DRMO Feasibility Study and PCBs.

(2) Surface water samples will be compared to the Federal AWQCs and Connecticut WQSs; sediment samples will be compared to NOAA ERLs/ERMs.

FIGURE 4-10

GROUNDWATER MONITORING PLAN DECISION DIAGRAM
DRMO
NSB-NLON, GROTON, CONNECTICUT

TETRA TECH NUS, INC.

Figure 4-11

Average Downgradient Concentration of Barium as a Function of Time

Rounds 1 through 12

NSB -NLON, Groton, Connecticut

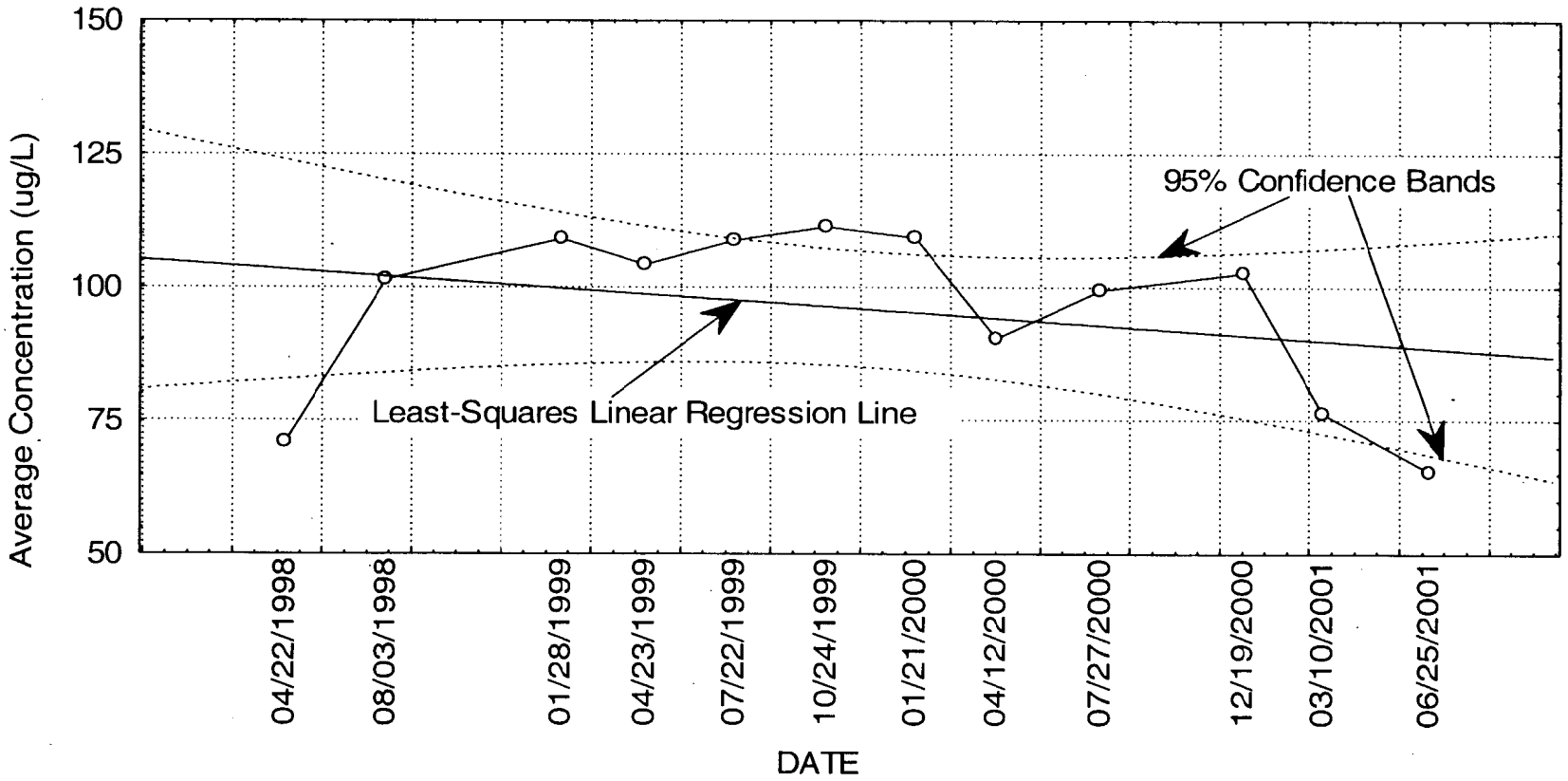
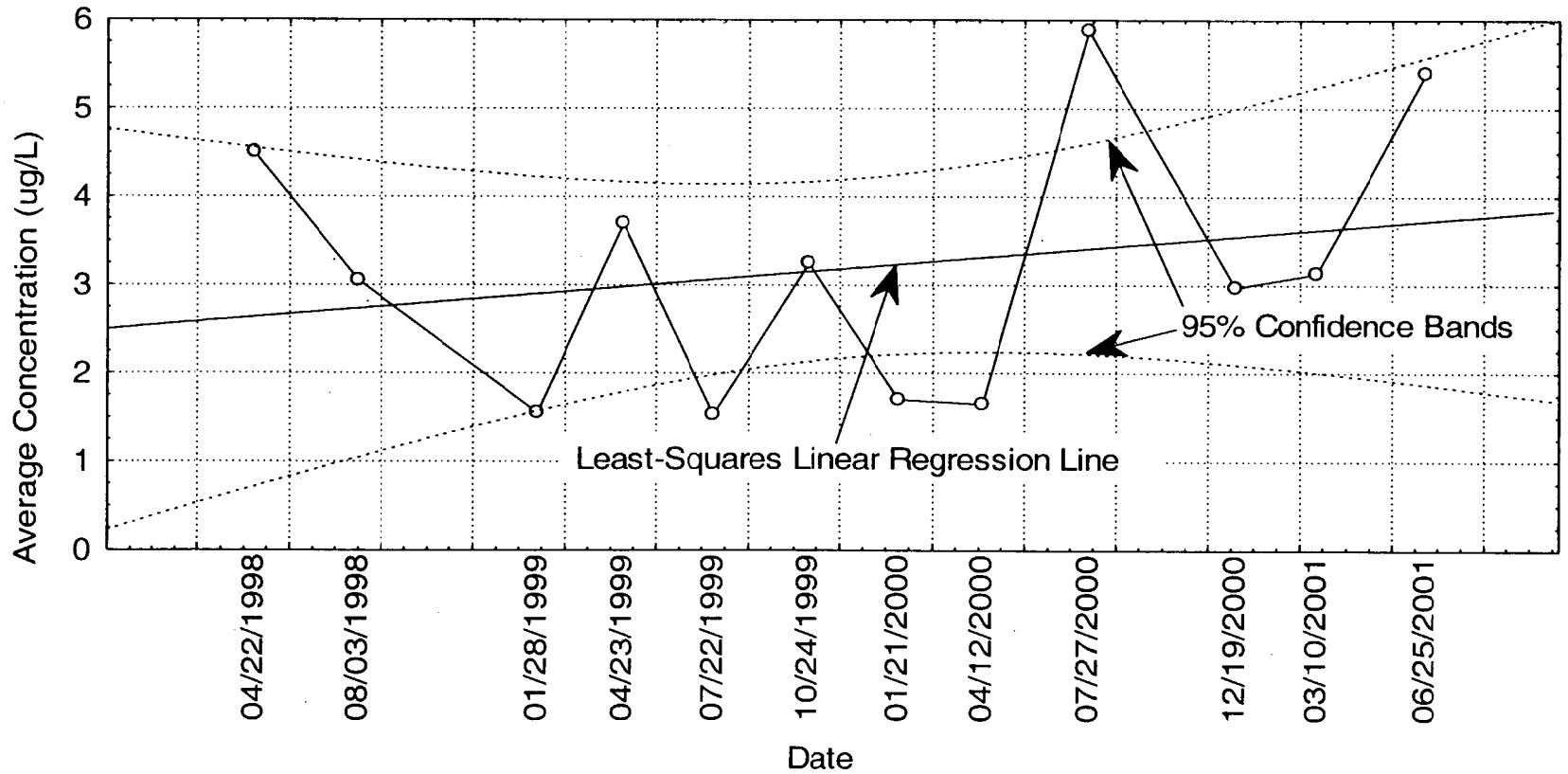


Figure 4-12

Average Downgradient Concentration of Arsenic as a Function of Time

Rounds 1 through 12

NSB - NLON, Groton, Connecticut



5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 CONCLUSIONS

This Year 3 Annual Groundwater Monitoring Report summarizes 4 rounds (9 through 12) of quarterly groundwater analytical data collected from 10 monitoring wells installed at the DRMO. The results of the monitoring program are being used to evaluate the success of the interim remedial action (i.e., soil removal action and installation of an asphalt/GCL cap) at minimizing contaminant migration from the DRMO. As previously stated, the COPCs evaluated for this monitoring program were identified in the Groundwater Monitoring Plan and they are summarized on Table 4-1. The steps generally followed during the data evaluation were those shown on Figure 4-10. The evaluation included the following:

- Comparison of analytical data to primary and secondary monitoring criteria.
- Statistical comparison of analytical data from downgradient and upgradient monitoring wells.
- Comparison of COPCs that were statistically higher in downgradient wells as compared to upgradient wells to background concentrations and primary criteria.
- Trend analysis of select total inorganics.
- Evaluation of the correlation between inorganic concentrations in downgradient wells and water quality parameters.

To verify that contaminants are not migrating from the site at concentrations above criteria, the analytical results were compared to previously defined primary and secondary screening criteria. The results obtained during Rounds 9 through 12 of groundwater monitoring for VOCs, SVOCs, Pesticides/PCBs, and inorganics indicated no exceedances of any primary criteria. BEHP was detected at concentrations that exceeded the secondary monitoring criteria in several samples. The concentrations detected in excess of the criteria during Year 3 were lower than the range of concentrations detected during the previous two years of sampling. The low concentrations of BEHP that were detected may be attributable to laboratory artifacts as no clear pattern has been exhibited in any monitoring wells. Benzo(a)pyrene (0.24 µg/L) and benzo(k)fluoranthene (0.27 µg/L) were also detected at concentrations in excess of their respective secondary monitoring criteria in the sample collected from 6MW9S during Round 12. These two compounds have been detected sporadically during the monitoring program, but none of the concentrations have ever exceeded the primary monitoring criteria. No pesticides or PCBs were detected in any of the groundwater samples collected during Year 3. Arsenic, barium, cadmium, chromium,

copper, lead, silver, and zinc were detected in the groundwater samples. None of the positive results exceeded their respective primary screening criteria. Concentrations of arsenic, cadmium, chromium, copper, lead, silver and zinc detected in some groundwater samples were in excess of the secondary screening criteria. The secondary monitoring criteria for arsenic is below the detection limits achievable using currently available technology and equipment.

As discussed in Section 4.3, COPC concentrations detected in upgradient monitoring wells were statistically compared to the COPC concentrations detected in downgradient monitoring wells. The statistical comparisons indicated that downgradient concentrations of trans-1,2-dichloroethene, vinyl chloride, arsenic, barium, chromium, lead, and silver were statistically higher than concentrations detected in upgradient wells. However, none of the detected concentrations of COPCs were in excess of primary monitoring criteria, indicating that no significant contaminant migration is occurring from the DRMO.

The average arsenic and barium concentrations for each round were plotted as a function of time to determine trends in the data. Concentrations of these two metals during previous sampling rounds showed statistically significant differences between upgradient and downgradient wells. However, downgradient barium concentrations were not statistically higher than upgradient concentrations, and the elevated arsenic detections were in the deep overburden wells only. The plots did not show any significant trends in arsenic or barium detections that would indicate a contaminant migration problem from the DRMO site. The correlation between arsenic and barium detections and ORP was also tested as part of the analysis. The results of the evaluation indicated that concentrations of these metals in downgradient wells were only weakly to moderately correlated with ORP, and thus indicate that the DRMO site is not causing the leaching these metals.

5.2 RECOMMENDATIONS

As discussed above, the analytical results for the third year of groundwater monitoring at the DRMO showed no exceedances of the primary monitoring criteria, although several contaminants were detected in excess of the secondary monitoring criteria and seven COPCs were detected in downgradient wells at concentrations that were statistically higher than concentrations in downgradient wells. In addition, there were no trends in COPCs that would indicate significant concentrations of COPCs are migrating from the DRMO site. These results are generally similar to the results of the first two years of groundwater monitoring. They indicate that the interim remedial action at the site removed sufficient contaminant source material and reduced infiltration of precipitation through any remaining source material so that significant contaminant migration from the site to the Thames River is not occurring. Therefore, it is recommended that the current interim Record of Decision for the DRMO should be amended and a final Record of Decision should be prepared for the site.

In addition, the following recommendations are made based on the results of the three years of monitoring at the DRMO.

- The sampling frequency should be reduced from quarterly to annually. This recommendation is justified because there have been no exceedances of primary monitoring criteria and no significant increasing contaminant trends have been noted in the downgradient wells over three years.

- The annual sampling frequency should be used for two years (Years 4 and 5) and then the frequency should be re-evaluated. This recommendation is based on Figure 4-10, which indicates that two years of data should be collected after a sample frequency change prior to making any further decisions.

- The future monitoring program should include 6MW6S, 6MW6D, and 6MW9S as upgradient monitoring wells and 6MW1S, 6MW2S, 6MW10S, and 6MW11S as downgradient monitoring wells. Monitoring wells 6MW2D, 6MW10D, and 6MW11D should be eliminated because upward flow gradients exist in these wells and therefore monitoring results from these wells do not provide an indication of impacts from the DRMO site. The deep monitoring wells should be appropriately abandoned if they will not be used for any other purposes. The shallow monitoring wells at these locations provide the best monitoring points to determine the impacts of the DRMO site on groundwater quality.

- Attempts to develop correlations between inorganics and ORP should be discontinued in future data evaluation reports. Conclusive arguments are provided in Section 4.0 that justify elimination of this effort.

- Routine maintenance should be conducted on the remaining monitoring wells included in the monitoring program to facilitate monitoring activities into the future.

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APPENDIX A

GROUNDWATER SAMPLE LOGSHEETS AND LOW-FLOW PURGE DATA SHEETS

TABLE A-1

SUMMARY OF GROUNDWATER FIELD PARAMETERS
DRMO GROUNDWATER MONITORING ROUNDS 1 THROUGH 12
NSB-NLON, GROTON, CONNECTICUT

WELL	Round	DATE	pH Standard	SC mS/cm	Temp Degree C	Turb. NTU	DO mg/L	Eh mV	Salinity ppt
6MW1S	1	4/21/1998	6.29	1.55	12.57	1.58	13.88	104.9	0.79
(DG)	2	8/3/1998	6.41	5.46	18.54	0.45	4.92	122.9	3.41
	3	1/28/1999	6.26	4.33	6.44	0.05	10.43	204.9	2.3
	4	4/23/1999	6.16	7.74	11	0	7.74	133.5	4.3
	5	7/22/1999	6.49	18.59	20.66	0	3.53	107.4	11.03
	6	10/24/1999	6.35	7.65	14.2	0	1.03	77	4.2
	7	1/21/2000	6.49	10.98	6.1	0	0	100	5.99
	8	4/11/2000	6.21	1.71	10.7	0	2.99	139	0.87
	9	7/27/2000	6.35	10.78	18.14	0	4.23	24.9	6.13
	10	12/19/2000	6.51	4.63	8.94	0.35	18.85	7.1	--
	11	3/10/2001	6.45	6.02	6.89	0.7	8.83	-3.4	3.27
	12	6/23/2001	6.24	2.41	16.54	0.21	8.71	104.3	--
6MW2S	1	4/21/1998	7.51	7.74	10.67	5.16	58.34	7.6	4.3
(DG)	2	7/31/1998	6.97	20.06	20.55	4.3	0.3	-201	13.22
	3	1/28/1999	6.92	16.12	7.5	2	4.56	-90.7	9.43
	4	4/21/1999	6.84	22	9.48	0.54	3.27	142.1	13.22
	5	7/21/1999	7.19	34.03	22.1	5	2.48	-146.7	21.29
	6	10/23/1999	6.91	25.41	18.9	1	0.72	-219	15.54
	7	1/20/2000	7.06	23.98	7.5	3.8	3.24	-132	14.45
	8	4/11/2000	7.1	11.27	8.7	6.7	0.06	59	6.41
	9	7/27/2000	6.9	23.32	19.66	3.3	0.22	-288	14.14
	10	12/18/2000	7.05	2.88	10.35	7	0.52	14	--
	11	3/7/2001	6.88	17.34	5.2	2.2	3.19	40	10.12
	12	6/21/2001	7.35	7.89	15.11	9.3	2.16	-221.1	--
6MW2D	1	4/21/1998	6.87	32.91	11.75	48.2	24.28	-164.1	20.57
(DG)	2	7/31/1998	6.87	20.68	16.28	24.3	0.41	-329	15.17
	3	1/25/1999	6.71	30.9	10.7	7.9	2.7	-231	19.5
	4	4/21/1999	6.79	35.85	11.5	6	0.88	-200.5	22.6
	5	7/21/1999	6.82	31.71	17.44	9.5	0.35	-265.8	19.78
	6	10/23/1999	6.64	38.84	14	16.1	0.09	-199	24.74
	7	1/20/2000	6.9	33.75	9.8	8.3	0	-308	21.17
	8	4/11/2000	6.89	34.66	11.3	15	0.1	-281	21.74
	9	7/26/2000	6.63	32.25	14.58	9.5	66.82	-457	20.17
	10	12/19/2000	6.85	30.97	11.97	16	0.01	-358	--
	11	3/7/2001	6.68	33.5	9.81	8.9	0.36	-267	20.88
	12	6/21/2001	6.78	23.35	13.69	2	8.44	-282.3	--
6MW6S	1	4/21/1998	6.05	0.274	8.01	5.87	11.89	66	0.13
(UG)	2	7/29/1998	5.87	0.205	11.46	4.25	8.66	255	0.13
	3	1/25/1999	6.06	0.325	10.1	0.4	8.01	169.9	0.16
	4	4/19/1999	5.69	0.32	9.8	0.3	9.57	148.6	0.15
	5	7/19/1999	5.78	0.309	12.09	0.9	7.36	-41.1	0.15
	6	10/21/1999	5.98	0.474	10.3	0.1	3.98	303	0.23
	7	1/18/2000	6.1	0.252	9.6	0.3	7.23	242	0.12
	8	4/10/2000	6.13	0.253	10.2	0.3	1.47	158	0.12
	9	7/23/2000	5.97	0.28	11.26	0.65	8.07	141.2	0.1
	10	12/15/2000	6.03	0.32	10.35	3.8	7.44	64.7	--
	11	3/6/2001	5.93	0.34	9.98	0.2	8.38	217	0.16
	12	6/25/2001	6.24	0.22	10.24	0.35	9.16	147.2	--
6MW6D	1	4/22/1998	6.59	4.61	8.85	35.6	2.49	-78.7	2.47
(UG)	2	7/29/1998	5.5	2.93	11.38	9.81	1.64	122	2.11
	3	1/25/1999	5.88	3.41	9.83	50	1.95	109.6	1.8
	4	4/19/1999	5.64	4.42	11.03	43.4	0.77	125.7	2.37
	5	7/19/1999	5.8	3.62	11.3	25	0.23	96.1	1.92
	6	10/21/1999	5.7	4.24	10.3	16	0.25	342	2.26
	7	1/18/2000	5.95	3.73	8.9	19	1.33	89	1.97
	8	4/10/2000	5.62	3.82	10.6	31	1.29	94	2.03
	9	7/23/2000	5.55	3.39	11.73	11	0.2	43.9	1.79
	10	12/15/2000	5.96	3.23	9.52	17.7	18.78	-24.3	--
	11	3/6/2001	5.62	3.11	9.6	32	0.28	197.2	1.63
	12	6/25/2001	5.98	2.62	10.98	11	0.64	91.7	--

TABLE A-1

SUMMARY OF GROUNDWATER FIELD PARAMETERS
DRMO GROUNDWATER MONITORING ROUNDS 1 THROUGH 12
NSB-NLON, GROTON, CONNECTICUT

WELL	Round	DATE	pH Standard	SC mS/cm	Temp Degree C	Turb. NTU	DO mg/L	Eh mV	Salinity ppt
6MW9S	1	--	--	--	--	--	--	--	--
(UG)	2	7/30/1998	4.77	0.047	14.61	0.76	0.83	286.6	0.03
	3	1/26/1999	5.52	0.055	7	0.1	9.34	250.1	0.03
	4	4/23/1999	4.1	0.05	8.9	0.9	1.92	178.6	0.02
	5	7/20/1999	5.02	0.08	14.89	0	0.72	-97.1	0.04
	6	10/22/1999	5.24	0.064	15.3	0	2.93	352	0.03
	7	1/19/2000	5.1	0.049	9.6	0.2	0.63	282	0.02
	8	4/11/2000	5.04	0.045	8.8	0	7.6	224	0.02
	9	7/25/2000	4.71	0.067	14.12	0	0.21	121.3	0.03
	10	12/18/2000	5.49	0.043	7.14	0.41	9.16	17.8	--
	11	3/10/2001	5.21	0.068	4.2	1	10.98	166	0.03
	12	6/23/2001	5.13	0.03	14.58	0.5	2.65	85.1	--
6MW10S	1	4/20/1998	7.99	8.91	11.13	6.6	49.07	-134.8	5
(DG)	2	7/30/1998	7.42	6.41	20.41	0.46	0.23	-272.1	3.87
	3	1/26/1999	7.17	12.22	10.05	1	0.29	-149	7.01
	4	4/20/1999	7.29	8.35	10.82	1.8	0.95	-112	4.66
	5	7/19/1999	7.15	13.28	21.12	2.7	0.19	-157.8	7.67
	6	10/22/1999	7.11	10.83	18.8	0	0.51	-152	6.17
	7	1/18/2000	7.33	11.18	10.9	0.1	0.47	-264	6.34
	8	4/10/2000	7.05	8.98	10.9	0.6	1.15	-281	5.04
	9	7/24/2000	6.99	7.138	21	1.2	46.9	-397	3.93
	10	12/16/2000	7.2	1.36	12.54	1.03	22.7	-345	--
	11	3/10/2001	7.2	6.59	6.2	5.7	4.93	-180	3.6
	12	6/24/2001	7.86	5.56	17.04	1	0.58	-259	--
6MW10D	1	4/20/1998	7.28	19.24	12.94	35.4	56.38	-235	11.47
(DG)	2	8/3/1998	7.15	16.42	16.06	6.41	4.67	-146.8	11.85
	3	1/26/1999	7.27	20.53	12.1	0.4	0.7	-80.8	12.36
	4	4/20/1999	7.14	21.56	12.3	1.93	0.2	-73.3	12.95
	5	7/19/1999	6.94	17.9	15	2	0.62	-64.8	10.61
	6	10/22/1999	7.23	21.37	14.3	0.4	0.15	-73	12.87
	7	1/18/2000	7.25	18.42	12.4	0.6	3.31	-142	11.22
	8	4/10/2000	7.2	18.76	12.6	0.9	na	-153	11.16
	9	7/24/2000	6.91	15.63	14.65	0.88	0.17	-190.9	9.18
	10	12/16/2000	7.3	1.69	12.72	6.8	6.58	-243	--
	11	3/9/2001	7.13	20.99	9.38	2.5	3.48	13	12.15
	12	6/24/2001	7.26	13.3	14.45	3	0.49	-127.2	--
6MW11S	1	--	--	--	--	--	--	--	--
(DG)	2	7/30/1998	7.38	9.65	20.93	1.37	0.26	-245	5.93
	3	1/27/1999	7.61	11.21	9.3	1.9	0.64	-244.8	6.38
	4	4/22/1999	7.08	9.68	10.4	1.09	0.39	-187.7	5.46
	5	7/20/1999	7.37	18.55	20.2	0.5	0.33	-193.4	11.03
	6	10/21/1999	7.39	14.88	19.8	1	1.11	-312	8.69
	7	1/19/2000	7.49	12.31	9.9	1.6	5.77	-326	7.06
	8	4/12/2000	7.44	8.53	10.6	6.1	1.24	-213	4.79
	9	7/25/2000	7.26	10.42	20.18	0.37	0.17	-358.1	5.94
	10	12/17/2000	7.56	1.55	12.41	5.5	0.16	-269	--
	11	3/8/2001	7.16	7.74	6	1.8	3.94	-162	4.27
	12	6/22/2001	7.34	4.25	17.24	1	1.55	-286.2	--
6MW11D	1	--	--	--	--	--	--	--	--
(DG)	2	7/30/1998	6.91	31.49	16.19	41.2	3.2	-171.5	24.07
	3	1/27/1999	6.9	36.08	12.3	8	0.28	-182.1	22.76
	4	4/22/1999	7.16	34.97	12.66	10	2.18	-99	22
	5	7/20/1999	6.94	35.74	17.96	0.85	0.37	-112.6	22.61
	6	10/21/1999	6.97	38.66	15	3.9	0.17	-130	24.63
	7	1/19/2000	6.91	34.4	11.8	0.5	5.04	-235	21.61
	8	4/12/2000	6.96	33.03	12.9	3.7	0.04	-131	20.68
	9	7/25/2000	6.85	32.58	14.83	52	6.73	-281	20.49
	10	12/17/2000	7.08	1.76	12.43	7.9	29.53	-101	--
	11	3/8/2001	6.76	23.99	10.87	3.8	0.8	-60	14.56
	12	6/22/2001	6.96	23.81	15.35	4	0.11	-140.7	--

DG = Downgradient Monitoring Well
UG = Upgradient Monitoring Well
Highlighted numbers are suspect results.
Locations marked with -- were either not sampled or had instrument error.

ROUND 9

Tetra Tech NUS, Inc

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSB-NLON / DRMO
Project No.: 7363

[ ] Domestic Well Data
[x] Monitoring Well Data
[ ] Other Well Type:
[ ] QA Sample Type:

Sample ID No.: DRMO- 6MW1S GW-09
Sample Location: 6MW1S
Sampled By: D. Whalen
C.O.C. No.: 072600-09
Type of Sample:
[X] Low Concentration
[ ] High Concentration

SAMPLING DATA:

	Color	pH	S.C.	Temp.	Turbidity	DO	Eh	Salinity
Date: 7-27-00	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	mV	ppt
Time: 1255								
Method: Low Flow/Bladder Pump	Clear	6.35	10.78	12.14	0.0	4.23	24.9	6.13

PURGE DATA:

Date: 7-27-00
Method: Low Flow/Bladder Pump
Monitor Reading (ppm):
Well Casing Diameter & Material Type: 2" PVC
Total Well Depth (TD): 15.7
Static Water Level (WL): 7.18
One Casing Volume(gal): 1.4
Start Purge (hrs): 1145
End Purge (hrs): 1250
Total Purge Time (min): 65
Total Vol. Purged (gal): 4.5

See Attached Low Flow Purge Data Sheet for Purge Data

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements		Collected
TCL VOLATILES (LOW-LEVEL)	HCL / 4° C	3	40 ml Vial	✓
TCL SEMIVOLATILES	4° C	2	Qt. Amber Glass	✓
TCL PEST/PCBs	4° C	2	Qt. Amber Glass	✓
TCL PAH	4° C	2	Qt. Amber Glass	✓
TAL METALS (TOTAL)	HNO_3 / 4° C	1	L PE	✓

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): Donald W. Whalen

Tetra Tech NUS, Inc. **LOW FLOW PURGE DATA SHEET** **Well No.:** 6MW1S

PROJECT: NSB-NLON, DRMO
PROJECT NUMBER: 7363
SITE: DRMO
DATE: 7-27-00
WEATHER: rain, ~70°
PERSONNEL: D. Whalen

Well Screen Depth: 5.7 / 15.7 ft.
Initial Water Level: 7.18 @ 1145 hrs.
Pump Type/Material: Bladder/PVC
Pump Intake Depth: 12.0 PVC
Tide Cycle: ☐ High @ ☒ Low @ 1314 ☐ Not Affected
Total Purge Volume= 4.5 (gal / L)
Total Purge Time= ~~120~~ 65 (min)

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	Salinity ppt	Eh mV	Comments
1145	7.18	0	278	40 R 40P 20psi								START PURGE
1150	7.22	↓	↓	↓	18.82	6.48	7.31	7.09	7.9	4.02	-0.8	
1155	7.25				18.36	6.39	12.02	4.05	4.2	5.61	8.6	
1200	7.29				18.29	6.37	12.03	4.03	1.0	6.91	11.9	
1205	7.31				18.25	6.36	11.93	4.04	0.3	6.85	15.4	
1210	7.33				18.27	6.35	11.84	4.08	0.1	6.80	17.7	
1215	7.35				18.23	6.36	11.71	4.05	0.0	6.71	19.5	
1220	7.36				18.31	6.35	11.56	4.10	0.0	6.62	20.3	
1225	7.37				18.25	6.35	11.40	4.07	0.2	6.52	20.6	
1230	7.38				18.19	6.35	11.28	4.11	0.1	6.44	22.2	
1235	7.40				18.23	6.35	11.10	4.11	0.1	6.35	23.6	
1240	7.40				18.16	6.35	11.02	4.20	0.1	6.29	23.7	
1245	7.42	↓	↓		18.18	6.35	10.90	4.19	0.1	6.21	24.3	
1250	7.45		↓	↓	18.14	6.35	10.78	4.23	0.0	6.13	24.9	END PURGE

Water Quality Meter (S/N): YSI
Control Box Type (S/N): QED
Turbidimeter (S/N): LaMotte
Notes:

Tetra Tech NUS, Inc

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSB-NLON / DRMO
Project No.: 7363

[ ] Domestic Well Data
[x] Monitoring Well Data
[ ] Other Well Type:
[ ] QA Sample Type:

Sample ID No.: DRMO- 6MW25 GW-09
Sample Location: 6MW25
Sampled By: CHUCK M.
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[ ] High Concentration

SAMPLING DATA:

	Color	pH	S.C.	Temp.	Turbidity	DO	Eh	Salinity
Date: 7/28/00	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	mV	ppt
Time: 1303								
Method: Low Flow/Bladder Pump	clear	6.40	23.315	19.66	3.3	0.22	-288.0	14.19

PURGE DATA:

Date: 7/28/00
Method: Low Flow/Bladder Pump
Monitor Reading (ppm): 0.0
Well Casing Diameter & Material Type: 2" PVC
Total Well Depth (TD): 13.60
Static Water Level (WL): 5.34
One Casing Volume(gal): 1.28
Start Purge (hrs): 1155
End Purge (hrs): 1302
Total Purge Time (min): 67
Total Vol. Purged (gal): 4.0

See Attached Low Flow Purge Data Sheet for Purge Data

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOLATILES (LOW-LEVEL)	HCL / 4° C	40 ml Vial	3
TCL SEMIVOLATILES	4° C	Qt. Amber Glass	2
TCL PEST/PCBs	4° C	Qt. Amber Glass	2
TCL PAH	4° C	Qt. Amber Glass	2
TAL METALS (TOTAL)	HNO_3 / 4° C	L PE	1

OBSERVATIONS / NOTES:

13.60
5.34
8.26
.163 gal per foot
2.08
4.16
.816
1.28 gal

Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s):

Tetra Tech NUS, Inc. **LOW FLOW PURGE DATA SHEET** **Well No.:** 6MW2S

PROJECT: NSB - NLON
PROJECT NUMBER: 7363
SITE: DRMO

DATE: 7/27/00
WEATHER: cloudy with rain
PERSONNEL: Chuck Mc[illegible]

Well Screen Depth: 3.6 / 13.6 ft.
Initial Water Level: 5.74 @ 1155 hrs.
Pump Type/Material: Bladder/Pvc
Pump Intake Depth: 10 ft
Tide Cycle: ☐ High @ ____ ☒ Low @ ____ ☐ Not Affected
Total Purge Volume= 40 (gal / L)
Total Purge Time= 67 (min)

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	Salinity ppt	Eh mV	Comments
1155	5.74	0	250	300/3012 15PSI	19.94	6.97	23.062	1.65	7.4	13.98	-221.8	
1200	5.75	1250	250		19.89	6.95	23.111	0.88	5.3	14.01	-230.5	
1205	5.75	2500	250		19.74	6.93	23.168	0.34	4.2	14.03	-257.8	
1210	5.75	3750	250		19.72	6.93	23.186	0.32	3.7	14.06	-261.0	
1215	5.79	5000	250		19.73	6.93	23.216	0.27	3.4	14.08	-263.7	
1220	5.82	6250	250		19.75	6.92	23.241	0.26	3.7	14.10	-274.3	
1225	5.85	7500	250		19.70	6.92	23.267	0.25	3.3	14.11	-277.8	
1230	5.87	8750	250		19.68	6.91	23.284	0.24	3.3	14.12	-278.3	
1235	5.89	10,000	250		19.69	6.91	23.292	0.24	3.4	14.13	-281.5	
1240	5.91	11,250	250		19.68	6.91	23.303	0.23	3.6	14.13	-283.3	
1245	5.93	12,500	250		19.67	6.91	23.299	0.23	3.4	14.13	-284.1	
1250	5.95	13,750	250		19.62	6.90	23.312	0.21	3.4	14.14	-287.3	
1255	5.98	15,000	250		19.65	6.90	23.316	0.21	3.4	14.14	-288.5	
1300	6.02	16,250	250		19.66	6.90	23.315	0.22	3.3	14.14	-288.0	
1302	Purging of 6MW28 was completed after removing 4 gallons, then the well											
1303	Sample DRMO 6MW2S-G[illegible] was collected											
1330	Sampling was complete											

Water Quality Meter (S/N): YSI
Control Box Type (S/N): QED
Turbidimeter (S/N): Lamotte 2020

Notes:

Tetra Tech NUS, Inc

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSB-NLON / DRMO
Project No.: 7363

[ ] Domestic Well Data
[x] Monitoring Well Data
[ ] Other Well Type:
[ ] QA Sample Type:

Sample ID No.: DRMO- 6MW2D GW-09
Sample Location: 6MW2D
Sampled By: D Whalen
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[ ] High Concentration

SAMPLING DATA:

	Color	pH	S.C.	Temp.	Turbidity	DO	Eh	Salinity
Date: 7-26-00								
Time: 1210	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	mV	ppt
Method: Low Flow/Bladder Pump	clear	6.63	32.25	14.58	9.5	66.92	-457	20.17

PURGE DATA:

Date: 7-26-00
Method: Low Flow/Bladder Pump
Monitor Reading (ppm):
Well Casing Diameter & Material Type: 2" PVC
Total Well Depth (TD): 78.8'
Static Water Level (WL): 5.43
One Casing Volume(gal): 12
Start Purge (hrs): 1055
End Purge (hrs): 1205
Total Purge Time (min): 70
Total Vol. Purged (gal): 6

See Attached Low Flow Purge Data Sheet for Purge Data

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements		Collected
TCL VOLATILES (LOW-LEVEL)	HCL / 4° C	3	40 ml Vial	✓
TCL SEMIVOLATILES	4° C	2	Qt. Amber Glass	✓
TCL PEST/PCBs	4° C	2	Qt. Amber Glass	✓
TCL PAH	4° C	2	Qt. Amber Glass	✓
TAL METALS (TOTAL)	HNO_3 / 4° C	1	L PE	✓

OBSERVATIONS / NOTES:

Water had sulfur odor.
- effervesced in VOA vials.

Circle if Applicable:

MS/MSD —

Duplicate ID No.: —

Signature(s): Donald Whalen

Tetra Tech NUS, Inc. **LOW FLOW PURGE DATA SHEET** **Well No.:** 6MW2D

PROJECT: NSB-NLON, DRMO
PROJECT NUMBER: 7363
SITE: DRMO

DATE: 7-26-00
WEATHER: raining ~65°F
PERSONNEL: D. Whalen

Well Screen Depth: 68.8 / 78.8 ft.
Initial Water Level: 5.43 @ 1053 hrs.
Total Purge Volume= 6 (gal/L)

Pump Type/Material: Bladder/PVC
Pump Intake Depth: 73.0' PVC
Total Purge Time= 70 (min)

Tide Cycle: ☐ High @ ☒ Low @ 1220 ☐ Not Affected

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	Salinity ppt	Eh mV	Comments
1055	5.43	0	340	35D35R 30psi								START PURGE
1100					15.19	6.78	32.92	23.26	8.9	20.65	-288	sulfur odor
1105	5.67				14.96	6.81	32.46	13.97	8.1	20.33	-297	
1110					15.09	6.64	32.03	18.02	5.6	20.07	-316	
1115	5.85				14.77	6.58	32.23	39.9	5.5	20.19	-326	
1120					14.70	6.57	32.18	56.14	5.7	20.11	-343	
1125	5.67				14.61	6.60	32.16	66.46	5.51	20.15	-359	
1130	5.80				14.62	6.61	32.29	66.88	6.1	20.21	-389	
1135					14.75	6.62	32.21	54.74	7.3	20.14	-377	
1140	5.72				14.78	6.62	32.23	64.44	8.4	20.17	-381	
1145	5.73				14.57	6.62	32.31	66.90	8.7	20.25	-384	
1150	5.91				14.47	6.63	32.44	66.67	9.1	20.26	-400	
1155	5.84				14.46	6.63	32.40	67.19	9.5	20.27	-406	
1200					14.45	6.63	32.34	67.24	9.8	20.21	-435	
1205	5.88	23800			14.58	6.63	32.25	66.83	9.5	20.17	-457	End Purge

Water Quality Meter (S/N): YSI
ontrol Box Type (S/N): QED
Turbidimeter (S/N): LaMotte

Notes:

Tetra Tech NUS, Inc

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSB-NLON / DRMO
Project No.: 7363

[ ] Domestic Well Data
[x] Monitoring Well Data
[ ] Other Well Type:
[ ] QA Sample Type:

Sample ID No.: DRMO- 6MW65 GW-09
Sample Location: 6MW65
Sampled By: CHUCK M.
C.O.C. No.: 072300-09
Type of Sample:
[X] Low Concentration
[ ] High Concentration

SAMPLING DATA:

	Color	pH	S.C.	Temp.	Turbidity	DO	Eh	Salinity
Date: 7/23/00	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	mV	ppt
Time: 1835								
Method: Low Flow/Bladder Pump	Clear	5.97	280	11.26	0.65	8.07	141.2	0.10

PURGE DATA:

Date: 7-23-00
Method: Low Flow/Bladder Pump
Monitor Reading (ppm): 0.0
Well Casing Diameter & Material
Type: PVC 2"
Total Well Depth (TD): 18.56
Static Water Level (WL): 8.73'
One Casing Volume(gal): 1.60
Start Purge (hrs): 1634
End Purge (hrs): 1735
Total Purge Time (min): 61
Total Vol. Purged (gal): 3.5

See Attached Low Flow Purge Data Sheet for Purge Data

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOLATILES (LOW-LEVEL)	HCL / 4° C	40 ml Vial	3
TCL SEMIVOLATILES	4° C	Qt. Amber Glass	2
TCL PEST/PCBs	4° C	Qt. Amber Glass	2
TCL PAH	4° C	Qt. Amber Glass	2
TAL METALS (TOTAL)	HNO_3 / 4° C	LPE	1

OBSERVATIONS / NOTES:

18.56
8.73
9.83
x.163
2949
5898
983
1.60229

Circle if Applicable:

MS/MSD —
Duplicate ID No.: —

Signature(s):

Tetra Tech NUS, Inc. **LOW FLOW PURGE DATA SHEET** **Well No.:** 6MW6S

PROJECT: NSB-NLON
PROJECT NUMBER: 7363
SITE: OLMO

DATE: 7/23/00
WEATHER: Sunny warm 84
PERSONNEL: Chuck Meyer

Well Screen Depth: 8.6 / 18.6 ft.
Initial Water Level: 8.73 @ 1635 hrs.
Pump Type/Material: Bladder/PVC
Pump Intake Depth: 14.0 TPVC
Total Purge Volume= 3.5 (gal / L)
Total Purge Time= 61 (min)

Tide Cycle: ☐ High @ ☐ Low @ ☒ Not Affected

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	Salinity ppt	Eh mV	Comments
1635	8.73	180	180	45/45	12.04	5.97	.279	11.87	4.5	0.0	121	
1640	8.74	900	225		11.85	5.95	.279	8.83	5.4	0.0	120.6	
1645	8.74	2,025	217		11.58	5.95	.279	9.20	5.3	0.0	123.6	
1650	8.74	3,110	217		11.53	5.95	.280	9.10	3.7	0.04	124.6	
1655	8.74	4,195	217		11.51	5.95	.280	9.03	4.2	0.05	127.6	
1700	8.74	5,280	217		11.50	5.95	.279	8.72	3.5	0.07	128.6	
1705	8.74	6,365	217		11.29	5.96	.281	8.53	2.2	0.08	132.2	
1710	8.74	7,450	217		11.52	5.97	.280	8.62	1.8	0.10	133.6	
1715	8.74	8,535	217		11.45	5.95	.280	8.54	1.7	0.10	134.9	
1720	8.74	9,620	217		11.36	5.97	.280	8.45	1.[illegible]	0.10	137.2	
1725	8.74	10,705	217		11.28	5.97	.281	8.20	1.00	0.10	138.4	
1730	8.74	11,790	217		11.26	5.98	.280	8.13	0.65	0.10	140.7	
1735	8.74	12,875	217		11.26	5.97	.280	8.07	0.65	0.10	141.2	
1737	Purging was completed after removing 3.5 gallons from the well											
1739	Sampling at 6MW6S was begun											

Water Quality Meter (S/N): YSI
Control Box Type (S/N): QED
Turbidimeter (S/N): Lamotte 2020

Notes:

Tetra Tech NUS, Inc

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSB-NLON / DRMO
Project No.: 7363

[ ] Domestic Well Data
[x] Monitoring Well Data
[ ] Other Well Type:
[ ] QA Sample Type:

Sample ID No.: DRMO- 6MW 6D GW-09
Sample Location: 6MW6D
Sampled By: DW
C.O.C. No.: 072300-09
Type of Sample:
[X] Low Concentration
[ ] High Concentration

SAMPLING DATA:

	Color	pH	S.C.	Temp.	Turbidity	DO	Eh	Salinity
Date: 7/23/00	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	mV	ppt
Time: 1745								
Method: Low Flow/Bladder Pump	clear	5.55	3394	11.73	11.0	0.20	43.9	1.79

PURGE DATA:

Date: 7-23-00
Method: Low Flow/Bladder Pump
Monitor Reading (ppm):
Well Casing Diameter & Material Type: 4" PVC
Total Well Depth (TD):
Static Water Level (WL): 9.19'
One Casing Volume(gal):
Start Purge (hrs): 1623
End Purge (hrs): 1739
Total Purge Time (min): 76
Total Vol. Purged (gal): ~~7~~ 6.3

See Attached Low Flow Purge Data Sheet for Purge Data

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements		Collected
TCL VOLATILES (LOW-LEVEL)	HCL / 4° C	9	40 ml Vial	✓
TCL SEMIVOLATILES	4° C	6	Qt. Amber Glass	✓
TCL PEST/PCBs	4° C	6	Qt. Amber Glass	✓
TCL PAH	4° C	6	Qt. Amber Glass	✓
TAL METALS (TOTAL)	HNO_3 / 4° C	3	L PE	✓

OBSERVATIONS / NOTES:

Circle if Applicable: MS/MSD

Duplicate ID No.: —

Signature(s): Donald Wheler

Tetra Tech NUS, Inc. **LOW FLOW PURGE DATA SHEET** **Well No.:** 6MW6D

PROJECT: NSB NLON, DRMO
PROJECT NUMBER: 7363
SITE: DRMO
DATE: 7-23-00
WEATHER: p. cloudy, ~80°F
PERSONNEL: D. Whalen, K. Simpson

Well Screen Depth: 30.5 / 46.0 ft.
Initial Water Level: 9.19 @ 1623 hrs.
Pump Type/Material: Bladder/PVC
Pump Intake Depth:
Tide Cycle: ☐ High @ ☐ Low @ ☒ Not Affected
Total Purge Volume= 6.3 (gal / L) **Total Purge Time=** 76 (min)

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	Salinity ppt	Eh mV	Comments
1623	9.19	~~350~~ 0	420									START
1629	9.19	↓	310	350 33K 25 psi	12.08	5.75	3.396	1.12	20.6	1.79	53.8	S
1639	9.20	↓	326	↓	11.94	5.59	3.405	0.41	16.3	1.79	49.8	
1649	9.20	↓	↓	↓	11.77	5.55	3.396	0.31	13.9	1.79	47.8	
1659	9.20	↓	↓	↓	11.72	5.53	3.391	0.26	12.8	1.79	45.4	
1709	9.20	↓	↓	↓	11.73	5.53	3.403	0.23	10.9	1.79	44.2	
1719	↓	↓	↓	↓	11.83	5.53	3.394	0.22	11.0	1.79	43.8	
1729	↓	↓	↓	↓	11.70	5.54	3.394	0.20	11.3	1.79	43.5	
1739	↓	25180	↓	↓	11.73	5.55	3.394	0.20	11.0	1.79	43.9	END PURGE

Water Quality Meter (S/N): YSI
Control Box Type (S/N): QED
Notes:

Tetra Tech NUS, Inc

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSB-NLON / DRMO
Project No.: 7363

[ ] Domestic Well Data
[x] Monitoring Well Data
[ ] Other Well Type:
[ ] QA Sample Type:

Sample ID No.: DRMO- 6MW09S GW-09
Sample Location: 6MW9S
Sampled By: CHUCK M.
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[ ] High Concentration

SAMPLING DATA:

	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	Eh mV	Salinity ppt
Date: 7/25/00								
Time: 1319								
Method: Low Flow/Bladder Pump	Clear	4.71	0.067	14.12	0.00	0.31	121.3	0.03

PURGE DATA:

Date: 7/25/00
Method: Low Flow/Bladder Pump
Monitor Reading (ppm): 0.0
Well Casing Diameter & Material Type: 2" PVC
Total Well Depth (TD): 11.80
Static Water Level (WL): 4.38
One Casing Volume(gal): 1.21
Start Purge (hrs): 1230
End Purge (hrs): 1315
Total Purge Time (min): 55
Total Vol. Purged (gal): 4.0

See Attached Low Flow Purge Data Sheet for Purge Data

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOLATILES (LOW-LEVEL)	HCL / 4° C	40 ml Vial	3
TCL SEMIVOLATILES	4° C	Qt. Amber Glass	2
TCL PEST/PCBs	4° C	Qt. Amber Glass	2
TCL PAH	4° C	Qt. Amber Glass	2
TAL METALS (TOTAL)	HNO_3 / 4° C	L PE	1

OBSERVATIONS / NOTES:

11.80
− 4.38
7.42
× .163 gallons per foot
1.21

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech NUS, Inc. **LOW FLOW PURGE DATA SHEET** **Well No.:** 6MW9S

PROJECT: NSB NLON
PROJECT NUMBER: 7363
SITE: DRMO

DATE: 7/25/00
WEATHER: cloudy with rain showers low 80's
PERSONNEL: Chuck Meyer

Well Screen Depth: 7.8 / 11.8 ft.
Initial Water Level: 4.38 @ 1220 hrs.

Pump Type/Material: Bladder/PVC
Pump Intake Depth: 10.0 Ft

Tide Cycle: ☐ High @ ☐ Low @ ☒ Not Affected

Total Purge Volume= 4.0 (gal / L) **Total Purge Time=** 55 (min)

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	Salinity ppt	Eh mV	Comments
1220	4.38	0	325	30R / 300 10PSI	15.17	5.48	0.095	5.40	1.7	0.04	76.8	
1225	4.38	1625	325		14.20	4.64	0.065	0.73	1.0	0.03	118.8	
1230	4.38	3250	325		14.19	4.56	0.067	0.41	0.42	0.03	124.1	
1235	4.38	4,875	325		14.22	4.59	0.067	0.32	0.10	0.03	120.5	
1240	4.38	6,500	325		14.18	4.59	0.067	0.27	0.00	0.03	120.7	
1245	4.38	8,125	325		14.21	4.60	0.067	0.25	0.00	0.03	120.7	
1250	4.38	9,750	325		14.18	4.63	0.067	0.23	0.00	0.03	120.2	
1255	4.38	11,375	325		14.15	4.64	0.067	0.22	0.00	0.03	120.9	
1300	4.38	13,000	325		14.16	4.65	0.067	0.23	0.00	0.03	119.6	
1305	4.38	14,625	325		14.13	4.68	0.067	0.22	0.00	0.03	119.9	
1310	4.38	16,250	325		14.15	4.70	0.067	0.21	0.00	0.03	120.5	
1315	4.38	17,875	325		14.12	4.71	0.067	0.21	0.00	0.03	121.3	
1317	Purging was complete after removing 4 gallons from the well											
1319	Sampling was begun											

Water Quality Meter (S/N): YSI 193932
Control Box Type (S/N): QED 17631
Turbidimeter (S/N): [illegible] 4798

Notes:

Tetra Tech NUS, Inc

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSB-NLON / DRMO
Project No.: 7363

[ ] Domestic Well Data
[x] Monitoring Well Data
[ ] Other Well Type:
[ ] QA Sample Type:

Sample ID No.: DRMO- 6MW10S - GW-09
Sample Location: 6MW10S
Sampled By: D. Whalen
C.O.C. No.: 072400-09
Type of Sample:
[X] Low Concentration
[ ] High Concentration

SAMPLING DATA:

Date: 7-24-00	Color	pH	S.C.	Temp.	Turbidity	DO	Eh	Salinity
Time: 1030	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	mV	ppt
Method: Low Flow/Bladder Pump	clear	6.99	7138	21.00	1.20	46.90	-397	3.93

PURGE DATA:

Date: 7-24-00
Method: Low Flow/Bladder Pump
Monitor Reading (ppm):
Well Casing Diameter & Material Type: 2" PVC
Total Well Depth (TD): 13.30
Static Water Level (WL): 2.32
One Casing Volume(gal): 1.8 (1.8)
Start Purge (hrs): 0924
End Purge (hrs): 1023
Total Purge Time (min): 59
Total Vol. Purged (gal): 5.3

See Attached Low Flow Purge Data Sheet for Purge Data

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements		Collected
TCL VOLATILES (LOW-LEVEL)	HCL / 4° C	3	40 ml Vial	✓
TCL SEMIVOLATILES	4° C	2	Qt. Amber Glass	✓
TCL PEST/PCBs	4° C	2	Qt. Amber Glass	✓
TCL PAH	4° C	2	Qt. Amber Glass	✓
TAL METALS (TOTAL)	HNO_3 / 4° C	1	L PE	✓

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s): Donald Whalen

Tetra Tech NUS, Inc. **LOW FLOW PURGE DATA SHEET** **Well No.:** 6MW10S

PROJECT: NSB-NLON, DRMO
PROJECT NUMBER: 7363
SITE: DRMO
DATE: 7-24-00
WEATHER: mostly cloudy, ~70°F
PERSONNEL: D. Whalen

Well Screen Depth: ____ / ____ ft.
Initial Water Level: 2.32 @ 0924 hrs.
Pump Type/Material: Bladder / PVC
Pump Intake Depth:
Total Purge Volume= 5.3 (gal / L)
Total Purge Time= 59 (min)

Tide Cycle: ☐ High @ ____ ☒ Low @ 1036 ☐ Not Affected

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	Salinity ppt	Eh mV	Comments
0924	2.32	0	360	30D 30R 20psi								START PURGE
0928	2.29				20.41	7.24	7.698	5.26	8.51	3.97	-273	
0933	2.22				20.96	7.21	6.898	10.36	6.46	3.79	-313	
0938	2.20				20.86	7.19	6.906	13.19	2.02	3.80	-325	
0943	2.22				20.88	7.14	7.004	19.76	1.27	3.87	-343	
0948	2.20				20.89	7.10	7.095	24.63	1.13	3.91	-356	
0953					21.01	7.06	7.054	26.74	1.27	3.89	-365	
0958	2.15				21.06	7.05	7.099	30.12	1.29	3.91	-369	
1003					21.05	7.02	7.147	33.14	1.55	3.94	-378	
1008	2.21				20.96	7.00	7.144	36.38	1.41	3.94	-381	
1013	2.00				20.91	7.00	7.174	40.71	1.34	3.96	-388	
1018					20.99	6.99	7.169	43.47	1.32	3.95	-392	
1023	2.36	21240			21.00	6.99	7.138	46.90	1.20	3.93	-397	END PURGE
			START SAMPLING @ 1025									
			END SAMPLING @ 1047									

Water Quality Meter (S/N): YSI
Control Box Type (S/N): QED
Turbidimeter (S/N): ____
Notes: ____

Tetra Tech NUS, Inc

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSB-NLON / DRMO
Project No.: 7363

[ ] Domestic Well Data
[x] Monitoring Well Data
[ ] Other Well Type:
[ ] QA Sample Type:

Sample ID No.: DRMO- 6MW10B GW-09
Sample Location: 6MW10D
Sampled By: CM
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[ ] High Concentration

SAMPLING DATA:

	Color	pH	S.C.	Temp.	Turbidity	DO	Eh	Salinity
	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	mV	ppt
Date: 7/24/00								
Time: 1027								
Method: Low Flow/Bladder Pump	Clear	6.91	15632	14.65	0.88	0.17	-190.9	9.18

PURGE DATA:

Date: 7/24/00
Method: Low Flow/Bladder Pump
Monitor Reading (ppm): 0.0
Well Casing Diameter & Material Type: 2" PVC
Total Well Depth (TD): 54.10
Static Water Level (WL): 2.38
* One Casing Volume(gal): ~~6.10~~ 1.63 CM 7/24/00
Start Purge (hrs): 0925
End Purge (hrs): 1026
Total Purge Time (min): 61
Total Vol. Purged (gal): 5.25

See Attached Low Flow Purge Data Sheet for Purge Data

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOLATILES (LOW-LEVEL)	HCL / 4° C	40 ml Vial	3
TCL SEMIVOLATILES	4° C	Qt. Amber Glass	2
TCL PEST/PCBs	4° C	Qt. Amber Glass	2
TCL PAH	4° C	Qt. Amber Glass	2
TAL METALS (TOTAL)	HNO_3 / 4° C	L PE	1

OBSERVATIONS / NOTES:

* Saturated Screen volumes 10' screen x 0.163 gallons per foot = 1.63 gal

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech NUS, Inc. **LOW FLOW PURGE DATA SHEET** **Well No.:** DRMO 6MW10D

PROJECT: NSB-NLON
PROJECT NUMBER: 7363
SITE: DRMO
DATE: 7/24/00
WEATHER: Sunny Warm and 50's
PERSONNEL: Chuck Pierce

Well Screen Depth: 44.10 / 54.10 ft.
Initial Water Level: 2.38 @ 0925 hrs.
Pump Type/Material: Bladder/PVC
Pump Intake Depth: 49.0 ft
Tide Cycle: ☐ High @ ____ ☒ Low @ 1030 ☐ Not Affected
Total Purge Volume= 5.25 (gal / L) **Total Purge Time=** ____ (min)

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	Salinity ppt	Eh mV	Comments
0925	2.38	360	360	30d 30/25 30A	16.71	7.25	16.788	1.30	2.0	9.80	-136.9	
0930	2.41	1260	360	30D/30R 30PST	14.95	7.12	16.113	0.44	0.85	9.55	-187	
0935	2.41	3960	360		14.90	7.09	15.918	0.34	0.89	9.29	-182.1	
0940	2.41	5760	360		14.77	7.08	15.736	0.27	0.40	9.26	-178.8	
0945	2.41	7560	360		14.71	7.07	15.642	0.23	0.55	9.22	-170.4	
0950	2.41	9360	360		14.71	7.05	15.641	0.21	0.20	9.18	-171.7	
0955	2.43	11,160	360		14.71	7.04	15.625	0.20	0.45	9.17	-172.5	
1000	2.43	12,960	360		14.74	7.03	15.545	0.19	0.80	9.15	-172.9	
1005	2.44	14,760	360		14.73	7.01	15.579	0.18	1.5	9.14	-173.0	
1010	2.45	16,560	360		14.69	6.99	15.560	0.17	1.2	9.16	-173.1	
1015	2.45	18,360	360		14.65	6.96	15.619	0.17	0.65	9.17	-172.2	
1020	2.46	20,160	360		14.66	6.92	15.627	0.17	0.95	9.18	-171.3	
1025	2.46	20,340	360		14.65	6.91	15.632	0.17	0.88	9.18	-170.9	
1026	Purging	completed after removing			5.25	gallons	from	the	well.			
1027	Sample	DRMO-6MW10D-GW-04			was	collected by	CM					

Water Quality Meter (S/N): YSI
Control Box Type (S/N): QED
Turbidimeter (S/N): Lamotte 2020

Notes:

Tetra Tech NUS, Inc

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSB-NLON / DRMO
Project No.: 7363

[ ] Domestic Well Data
[x] Monitoring Well Data
[ ] Other Well Type:
[ ] QA Sample Type:

Sample ID No.: DRMO- 6MW11S GW-09
Sample Location: 6MW11S
Sampled By: CHUCK M.
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[ ] High Concentration

SAMPLING DATA:

	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	Eh mV	Salinity ppt
Date: 7/25/00								
Time: 1119								
Method: Low Flow/Bladder Pump	Clear	7.26	10.42	20.18	0.37	0.17	-358.1	5.94

PURGE DATA:

Date: 7/25/00
Method: Low Flow/Bladder Pump
Monitor Reading (ppm): 0.0
Well Casing Diameter & Material Type: 2" PVC
Total Well Depth (TD): 13.50
Static Water Level (WL): 2.96
One Casing Volume(gal): 1.72
Start Purge (hrs): 1000
End Purge (hrs): 1117
Total Purge Time (min): 77
Total Vol. Purged (gal): 4.0

See Attached Low Flow Purge Data Sheet for Purge Data

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOLATILES (LOW-LEVEL)	HCL / 4° C	40 ml Vial	3
TCL SEMIVOLATILES	4° C	Qt. Amber Glass	2
TCL PEST/PCBs	4° C	Qt. Amber Glass	2
TCL PAH	4° C	Qt. Amber Glass	2
TAL METALS (TOTAL)	HNO_3 / 4° C	LPE	1

OBSERVATIONS / NOTES:

13.50
- 2.96
10.54
.163 gal per foot
3162
6324
1054
1.7152

Circle if Applicable:

MS/MSD —
Duplicate ID No.: —

Signature(s):

Tetra Tech NUS, Inc. **LOW FLOW PURGE DATA SHEET** **Well No.:** 6MW11S

PROJECT: NSB - NLON
PROJECT NUMBER: 7363
SITE: DRMO

DATE: 7/25/00
WEATHER: cloudy with showers Low 80s
PERSONNEL: Chuck Meyer

Well Screen Depth: 3.50 / 13.50 ft.
Initial Water Level: 2.94 @ 1000 hrs.

Pump Type/Material: Bladder/PVC
Pump Intake Depth: 11.0 ft

Tide Cycle: ☐ High @ ____ ☒ Low @ 1127 ☐ Not Affected

Total Purge Volume= 4.0 (gal / L) **Total Purge Time=** 77 (min)

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond µS/cm	DO mg/L	Turbidity NTU	Salinity ppt	Eh mV	Comments
1000	2.94	240	240	45D/45R 30PSI	20.87	7.38	9,467	2.95	15.4	5.36	-234.2	
1005	3.14	1200	240		17.85	7.31	10,500	0.48	9.2	5.84	-249.9	
1010	3.19	2400	240		20.07	7.29	10,396	0.37	5.2	5.88	-311.9	
1015	3.20	3600	240		20.18	7.29	10,454	0.25	3.4	5.94	-322.8	
1020	3.21	4800	240	50D/50R 20PSI	20.23	7.29	10,510	0.21	1.5	5.97	331.1	
1025	3.21	5880	216		20.17	7.29	10,519	0.19	1.1	5.97	-332.9	
1030	3.21	6960	216		20.10	7.28	10,531	0.18	0.95	5.98	-336.4	
1035	3.21	8040	216		20.19	7.27	10503	0.17	0.65	5.96	-343.8	
1040	3.21	9120	216		20.35	7.27	10,493	0.17	0.75	5.96	-345.4	
1045	3.21	10,200	216		20.24	7.27	10,506	0.16	0.60	5.96	-347.7	
1050	3.21	11,280	216		20.27	7.26	10,470	0.16	0.50	5.94	-349.5	
1055	3.21	12,360	216		20.16	7.26	10,483	0.17	0.35	5.95	-351.1	
1100	3.21	13,440	216		20.11	7.26	10,467	0.17	0.30	5.94	-353.7	
1105	3.21	14,520	216		20.19	7.26	10,449	0.17	0.45	5.94	-355.0	
1110	3.21	15,600	216		20.25	7.26	10,435	0.17	0.25	5.94	-356.4	
1115	3.23	16,680	216		20.18	7.26	10,423	0.17	0.37	5.94	-358.1	
1117	Purging completed after removing				approximately 4 gallons from the well							

Water Quality Meter (S/N): YSI 19393 R
Control Box Type (S/N): QED 17631
Turbidimeter (S/N): Lamotte 2020 0920 4298

Notes: 1119 Sample DRMO-6MW11S-GW-04 was collected

Tetra Tech NUS, Inc

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSB-NLON / DRMO
Project No.: 7363

[ ] Domestic Well Data
[x] Monitoring Well Data
[ ] Other Well Type:
[ ] QA Sample Type:

Sample ID No.: DRMO- 6MW11D - GW-09
Sample Location: 6MW11D
Sampled By: D. Whalen
C.O.C. No.: 072400-09
Type of Sample:
[X] Low Concentration
[ ] High Concentration

SAMPLING DATA:

Date: 7-25-00	Color	pH	S.C.	Temp.	Turbidity	DO	Eh	Salinity
Time: 1125	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	mV	ppt
Method: Low Flow/Bladder Pump	CLEAR	6.85	32.58	14.83	52	6.73	-281	20.49

PURGE DATA:

Date: 7-25-00
Method: Low Flow/Bladder Pump
Monitor Reading (ppm): —
Well Casing Diameter & Material Type: 2" PVC
Total Well Depth (TD): 85'
Static Water Level (WL): 2.04
One Casing Volume(gal): 13.5
Start Purge (hrs): 1012
End Purge (hrs): 1115
Total Purge Time (min): 63
Total Vol. Purged (gal): 5.5

See Attached Low Flow Purge Data Sheet for Purge Data

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements		Collected
TCL VOLATILES (LOW-LEVEL)	HCL / 4° C	3	40 ml Vial	✓
TCL SEMIVOLATILES	4° C	2	Qt. Amber Glass	✓
TCL PEST/PCBs	4° C	2	Qt. Amber Glass	✓
TCL PAH	4° C	2	Qt. Amber Glass	✓
TAL METALS (TOTAL)	HNO_3 / 4° C	1	L PE	✓

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD —

Duplicate ID No.: GWFD-072500

Signature(s): Donald Whalen

Tetra Tech NUS, Inc. **LOW FLOW PURGE DATA SHEET** **Well No.:** 6MW11D

PROJECT: NSB-NLON, DRMO
PROJECT NUMBER: 7363
SITE: DRMO
DATE: 7-25-00
WEATHER: mostly cloudy, ~75°F
PERSONNEL: D. Whalen

Well Screen Depth: 75 / 85 ft.
Initial Water Level: 2.09 @ 1012 hrs.
Pump Type/Material: Bladder/PVC
Pump Intake Depth: 82.0 TPVC
Tide Cycle: ☐ High @ ☒ Low @ 1127 ☐ Not Affected
Total Purge Volume= 5.5 (gal / L) **Total Purge Time=** 63 (min)

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	Salinity ppt	Eh mV	Comments
1012	2.09	0	390	30D30R 45 psi								START PURGE
1015	2.12		390		15.83	7.08	32.60	16.16	12.7	18.69	-264	
1020	2.12		390		15.38	6.90	33.46	12.57	10.9	21.10	-282	
1025	2.12		340	35D35R 45 psi	15.88	6.86	33.42	8.61	11.1	21.10	-284	
1030	2.13				15.75	6.87	33.14	7.41	11.6	20.80	-285	
1035	2.12				15.20	6.85	32.98	6.94	16.7	20.69	-285	
1040	2.12				15.16	6.85	32.83	6.85	20.1	20.56	-284	
1045	2.12				15.18	6.85	32.67	6.80	20.8	20.47	-283	
1050	2.11				15.14	6.85	32.63	6.95	22.0	20.45	-285	
1055	2.11				15.26	6.85	32.42	7.03	23.1	20.40	-282	
1100	2.10				15.32	6.85	32.53	6.62	26.4	20.44	-282	
1105	2.09				15.01	6.84	32.57	6.80	34.7	20.37	-281	
1110	2.09				14.84	6.85	32.56	6.78	30.8	20.37	-281	
1115	2.08	22070			14.83	6.85	32.58	6.73	52.0	20.49	-281	End PURGE
	Start Sampling @ 1119											
	Finish Sampling @ 1202											

Water Quality Meter (S/N): YSI
Control Box Type (S/N): QED
Turbidimeter (S/N): LaMotte
Notes:

ROUND 10

Tetra Tech NUS, Inc

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSB-NLON / DRMO
Project No.: 7363

[ ] Domestic Well Data
[x] Monitoring Well Data
[ ] Other Well Type:
[ ] QA Sample Type:

Sample ID No.: DRMO- 6MW15 - GW-10
Sample Location: 6MW15
Sampled By: RD Munson
C.O.C. No.: D-121900
Type of Sample:
[X] Low Concentration
[ ] High Concentration

SAMPLING DATA:

	Color	pH	S.C.	Temp.	Turbidity	DO	Eh	Salinity
Date: 12-19-00	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	mV	ppt
Time: 1035								
Method: Low Flow/Bladder Pump	Clear	6.51	4.63	8.94	0.35	18.85	7.1	—

PURGE DATA:

Date: 12-19-00
Method: Low Flow/Bladder Pump
Monitor Reading (ppm):
Well Casing Diameter & Matenal
Type: PVC
Total Well Depth (TD): 15.7
Static Water Level (WL): 7.64
One Casing Volume(gal): 1.32
Start Purge (hrs): 0935
End Purge (hrs): 1035 ~~0935~~ RDM
Total Purge Time (min): 60
Total Vol. Purged (gal): 4.28

See Attached Low Flow Purge Data Sheet for Purge Data

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOLATILES (LOW-LEVEL)	HCL / 4° C	40 ml Vial	3
TCL SEMIVOLATILES	4° C	Qt. Amber Glass	2
TCL PEST/PCBs	4° C	Qt. Amber Glass	2
TCL PAH	4° C	Qt. Amber Glass	2
TAL METALS (TOTAL)	HNO_3 / 4° C	L PE	1

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD — Duplicate ID No.:

Signature(s): RD Munson

Tetra Tech NUS, Inc. **LOW FLOW PURGE DATA SHEET** Well No.: 6MW15

PROJECT: NSB - NLON
PROJECT NUMBER: 7363
SITE: DRMO

DATE: 12-19-00
WEATHER: Partly Cloudy 35°F
PERSONNEL: RD Munson

Well Screen Depth: ____ / ____ ft.
Initial Water Level: 7.64 @ 0932 hrs.
Pump Type/Material:
Pump Intake Depth:
Tide Cycle: ☐ High @ ____ ☒ Low @ 1105 ☐ Not Affected
Total Purge Volume= 4.28 (gal) L)
Total Purge Time= 60 (min)

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	Salinity ppt	Eh mV	Comments
0935	7.68		272	40R 40D 2WPSF	8.41	6.68	5.71	17.24	1.8		-32.2	
0940	7.83				8.61	6.59	5.03	11.22	1.3		-26.1	
0945	7.87	2720			8.59	6.57	4.98	11.74	0.80		-20.8	
0950	7.89	4070	276		8.57	6.55	4.94	11.85	0.40		-16.3	
0955	7.90	5420			8.65	6.54	4.90	11.81	0.38		-12.5	
1000	7.93	6770			8.71	6.53	4.85	13.03	0.40		-8.8	
1005	7.96	8120			8.76	6.53	4.85	14.10	0.50		-5.0	
1010	7.98	9470			8.73	6.53	4.82	17.78	0.40		-2.9	
1015	7.99	10820			8.77	6.52	4.77	17.94	0.35		-0.4	
1020	8.02	12170			8.77	6.52	4.75	15.91	0.40		1.4	
1025	8.06	13520			8.75	6.52	4.71	16.19	0.25		3.5	
1030	8.08	14870			8.82	6.52	4.68	16.51	0.30		5.6	End purge
1035	8.10	16220			8.94	6.51	4.63	18.85	0.35		7.1	
	Begin sample											
	1104 Sample complete											

Water Quality Meter (S/N):
Control Box Type (S/N):
Turbidimeter (S/N):

Notes:

Tetra Tech NUS, Inc

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSB-NLON / DRMO
Project No.: 7363

[ ] Domestic Well Data
[x] Monitoring Well Data
[ ] Other Well Type:
[ ] QA Sample Type:

Sample ID No.: DRMO-6MW 25-00 GW-10
Sample Location: 6 MW 25
Sampled By: R.D. Munson
C.O.C. No.: D-121600
Type of Sample:
[X] Low Concentration
[ ] High Concentration

SAMPLING DATA:

	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	Eh mV	Salinity ppt
Date: 12-18-00								
Time: 0930								
Method: Low Flow/Bladder Pump	Clear	7.05	2.88	10.35	7	0.52	14	0

PURGE DATA:

Date: 12-18-00
Method: Low Flow/Bladder Pump
Monitor Reading (ppm): —
Well Casing Diameter & Material
Type: PVC
Total Well Depth (TD): 13.60
Static Water Level (WL): 7.05
One Casing Volume(gal): 1.23
Start Purge (hrs): 0830
End Purge (hrs): 930
Total Purge Time (min): 60
Total Vol. Purged (gal): 4

See Attached Low Flow Purge Data Sheet for Purge Data

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOLATILES (LOW-LEVEL)	HCL / 4° C	7 ~~4~~ 3 40 ml Vial	✓
TCL SEMIVOLATILES	4° C	3 Qt. Amber Glass	✓
TCL PEST/PCBs	4° C	3 Qt. Amber Glass	✓
TCL PAH	4° C	2 Qt. Amber Glass	✓
TAL METALS (TOTAL)	HNO_3 / 4° C	2 L PE	✓

OBSERVATIONS / NOTES:

Circle if Applicable:
MS/MSD
Duplicate ID No.:

Signature(s): R.D. Munson

Tetra Tech NUS, Inc. **LOW FLOW PURGE DATA SHEET** **Well No.:** 6MW25

PROJECT: NSB -NLON
PROJECT NUMBER: 7363
SITE: DRMO

DATE: 12-18-00
WEATHER: Clear windy, cold
PERSONNEL: R.D. Munson

Well Screen Depth: 3.6 / 13.6 ft.
Initial Water Level: ~~5.93~~ 6.45 @ 0828 hrs.
Total Purge Volume= 4 (gal / L)

Pump Type/Material: Bladder / PVC
Pump Intake Depth: 10'
Total Purge Time= 60 (min)

Tide Cycle: ☐ High @ ☒ Low @ 1001 ☐ Not Affected

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	Salinity ppt	Eh mV	Comments
0830	7.02			30D 30I 15 PSI								
0846	7.15		260		9.79	7.05	2.90	0.48	3.7	–	58	
0855	7.10				9.93	7.05	2.89	0.53	3.2	–	47	
0900	7.13				9.90	7.05	2.89	0.54	3.2	–	39	
0905	7.15				10.01	7.05	2.89	0.55	3.2	–	32	
0910	7.15				10.14	7.05	2.89	0.55	3.4	–	29	
0915	7.19				10.12	7.05	2.89	0.54	4.3	–	25	
0920	7.20				10.07	7.05	2.89	0.53	5.0	–	20	
0925	7.20				10.13	7.05	2.89	0.54	5.2	–	17	
0930	7.20				10.35	7.05	2.88	0.52	7.0	–	14	Sample End
1005												

Water Quality Meter (S/N): YSI
Control Box Type (S/N): QED
Turbidimeter (S/N): Lamotte

Notes:

Tetra Tech NUS, Inc

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSB-NLON / DRMO
Project No.: 7363

[ ] Domestic Well Data
[x] Monitoring Well Data
[ ] Other Well Type:
[ ] QA Sample Type:

Sample ID No.: DRMO-GMW2D- GW-10
Sample Location: GMW2D
Sampled By: FW
C.O.C. No.: D-121900
Type of Sample:
[X] Low Concentration
[ ] High Concentration

SAMPLING DATA:

	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	Eh mV	Salinity ppt
Date: 12-19-00								
Time: 1035								
Method: Low Flow/Bladder Pump	Clear	6.85	30.97	11.97	16	0.01	-358	—

PURGE DATA:

Date: 12-19-00	See Attached Low Flow Purge Data Sheet for Purge Data
Method: Low Flow/Bladder Pump	
Monitor Reading (ppm): —	
Well Casing Diameter & Material Type: PVC	
Total Well Depth (TD): 78.8	
Static Water Level (WL): 5.61	
One Casing Volume(gal): 12	
Start Purge (hrs): 0935	
End Purge (hrs): 1035	
Total Purge Time (min): 60	
Total Vol. Purged (gal): 4.7	

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOLATILES (LOW-LEVEL)	HCL / 4° C	3 x 40 ml Vial	✓
TCL SEMIVOLATILES	4° C	2 x Qt. Amber Glass	✓
TCL PEST/PCBs	4° C	2 y Qt. Amber Glass	✓
TCL PAH	4° C	2 Y Qt. Amber Glass	✓
TAL METALS (TOTAL)	HNO_3 / 4° C	1 L PE	✓

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): FW

Tetra Tech NUS, Inc. **LOW FLOW PURGE DATA SHEET** Well No.: 6MW 2D

PROJECT: NSB NLON
PROJECT NUMBER: CTO-267
SITE: DRMO

DATE: 12-19-00
WEATHER: 30's OVERCAST
PERSONNEL: F. WUDKWYCH

Well Screen Depth: 68.8 / 78.8 ft.
Initial Water Level: 5.61 @ 0920 hrs.
Pump Type/Material: bladder/PVC
Pump Intake Depth: 73
Tide Cycle: ☐ High @ ☑ Low @ 1105 ☐ Not Affected
Total Purge Volume= 4.7 (gal/L) Total Purge Time= 60 (min)

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	Salinity ppt	Eh mV	Comments
0935	5.61			350 33R 50PS								
0940	6.10		230		11.14	6.89	30.48	0.09	19	–	-243	
0945	6.08		300		11.23	6.90	30.49	0.04	15	–	-269	
0950	6.02		300		11.36	6.89	30.53	0.06	10	–	-280	
0955	6.04		300		11.42	6.91	30.73	0.03	9.3	–	-298	
1000	6.05		300		11.45	6.91	30.90	0.00	15	–	-312	
1005	6.10		300		11.49	6.91	31.00	0.01	16	–	-327	
1010	6.02		300		11.52	6.90	31.05	0.01	15	–	-335	
1015	6.09		300		11.51	6.90	31.06	0.01	16	–	-340	
1020	6.05		300		11.64	6.88	31.04	0.01	17	–	-345	
1025	6.12		300		11.61	6.87	31.04	0.01	21	–	-347	
1030	6.07		300		11.65	6.86	30.99	0.00	20	–	-352	
1035	6.06		300		11.67	6.85	30.97	0.01	16		-358	sample
1100												End

Water Quality Meter (S/N):
Control Box Type (S/N):
Turbidimeter (S/N):

Notes:

Tetra Tech NUS, Inc

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSB-NLON / DRMO
Project No.: 7363

[ ] Domestic Well Data
[x] Monitoring Well Data
[ ] Other Well Type:
[ ] QA Sample Type:

Sample ID No.: DRMO-6MW65 - GW-10
Sample Location: 6MW65
Sampled By: FCW
C.O.C. No.: D-121500
Type of Sample:
[X] Low Concentration
[ ] High Concentration

SAMPLING DATA:

	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	Eh mV	Salinity ppt
Date: 12-15-00								
Time: 0938								
Method: Low Flow/Bladder Pump	Clear	6.03	0.320	10.35	3.5	7.44	647	—

PURGE DATA:

Date: 12-15-00
Method: Low Flow/Bladder Pump
Monitor Reading (ppm): —
Well Casing Diameter & Material
Type: PVC
Total Well Depth (TD): 18.56
Static Water Level (WL): 9.37
One Casing Volume(gal): 1.5
Start Purge (hrs): 0729
End Purge (hrs): 0938
Total Purge Time (min): 70
Total Vol. Purged (gal): 5

See Attached Low Flow Purge Data Sheet for Purge Data

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOLATILES (LOW-LEVEL)	HCL / 4° C	3x 40 ml Vial	✓
TCL SEMIVOLATILES	4° C	2x Qt. Amber Glass	✓
TCL PEST/PCBs	4° C	2x Qt. Amber Glass	✓
TCL PAH	4° C	2x Qt. Amber Glass	✓
TAL METALS (TOTAL)	HNO_3 / 4° C	1 L PE	✓

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD

Duplicate ID No.: GWFD-121500-01

Signature(s): FCW

Tetra Tech NUS, Inc. **LOW FLOW PURGE DATA SHEET** Well No.: 6MW65

PROJECT: NSB-NLON
PROJECT NUMBER: 7363
SITE: DRMO

DATE: 12-15-00
WEATHER: 30's
PERSONNEL: F. WUDKWYCH

Well Screen Depth: 8.6 / 18.6 ft.
Initial Water Level: 8.73 @ 0720 hrs.

Pump Type/Material: bladder/PVC
Pump Intake Depth: 14

Tide Cycle: ☐ High @ ☐ Low @ ☒ Not Affected

Total Purge Volume= (gal / L) Total Purge Time= (min)

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	Salinity ppt	Eh mV	Comments
0728	9.37			20PSI 45D45R								START
0738	9.50		280		10.33	6.34	0.322	6.80	11	—	25.8	
0748	9.40		280		10.35	6.11	0.322	7.22	9.1	—	39.9	
0758	9.20		276		10.30	6.04	0.321	7.52	6.3	—	47.7	
0808	9.20		276		10.42	6.04	0.321	7.19	4.8	—	52.1	
0818	9.20		276		10.36	6.03	0.320	6.77	3.7	—	56.9	
0828	9.20		276		10.32	6.03	0.321	8.01	5.8	—	61.2	
0838	9.20		276		10.35	6.03	0.320	7.44	3.9	—	64.7	Sample

Water Quality Meter (S/N):
Control Box Type (S/N):
Turbidimeter (S/N):

Notes: MOVED + PULLED UP PUMP PRIOR TO PURGING / CHANGED WATER LEVEL

Tetra Tech NUS, Inc

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSB-NLON / DRMO
Project No.: 7363

[ ] Domestic Well Data
[x] Monitoring Well Data
[ ] Other Well Type:
[ ] QA Sample Type:

Sample ID No.: DRMO- 6MW6D GW-10
Sample Location: 6MW6D
Sampled By: RD Munson
C.O.C. No.: D-121500
Type of Sample:
[X] Low Concentration
[ ] High Concentration

SAMPLING DATA:

	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	Eh mV	Salinity ppt
Date: 12·15-00								
Time: 0930								
Method: Low Flow/Bladder Pump	Clear	5.96	3.23	9.52	17.7	18.78	-24.3	—

PURGE DATA:

Date: 12·15·00	See Attached Low Flow Purge Data Sheet for Purge Data
Method: Low Flow/Bladder Pump	
Monitor Reading (ppm):	
Well Casing Diameter & Material Type: PVC	
Total Well Depth (TD): 46.0	
Static Water Level (WL): 9.31	
One Casing Volume(gal): 6	
Start Purge (hrs): 0730	
End Purge (hrs): 0930	
Total Purge Time (min): 120	
Total Vol. Purged (gal): 6.0	

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOLATILES (LOW-LEVEL)	HCL / 4° C	3 - 40 ml Vial	✓
TCL SEMIVOLATILES	4° C	2 Qt. Amber Glass	✓
TCL PEST/PCBs	4° C	2 Qt. Amber Glass	✓
TCL PAH	4° C	2 Qt. Amber Glass	✓
TAL METALS (TOTAL)	HNO_3 / 4° C	1 L PE	✓

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): RD Munson

Tetra Tech NUS, Inc. **LOW FLOW PURGE DATA SHEET** **Well No.:** GMW6D

PROJECT: NSB NLON
PROJECT NUMBER: 7363
SITE: DRMO

DATE: 12-15-00
WEATHER: Clear Light wind - Cold 30°F
PERSONNEL: R.D. Munson

Well Screen Depth: _____ / _____ ft.
Initial Water Level: 9.39 @ 0710 hrs.

Pump Type/Material: bladder/PVC
Pump Intake Depth: _____

Tide Cycle: ☐ High @ _____ ☐ Low @ _____ ☑ Not Affected

Total Purge Volume= _____ (gal / L) **Total Purge Time=** _____ (min)

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	Salinity ppt	Eh mV	Comments
0730	9.40		290 30psi	350 33R	8.69	6.41	3.01	6.58	25.2		-56.9	
0740	9.41		↓	↓	9.13	6.12	3.19	10.08	24.7		-64.6	
0750	9.40		↓	↓	7.11	6.11	3.22	11.19	25.3		-62.0	
0800	9.40		90	↓	6.31	6.10	3.21	14.01	24.6		-59.7	
0810	9.40		135	450 456 @5PSI	7.62	6.11	3.18	10.88	30.1		-58.2	
0820	9.41		↓	↓	7.81	6.08	3.19	10.97	38.2		-53.7	
0830	9.40		↓	↓	7.81	6.03	3.20	11.06	42.0		-48.1	
0840	9.40		↓	↓	8.12	6.00	3.19	13.56	39.7		-42.4	
0850	9.44		276	↓	9.53	5.97	3.20	6.71	37.7		-38.0	
0900	9.42		↓	↓	9.53	5.96	3.22	17.40	31.2		-33.6	
0910	9.44		↓	↓	9.66	5.96	3.21	19.10	25.1		-30.0	
0920	9.42		↓	↓	9.64	5.96	3.26	18.50	20.9		-27.1	
0930	9.41		276		9.52	5.96	3.23	18.78	17.7		-24.3	End purge
	End purge	begin sample										

Water Quality Meter (S/N): YSI
Control Box Type (S/N): QED
Turbidimeter (S/N): Lamotte

Notes:

Tetra Tech NUS, Inc

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSB-NLON / DRMO
Project No.: 7363

[ ] Domestic Well Data
[x] Monitoring Well Data
[ ] Other Well Type:
[ ] QA Sample Type:

Sample ID No.: DRMO- 6MW09S - GW-10
Sample Location: 6MW9S
Sampled By: RD Munson
C.O.C. No.: 0-121600
Type of Sample:
[X] Low Concentration
[ ] High Concentration

SAMPLING DATA:

	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	Eh mV	Salinity ppt
Date: 12-18-00								
Time: 1005								
Method: Low Flow/Bladder Pump	Clear	5.49	0.043	7.14	0.41	9.16	17.8	—

PURGE DATA:

Date: 12-18-00
Method: Low Flow/Bladder Pump
Monitor Reading (ppm): —
Well Casing Diameter & Material
Type: PVC
Total Well Depth (TD): 11.80
Static Water Level (WL): 3.84
One Casing Volume(gal): 1.29
Start Purge (hrs): 0917
End Purge (hrs): 1002
Total Purge Time (min): 45
Total Vol. Purged (gal): 1.98

See Attached Low Flow Purge Data Sheet for Purge Data

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOLATILES (LOW-LEVEL)	HCL / 4° C	40 ml Vial	3
TCL SEMIVOLATILES	4° C	Qt. Amber Glass	2
TCL PEST/PCBs	4° C	Qt. Amber Glass	2
TCL PAH	4° C	Qt. Amber Glass	2
TAL METALS (TOTAL)	HNO_3 / 4° C	L PE	1

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD — Duplicate ID No.:

Signature(s): RD Munson

Tetra Tech NUS, Inc. **LOW FLOW PURGE DATA SHEET** Well No.: 6MW9S

PROJECT: NSB NLON
PROJECT NUMBER: 7363
SITE: DRMO

DATE: 12.18.00
WEATHER: Clear Windy Cold
PERSONNEL: RD Munson

Well Screen Depth: 7.8 / 11.8 ft.
Initial Water Level: 3.84 @ 0910 hrs.

Pump Type/Material: Bladder/Poly
Pump Intake Depth: 10.00

Tide Cycle: ☐ High @ ☐ Low @ ☑ Not Affected

Total Purge Volume= 1.98 (gal / L)
Total Purge Time= ~~0845~~ (min)

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	Salinity ppt	Eh mV	Comments
0917	3.89		440	3 & R 300 10 PSI	7.00	6.44	055.0	9.35	6.06		-25.9	
0922	3.94		↓		7.10	5.71	0.044	9.26	1.84		-8.5	
0927	3.93				7.12	5.56	0.044	9.24	2.67		-4.2	
0932	3.96		↓		7.10	5.52	0.044	9.17	1.59		0.1	
0937	3.95		430		7.15	5.51	0.044	9.20	1.33		2.8	
0942	4.02		↓		7.14	5.51	0.043	9.20	0.95		6.5	
0947	4.02				7.13	5.49	0.043	9.18	0.61		9.7	
0952	4.08				7.17	5.49	0.043	9.15	0.57		12.8	
0957 ~~1002~~	4.03				7.12	5.49	0.043	9.14	0.41		16.2	
1002	4.06		↓		7.14	5.49	0.043	9.16	0.41		17.8	Purge ends
	1005 Start	Sample										
	1030 End	Sample										

Water Quality Meter (S/N):
Control Box Type (S/N):
Turbidimeter (S/N):

Notes:

Tetra Tech NUS, Inc

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSB-NLON / DRMO
Project No.: 7363

[ ] Domestic Well Data
[x] Monitoring Well Data
[ ] Other Well Type:
[ ] QA Sample Type:

Sample ID No.: DRMO- 6MW105- GW-10
Sample Location: 6MW105
Sampled By: R.D MUNSON
C.O.C. No.: D-121600
Type of Sample:
[X] Low Concentration
[ ] High Concentration

SAMPLING DATA:

Date: 12.16.00	Color	pH	S.C.	Temp.	Turbidity	DO	Eh	Salinity
Time: 0725	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	mV	ppt
Method: Low Flow/Bladder Pump	Clear	~~4.29~~ 7.23	1.36	12.54	1.03	22.7	-34.5.0	—

PURGE DATA:

Date: 12-16-00	See Attached Low Flow Purge Data Sheet for Purge Data
Method: Low Flow/Bladder Pump	
Monitor Reading (ppm): –	
Well Casing Diameter & Material Type: PVC	
Total Well Depth (TD): 13.30	
Static Water Level (WL): 3.90	
One Casing Volume(gal): 1.53	
Start Purge (hrs): 0622	
End Purge (hrs): 0722	
Total Purge Time (min): 60	
Total Vol. Purged (gal): 6.0	

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOLATILES (LOW-LEVEL)	HCL / 4° C	3 40 ml Vial	✓
TCL SEMIVOLATILES	4° C	2 Qt. Amber Glass	✓
TCL PEST/PCBs	4° C	2 Qt. Amber Glass	✓
TCL PAH	4° C	2 Qt. Amber Glass	✓
TAL METALS (TOTAL)	HNO_3 / 4° C	1 L PE	✓

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	

Signature(s): R D Munson

Tetra Tech NUS, Inc. **LOW FLOW PURGE DATA SHEET** Well No.: 6MW10S

PROJECT: NSB - NLON
PROJECT NUMBER: 7363
SITE: DRMO

DATE: 12-16-00
WEATHER: OVERCAST 35°F
PERSONNEL: RD MUNSON

Well Screen Depth: ____ / ____ ft.
Initial Water Level: 3.90 @ 0600 hrs.
Pump Type/Material: ____
Pump Intake Depth: ____
Tide Cycle: ☐ High @ ____ ☒ Low @ 0750 ☐ Not Affected
Total Purge Volume= 6.0 (gal / L) Total Purge Time= ____ (min)

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	Salinity ppt	Eh mV	Comments
0622	4.27		420	30D 30I 30PSI	12.87	7.06	1.35	6.04	18.0	—	-205.8	
0627	4.07				12.58	7.11	1.39	18.48	6.52		-238.6	
0632	4.01				12.51	7.15	1.39	20.17	3.70		-277.4	
0637	4.14				12.54	7.16	1.39	21.80	2.23		-294.4	
0642	4.19				12.54	7.18	1.38	23.24	2.19		-302.1	
0647	4.17				12.49	7.19	1.38	27.59	1.98		-313.0	
0652	4.18				12.41	7.20	1.37	18.56	1.44		-324.1	
0657	4.18				12.45	7.21	1.37	19.31	1.14		-327.6	
0702	4.20				12.45	7.22	1.36	24.16	0.96		-336.5	
0707	4.22				12.42	7.22	1.36	23.38	1.00		-338.7	
0712	4.28				12.42	7.22	1.36	24.64	1.22		-340.9	
0717	4.28				12.44	7.23	1.36	25.03	1.01		-342.7	
0722	4.29				12.54	7.23	1.36	22.7	1.03		-345.6	End purge
	Begin Sample @ 0725 End 0800											

Water Quality Meter (S/N): YSI
Control Box Type (S/N): QED
Turbidimeter (S/N): LaMotte

Notes: ____

Tetra Tech NUS, Inc

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSB-NLON / DRMO
Project No.: 7363

[ ] Domestic Well Data
[x] Monitoring Well Data
[ ] Other Well Type:
[ ] QA Sample Type:

Sample ID No.: DRMO- 6MW 100 GW-10
Sample Location: 6MW100
Sampled By: FCV
C.O.C. No.: D-121600
Type of Sample:
[X] Low Concentration
[ ] High Concentration

SAMPLING DATA:

	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	Eh mV	Salinity ppt
Date: 12-16-00								
Time: 0720								
Method: Low Flow/Bladder Pump	Clear	7.28	1.69	17.72	6.8	6.58	-243	—

PURGE DATA:

Date: 12-16-00
Method: Low Flow/Bladder Pump
Monitor Reading (ppm): —
Well Casing Diameter & Material
Type: PVC
Total Well Depth (TD): 54.10
Static Water Level (WL): 2.69
One Casing Volume(gal): 8.3
Start Purge (hrs): 0620
End Purge (hrs): 0720
Total Purge Time (min): 60
Total Vol. Purged (gal): 4.2

See Attached Low Flow Purge Data Sheet for Purge Data

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOLATILES (LOW-LEVEL)	HCL / 4° C	3 X 40 ml Vial	✓
TCL SEMIVOLATILES	4° C	2 X Qt. Amber Glass	✓
TCL PEST/PCBs	4° C	2 X Qt. Amber Glass	✓
TCL PAH	4° C	2 X Qt. Amber Glass	✓
TAL METALS (TOTAL)	HNO_3 / 4° C	1 L PE	—

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s): FCV

Tetra Tech NUS, Inc. **LOW FLOW PURGE DATA SHEET** Well No.: DRMO-6 MW100

PROJECT: NSB NLON
PROJECT NUMBER:
SITE: DRMO

DATE: 12-16-00
WEATHER: 30's
PERSONNEL: F. WUOKWYCH

Well Screen Depth: 44.10 / 54.10 ft.
Initial Water Level: 2.69 @ 0620 hrs.

Pump Type/Material: Waterlift
Pump Intake Depth: 49

Tide Cycle: ☐ High @ ☑ Low @ 0750 ☐ Not Affected

Total Purge Volume= (gal / L) Total Purge Time= 60 (min)

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	Salinity ppt	Eh mV	Comments
0620	2.69											START
0625	2.74		220		12.71	7.23	1.78	0.57	2.5	–	-242	
0630	2.74		220		12.63	7.24	1.73	0.76	3.1	–	-245	
0635	2.79		220		12.53	7.25	1.71	1.31	2.0	–	-243	
0640	2.75		220		12.25	7.26	1.72	1.66	2.5	–	-242	
0645	2.72		220		11.73	7.26	1.72	2.35	2.3	–	-237	
0650	2.73		220		11.58	7.27	1.73	2.87	2.3	–	-235	
0655	2.73		240		12.66	7.29	1.76	3.53	1.8	–	-241	
0700	2.71		240		12.73	7.30	1.75	3.87	2.6	–	-243	
0705	2.70		240		12.69	7.28	1.70	4.77	2.3	–	-241	
0710	2.73		240		12.72	7.28	1.69	5.62	3.5	–	-242	
0715	2.70		220		12.68	7.28	1.69	5.49	4.5	–	-242	
0720	2.74				12.72	7.28	1.69	6.58	6.8		-243	Sample
0750												End

Water Quality Meter (S/N):
Control Box Type (S/N):
Turbidimeter (S/N):

Notes:

Tetra Tech NUS, Inc

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSB-NLON / DRMO
Project No.: 7363

[ ] Domestic Well Data
[x] Monitoring Well Data
[ ] Other Well Type:
[ ] QA Sample Type:

Sample ID No.: DRMO- 6MW 115 - GW-10
Sample Location: 6MW115
Sampled By: FCW
C.O.C. No.: 0-121600
Type of Sample:
[X] Low Concentration
[ ] High Concentration

SAMPLING DATA:

	Color	pH	S.C.	Temp.	Turbidity	DO	Eh	Salinity
Date: 12-17-00	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	mV	ppt
Time: 0826								
Method: Low Flow/Bladder Pump	Clear	7.56	1.55	12.41	5.5	0.16	-269	—

PURGE DATA:

Date: 12-17-00
Method: Low Flow/Bladder Pump
Monitor Reading (ppm): —
Well Casing Diameter & Material
Type: PVC
Total Well Depth (TD): 13.50
Static Water Level (WL): 2.67
One Casing Volume(gal): 1.7
Start Purge (hrs): 0720
End Purge (hrs): 0826
Total Purge Time (min): 66
Total Vol. Purged (gal): 3.9

See Attached Low Flow Purge Data Sheet for Purge Data

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOLATILES (LOW-LEVEL)	HCL / 4° C	3x 40 ml Vial	✓
TCL SEMIVOLATILES	4° C	2x Qt. Amber Glass	✓
TCL PEST/PCBs	4° C	2x Qt. Amber Glass	✓
TCL PAH	4° C	2x Qt. Amber Glass	✓
TAL METALS (TOTAL)	HNO_3 / 4° C	1 L PE	✓

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	

Signature(s): [signature]

Tetra Tech NUS, Inc. **LOW FLOW PURGE DATA SHEET** Well No.: 6MW115

PROJECT:	NSB NLON	DATE:	12-17-00
PROJECT NUMBER:	7363	WEATHER:	breezy drizzling
SITE:	ORMO	PERSONNEL:	F. Wuokwych

Well Screen Depth: 3.50 / 13.50 ft.
Initial Water Level: 2.67 @ 0720 hrs.
Pump Type/Material: bladder/PVC
Pump Intake Depth: 11.0
Tide Cycle: ☐ High @ ☑ Low @ 0856 ☐ Not Affected
Total Purge Volume= 3.9 (~~gal~~ L) Total Purge Time= 66 (min)

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	Salinity ppt	Eh mV	Comments
0720	2.67			30PSI 500/30R								START PURGING
0726	2.76		280		12.43	7.27	7.82	1.28	34	–	-180	
0732	2.82		220		12.40	7.39	1.21	0.73	18	–	-207	
0738	2.84		220		12.40	7.44	1.35	0.51	12	–	-222	
0744	2.85		220		12.39	7.47	1.45	0.33	15	–	~~-235~~	-235
0750	2.84		220		12.39	7.49	1.48	0.26	7.2	–	-244	
0756	2.85		220		12.40	7.51	1.51	0.22	6.8	–	-251	
0802	2.86		220		12.42	7.53	1.52	0.18	6.8		-257	
0808	2.90		220		12.40	7.54	1.53	0.18	5.3		-261	
0814	2.92		220		12.40	7.55	1.54	0.17	5.4		-264	
0820	2.95		220		12.42	7.56	1.54	0.16	5.6		-266	
0825	2.96		220		12.41	7.56	1.55	0.16	5.5		-269	Sample
0900												End

Water Quality Meter (S/N):
Control Box Type (S/N):
Turbidimeter (S/N):
Notes:

Tetra Tech NUS, Inc

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSB-NLON / DRMO
Project No.: 7363

[ ] Domestic Well Data
[x] Monitoring Well Data
[ ] Other Well Type:
[ ] QA Sample Type:

Sample ID No.: DRMO-6MW 11D – GW-10
Sample Location: 6MW11D
Sampled By: R.D. Munson
C.O.C. No.: D-121600
Type of Sample:
[X] Low Concentration
[ ] High Concentration

SAMPLING DATA:

	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	Eh mV	Salinity ppt
Date: 12-17-00								
Time: 0825								
Method: Low Flow/Bladder Pump	CLR *	7.08	1.76	12.43	7.90	29.53	-101.0	—

PURGE DATA:

Date: 12-17-00
Method: Low Flow/Bladder Pump
Monitor Reading (ppm): —
Well Casing Diameter & Material
Type: PVC
Total Well Depth (TD): 85'
Static Water Level (WL): 1.75
One Casing Volume(gal): 13.6
Start Purge (hrs): 0722
End Purge (hrs): 0822
Total Purge Time (min): 60
Total Vol. Purged (gal): 2.5

*with tan fines

See Attached Low Flow Purge Data Sheet for Purge Data

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOLATILES (LOW-LEVEL)	HCL / 4° C	3 40 ml Vial	✓
TCL SEMIVOLATILES	4° C	2 Qt. Amber Glass	✓
TCL PEST/PCBs	4° C	2 Qt. Amber Glass	✓
TCL PAH	4° C	2 Qt. Amber Glass	✓
TAL METALS (TOTAL)	HNO_3 / 4° C	1 L PE	✓

OBSERVATIONS / NOTES:

TAN Fines in water

Circle if Applicable:

MS/MSD —
Duplicate ID No.: —

Signature(s): RD Munson

Tetra Tech NUS, Inc. **LOW FLOW PURGE DATA SHEET** **Well No.:** 6MW11 D

PROJECT: NSB-NLON
PROJECT NUMBER: 7363
SITE: DRMO

DATE: 12.17.00
WEATHER: Cloudy Fog hgTRAIN windy 50°F
PERSONNEL: TD Munson

Well Screen Depth: _____ / _____ ft.
Initial Water Level: 1.75 @ 0717 hrs.
Pump Type/Material:
Pump Intake Depth:
Tide Cycle: ☐ High @ ☑ Low @ 0856 ☐ Not Affected
Total Purge Volume= _____ (gal / L)
Total Purge Time= 60 (min)

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	Salinity ppt	Eh mV	Comments
0722	1.85		168	30D 3R 45 PSI	12.11	7.63	2.83	11.08	25.2		-64.2	
0727	1.79		↓		12.28	7.25	1.97	20.48	22.2		-121.3	
0732	1.81		↓		12.26	7.19	1.49	19.49	11.1		-120.0	
0737	1.78		165		12.28	7.16	1.28	19.27	6.96		-114.9	
0742	1.75		↓		12.31	7.13	1.23	20.01	6.32		-107.9	
0747	1.75		↓		12.32	7.11	1.29	21.33	5.99		-101.8	
0752	1.74		↓		12.35	7.10	1.40	22.83	6.96		-98.2	
0757	1.69		↓		12.39	7.09	1.52	24.91	8.48		-96.7	
080	1.70		↓		1239	7.09	1.59	26.13	9.26		-96.6	
0807	1.77		↓		12.41	7.08	1.64	27.54	10.76		-97.2	TAN Fines
0812	1.77		↓		12.42	7.08	1.69	28.01	8.82		-98.7	
0817	1.78		↓		12.42	7.08	1.72	29.18	9.46		-99.9	
0822	1.77		↓		12.43	7.08	1.76	29.53	7.90		-101.0	End of Purge
	0825-Sampling											
	0910 Finish Sampling											

Water Quality Meter (S/N): YSI
Control Box Type (S/N): QED
Turbidimeter (S/N): Hamotte

Notes:

ROUND 11

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSB-NLON / DRMO
Project No.: 7363

[ ] Domestic Well Data
[x] Monitoring Well Data
[ ] Other Well Type:
[ ] QA Sample Type:

Sample ID No.: DRMO- GMW01S GW-11
Sample Location: GMW1S
Sampled By: T. ROJAHN
C.O.C. No.: 031001-02
Type of Sample:
[X] Low Concentration
[ ] High Concentration

SAMPLING DATA:

	Color	pH	S.C.	Temp.	Turbidity	DO	Eh	Salinity
Date: 3/10/01	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	mV	ppt
Time: 1615								
Method: Low Flow/Bladder Pump	CLEAR	6.45	6.020	6.89	0.70	8.83	-3.4	3.27

PURGE DATA:

Date: 3/10/01
Method: Low Flow/Bladder Pump
Monitor Reading (ppm): —
Well Casing Diameter & Material Type: 2" PVC
Total Well Depth (TD): 15.7
Static Water Level (WL): 8.20
One Casing Volume(~~gal~~): 4.6 L
Start Purge (hrs): 1515
End Purge (hrs): 1605
Total Purge Time (min): 50
Total Vol. Purged (~~gal~~): 13.5 L

See Attached Low Flow Purge Data Sheet for Purge Data

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements		Collected
TCL VOLATILES (LOW-LEVEL)	HCL / 4° C	(3)	40 ml Vial	✓
TCL SEMIVOLATILES	4° C	(2)	Qt. Amber Glass	✓
TCL PEST/PCBs	4° C	(2)	Qt. Amber Glass	✓
TCL PAH	4° C	(1)	Qt. Amber Glass	✓
TAL METALS (TOTAL)	HNO_3 / 4° C	(1)	L PE	✓

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s): Terry Rojahn

Tetra Tech NUS, Inc. **LOW FLOW PURGE DATA SHEET** **Well No.:** 6MW15

PROJECT: NSB-NLON
PROJECT NUMBER: 7363
SITE: DRMO

DATE: 3-10-01
WEATHER: SUNNY & 35°F
PERSONNEL: T. ROHAHN

Well Screen Depth: ~~8.20~~ (?) / _____ ft.
Initial Water Level: 8.20 @ 1515 hrs.
Pump Type/Material: Bladder / Teflon & PVC
Pump Intake Depth: _____
Tide Cycle: ☐ High @ _____ ☒ Low @ 1633 ☐ Not Affected
Total Purge Volume= 13.5 (gal/(L)) **Total Purge Time=** 50 (min)

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	Salinity ppt	Eh mV	Comments
1515	8.20	~~300~~	300	30 & 300 15 PSI							→	Start Purge
1525	8.38	3000	300	"	6.90	7.26	7.001	4.90	9.5	3.94	-121	CLEAR
1535	8.45	6000	300	"	6.81	7.01	6.743	7.68	1.6	3.69	-98	"
1545	8.51	8500	250	45 & 300 15 PSI	6.81	6.71	6.424	8.48	1.3	3.50	-61	"
1555	8.55	11000	250	"	6.84	6.56	6.234	9.22	0.81	3.38	-29	"
1605	8.60	13500	250	"	6.89	6.45	6.020	8.83	0.70	3.27	-3.4	"
1615											→	Start Sampling
	Stop pump	@ 1605										
		TIME	W.L									
	NOTES	1610	8.63									
		1615	8.64	→ then	start	sampling / Restart Pump						
		1640	--	END	SAMPLING							
		~~1645~~	8.33	TK								
		1650	8.61									
		1655	8.71		1700	8.75		1705	8.73			

Water Quality Meter (S/N): YST
Control Box Type (S/N): QED
T dimeter (S/N): LaMotte

Notes: _____

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSB-NLON / DRMO
Project No.: 7363

[ ] Domestic Well Data
[x] Monitoring Well Data
[ ] Other Well Type:
[ ] QA Sample Type:

Sample ID No.: DRMO- GMW25 GW-11
Sample Location: GMW25
Sampled By: R. SIMPSON
C.O.C. No.: 030601-01
Type of Sample:
[X] Low Concentration
[ ] High Concentration

SAMPLING DATA:

	Color	pH	S.C.	Temp.	Turbidity	DO	Eh	Salinity
Date: 3.7.01	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	mV	ppt
Time: 1335								
Method: Low Flow/Bladder Pump	CLEAR	6.88	17.34	5.2	2.2	3.19	40.0	10.12

PURGE DATA:

Date: 3.7.01
Method: Low Flow/Bladder Pump
Monitor Reading (ppm):
Well Casing Diameter & Material Type: 2" PVC
Total Well Depth (TD): 13.6
Static Water Level (WL): 4.45
One Casing Volume(gal): 1.5
Start Purge (hrs): 1226
End Purge (hrs): 1330
Total Purge Time (min): 64
Total Vol. Purged (gal): 4.2

See Attached Low Flow Purge Data Sheet for Purge Data

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements		Collected
TCL VOLATILES (LOW-LEVEL)	HCL / 4° C	3	40 ml Vial	✓
TCL SEMIVOLATILES	4° C	2	Qt. Amber Glass	✓
TCL PEST/PCBs	4° C	2	Qt. Amber Glass	✓
TCL PAH	4° C	1	Qt. Amber Glass	✓
TAL METALS (TOTAL)	HNO_3 / 4° C	1	L PE	✓

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): [illegible]

Tetra Tech NUS, Inc. **LOW FLOW PURGE DATA SHEET** **Well No.:** GMW2S

PROJECT: NSB NLON
PROJECT NUMBER: DRMO 7363
SITE: DRMO

DATE: 3.7.01
WEATHER: OVER CAST 35°F
PERSONNEL: R. SIMPSON

Well Screen Depth: 3.6 / 13.6 ft.
Initial Water Level: 4.45 @ 1226 hrs.

Pump Type/Material: Bladder / TEFLON & PVC
Pump Intake Depth:

Tide Cycle: ☐ High @ ☒ Low @ 1346 ☐ Not Affected

Total Purge Volume= 4.2 (gal / L) **Total Purge Time=** 64 (min)

Time	Water Level feet below TOC	Volume ~~mL~~ GAL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	Salinity ppt	Eh mV	Comments
1226	4.45	—	—	—	—	—	—	—	—	—	—	START PURGE
1232	4.45	0	250	30 PSI/30D	4.8	7.22	14.78	5.64	5.7	8.51	-49.2	
1242	4.56	↓	↓	13 PSI	5.1	6.92	16.98	3.34	4.5	9.89	-22.5	
1252	4.46	↓	↓	↓	4.9	6.91	16.73	3.31	2.9	9.72	-0.6	
1302	4.51	↓	↓	↓	5.1	6.90	17.16	3.82	2.5	10.00	12.5	
1312	4.57	↓	↓	↓	5.1	6.93	17.28	3.34	2.2	10.07	24.6	
1320	4.63	↓	↓	↓	5.2	6.90	17.31	3.40	2.2	10.09	32.7	
1325	4.74	↓	↓	↓	5.2	6.86	17.33	3.08	2.2	10.12	38.5	
1330	4.78	4.2	↓	↓	5.2	6.88	17.34	3.19	2.2	10.12	40.0	END PURGE

Water Quality Meter (S/N): YSI
Control Box Type (S/N): QED
T limeter (S/N): LAMOTTE

Notes:

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSB-NLON / DRMO
Project No.: 7363

[ ] Domestic Well Data
[x] Monitoring Well Data
[ ] Other Well Type:
[ ] QA Sample Type:

Sample ID No.: DRMO- GMW2D - GW-11
Sample Location: GMW2D
Sampled By: T. ROJAHN
C.O.C. No.: 030601-01
Type of Sample:
[X] Low Concentration
[ ] High Concentration

SAMPLING DATA:

Date: 3/07/01	Color	pH	S.C.	Temp.	Turbidity	DO	Eh	Salinity
Time: 1340	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	mV	ppt
Method: Low Flow/Bladder Pump	CLEAR	6.68	33.50	9.81	8.9	0.36	-267	20.88

PURGE DATA:

Date: 3/07/01	See Attached Low Flow Purge Data Sheet for Purge Data
Method: Low Flow/Bladder Pump	
Monitor Reading (ppm): —	
Well Casing Diameter & Material Type: 2" PVC	
Total Well Depth (TD): 79.80	
Static Water Level (WL): 4.71	
One Casing Volume(~~gal~~): 46L	
Start Purge (hrs): 1235	
End Purge (hrs): 1335	
Total Purge Time (min): 60	
Total Vol. Purged (~~gal~~): 21.5L	

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOLATILES (LOW-LEVEL)	HCL / 4° C	(3) 40 ml Vial	✓
TCL SEMIVOLATILES	4° C	(2) Qt. Amber Glass	✓
TCL PEST/PCBs	4° C	(2) Qt. Amber Glass	✓
TCL PAH	4° C	(1) Qt. Amber Glass	✓
TAL METALS (TOTAL)	HNO_3 / 4° C	(1) LPE	✓

OBSERVATIONS / NOTES:

Sulfur ODOR

Circle If Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): Terry Nagel

Tetra Tech NUS, Inc. **LOW FLOW PURGE DATA SHEET** **Well No.:** 6MW2D

PROJECT: NSB NLON
PROJECT NUMBER: 7363
SITE: DRMO

DATE: 3-07-01
WEATHER: OVERCAST 35°F
PERSONNEL: T. ROJAHN

Well Screen Depth: 68.8 / 78.8 ft.
Initial Water Level: 4.71 @ 1235 hrs.

Pump Type/Material: Bladder/PVC
Pump Intake Depth: 73.0' + PVC

Tide Cycle: ☐ High @ ☒ Low @ 1346 ☐ Not Affected

Total Purge Volume= 21.5 (gal/L) **Total Purge Time=** 60 (min)

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	Salinity ppt	Eh mV	Comments
1235	4.71	—	400	630 35% 35PSI								Start Purge
1245	5.23	4000	350	35PSI	9.40	6.69	34.63	2.14	4.7	21.66	-113	CLEAR - SLIGHT ODOR
1255	5.36	7500	350	35PSI	9.45	6.71	34.61	0.74	4.1	21.63	-146	CLEAR ODOR
1305	5.30	11000	350	"	9.48	6.72	34.68	0.29	4.2	21.70	-184	CLEAR
1315	5.33	14500	350	"	9.57	6.70	34.17	0.52	6.3	21.32	-239	CLEAR
1325	5.30	18000	350	"	9.74	6.69	33.66	0.43	8.4	20.97	-254	CLEAR
1335	5.30	21500	350	"	9.81	6.69	33.50	0.36	8.9	20.88	-267	CLEAR
1340												Start Sampling

Water Quality Meter (S/N): YSI
Control Box Type (S/N): QED
Turbidimeter (S/N): LaMotte

Notes:

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSB-NLON / DRMO
Project No.: 7363

[ ] Domestic Well Data
[x] Monitoring Well Data
[ ] Other Well Type:
[ ] QA Sample Type:

Sample ID No.: DRMO- GMWGS - GW-11
Sample Location: DRMO - GMWGS
Sampled By: T. ROJANA'
C.O.C. No.: 030601-01
Type of Sample:
[X] Low Concentration
[ ] High Concentration

SAMPLING DATA:

Date: 3/6/01	Color	pH	S.C.	Temp.	Turbidity	DO	Eh	Salinity
Time: 1130	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	mV	ppt
Method: Low Flow/Bladder Pump	CLEAR	5.93	0.336	9.98	0.2	8.38	217	0.16

PURGE DATA:

Date: 3/6/01
Method: Low Flow/Bladder Pump
Monitor Reading (ppm): —
Well Casing Diameter & Material Type: 2" PVC
Total Well Depth (TD): 15.56
Static Water Level (WL): 8.22
One Casing Volume(~~gal~~): 6.4 L
Start Purge (hrs): 1015
End Purge (hrs): 1125
Total Purge Time (min): 70
Total Vol. Purged (~~gal~~): 14 L

See Attached Low Flow Purge Data Sheet for Purge Data

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOLATILES (LOW-LEVEL)	HCL / 4° C	(7) 40 ml Vial	✓
TCL SEMIVOLATILES	4° C	Qt. Amber Glass	✓
TCL PEST/PCBs	4° C	(8) Qt. Amber Glass	✓
TCL PAH	4° C	Qt. Amber Glass	✓
TAL METALS (TOTAL)	HNO_3 / 4° C	(2) L PE	✓

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD YES

Duplicate ID No.: —

Signature(s): Tony Rojana

Tetra Tech NUS, Inc. **LOW FLOW PURGE DATA SHEET** **Well No.:** 6MW65

PROJECT: NSB NLON
PROJECT NUMBER: 7363
SITE: DRMO

DATE: 03-06-01
WEATHER: SNOW 33°F
PERSONNEL: T. ROJAHN

Well Screen Depth: 8.6 / 18.6 ft.
Initial Water Level: 8.22 @ 1015 hrs.
Total Purge Volume= 14 (gal (L))

Pump Type/Material: BLADDER/PVC
Pump Intake Depth: 14
Total Purge Time= 70 (min)

Tide Cycle: ☐ High @ ☐ Low @ ☒ Not Affected

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	Salinity ppt	Eh mV	Comments
1015	8.22	–	200	20 PSI 45 PSI	~~9.6~~ (PX)	–	–	–	–	–	–	START PURGE
1025	8.26	2000	200	"	9.88	6.11	0.336	7.70	3.0	0.16	192	CLEAR
1035	8.26	4000	200	"	9.90	5.97	0.336	8.18	2.7	0.16	205	"
1045	8.26	6000	200	"	9.97	5.95	0.335	7.72	2.0	0.16	208	"
1055	8.30	8000	200	"	9.94	5.94	0.335	8.39	1.1	0.16	211	"
1105	8.31	10,000	200	"	10.05	5.94	0.335	8.35	0.6	0.16	214	"
1115	8.32	12,000	200	"	9.95	5.93	0.336	8.30	0.3	0.16	216	"
1125	8.33	14,000	200	"	9.98	5.93	0.336	8.38	0.2	0.16	217	END PURGE
1130	→											Start Sampling

Water Quality Meter (S/N): YSI
Control Box Type (S/N): QED
Turbidimeter (S/N): LaMotte

Notes:

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSB-NLON / DRMO
Project No.: 7363

[ ] Domestic Well Data
[x] Monitoring Well Data
[ ] Other Well Type:
[ ] QA Sample Type:

Sample ID No.: DRMO- 6MW6D GW-11
Sample Location: 6MW6D
Sampled By: K. SIMPSON
C.O.C. No.: 030601-01
Type of Sample:
[X] Low Concentration
[ ] High Concentration

SAMPLING DATA:

	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	Eh mV	Salinity ppt
Date: 3·6·01 Time: 1130 Method: Low Flow/Bladder Pump	CLEAR	5.62	3.110	9.6	32	0.28	197.2	1.63

PURGE DATA:

Date: 3·6·01
Method: Low Flow/Bladder Pump
Monitor Reading (ppm): NA
Well Casing Diameter & Material Type: 6" OPEN BOREHOLE
Total Well Depth (TD): 46.0
Static Water Level (WL): 8.51
One Casing Volume(gal): 5.5
Start Purge (hrs): 1010
End Purge (hrs): 1125
Total Purge Time (min): 75
Total Vol. Purged (gal): 5.2

See Attached Low Flow Purge Data Sheet for Purge Data

1.47 GAL/FT

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements		Collected
TCL VOLATILES (LOW-LEVEL)	HCL / 4° C	6	40 ml Vial	✓
TCL SEMIVOLATILES	4° C	4	Qt. Amber Glass	✓
TCL PEST/PCBs	4° C	4	Qt. Amber Glass	✓
TCL PAH	4° C	4	Qt. Amber Glass	✓
TAL METALS (TOTAL)	HNO_3 / 4° C	2	L PE	✓
	X2 VOL	FOR	DUP	

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD —

Duplicate ID No.: GWFD- 030601-01 (YES)

Signature(s): [illegible]

Tetra Tech NUS, Inc. **LOW FLOW PURGE DATA SHEET** **Well No.:** GMW6D

PROJECT: NSB NLON DRMO
PROJECT NUMBER: 7363
SITE: DRMO

DATE: 3.6.01
WEATHER: SNOW 33°F
PERSONNEL: R SIMPSON

Well Screen Depth: 30.5 / 46.0 ft.
Initial Water Level: 8.52 @ 1018 hrs.

Pump Type/Material: BLADER
Pump Intake Depth: 76

Tide Cycle: ☐ High @ ☐ Low @ ☒ Not Affected

Total Purge Volume= 5.2 (gal) L) Total Purge Time= 75 (min)

Time	Water Level feet below TOC	Volume ~~mL~~ GAL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	Salinity ppt	Eh mV	Comments
1018	8.52	0	275	37D 37R	9.6	5.65	3.122	0.30	40	1.63	209.8	
1028	8.53	↓	↓	25PSI	9.5	5.61	3.117	0.26	39	3.123	204.4	
1038	8.53	↓	250	↓	9.4	5.60	3.125	0.23	33	1.64	203.5	
1048	8.54	↓	↓	↓	9.5	5.59	3.118	0.21	31	1.64	204.8	
1058	8.54	↓	↓	↓	9.6	5.62	3.113	0.24	37	1.63	202.2	
1108	8.54	↓	↓	↓	9.6	5.66	3.116	0.32	34	1.63	197.2	
1115	↓	↓	↓	↓	9.6	5.62	3.110	0.28	33	1.63	198.4	
1120	↓	↓	↓	↓	9.6	5.61	3.111	0.29	33	1.63	197.8	
1125	↓	5.2	↓	↓	9.6	5.62	3.110	0.28	32	1.63	197.2	END PURGE

Water Quality Meter (S/N): YSI
Control Box Type (S/N): QED
Turbidimeter (S/N): LAMOTTE

Notes:

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSB-NLON / DRMO
Project No.: 7363

[ ] Domestic Well Data
[x] Monitoring Well Data
[ ] Other Well Type:
[ ] QA Sample Type:

Sample ID No.: DRMO-6MW095 GW-11
Sample Location: 6MW95
Sampled By: K. SIMPSON
C.O.C. No.: 031001-02
Type of Sample:
[X] Low Concentration
[ ] High Concentration

SAMPLING DATA:

Date: 3·10·01	Color	pH	S.C.	Temp.	Turbidity	DO	Eh	Salinity
Time: 1620	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	mV	ppt
Method: Low Flow/Bladder Pump	CLEAR	5.2	0.068	4.2	1.0	10.98	166	0.03

PURGE DATA:

Date: 3·10·01
Method: Low Flow/Bladder Pump
Monitor Reading (ppm):
Well Casing Diameter & Material
Type: 2" PVC FLUSH MT
Total Well Depth (TD): 11.80
Static Water Level (WL): 3.92
One Casing Volume(gal): 1.3
Start Purge (hrs): 1524
End Purge (hrs): 1615
Total Purge Time (min): 51
Total Vol. Purged (gal): 4.2

See Attached Low Flow Purge Data Sheet for Purge Data

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOLATILES (LOW-LEVEL)	HCL / 4° C	40 ml Vial	✓
TCL SEMIVOLATILES	4° C	Qt. Amber Glass	✓
TCL PEST/PCBs	4° C	Qt. Amber Glass	✓
TCL PAH	4° C	Qt. Amber Glass	✓
TAL METALS (TOTAL)	HNO_3 / 4° C	L PE	✓

OBSERVATIONS / NOTES:

RUN OFF GETTING INTO VAULT & SOME INTO RISER (SNOW MELT)

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech NUS, Inc. **LOW FLOW PURGE DATA SHEET** **Well No.:** 6MW09S

PROJECT: NSB-NION
PROJECT NUMBER: 7363
SITE: DRMO RD 11

DATE: 3.10.01
WEATHER: SUNNY 35°F
PERSONNEL: K. SIMPSON

Well Screen Depth: / ft.
Initial Water Level: 3.92 @ 1524 hrs.
Pump Type/Material:
Pump Intake Depth:

Tide Cycle: ☐ High @ ☒ Low @ 1433 ☒ Not Affected
9S NOT AFFECTED

Total Purge Volume= 4.2 (gal)/(L) **Total Purge Time=** 51 (min)

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	Salinity ppt	Eh mV	Comments
1524	3.92	—	—	—	—	—	—	—	—	—	—	START PURGE
1530	4.04	0	310	30 R/30 D 10 PSI	4.4	7.54	0.069	9.39	25	0.06	-29	
1540	4.00	↓	↓	↓	4.2	6.00	0.070	11.30	19	0.06	112	
1550	↓	↓	↓	↓	4.2	5.71	0.069	12.32	15	0.03	129	
1600	↓	↓	↓	↓	4.3	5.43	0.067	11.92	8.1	0.03	150	
1605	↓	↓	↓	↓	4.2	5.23	0.067	11.00	1.2	0.03	160	
1610	↓	↓	↓	↓	4.3	5.22	0.067	10.95	1.2	0.03	164	
1615	↓	↓	↓	↓	4.2	5.21	0.068	10.98	1.0	0.03	166	END PURGE

Water Quality Meter (S/N): YSI
Control Box Type (S/N): QED
Turbidimeter (S/N): LA MOTTE

Notes:

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSB-NLON / DRMO
Project No.: 7363

[ ] Domestic Well Data
[x] Monitoring Well Data
[ ] Other Well Type:
[ ] QA Sample Type:

Sample ID No.: DRMO- GMW/10S GW-11
Sample Location: GMW/10S
Sampled By: R. SIMPSON
C.O.C. No.: 030901-02
Type of Sample:
[X] Low Concentration
[ ] High Concentration

SAMPLING DATA:

	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	Eh mV	Salinity ppt
Date: 3.9.01								
Time: 1535								
Method: Low Flow/Bladder Pump	CLEAR	7.20	6.592	6.2	5.7	4.93	-180	3.60

PURGE DATA:

Date: 3.9.01
Method: Low Flow/Bladder Pump
Monitor Reading (ppm):
Well Casing Diameter & Material Type: 2" PVC
Total Well Depth (TD): 13.50
Static Water Level (WL): 3.33
One Casing Volume(gal): 1.7
Start Purge (hrs): 1440
End Purge (hrs): 1530
Total Purge Time (min): 50
Total Vol. Purged (gal): 4.5

See Attached Low Flow Purge Data Sheet for Purge Data

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements		Collected
TCL VOLATILES (LOW-LEVEL)	HCL / 4° C	3	40 ml Vial	✓
TCL SEMIVOLATILES	4° C	2	Qt. Amber Glass	—
TCL PEST/PCBs	4° C	2	Qt. Amber Glass	✓
TCL PAH	4° C	1	Qt. Amber Glass	✓
TAL METALS (TOTAL)	HNO_3 / 4° C	1	L PE	✓

OBSERVATIONS / NOTES:

ALL 4 FLUSH MT. WELLS CLOSE TO THE RIVER, HAVE ~~LOT~~ LOT RUN-OFF IN THE VAULT AND MAY BE GETTING INTO THE RISER

Circle if Applicable:

MS/MSD —
Duplicate ID No.: —

Signature(s): [signature]

Tetra Tech NUS, Inc. **LOW FLOW PURGE DATA SHEET** **Well No.:** 6MW/10S

PROJECT: NSB-NLON
PROJECT NUMBER: 7363
SITE: DRMO

DATE: 3.9.01
WEATHER: SNOW 33°F
PERSONNEL: R. SIMPSON

Well Screen Depth: / ft.
Initial Water Level: 3.33 @ 1440 hrs.
Pump Type/Material: Bladder / Teflon/PVC
Pump Intake Depth:
Total Purge Volume= 4.5 (gal) (L)
Total Purge Time= 50 (min)

Tide Cycle: ☐ High @ ☒ Low @ 3:47PM ☐ Not Affected 1547

Time	Water Level feet below TOC	Volume GAL ~~mL~~	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	Salinity ppt	Eh mV	Comments
1440	3.33	—	—	—	—	—	—	—	—	—	—	START PURGE
1450	3.43	15 340 0	340	30 R/300	7.1	7.39	7.937	3.54	10	4.39	-143	NO ODOR
1500	3.52			25 PSI	6.4	7.24	5.407	5.20	14	3.20	-154	TR. BLACK FINES
1510	3.55				6.3	7.25	6.163	5.55	9.1	3.36	-172	
1520	3.56				6.4	7.22	6.643	5.39	7.0	3.64	-180	
1525	3.56				6.2	7.18	6.693	4.71	6.3	3.66	-181	
1530	3.57	4.5			6.2	7.20	6.542	4.93	5.7	3.60	-180	

Water Quality Meter (S/N): YSI
Control Box Type (S/N): QED
T imeter (S/N): LA MOTTE

Notes:

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Page___ of ___

Project Site Name: NSB-NLON / DRMO
Project No.: 7363

[ ] Domestic Well Data
[x] Monitoring Well Data
[ ] Other Well Type:
[ ] QA Sample Type:

Sample ID No.: DRMO- 6MW10D GW-11
Sample Location: 6MW10D
Sampled By: T ROJAHN
C.O.C. No.: 030901-02
Type of Sample:
[X] Low Concentration
[ ] High Concentration

SAMPLING DATA:

Date: 3-09-01	Color	pH	S.C.	Temp.	Turbidity	DO	Eh	Salinity
Time: 1530	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	mV	ppt
Method: Low Flow/Bladder Pump	CLEAR	7.13	20.99	9.38	2.5	3.48	+ 13	12.15

PURGE DATA:

Date: 3-09-01
Method: Low Flow/Bladder Pump
Monitor Reading (ppm): —
Well Casing Diameter & Material
Type: 2" Ø PVC
Total Well Depth (TD): 54.10
Static Water Level (WL): 1.94
One Casing Volume(gal): NA
Start Purge (hrs): 1445
End Purge (hrs): 1525
Total Purge Time (min): 40
Total Vol. Purged (~~gal~~): 14 L

See Attached Low Flow Purge Data Sheet for Purge Data

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOLATILES (LOW-LEVEL)	HCL / 4° C	(3) 40 ml Vial	✓
TCL SEMIVOLATILES	4° C	(2) Qt. Amber Glass	✓
TCL PEST/PCBs	4° C	(2) Qt. Amber Glass	✓
TCL PAH	4° C	(1) Qt. Amber Glass	✓
TAL METALS (TOTAL)	HNO_3 / 4° C	(1) L PE	✓

OBSERVATIONS / NOTES:

NOTE - SEE OBSERVATION FOR 6MW10S

Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s): Terry Rojahn

Tetra Tech NUS, Inc. **LOW FLOW PURGE DATA SHEET** **Well No.:** 6MW10D

PROJECT: NSB NLON
PROJECT NUMBER: 7363
SITE: DRMO

DATE: 03-09-01
WEATHER: SNOW 33°F
PERSONNEL: T. ROJAHN

Well Screen Depth: 44.10 / 54.10 ft.
Initial Water Level: 1.94 @ 1445 hrs.

Pump Type/Material: Bladder/Teflon
Pump Intake Depth: 49'

Tide Cycle: ☐ High @ ☒ Low @ 1547 ☐ Not Affected

Total Purge Volume= 14 (gal/(L))
Total Purge Time= 40 (min)

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	Salinity ppt	Eh mV	Comments
1445	1.94	—	—	—	—	—	—	—	—	—	—	Start Purge
1455	2.07	3500	350	30D30A 20 PSI	8.02	7.18	13.38	3.22	12	7.77	22	CLEAR
1505	2.11	7000	350	"	8.76	7.14	18.16	4.90	4.9	10.81	21	CLEAR
1515	2.11	10500	350	"	9.42	7.14	19.94	4.97	2.3	11.88	16	CLEAR
1525	2.11	14000	350	"	9.38	7.13	20.99	3.48	2.5	12.15	13	CLEAR
1530											→	Start Sampling

Water Quality Meter (S/N): YSI
Control Box Type (S/N): QED
Turbidimeter (S/N): LaMotte

Notes:

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSB-NLON / DRMO
Project No.: 7363

[ ] Domestic Well Data
[x] Monitoring Well Data
[ ] Other Well Type:
[ ] QA Sample Type:

Sample ID No.: DRMO- GMW11S GW-11
Sample Location: GMW11S
Sampled By: R. SIMPSON
C.O.C. No.: 030801-02
Type of Sample:
[X] Low Concentration
[ ] High Concentration

SAMPLING DATA:

	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	Eh mV	Salinity ppt
Date: 3-8-01 Time: 1445 Method: Low Flow/Bladder Pump	CLEAR	7.16	7.735	6.0	1.8	3.94	-162	4.27

PURGE DATA:

Date: 3-8-01
Method: Low Flow/Bladder Pump
Monitor Reading (ppm):
Well Casing Diameter & Material Type: 2" PVC
Total Well Depth (TD):
Static Water Level (WL): 3.04 T-PVC
One Casing Volume(gal):
Start Purge (hrs): 1336
End Purge (hrs): 1440
Total Purge Time (min): 64
Total Vol. Purged (gal): 5.1

See Attached Low Flow Purge Data Sheet for Purge Data

WL @ END OF SAMPLING (1504) = 3.45'

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements		Collected
TCL VOLATILES (LOW-LEVEL)	HCL / 4° C	3	40 ml Vial	✓
TCL SEMIVOLATILES	4° C	2	Qt. Amber Glass	✓
TCL PEST/PCBs	4° C	2	Qt. Amber Glass	✓
TCL PAH	4° C	1	Qt. Amber Glass	✓
TAL METALS (TOTAL)	HNO_3 / 4° C	1	L PE	✓

OBSERVATIONS / NOTES:

SOME RUN OFF MAY BE GETTING INTO WELL

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s):

Tetra Tech NUS, Inc. **LOW FLOW PURGE DATA SHEET** **Well No.:** GMW11S

PROJECT: NSB-NLON
PROJECT NUMBER: 7363
SITE: DRMO

DATE: 3-9-01
WEATHER: OVERCAST 35°F
PERSONNEL: K. SIMPSON

Well Screen Depth: 3.50 / 13.50 ft.
Initial Water Level: 3.04 @ 1336 hrs.
Total Purge Volume= 5.1 (gal) L)
Total Purge Time= 64 (min)

Pump Type/Material: Bladder / Teflon
Pump Intake Depth: 11'

Tide Cycle: ☐ High @ ☒ Low @ 1500 ☐ Not Affected

Time	Water Level feet below TOC	Volume ~~mL~~	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	Salinity ppt	Eh mV	Comments
1336	3.04	GAL	—	—	—	—	—	—	—	—	—	START PURGE
1340	3.10	0	300	35 P/35D	5.4	7.15	7.220	5.31	35	3.96	-149	NO ODOR
1350	3.10	↓	↓	12 PSI	5.6	7.11	7.535	4.98	10	4.15	-155	TR FINES
1400	3.23	↓	↓	↓	5.7	7.24	7.646	5.29	4.2	4.20	-162	CLEAR
1410	3.21	↓	↓	↓	5.9	7.16	7.590	4.83	3.6	4.18	-160	
1420	3.25	↓	↓	↓	5.9	7.13	7.572	4.43	3.3	4.19	-160	
1430	3.31	↓	↓	↓	6.0	7.10	7.699	3.87	2.8	4.24	-160	
1435	3.35	↓	↓	↓	6.0	7.11	7.717	3.65	2.2	4.25	-161	
1440	3.36	5.1	↓	↓	6.0	7.16	7.735	3.94	1.8	4.27	-162	END PURGE

Water Quality Meter (S/N): YSI
ontrol Box Type (S/N): QED
Turbidimeter (S/N): LAMOTTE

Notes:

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSB-NLON / DRMO
Project No.: 7363

[ ] Domestic Well Data
[x] Monitoring Well Data
[ ] Other Well Type:
[ ] QA Sample Type:

Sample ID No.: DRMO- 6MW11D- GW-11
Sample Location: 6MW11D
Sampled By: T. ROJAHN
C.O.C. No.: 030801-02
Type of Sample:
[X] Low Concentration
[ ] High Concentration

SAMPLING DATA:

	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	Eh mV	Salinity ppt
Date: 3/08/01 Time: 1450 Method: Low Flow/Bladder Pump	CLEAR	6.76	23.99	10.87	3.8	0.80	-60	14.56

PURGE DATA:

Date: 3/08/01
Method: Low Flow/Bladder Pump
Monitor Reading (ppm): —
Well Casing Diameter & Material Type: 2" PVC
Total Well Depth (TD): 85'
Static Water Level (WL): 1.94
One Casing Volume(gal): N/A
Start Purge (hrs): 1325
End Purge (hrs): 1445
Total Purge Time (min): 80
Total Vol. Purged (gal): 24 L

See Attached Low Flow Purge Data Sheet for Purge Data

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements		Collected
TCL VOLATILES (LOW-LEVEL)	HCL / 4° C	(3)	40 ml Vial	✓
TCL SEMIVOLATILES	4° C	(2)	Qt. Amber Glass	✓
TCL PEST/PCBs	4° C	(2)	Qt. Amber Glass	✓
TCL PAH	4° C	(1)	Qt. Amber Glass	✓
TAL METALS (TOTAL)	HNO_3 / 4° C	(1)	L PE	✓

OBSERVATIONS / NOTES:

Well Cap Damaged - SURFACE RUN OFF COULD GET INTO WELL.
Concrete W/ CRACKS

Circle if Applicable:

MS/MSD | Duplicate ID No.:

Signature(s): Terry Rojahn

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

Well No.: 6MW11D

PROJECT: NSB NLON
PROJECT NUMBER: 7363
SITE: DRMO

DATE: 03-08-01
WEATHER: OVERCAST & 35°F
PERSONNEL: T. ROJAHN

Well Screen Depth: 75 / 85 ft.
Initial Water Level: 1.94 @ 1325 hrs.

Pump Type/Material: BLADER / TEFLON
Pump Intake Depth: 82'

Tide Cycle: ☐ High @ ☒ Low @ 1500 ☐ Not Affected

Total Purge Volume= 24 (gal (L))
Total Purge Time= 80 (min)

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	Salinity ppt	Eh mV	Comments
1325	1.94	—	300	ISR 150 35 PSI								START PURGE
1335	1.95	3000	300	"	10.69	6.71	24.97	0.93	44	15.21	-15	Clear w/ Particle
1345	1.98	6000	300	"	10.81	6.70	25.11	0.43	21	15.29	-35	" w/ "
1355	2.00	9000	300	"	10.84	6.71	24.58	1.40	12	14.92	-40	" w/ Sl. Particle
1405	2.00	12000	300	"	10.84	6.73	24.02	2.05	7.6	14.57	-46	" " "
1415	2.02	15000	300	"	10.83	6.74	23.89	1.35	5.9	14.48	-50	" " "
1425	2.02	18000	300	"	10.83	6.74	23.83	1.11	4.3	14.44	-54	CLEAR w/ Trace Particle
1435	2.02	21000	300	"	10.87	6.75	23.86	1.58	5.1	14.47	-58	" "
1445	2.02	24000	300	"	10.97	6.76	23.99	0.90	3.8	14.56	-60	" "
1450												START Sampling

24
16
40

Water Quality Meter (S/N): YSI
Control Box Type (S/N): QED
Turbidimeter (S/N): LAMOTTE

Notes:

ROUND 12

Tetra Tech NUS, Inc

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSB-NLON / DRMO
Project No.: CTO 257

[ ] Domestic Well Data
[x] Monitoring Well Data
[ ] Other Well Type:
[ ] QA Sample Type:

Sample ID No.: DRMO- 6MW01S GW-1
Sample Location: 6MW1S
Sampled By: Wellman
C.O.C. No.: 41502
Type of Sample:
[X] Low Concentration
[ ] High Concentration

SAMPLING DATA:

	Color	pH	S.C.	Temp.	Turbidity	DO	~~Eh~~ ORP	Salinity
Date: 6/23/01	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	mV	ppt
Time: 1819								
Method: Low Flow/Bladder Pump	Clear	6.24	2409	16.54	0.21	8.71	104.3	

PURGE DATA:

Date: 6/23/01
Method: Low Flow/Bladder Pump
Monitor Reading (ppm): 7.52
Well Casing Diameter & Material
Type: 2" PVC
Total Well Depth (TD): 157
Static Water Level (WL): 7.52
One Casing Volume(~~gal~~): 6.6L
Start Purge (hrs): 1734
End Purge (hrs): 1819
Total Purge Time (min): 45
Total Vol. Purged (~~gal~~): 14.6L

See Attached Low Flow Purge Data Sheet for Purge Data

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOLATILES (LOW-LEVEL)	HCL / 4° C	3 - 40 ml Vial	✓
TCL SEMIVOLATILES	4° C	1 Qt. Amber Glass	✓
TCL PEST/PCBs	4° C	2 Qt. Amber Glass	✓
TCL PAH	4° C	1 Qt. Amber Glass	✓
TAL METALS (TOTAL)	HNO_3 / 4° C	1 - 500mL PE	✓
TAL Metals (dissolved)	HNO_3 / 4°C	1 - 500mL PE	✓

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s): Jennifer C. Wellman

Tetra Tech NUS, Inc. **LOW FLOW PURGE DATA SHEET** **Well No.:** MW15

PROJECT: NSB - NLON
PROJECT NUMBER: CTO 257
SITE: DRMO

DATE: 6/23/01
WEATHER: Cloudy - Lower 70s
PERSONNEL: Wellman

Well Screen Depth: 5.7 / 15.7 ft.
Initial Water Level: 7.52 @ 1734 hrs.
Pump Type/Material: bladder/ teflon
Pump Intake Depth:
Tide Cycle: ☐ High @ ☒ Low @ 1818 ☐ Not Affected
Total Purge Volume= 14.6 (gal / L) **Total Purge Time=** 45 (min)

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	~~Salinity~~ ppt	~~Eh~~ ORP mV	Comments
1734	7.52		~~325~~	45C 300 is PSI						—		
1739	7.52	~~1625~~	325		17.02	7.18	27.55	5.69	15.5	—	42.0	
1744	7.52	3250	325		16.87	6.83	2772	4.63	3.60	—	61.2	
1749	7.52	~~4875~~	325		16.80	6.66	2722	4.89	2.88	—	70.1	
1754	7.53	6500	325		16.76	6.54	2633	5.85	1.09	—	79.1	
1759	7.53	8125	325		16.69	6.42	2564	6.40	0.84	—	87.6	
1804	7.54	9750	325		16.71	6.36	2527	6.36	0.60	—	93.2	
1809	7.54	11375	325		16.62	6.31	2474	8.63	0.97	—	96.9	
1814	7.55	13000	325		16.58	6.25	2426	8.68	0.45	—	102.0	
1819	7.55	14625	325		16.54	6.24	2409	8.71	0.21	—	104.3	

Water Quality Meter (S/N): 99B1377AA
Control Box Type (S/N): DIB0583 AB
Turbidimeter (S/N): 1728-1600

Notes:

Tetra Tech NUS, Inc

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSB-NLON / ~~AREA A~~ DRMO
Project No.: CTO [redacted]

[ ] Domestic Well Data
[x] Monitoring Well Data
[ ] Other Well Type:
[ ] QA Sample Type:

Sample ID No.: DRMO-GMW25-GW-12 ~~GW-00~~
Sample Location: GMW2
Sampled By: Wellman
C.O.C. No.: 41512
Type of Sample:
[X] Low Concentration
[ ] High Concentration

SAMPLING DATA:

	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	~~Eh mV~~ ORP	~~Salinity ppt~~
Date: 6/21/01								
Time: 1627								
Method: ~~Peristaltic Pump~~ bladder	clear	7.35	7894	15.11	9.3	2.16	-221.1	

PURGE DATA:

Date: 6/21/01
Method: ~~Peristaltic Pump~~ bladder
Monitor Reading (ppm):
Well Casing Diameter & Material
Type: 2" PVC
Total Well Depth (TD): 13.6
Static Water Level (WL): 6.26
One Casing Volume(~~gal~~): 6.6 L
Start Purge (hrs): 1547
End Purge (hrs): 1627
Total Purge Time (min): 40
Total Vol. Purged (~~gal~~): 13 L

See Attached Low Flow Purge Data Sheet for Purge Data

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOLATILES	HCL / 4° C	3 - 40 ml Vial	✓
TCL SEMIVOLATILES	4° C	1 - Qt. Amber Glass	✓
TCL PEST/PCBs	4° C	1 - Qt. Amber Glass	✓
TCL PAH	4° C	1 - Qt. Amber Glass	✓
TAL METALS (TOTAL) + Hardness	HNO_3 / 4° C	1- 500 ml PE	✓
TAL METALS (DISSOLVED)	HNO_3 / 4° C	1 - 500 ml PE	✓
~~Total Organic Carbon (TOC)~~	~~HCL / 4° C~~	~~2 - 40 mL Glass~~	
~~Chemical Oxygen Demand (COD)~~	~~H_2SO_4 / 4° C~~	~~1 - 250 mL PE~~	
~~Alkalinity, Chloride, Sulfate, TDS~~	~~4° C~~	~~1 - 500 ml PE~~	

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): Jennifer C. Wellman

Tetra Tech NUS, Inc. **LOW FLOW PURGE DATA SHEET** **Well No.:** GMW258

PROJECT: DRMO - 12th round Quarterly Sampling **DATE:** 6/21/01
PROJECT NUMBER: 7091 **WEATHER:** overcast 70's
SITE: DRMO **PERSONNEL:** Wellman / Ramser

Well Screen Depth: 3.6 / 13.6 ft. **Pump Type/Material:** bladder
Initial Water Level: 6.26 @ _____ hrs. **Pump Intake Depth:** _____

Tide Cycle: ☐ High @ _____ ☒ Low @ 41609 ☐ Not Affected

Total Purge Volume= 13.0 (gal / L) **Total Purge Time=** 40 (min)

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	~~Salinity ppt~~	~~Eh~~ ORP mV	Comments
1547	6.26	—	350	30R 30D 15PSI	16.69	7.26	8065	8.09	17		-29.5	
1557	6.30	3500	350	30R 30D 15PSI	15.43	7.34	7863	1.75	10		-147.6	
1607	6.36	7000	350	30R 30D 15PSI	15.20	7.34	7836	2.00	9.3		-182.3	
1612	6.39	~~10500~~ 8750	350	30R 30D 15PSI	15.21	7.35	7861	2.28	8.6		-203.5	
1617	6.45	10500	350	30R 30D 15PSI	15.42	7.35	7899	2.10	9.5		-203.1	
1622	6.46	11250	350	30R 30D 15PSI	15.38	7.34	7855	2.10	8.2		-211.3	
1627	6.45	13000	350	30R 30D 15PSI	15.11	7.35	7894	2.16	9.3		-221.1	

Water Quality Meter (S/N): 99B1377AA
Control Box Type (S/N): 01B0583AB
Turbidimeter (S/N): 1728-1600

Notes: _____

Tetra Tech NUS, Inc

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSB-NLON / ~~AREA A~~ DRMO 7091
Project No.: CTO [redacted] 257

[ ] Domestic Well Data
[x] Monitoring Well Data
[ ] Other Well Type:
[ ] QA Sample Type:

Sample ID No.: DRMO-6MW2D-GW-12 ~~GW-06~~
Sample Location: 6MW2D
Sampled By: FREDW. RAMSER
C.O.C. No.: 41512
Type of Sample:
[X] Low Concentration
[ ] High Concentration

SAMPLING DATA:

	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	~~Eh~~ mV ORP	Salinity ppt
Date: 6-21-01								
Time: 1640								
Method: Peristaltic Pump	CLEAR	6.78	23348	13.69	2.0	8.44	-282.3	—

PURGE DATA:

Date: 6-21-01
Method: Peristaltic Pump
Monitor Reading (ppm):
Well Casing Diameter & Material
Type: 2" PVC
Total Well Depth (TD): 78.8
Static Water Level (WL): 5.44
One ~~Casing~~ Volume ~~(gal)~~:
Start Purge (hrs): 1555
End Purge (hrs): 1640
Total Purge Time (min): 45
Total Vol. Purged ~~(gal)~~ liters: 12.25 l

See Attached Low Flow Purge Data Sheet for Purge Data

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOLATILES	HCL / 4° C	3 - 40 ml Vial	✓
TCL SEMIVOLATILES	4° C	2 - Qt. Amber Glass	✓
TCL PEST/PCBs	4° C	2 - Qt. Amber Glass	✓
TCL PAH	4° C	2 - Qt. Amber Glass	✓
TAL METALS (TOTAL) ~~+ Hardness~~	HNO_3 / 4° C	1- 500 ml PE	✓
TAL METALS (DISSOLVED)	HNO_3 / 4° C	1 - 500 ml PE	✓
~~Total Organic Carbon (TOC)~~	HCL / 4° C	2 - 40 mL Glass	—
~~Chemical Oxygen Demand (COD)~~	H_2SO_4 / 4° C	1 - 250 mL PE	—
~~Alkalinity, Chloride, Sulfate, TDS~~	4° C	1 - 500 ml PE	—

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): Fred W Ramser

Tetra Tech NUS, Inc. **LOW FLOW PURGE DATA SHEET** **Well No.:** 6MW2D

PROJECT: DRMO 12th QTR SAMPLE **DATE:** 6-21-01
PROJECT NUMBER: 7091 **WEATHER:** OVERCAST 70°F
SITE: DRMO **PERSONNEL:** FRED W RAMSER

Well Screen Depth: 68.8 / 78.8 ft. **Pump Type/Material:** BLADDER/PVC
Initial Water Level: 5.44 @ 1512 hrs. **Pump Intake Depth:** 730+PVC
Total Purge Volume= 12.25 (gal / L) **Total Purge Time=** 45 min (min)

Tide Cycle: ☐ High @ ☒ Low @ 1633 ☐ Not Affected

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	Salinity ppt	ORP ~~Eh~~ mV	Comments
1540		~~1600~~	100 ml/m?	30D 30R 3BI								NO FLOW ?
1555	5.50	~~5350~~ 5350	350 ml/m	30D 30R 40BI								
1610	5.52	~~10,500~~ 8,000	350 ml/m		14.13	6.72	24290	1.37	4.0	—	-242.7	
1615	5.58		350 ml		14.20	6.73	24235	1.14	3.2	—	-258.4	
1620	5.64		350 ml		13.92	6.74	23985	1.98	3.0	—	-266.4	
1625	5.55		350 ml		13.94	6.76	23842	8.78	3.0	—	-278.3	
1630	5.57		350		13.97	6.77	23606	5.98	2.5	—	-277.5	
1635	5.54		350		13.62	6.78	23490	~~1.54~~ 8.00	2.1	—	-282.3	
1640	5.54	12,250	350	30D 30R 40BI	13.69	6.78	23348	8.44	2.0	—	-282.3	CLEAR NOTE
									(END	PURGE)		DURING
												SAMPLING
												SOME CONTAINERS
												HAD STRONG
												SULPHUR ODOR
												AND GREY COLOR.

Water Quality Meter (S/N): 01D1391 AA w/ 6820 SONDE
Control Box Type (S/N): MP10-1012
Turbidimeter (S/N): 1735-1600

Notes: 1750 ml/5 min

Tetra Tech NUS, Inc

GROUNDWATER SAMPLE LOG SHEET

Page___ of ___

Project Site Name: NSB-NLON / DRMO
Project No.: 7091

[ ] Domestic Well Data
[x] Monitoring Well Data
[ ] Other Well Type:
[ ] QA Sample Type:

Sample ID No.: DRMO- 6MW06S GW-12
Sample Location: 6MW06S
Sampled By: JWellman
C.O.C. No.: 41505
Type of Sample:
[X] Low Concentration
[ ] High Concentration

SAMPLING DATA:

	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	ORP mV	Salinity ppt
Date: 6/25/01 Time: 0930 Method: Low Flow/Bladder Pump	Clear	6.24	222	10.24	0.35	9.16	147.2	

PURGE DATA:

Date: 6/25/01
Method: Low Flow/Bladder Pump
Monitor Reading (ppm):
Well Casing Diameter & Material
Type: 2" PVC
Total Well Depth (TD): 18.56
Static Water Level (WL): 8.67
One Casing Volume(~~gal~~): 6 L
Start Purge (hrs): 0820
End Purge (hrs): 0930
Total Purge Time (min): 80
Total Vol. Purged (~~gal~~): 12 L

See Attached Low Flow Purge Data Sheet for Purge Data

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOLATILES (LOW-LEVEL)	HCL / 4° C	3 - 40 ml Vial	6
TCL SEMIVOLATILES	4° C	1 - 1L ~~Qt.~~ Amber Glass	2
TCL PEST/PCBs	4° C	2 - 1L ~~Qt.~~ Amber Glass	4
TCL PAH	4° C	1 - 1L ~~Qt.~~ Amber Glass	2
TAL METALS (TOTAL)	HNO_3 / 4° C	1-500mL PE	2
TAL METALS (DISSOLVED)	HNO_3/4°C	1-500mL PE	2

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD

Duplicate ID No.: GWFDC6250101

Signature(s): Jennifer C. Wellman

Tetra Tech NUS, Inc. **LOW FLOW PURGE DATA SHEET** **Well No.:** GMW68

PROJECT: NSB-NLON
PROJECT NUMBER: CTO 257
SITE: DRMO
DATE: 6/25/01
WEATHER: Sunny
PERSONNEL: Wellman, Ramser

Well Screen Depth: 8.6 / 18.6 ft.
Initial Water Level: 8.67 @ 0815 hrs.
Pump Type/Material: bladder
Pump Intake Depth:
Tide Cycle: ☐ High @ ☐ Low @ ☒ Not Affected
Total Purge Volume= 12.0 (gal (L))
Total Purge Time= 80 (min)

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	~~Salinity~~ ppt	~~Eh~~ ORP mV	Comments
0820	8.67	-	~~[illegible]~~	450/45R 20PSI								Start purge
0825	8.69	1000	200	450/45R 20PSI	10.17	7.01	229	9.61	3.2		66.9	
0830	8.70	2000	200		9.80	6.61	220	8.77	2.2		96.1	
0835	8.70	3000	200		9.83	6.49	222	8.70	1.6		105.6	
0845	8.70	4000	200		9.86	6.47	221	8.36	1.8		119.6	
0850	8.71	5000	200		9.81	6.35	221	9.06	1.0		132.4	
0855	8.71	6000	200		9.93	6.32	222	9.07	2.4		137.2	
0900	8.71	7000	200		9.88	6.30	221	9.01	0.85		139.4	
0910	8.71	8000	200		10.04	6.27	222	9.02	0.40		140.4	
0915	8.71	9000	200		10.12	6.27	222	9.02	0.35		143.7	
0920	8.71	10000	200		10.12	6.24	222	9.12	0.35		144.4	
0925	8.71	11000	200		10.11	6.25	222	9.02	1.0		146.3	
0930	8.71	12000	200		10.24	6.24	222	9.16	0.35		147.2	

Water Quality Meter (S/N): 99B1377AA
Control Box Type (S/N): 01B0583 AB
Turbidimeter (S/N): 1728-1600

Notes: alot of air bubbles coming in with water

Tetra Tech NUS, Inc

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSB-NLON / DRMO
Project No.: 7091

[ ] Domestic Well Data
[x] Monitoring Well Data
[ ] Other Well Type:
[ ] QA Sample Type:

Sample ID No.: DRMO- 6MW6D - ~~GW-11~~ GW-12
Sample Location: 6MW6D
Sampled By: FWR
C.O.C. No.: 41505
Type of Sample:
[X] Low Concentration
[ ] High Concentration

SAMPLING DATA:

	Color Visual	pH Standard	S.C. µS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	~~Eh~~ ORP mV	Salinity ppt
Date: 6-25-01								
Time: 905								
Method: Low Flow/Bladder Pump	CLEAR	5.98	2623	10.98	11	0.64	91.7	—

PURGE DATA:

Date: 6-25-01
Method: Low Flow/Bladder Pump
Monitor Reading (ppm): NA
Well Casing Diameter & Material Type: PVC 2"
Total Well Depth (TD): 46.0
Static Water Level (WL): 8.90
One Casing Volume(gal): NA
Start Purge (hrs): 830
End Purge (hrs): 905
Total Purge Time (min): 35
Total Vol. Purged ~~(gal)~~ liter: 12.25

See Attached Low Flow Purge Data Sheet for Purge Data

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOLATILES (LOW-LEVEL)	HCL / 4° C	3 x 40 ml Vial	✓
TCL SEMIVOLATILES	4° C	1 x Qt. Amber Glass	✓
TCL PEST/PCBs	4° C	2 x Qt. Amber Glass	✓
TCL PAH	4° C	1 x Qt. Amber Glass	✓
TAL METALS (TOTAL)	HNO_3 / 4° C	1 x .5 L PE	✓
TAL METALS (DIS)		1 x .5	✓

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
✓	

Signature(s): [signature]

Tetra Tech NUS, Inc. **LOW FLOW PURGE DATA SHEET** **Well No.:** 6W4W6D

PROJECT: NSB-NLON
PROJECT NUMBER: 7091
SITE: DRMO

DATE: 6-25-01
WEATHER: SUNNY 70's
PERSONNEL: FRED WRAMSER

Well Screen Depth: 30.5 / 46.0 ft.
Initial Water Level: 8.90 @ 827 hrs.
Pump Type/Material: BLADDER
Pump Intake Depth:
Tide Cycle: ☐ High @ ☐ Low @ ☒ Not Affected
Total Purge Volume= 12.25 (gal (L))
Total Purge Time= 35 (min)

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond µS/cm	DO mg/L	Turbidity NTU	Salinity ppt	ORP Eh mV	Comments
830	8.91		350	300 30R 25PSI								
835	8.82	1750			11.04	6.05	2435	5.05	30	–	49.7	
840	8.82	3500			10.87	6.00	2472	3.09	25	–	62.0	
845	8.85	500			10.95	5.99	2519	1.37	15	–	72.8	
850	8.85	7000			10.87	5.98	2552	0.85	13	–	80.2	
855	8.85	8750			10.93	5.98	2585	0.60	12	–	83.6	
900	8.85	10,500			10.97	5.98	2609	0.64	12	–	88.3	
905	8.85	12,250	350	300 30R 25PSI	10.98	5.98	2623	0.64	11	–	91.7	

Water Quality Meter (S/N):
Control Box Type (S/N):
Turbidimeter (S/N):

Notes:

Tetra Tech NUS, Inc

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSB-NLON / DRMO
Project No.: 7091 CTO

[ ] Domestic Well Data
[x] Monitoring Well Data
[ ] Other Well Type:
[ ] QA Sample Type:

Sample ID No.: DRMO- GMW 9S - GW-12 ~~GW-11~~
Sample Location: GMW9S
Sampled By: FRED WRAMER
C.O.C. No.: 41502
Type of Sample:
[X] Low Concentration
[ ] High Concentration

SAMPLING DATA:

	Color Visual	pH Standard	S.C. µS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	Eh ORP mV	Salinity ppt
Date: 6-23-01								
Time: 1845								
Method: Low Flow/Bladder Pump	CLEAR	5.13	30	14.58	0.50	2.65	85.1	—

PURGE DATA:

Date: 6-23-01
Method: Low Flow/Bladder Pump
Monitor Reading (ppm): NA
Well Casing Diameter & Material
Type: 2" PVC
Total Well Depth (TD):
Static Water Level (WL): 4.06
One Casing Volume(gal): NA
Start Purge (hrs): 1757
End Purge (hrs): 1845
Total Purge Time (min): 48
Total Vol. Purged ~~(gal)~~ liter: 12.5 L

See Attached Low Flow Purge Data Sheet for Purge Data

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOLATILES (LOW-LEVEL)	HCL / 4° C	3 x 40 ml Vial	✓
TCL SEMIVOLATILES	4° C	1 x Qt. Amber Glass	✓
TCL PEST/PCBs	4° C	2 x Qt. Amber Glass	✓
TCL PAH	4° C	1 x Qt. Amber Glass	✓
TAL METALS (TOTAL)	HNO_3 / 4° C	0.5 L PE	✓
" " (DIS)		0.5 L	✓

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): [signature]

Tetra Tech NUS, Inc. **LOW FLOW PURGE DATA SHEET** **Well No.:** GMW95

PROJECT: DRMO QTR SPL. (12RD)
PROJECT NUMBER: 7091 CTO 257
SITE: DRMO NSB NLON

DATE: 6-23-01
WEATHER: OVER CAST 70'S
PERSONNEL: FRED WURAMSER

Well Screen Depth: ____ / ____ ft.
Initial Water Level: ~~4.06~~ 4.06 @ 1757 hrs.
Pump Type/Material: BLADDER
Pump Intake Depth:
Tide Cycle: ☐ High @ ____ ☒ Low @ NA ☒ Not Affected
Total Purge Volume= ____ (gal / L) **Total Purge Time=** ____ (min)

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond µS/cm	DO mg/L	Turbidity NTU	Salinity ppt	ORP mV	Comments
1757	4.06		250 mL/min	40 40 15psi								START
1800	4.06	750	↓	↓	15.24	5.21	32	2.85	5.4	—	67.6	
1805	4.09	1950			15.08	5.13	30	2.43	3.7	—	69.5	
1810	4.10	2200			15.01	5.11	30	2.56	1.3	-	71.1	
1815	4.09	3450	250	40 40 15psi	14.91	5.10	30	2.50	0.55	—	72.8	
1820	4.09	4700		↓	14.82	5.11	30	2.54	0.60	-	75.9	
1825	4.09	5950			14.68	5.12	31	2.64	0.50	-	75.7	
1830	4.09	7200		40 40	14.68	5.11	30	2.62	0.50		80.8	~~INC. FLOW RATE~~ FLOW
1835	4.09	8450			14.64	5.11	30	2.65	0.50		82.5	
1840	4.09	9700			14.61	5.12	30	2.68	0.50		83.1	
1845	4.09	1250			14.58	5.13	30	2.65	0.50		85.1	
								(PURGE COMPLETED)				

Water Quality Meter (S/N): 01D391
Control Box Type (S/N): MP10-1012
Turbidimeter (S/N): 1735-1600

Notes:

Tetra Tech NUS, Inc

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSB-NLON / DRMO
Project No.:

[ ] Domestic Well Data
[x] Monitoring Well Data
[ ] Other Well Type:
[ ] QA Sample Type:

Sample ID No.: DRMO- 6MW10S GW-12
Sample Location: 6MW10S
Sampled By: Wellman
C.O.C. No.: 41502
Type of Sample:
[X] Low Concentration
[ ] High Concentration

SAMPLING DATA:

	Color	pH	S.C.	Temp.	Turbidity	DO	~~Eh~~ ORP	~~Salinity~~
Date: 6/24/01	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	mV	ppt
Time: 1920								
Method: Low Flow/Bladder Pump	clear	7.86	5561	17.04	1.0	0.58	-258.6	

PURGE DATA:

Date: 6/24/01
Method: Low Flow/Bladder Pump
Monitor Reading (ppm):
Well Casing Diameter & Material Type: 2" PVC
Total Well Depth (TD): 13.5
Static Water Level (WL): 4.24
One Casing Volume(gal): 6 L
Start Purge (hrs): 1845
End Purge (hrs): 1920
Total Purge Time (min): 35
Total Vol. Purged (gal): 12.3

See Attached Low Flow Purge Data Sheet for Purge Data

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOLATILES (LOW-LEVEL)	HCL / 4° C	3 - 40 ml Vial	✓
TCL SEMIVOLATILES	4° C	1 - Qt. Amber Glass	✓
TCL PEST/PCBs	4° C	1 - Qt. Amber Glass	✓
TCL PAH	4° C	1 - Qt. Amber Glass	✓
TAL METALS (TOTAL)	HNO_3 / 4° C	1-500mL PE	✓
TAL Dissolved metals	HNO_3/4°C	1-500mL PE	✓

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s): Jennifer C. Wellman

Tetra Tech NUS, Inc. **LOW FLOW PURGE DATA SHEET** **Well No.:** GMW105

PROJECT: NSB NLON
PROJECT NUMBER: CTO 257
SITE: DEMO

DATE: 6/29/01
WEATHER: overcast 70's
PERSONNEL: Wellman, Ramser

Well Screen Depth: 3.5 / 13.5 ft.
Initial Water Level: 4.24 @ 1840 hrs.

Pump Type/Material: bladder
Pump Intake Depth:

Tide Cycle: ☐ High @ ☒ Low @ 1916 ☐ Not Affected

Total Purge Volume= 12.3 (gal / L) **Total Purge Time=** 35 (min)

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	~~Salinity~~ ppt	~~Eh~~ ORP mV	Comments
1845	4.24	—	350	30P/30D	17.47	7.96	6203	2.51	8.0		-240.8	
1850	4.25	1750	350	15PSI	16.66	7.99	5835	1.29	6.2		-252.4	
1855	4.25	3500	350		16.93	7.96	5717	0.99	3.5		-254.0	
1900	4.25	5250	350		17.06	7.93	5609	0.74	4.1		-255.1	
1905	4.26	7000	350		17.07	7.90	5575	0.65	3.0		-255.8	
1910	4.27	8750	350		17.02	7.88	5579	0.63	1.7		-256.7	
1915	4.28	10500	350		16.98	7.87	5583	0.62	1.5		-257.9	
1920	4.30	12250	350		17.04	7.86	5561	0.58	1.0		-258.6	Sample

Water Quality Meter (S/N): 99B1377AA
Control Box Type (S/N): 01B0 583 AB
Turbidimeter (S/N): 1728-1600

Notes:

Tetra Tech NUS, Inc

GROUNDWATER SAMPLE LOG SHEET

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Project Site Name: NSB-NLON / DRMO
Project No.: 7091

[ ] Domestic Well Data
[x] Monitoring Well Data
[ ] Other Well Type:
[ ] QA Sample Type:

Sample ID No.: DRMO- GMW 10D ~~GW-11~~ GW-12
Sample Location: GMW10D
Sampled By: PWR
C.O.C. No.: 41502
Type of Sample:
[X] Low Concentration
[ ] High Concentration

SAMPLING DATA:

	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	~~Eh~~ ORP mV	Salinity ppt
Date: 6-24-01								
Time: 1927								
Method: Low Flow/Bladder Pump	CLEAR	7.26	13302	14.45	3.0	0.49	-127.2	—

PURGE DATA:

Date: 6-24-01
Method: Low Flow/Bladder Pump
Monitor Reading (ppm):
Well Casing Diameter & Material
Type: 2" PVC
Total Well Depth (TD): 54.10'
Static Water Level (WL): 2.35
One Casing Volume(gal): NA
Start Purge (hrs): 1852
End Purge (hrs): 1927
Total Purge Time (min): 35
Total Vol. Purged (gal): liter 12.25

See Attached Low Flow Purge Data Sheet for Purge Data

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOLATILES (LOW-LEVEL)	HCL / 4° C	3x 40 ml Vial	✓
TCL SEMIVOLATILES	4° C	1x Qt. Amber Glass	✓
TCL PEST/PCBs	4° C	2x Qt. Amber Glass	✓
TCL PAH	4° C	1x Qt. Amber Glass	✓
TAL METALS (TOTAL)	HNO_3 / 4° C	0.5 L PE	✓
TAL METAL (DLS)	HNO_3/4°C	0.5 L PE	✓

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): SLRanser

Tetra Tech NUS, Inc. **LOW FLOW PURGE DATA SHEET** **Well No.:** GMW10D

PROJECT: NSB NLON QTR SAMPLING
PROJECT NUMBER: 7091-1210, CTO 257
SITE: ORMO
DATE: 6-24-01
WEATHER: OVERCAST
PERSONNEL: FRED W RAMSER

Well Screen Depth: 44.10 / 54.10 ft.
Initial Water Level: 2.35 @ 1834 hrs.
Pump Type/Material: BLADDER/TEFLON
Pump Intake Depth: 49'
Tide Cycle: ☐ High @ ☒ Low @ 1916HR ☐ Not Affected
Total Purge Volume= 12.25 (gal / L) **Total Purge Time=** 35 (min)

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond µS/cm	DO mg/L	Turbidity NTU	Salinity ppt	ORP ~~Eh~~ mV	Comments
1852			350	30D 30R PSI	15.64	7.24	13719	1.92	7.2	—	-20.3	
1857	2.35	1750	350		14.72	7.24	12795	0.97	6.9	—	-71.9	
1902	2.35	3500	350		14.59	7.24	12822	1.28	6.5	—	-97.6	
1907	2.35		350		14.52	7.24	12943	0.47	4.5		-109.8	
1912	2.35	7000	↓		14.50	7.25	13052	0.33	3.9		-115.7	
1917	2.35	8750			14.49	7.26	13241	0.64	2.9		-122.6	
1922	2.35	10500			14.49	7.26	13220	0.53	3.0		-124.6	
1927	2.35	12250	350		14.45	7.26	13302	0.49	3.0		-127.2	
							(PURGE COMPLETED)					

Water Quality Meter (S/N): YSI 01D1391
Control Box Type (S/N): MP10-1012
Turbidimeter (S/N): 1735-1600

Notes: SAMPLING HOSE FELL INTO WELL W/STAINLESS STEEL HOSE CLAMP

Tetra Tech NUS, Inc

GROUNDWATER SAMPLE LOG SHEET

Page___ of ___

Project Site Name: NSB-NLON / DRMO
Project No.:

[ ] Domestic Well Data
[x] Monitoring Well Data
[ ] Other Well Type:
[ ] QA Sample Type:

Sample ID No.: DRMO- 6MW115- ~~GW-11~~ GW-12
Sample Location: 6MW115
Sampled By: FWR
C.O.C. No.: 41502
Type of Sample:
[X] Low Concentration
[ ] High Concentration

SAMPLING DATA:

	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	~~Eh~~ ORP mV	Salinity ppt
Date: 6-22-01								
Time: 1640								
Method: Low Flow/Bladder Pump	CLEAR	7.34	4252	17.24	1.0	1.55	-286.2	—

PURGE DATA:

Date: 6-21-01
Method: Low Flow/Bladder Pump
Monitor Reading (ppm): —
Well Casing Diameter & Material Type: 2" PVC
Total Well Depth (TD): 13.50
Static Water Level (WL): 3.15
One ~~Casing~~ Volume(gal):
Start Purge (hrs): 1545
End Purge (hrs): 1640
Total Purge Time (min): 55
Total Vol. Purged (~~gal~~ liters): 2.4 l

See Attached Low Flow Purge Data Sheet for Purge Data

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOLATILES (LOW-LEVEL)	HCL / 4° C	3 x 40 ml Vial	✓
TCL SEMIVOLATILES	4° C	1 Qt. Amber Glass	✓
TCL PEST/PCBs	4° C	2 Qt. Amber Glass	✓
TCL PAH	4° C	1 Qt. Amber Glass	✓
TAL METALS (TOTAL)	HNO_3 / 4° C	~~1LPE~~ 500mL PE	✓
TAL METALS (DLS)	HNO_3	~~1L~~ 500mL PE	✓

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): Fred Ullrauser

Tetra Tech NUS, Inc. **LOW FLOW PURGE DATA SHEET** **Well No.:** GMW 115-GW-12

PROJECT: DRMO 12 RD SPL
PROJECT NUMBER:
SITE: DRMO

DATE: 6-22-01
WEATHER: CLOUDY
PERSONNEL: FRED W RAMSER

Well Screen Depth: 350 / 1350 ft.
Initial Water Level: 3.15 @ 1546 hrs.

Pump Type/Material: BLADDER PUMP
Pump Intake Depth: ~1600

Tide Cycle: ☐ High @ ☒ Low @ 1659 ☐ Not Affected

Total Purge Volume= _____ (gal / L) **Total Purge Time=** 55 (min)

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp ºC	pH	Sp Cond µS/cm	DO mg/L	Turbidity NTU	Salinity ppt	ORP Eh mV	Comments
1545	3.20		267	400 40 15 PSI	17.36	7.27	4572	2.58	15.0	–	-202.5	
1550	3.50		↓		17.29	7.27	4643	1.66	9.5	–	-213.9	
1555	3.57		↓		17.30	7.30	4625	0.95	7.3	–	-222.1	
1600	3.48		↓		17.34	7.33	4012	0.83	2.2	–	-235.0	
1605	3.55		↓		17.20	7.35	4080	0.55	1.6	–	-240.0	
1610	3.55		↓		17.33	7.36	4140	0.61	0.00	–	-202.7	
1615		BATTERY WENT DEAD STOP PURGE FOR ~10 min										
1620	3.70		267		18.19	7.36	4259	0.72	0.00	–	-275.0	
1630	3.65		267		17.74	7.35	4273	1.61	9.5	–	-277.9	
1635	3.55		267		17.29	7.33	4242	1.48	1.4	–	-282.9	
1640	3.60		267		17.24	7.34	4252	1.55	1.0	–	-286.2	
								(PURGE COMPLETED)				

Water Quality Meter (S/N): YSI 01D1391 AA W/6820 SONDE
Control Box Type (S/N):
Turbidimeter (S/N): LA MOTTE 1735-1600

Notes:

Page

Tetra Tech NUS, Inc

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: NSB-NLON / DRMO
Project No.:

[ ] Domestic Well Data
[x] Monitoring Well Data
[ ] Other Well Type:
[ ] QA Sample Type:

Sample ID No.: DRMO- 6MW11D GW-12
Sample Location: 6MW11D
Sampled By: Wellman
C.O.C. No.: 41502
Type of Sample:
[X] Low Concentration
[ ] High Concentration

SAMPLING DATA:

	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	~~Eh~~ ORP mV	Salinity ppt
Date: 6/22/01								
Time: 1630								
Method: Low Flow/Bladder Pump	clear	6.96	238.06	15.35	4.0	0.11	-140.7	

PURGE DATA:

Date: 6/22/01
Method: Low Flow/Bladder Pump
Monitor Reading (ppm): —
Well Casing Diameter & Material Type: 2" PVC
Total Well Depth (TD): 85"
Static Water Level (WL): 1.71
One Casing Volume (~~gal~~ L): 6.6 L
Start Purge (hrs): 1545
End Purge (hrs): 1630
Total Purge Time (min): 45
Total Vol. Purged (~~gal~~ L): 13.5

See Attached Low Flow Purge Data Sheet for Purge Data

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
TCL VOLATILES (LOW-LEVEL)	HCL / 4° C	40 ml Vial	
TCL SEMIVOLATILES	4° C	1 - 1 L Qt. Amber Glass	✓
TCL PEST/PCBs	4° C	2 - 1 L Qt. Amber Glass	✓
TCL PAH	4° C	1 - 1 L Qt. Amber Glass	✓
TAL METALS (TOTAL)	HNO_3 / 4° C	1-500 mL PE	✓
TAL Metals (filtered)		1-500 mL PE	✓

OBSERVATIONS / NOTES:

Questionable sample integrety. - Riser needs to be cut down 3 inches, and replace head.

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	

Signature(s): Jennifer C. Wellman

Tetra Tech NUS, Inc. **LOW FLOW PURGE DATA SHEET** **Well No.:** ~~DER~~ 6MW11D

PROJECT: DRMO . 12 Quarterly gr. water sampling round **DATE:** 6/22/01
PROJECT NUMBER: CTO 257 **WEATHER:** Sunny
SITE: DRMO **PERSONNEL:** Wellman / Ramser

Well Screen Depth: 75 / 85 ft. **Pump Type/Material:** bladder / teflon **Tide Cycle:** ☐ High @
Initial Water Level: 1.71 @ 1519 hrs. **Pump Intake Depth:** 82" ☒ Low @ 459 (1659)
Total Purge Volume= 13.5 (gal / L) **Total Purge Time=** 45 (min) ☐ Not Affected

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	Salinity ppt	ORP Eh mV	Comments
1545	1.71	~~300~~	~~150~~ 300	15R/15D 32PSI	19.45	7.21	18301	0.70	2.3		16.5	Start purge
1550	1.76	1500	300		16.05	7.15	24077	0.22	27		-124.6	
1555	1.80	3000	300		15.88	7.09	24312	0.16	19		-135.7	
1600	1.81	4500	300		15.74	7.04	24252	0.16	18		-140.4	
1605	1.83	6000	300		15.67	7.02	24031	0.15	8.6		-141.5	
1610	1.85	7500	300		15.51	7.01	23894	0.14	8.7		-141.9	
1615	1.86	9000	300		15.53	6.99	23856	0.18	5.9		-141.0	
1620	1.88	10500	300		15.44	6.97	23822	0.13	6.5		-140.5	
1625	1.88	12000	300		15.36	6.96	23816	0.12	4.8		-140.5	
1630	1.89	13500	300		15.35	6.96	23806	0.11	4.0		-140.7	

Water Quality Meter (S/N): ~~[illegible]~~ 99B1377AM **Notes:**
Control Box Type (S/N): 01B0583-AB
Turbidimeter (S/N): 1728-1600

APPENDIX B

DATA VALIDATION LETTERS AND LABORATORY DATA SHEETS

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO: **C. RICH** **DATE: OCTOBER 29, 2001**

FROM: **LINDA KARSONOVICH** **COPIES: DV FILE**
REV. 1

SUBJECT: **ORGANIC DATA VALIDATION: VOA/SVOA/PEST/PCB/PAH**
CTO 257, NSB NEW LONDON
SDG 4939

SAMPLES: 3/Aqueous/

DRMO-6MW2D-GW12 DRMO-6MW2S-GW12 DRMO-GWTB-062101

Overview

The sample set for the CTO 257, NSB New London, SDG 4939 consists of two (2) aqueous environmental samples and one (1) aqueous field quality control sample. All samples were analyzed for volatile organic compounds (VOCs). All of the environmental samples, except DRMO-GWTB-062101, were also analyzed for semivolatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs), and polynuclear aromatic hydrocarbons (PAHs). No field duplicate pairs were included in the SDG.

The samples were collected by TetraTech NUS on June 21, 2001 and were analyzed by Chemtech. Analyses were conducted using the Contract Laboratory Program (CLP) Statement of Work (SOW) OLC02.1, and SW-846 Method 8310 analytical and reporting protocols.

The data were evaluated based on the following parameters:

* • Data Completeness
* • Holding Times
* • GC/MS Tuning
  • Calibration
* • Blanks
* • Surrogate Spike Recoveries
* • Blank Spike Recoveries
* • Matrix Spike/Matrix Spike Duplicate Recoveries
* • Internal Standards Performance
* • Instrument Performance
* • Compound Identification
* • Compound Quantitation
* • Tentatively Identified Compounds (TICs)

The asterisk (*) indicates that all quality control criteria were met for this parameter. Qualified (if applicable) analytical results are summarized in Appendix A. Results as reported by the laboratory are presented in Appendix B. Appendix C contains Region I Worksheets, and Appendix D contains the documentation to support the findings as discussed in this data validation report. The attached Table I summarizes the validation qualifications which were based on the following information:

CALIBRATIONS

The following tables summarize calibration non-compliances and corresponding actions:

Compound	IC 06/29/01	CC 06/30/01
Acetone	RD	R
2-Butanone	R	RX
2-Hexanone	R	R
1,2-Dibromo-3-chloropropane	R	RX
Chloroethane		X
1,1-Dichlorothene		X
1,2-Dichloroethane		X
Chloroform		X
1,1,1-Trichloroethane		X
Carbon tetrachloride		X
1,2-Dichloropropane		X
cis-1,3-Dichloropropene		X

Associated Samples: DRMO-6MW2D-GW12
DRMO-6MW2S-GW12
DROM-GWTB-062101

Compound	IC 06/24/01	CC 06/30/01
2,4-Dinitrophenol	D	
2,2'oxybis(1-chloropropane)		X
N-Nitroso-di-n-propylamine		X
2-Nitroanline		X

Associated Samples: DRMO-6MW2D-GW12
DRMO-6MW2S-GW12

Calibration Actions:

D - Percent Relative Standard Deviation > 30%; Estimate (UJ) nondetected results.
X - Percent Difference > 25%; Estimate (J) positive and (UJ) nondetected results.
R - Relative Response Factors < 0.05; Reject (UR) nondetected results and estimate, (J) positive.

ADDITIONAL COMMENTS

The laboratory did not report to the requested reporting limits in the Statement of Work for the semivolatile, PCB, and PAH fractions. The laboratory was contacted and resubmitted the Form Is for these results.

Positive results reported at concentrations below the CRQL were qualified as estimated, (J).

The following compounds were reported in both the volatile and semivolatile fractions. The volatile fraction had the lower reporting limit. No qualifiers were assigned on this basis.

1,2-Dichlorobenzene 1,3-Dchlorobenzene 1,4-Dichlorobenzene 1,2,4-Trichlorobenzene

The text of this report has been formulated to address only those problem areas affecting data quality.

OVERALL ASSESSMENT

Laboratory Performance: The laboratory was unable to obtain acceptable percent differences between initial and continuing calibration response factors for several volatile and semivolatile compounds. The laboratory was unable to obtain acceptable relative response factors for several volatile compounds.

Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to the Region I EPA "Volatile and Semivolatile Data Validation Functional Guidelines - Part II" (12/96).

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

TetraTech NUS

Linda Karsonovich
Chemist/Data Validator

TetraTech NUS

Joseph A. Samchuck
Data Validation Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Regional Worksheets
4. Appendix D - Support Documentation

NSB NEW LONDON

SDG 4939

TABLE I. Summary of Tentatively Identified Volatile Compounds

TIC	DRMO-6MW2D-GW12
Unknown(s)	X

NSB NEW LONDON

SDG 4939

TABLE II. Summary of Tentatively Identified Semivolatile Compounds

TIC	None Reported

APPENDIX A

QUALIFIED LABORATORY RESULTS

CTO2 NEW LONDON
WATER DATA
CHEMTECH CONSULTING GROUP
SDG: 4939

SAMPLE NUMBER:	DRMO-6MW2D-GW12			DRMO-6MW2S-GW12			DRMO-GWTB-062101			/ /		
SAMPLE DATE:	06/21/01			06/21/01			06/21/01					
LABORATORY ID:	N4939-02			N4939-01			N4939-03					
QC_TYPE:	NORMAL			NORMAL			NORMAL					
% SOLIDS:	0.0 %			0.0 %			0.0 %			100.0 %		
UNITS:	UG/L			UG/L			UG/L					
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
VOLATILES												
1,1,1-TRICHLOROETHANE	1	UJ	C	1	UJ	C	1	UJ	C			
1,1,2,2-TETRACHLOROETHANE	1	U		1	U		1	U				
1,1,2-TRICHLOROETHANE	1	U		1	U		1	U				
1,1-DICHLOROETHANE	1	UJ	C	1	UJ	C	1	UJ	C			
1,1-DICHLOROETHENE	1	UJ	C	1	UJ	C	1	UJ	C			
1,2,4-TRICHLOROBENZENE	1	U		1	U		1	U				
1,2-DIBROMO-3-CHLOROPROPANE	1	UR	C	1	UR	C	1	UR	C			
1,2-DIBROMOETHANE	1	U		1	U		1	U				
1,2-DICHLOROBENZENE	1	U		1	U		1	U				
1,2-DICHLOROETHANE	1	U		1	U		1	U				
1,2-DICHLOROPROPANE	1	UJ	C	1	UJ	C	1	UJ	C			
1,3-DICHLOROBENZENE	1	U		1	U		1	U				
1,4-DICHLOROBENZENE	1	U		1	U		1	U				
2-BUTANONE	5	UR	C	5	UR	C	5	UR	C			
2-HEXANONE	5	UR	C	5	UR	C	5	UR	C			
4-METHYL-2-PENTANONE	5	U		5	U		5	U				
ACETONE	5	UR	C	5	UR	C	5	UR	C			
BENZENE	1	U		1	U		1	U				
BROMOCHLOROMETHANE	1	U		1	U		1	U				
BROMODICHLOROMETHANE	1	U		1	U		1	U				
BROMOFORM	1	U		1	U		1	U				
BROMOMETHANE	1	U		1	U		1	U				
CARBON DISULFIDE	0.9	J	P	1	U		1	U				
CARBON TETRACHLORIDE	1	UJ	C	1	UJ	C	1	UJ	C			
CHLOROBENZENE	1	U		1	U		1	U				
CHLORODIBROMOMETHANE	1	U		1	U		1	U				
CHLOROETHANE	1	UJ	C	1	UJ	C	1	UJ	C			
CHLOROFORM	1	UJ	C	1	UJ	C	1	UJ	C			
CHLOROMETHANE	1	U		1	U		1	U				
CIS-1,2-DICHLOROETHENE	1	U		1	U		1	U				
CIS-1,3-DICHLOROPROPENE	1	UJ	C	1	UJ	C	1	UJ	C			
ETHYLBENZENE	1	U		1	U		1	U				

CTO257-NEW LONDON
WATER DATA
CHEMTECH CONSULTING GROUP
SDG: 4939

SAMPLE NUMBER:	DRMO-6MW2D-GW12	DRMO-6MW2S-GW12	DRMO-GWTB-062101	
SAMPLE DATE:	06/21/01	06/21/01	06/21/01	/ /
LABORATORY ID:	N4939-02	N4939-01	N4939-03	
QC_TYPE:	NORMAL	NORMAL	NORMAL	
% SOLIDS:	0.0 %	0.0 %	0.0 %	100.0 %
UNITS:	UG/L	UG/L	UG/L	
FIELD DUPLICATE OF:				

	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
VOLATILES												
METHYLENE CHLORIDE	2	U		0.7	J	P	2	U				
O-XYLENE	1	U		1	U		1	U				
STYRENE	1	U		1	U		1	U				
TETRACHLOROETHENE	1	U		1	U		1	U				
TOLUENE	1	U		1	U		1	U				
TOTAL XYLENES	1	U		1	U		1	U				
TRANS-1,2-DICHLOROETHENE	1	U		1	U		1	U				
TRANS-1,3-DICHLOROPROPENE	1	U		1	U		1	U				
TRICHLOROETHENE	1	U		1	U		1	U				
VINYL CHLORIDE	1	U		1	U		1	U				

CTO: NEW LONDON
WATER DATA
CHEMTECH CONSULTING GROUP
SDG: 4939

SAMPLE NUMBER:	DRMO-6MW2D-GW-12			DRMO-6MW2S-GW-12								
SAMPLE DATE:	06/21/01			06/21/01			/ /			/ /		
LABORATORY ID:	N4939-02			N4939-01								
QC_TYPE:	NORMAL			NORMAL								
% SOLIDS:	0.0 %			0.0 %			100.0 %			100.0 %		
UNITS:	UG/L			UG/L								
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
SEMIVOLATILES												
1,2,4-TRICHLOROBENZENE	5	U		5	U							
1,2-DICHLOROBENZENE	5	U		5	U							
1,3-DICHLOROBENZENE	5	U		5	U							
1,4-DICHLOROBENZENE	5	U		5	U							
2,2'-OXYBIS(1-CHLOROPROPANE)	5	UJ	C	5	UJ	C						
2,4,5-TRICHLOROPHENOL	5	U		5	U							
2,4,6-TRICHLOROPHENOL	20	U		20	U							
2,4-DICHLOROPHENOL	5	U		5	U							
2,4-DIMETHYLPHENOL	5	U		5	U							
2,4-DINITROPHENOL	20	UJ	C	20	UJ	C						
2,4-DINITROTOLUENE	5	U		5	U							
2,6-DINITROTOLUENE	5	U		5	U							
2-CHLORONAPHTHALENE	5	U		5	U							
2-CHLOROPHENOL	5	U		5	U							
2-METHYLNAPHTHALENE	5	U		5	U							
2-METHYLPHENOL	5	U		5	U							
2-NITROANILINE	20	UJ	C	20	UJ	C						
2-NITROPHENOL	5	U		5	U							
3&4-METHYLPHENOL	5	U		5	U							
3,3'-DICHLOROBENZIDINE	5	U		5	U							
3-NITROANILINE	20	U		20	U							
4,6-DINITRO-2-METHYLPHENOL	20	U		20	U							
4-BROMOPHENYL PHENYL ETHER	5	U		5	U							
4-CHLORO-3-METHYLPHENOL	5	U		5	U							
4-CHLOROANILINE	5	U		5	U							
4-CHLOROPHENYL PHENYL ETHER	5	U		5	U							
4-NITROANILINE	20	U		20	U							
4-NITROPHENOL	20	U		20	U							
BENZOIC ACID	5	U		5	U							
BIS(2-CHLOROETHOXY)METHANE	5	U		5	U							
BIS(2-CHLOROETHYL)ETHER	5	U		5	U							
BIS(2-ETHYLHEXYL)PHTHALATE	40			1.7	J	P						

CTO257-NEW LONDON
WATER DATA
CHEMTECH CONSULTING GROUP
SDG: 4939

SAMPLE NUMBER:	DRMO-6MW2D-GW-12			DRMO-6MW2S-GW-12								
SAMPLE DATE:	06/21/01			06/21/01			/ /			/ /		
LABORATORY ID:	N4939-02			N4939-01								
QC_TYPE:	NORMAL			NORMAL								
% SOLIDS:	0.0 %			0.0 %			100.0 %			100.0 %		
UNITS:	UG/L			UG/L								
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
SEMIVOLATILES												
BUTYL BENZYL PHTHALATE	5	U		5	U							
CARBAZOLE	5	U		5	U							
DI-N-BUTYL PHTHALATE	1.8	J	P	1.4	J	P						
DI-N-OCTYL PHTHALATE	5	U		5	U							
DIBENZOFURAN	5	U		5	U							
DIETHYL PHTHALATE	5	U		5	U							
DIMETHYL PHTHALATE	5	U		5	U							
HEXACHLOROBENZENE	5	U		5	U							
HEXACHLOROBUTADIENE	5	U		5	U							
HEXACHLOROCYCLOPENTADIENE	5	U		5	U							
HEXACHLOROETHANE	5	U		5	U							
ISOPHORONE	5	U		5	U							
N-NITROSO-DI-N-PROPYLAMINE	5	UJ	C	5	UJ	C						
N-NITROSODIPHENYLAMINE	5	U		5	U							
NITROBENZENE	5	U		5	U							
PENTACHLOROPHENOL	20	U		20	U							
PHENOL	5	U		5	U							

CTO257-NSB NEW LONDON
WATER DATA
CHEMTECH CONSULTING GROUP
SDG: 4939

SAMPLE NUMBER:	DRMO-6MW2D-GW-12	DRMO-6MW2S-GW-12		
SAMPLE DATE:	06/21/01	06/21/01	/ /	/ /
LABORATORY ID:	N4939-02	N4939-01		
QC_TYPE:	NORMAL	NORMAL		
% SOLIDS:	0.0 %	0.0 %	100.0 %	100.0 %
UNITS:	UG/L	UG/L		
FIELD DUPLICATE OF:				

	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
PESTICIDES/PCBs												
4,4'-DDD	0.02	U		0.02	U							
4,4'-DDE	0.02	U		0.02	U							
4,4'-DDT	0.02	U		0.02	U							
ALDRIN	0.01	U		0.01	U							
ALPHA-BHC	0.01	U		0.01	U							
ALPHA-CHLORDANE	0.01	U		0.01	U							
AROCLOR-1016	0.2	U		0.2	U							
AROCLOR-1221	0.4	U		0.4	U							
AROCLOR-1232	0.2	U		0.2	U							
AROCLOR-1242	0.2	U		0.2	U							
AROCLOR-1248	0.2	U		0.2	U							
AROCLOR-1254	0.2	U		0.2	U							
AROCLOR-1260	0.2	U		0.2	U							
BETA-BHC	0.01	U		0.01	U							
DELTA-BHC	0.01	U		0.01	U							
DIELDRIN	0.02	U		0.02	U							
ENDOSULFAN I	0.01	U		0.01	U							
ENDOSULFAN II	0.02	U		0.02	U							
ENDOSULFAN SULFATE	0.02	U		0.02	U							
ENDRIN	0.02	U		0.02	U							
ENDRIN ALDEHYDE	0.02	U		0.02	U							
ENDRIN KETONE	0.02	U		0.02	U							
GAMMA-BHC (LINDANE)	0.01	U		0.01	U							
GAMMA-CHLORDANE	0.01	U		0.01	U							
HEPTACHLOR	0.01	U		0.01	U							
HEPTACHLOR EPOXIDE	0.01	U		0.01	U							
METHOXYCHLOR	0.1	U		0.1	U							
TOXAPHENE	1	U		1	U							

CTO257-NEW LONDON
WATER DATA
CHEMTECH CONSULTING GROUP
SDG: 4939

SAMPLE NUMBER:	DRMO-6MW2D-GW-12	DRMO-6MW2S-GW-12		
SAMPLE DATE:	06/21/01	06/21/01	/ /	/ /
LABORATORY ID:	N4939-02	N4939-01		
QC_TYPE:	NORMAL	NORMAL		
% SOLIDS:	0.0 %	0.0 %	100.0 %	100.0 %
UNITS:	UG/L	UG/L		
FIELD DUPLICATE OF:				

	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
POLYNUCLEAR AROMATIC HYDROCARBONS												
ACENAPHTHENE	0.016	U		0.016	U							
ACENAPHTHYLENE	0.013	U		0.013	U							
ANTHRACENE	0.28			0.03	U							
BENZO(A)ANTHRACENE	0.012	U		0.012	U							
BENZO(A)PYRENE	0.021	U		0.021	U							
BENZO(B)FLUORANTHENE	0.02	U		0.02	U							
BENZO(G,H,I)PERYLENE	0.009	U		0.009	U							
BENZO(K)FLUORANTHENE	0.02	U		0.02	U							
CHRYSENE	0.012	U		0.012	U							
DIBENZO(A,H)ANTHRACENE	0.014	U		0.014	U							
FLUORANTHENE	0.009	U		0.009	U							
FLUORENE	0.007	U		0.007	U							
INDENO(1,2,3-CD)PYRENE	0.49			0.49	U							
NAPHTHALENE	0.008	U		0.008	U							
PHENANTHRENE	0.004	U		0.004	U							
PYRENE	0.008	U		0.008	U							

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO:	**C. RICH**	**DATE:**	**AUGUST 7, 2001**
FROM:	**ERIN M. FAUST**	**COPIES:**	**DV FILE**

SUBJECT: **INORGANIC DATA VALIDATION – TAL METALS**
CTO-257 NSB NEW LONDON
SAMPLE DELIVERY GROUP (SDG) – 4939

SAMPLES: 2/Aqueous/

DRMO-6MW2D-GW-12 DRMO-6MW2S-GW-12

Overview

The sample set for CTO 257, NSB New London, SDG 4939, consists of two (2) aqueous environmental samples.

All samples were analyzed for target analyte list (TAL) metals. The samples were collected by TetraTech NUS on June 21, 2001 and analyzed by Chemtech Consulting Group under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. Metals analyses, with the exception of mercury, were conducted using Contract Laboratory Program (CLP) method ILM04.1. Mercury analyses were conducted using EPA method 245.1.

All metals analyses, with the exception of mercury, were conducted using Inductively Coupled Plasma (ICP) methodologies. Mercury analyses were conducted using Cold Vapor Atomic Absorption (CVAA).

These data were evaluated based on the following parameters:

* • Data Completeness
* • Holding Times
• Calibration Recoveries
• Laboratory Blank Analyses
* • Laboratory Control Sample Results
• ICP Interference Check Sample Results
* • Matrix Spike Results
* • Laboratory Duplicate Results
* • ICP Serial Dilution Results
• Sample Quantitation
* • Detection Limits

* - All quality control criteria were met for this parameter.

Calibration Recoveries

The contract required detection limit (CRDL) percent recoveries for beryllium and mercury were < 80% quality control limit. Nondetected results reported for beryllium and mercury were qualified as estimated, "UJ".

Laboratory Blank Analyses

The following contaminants were detected in the laboratory method blanks at the following maximum concentrations:

Analyte	Maximum Concentration	Action Level
Beryllium	0.20 µg/L	1.0 µg/L
Calcium	57.3 µg/L	286.5 µg/L
Iron	38.8 µg/L	194 µg/L

An action level of 5X the maximum concentration was used to evaluate the sample data for blank contamination. Sample aliquot and dilution factors were taken into consideration when evaluating for blank contamination. No validation action was necessary because all reported results were either nondetected or greater than the action level.

ICP Interference Check Sample Results

The interfering analyte magnesium was present in sample DRM0-6MW2D-GW-12 at a concentration that was comparable to the level of magnesium in the Interference Check Sample (ICS) solution. Several analytes namely antimony, beryllium, cobalt, manganese and potassium were present in the ICS solution at concentrations which exceeded 2X the Instrument Detection Limit (IDL). Interference affects exist for antimony, beryllium and cobalt in the affected sample. The nondetected results reported for antimony and beryllium were qualified as estimated, "UJ". The positive result reported for cobalt was qualified as estimated, "J".

Sample Quantitation

Due to uncertainty near the IDL, all positive results less than two times the IDL for cobalt, thallium and zinc were qualified as estimated, "J".

Notes

The chain-of-custody lists total and dissolved metals to be performed on the samples in this SDG. The laboratory was instructed by the project manager to analyze the total metals only.

Executive Summary

Laboratory Performance: Several analytes were present in the laboratory method blanks. Mercury and beryllium were qualified due to calibration noncompliance.

Other Factors Affecting Data Quality: Cobalt, thallium and zinc were qualified due to uncertainty near the IDL. The interfering analyte magnesium was present in sample DRMO-6MW2D-GW-12.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Review", February 1989 and the NFESC document entitled "Navy IRCDQM" (September 1999).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

Tetra Tech NUS
Erin M. Faust
Environmental Scientist

TetraTech NUS
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Regional Worksheets
4. Appendix D - Support Documentation

APPENDIX A
QUALIFIED ANALYTICAL RESULTS

Qualifier Codes:

A = Lab Blank Contamination
B = Field Blank Contamination
C = Calibration (i.e., % RSDs, %Ds, ICVs, CCVs, RPDs, RRFs, etc.) Noncompliance
D = MS/MSD Noncompliance
E = LCS/LCSD Noncompliance
F = Lab Duplicate Imprecision
G = Field Duplicate Imprecision
H = Holding Time Exceedance
I = ICP Serial Dilution Noncompliance
J = GFAA PDS - GFAA MSA's $r < 0.995$
K = ICP Interference - include ICSAB % R's
L = Instrument Calibration Range Exceedance
M = Sample Preservation
N = Internal Standard Noncompliance
N01 = Internal Standard Noncompliance Dioxins
N02 = Recovery Standard Noncompliance Dioxins
N03 = Clean-up Standard Noncompliance Dioxins
O = Poor Instrument Performance (i.e., base-time drifting)
P = Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
Q = Other problems (can encompass a number of issues)
R = Surrogates Recovery Noncompliance
S = Pesticide/PCB Resolution
T = % Breakdown Noncompliance for DDT and Endrin
U = Pest/PCD% between columns for positive results
V = Non-linear calibrations, tuning $r < 0.995$ (correlation coefficient)
W = EMPC result
X = Signal to noise response drop
Y = Percent solids <30%
Z = Uncertainty at 2 sigma deviation is less than sample activity

CTO25 EW LONDON
WATER A
CHEMTECH CONSULTING GROUP
SDG: 4939

SAMPLE NUMBER:	DRMO-6MW2D-GW-12			DRMO-6MW2S-GW-12								
SAMPLE DATE:	06/21/01			06/21/01			/ /			/ /		
LABORATORY ID:	N4939-02			N4939-01								
QC_TYPE:	NORMAL			NORMAL								
% SOLIDS:	0.0 %			0.0 %			100.0 %			100.0 %		
UNITS:	UG/L			UG/L								
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
INORGANICS												
ALUMINUM	45.7	U		45.7	U							
ANTIMONY	3.7	UJ	K	3.7	U							
ARSENIC	5.0	U		5.0	U							
BARIUM	111			19.3								
BERYLLIUM	0.10	UJ	CK	0.10	UJ	C						
CADMIUM	3.0	U		3.0	U							
CALCIUM	232000			80500								
CHROMIUM	5.0	U		5.0	U							
COBALT	2.0	J	KP	2.3	J	P						
COPPER	2.2	U		4.6								
IRON	2260			254								
LEAD	3.0	U		3.0	U							
MAGNESIUM	946000			234000								
MANGANESE	484			105								
MERCURY	0.20	UJ	C	0.20	UJ	C						
NICKEL	4.0	U		4.0	U							
POTASSIUM	531000			140000								
SELENIUM	5.0	U		5.0	U							
SILVER	5.0	U		5.0	U							
SODIUM	1470000			3370000								
THALLIUM	9.2	J	P	8.2	J	P						
VANADIUM	7.0			10.2								
ZINC	8.5	U		10.8	J	P						

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO: **C. RICH** **DATE: OCTOBER 29, 2001**

FROM: **LINDA KARSONOVICH** **COPIES: DV FILE**
REV. 1

SUBJECT: **ORGANIC DATA VALIDATION: VOA/SVOA/PEST/PCB/PAH**
CTO 257, NSB NEW LONDON
SDG 4962

SAMPLES: 10/Aqueous/

DRMO-6MW01S-GW-12	DRMO-6MW10D-GW-12	DRMO-6MW10S-GW-12
DRMO-6MW-11D-GW-12	DRMO-6MW11S-GW-12	DRMO-6MW6D-GW-12
DRMO-6MW6S-GW-12	DRMO-6MW9S-GW-12	DRMO-6TB-062201
GWFD06250101		

Overview

The sample set for the CTO 257, NSB New London, SDG 4962 consists of nine (9) aqueous environmental samples and one (1) aqueous field quality control sample. All samples were analyzed for volatile organic compounds (VOCs). All of the environmental samples, except DRMO-6WTB-062201, were also analyzed for semivolatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs), and polynuclear aromatic hydrocarbons (PAHs). One field duplicate pair was included in the SDG: DRMO-6MW6S-GW-12 and GWFD06250101.

The samples were collected by TetraTech NUS on June 22-25, 2001 and were analyzed by Chemtech. Analyses were conducted using the Contract Laboratory Program (CLP) Statement of Work (SOW) OLC02.1, and SW-846 Method 8310 analytical and reporting protocols.

The data were evaluated based on the following parameters:

* • Data Completeness
* • Holding Times
* • GC/MS Tuning
• Calibration
• Blanks
• Surrogate Spike Recoveries
* • Blank Spike Recoveries
• Matrix Spike/Matrix Spike Duplicate Recoveries
* • Internal Standards Performance
* • Instrument Performance
* • Compound Identification
• Compound Quantitation
* • Tentatively Identified Compounds (TICs)

The asterisk (*) indicates that all quality control criteria were met for this parameter. Qualified (if applicable) analytical results are summarized in Appendix A. Results as reported by the laboratory are presented in Appendix B. Appendix C contains Region I Worksheets, and Appendix D contains the documentation to support the findings as discussed in this data validation report. The attached Table I summarizes the validation qualifications which were based on the following information:

HOLD TIME

The semivolatile and PAH fractions of samples DRMO-6MW11D-GW-12 and DRMO-6MW11S-GW-12 were extracted eight days after sample collection. Positive and nondetected results were qualified as estimated, J and UJ, on this basis.

CALIBRATIONS

The following tables summarize calibration non-compliances and corresponding actions:

Compound	IC 07/05/01	CC 07/05/01
Methylene chloride	D	
Acetone	RD	RX
2-Butanone	R	R
4-Methyl-2-pentanone	D	
2-Hexanone	RD	R
1,2-Dibromo-3-chloropropane	RD	RX
1,2,4-Trichlorobenzene	D	

Associated Samples: All

Calibration Actions:

D - Percent Relative Standard Deviation > 30%; Estimate (UJ) nondetected results.
X - Percent Difference > 25%; Estimate (J) positive and (UJ) nondetected results.
R - Relative Response Factors < 0.05; Reject (UR) nondetected results and estimate, (J) positive.

BLANKS

The maximum concentration of contaminants found in associated laboratory method blank and/or field quality control blanks (designated *) are summarized below:

Compound	Maximum Concentration	Aqueous Blank Action Level
Methylene chloride*	1.3 µg/L	13 µg/L

Samples Affected: All

Blank Actions:

- Value < Contract Required Quantitation Limit (CRQL); report CRQL followed by a U.
- Value > CRQL and < action level; report value followed by a U.
- Value > CRQL and > action level; report value unqualified.

Dilution factors and sample aliquots used for analysis were taken into consideration prior to the application of all action levels. Positive results for methylene chloride were qualified in the manner indicated by the blank action table. Field quality control blanks were not qualified due to method blank contamination or contamination in other field quality control blanks.

SURROGATE RECOVERY

Recoveries of two or more base/neutral fraction surrogates fell below the lower quality control limit in all of the semivolatile samples. Positive and nondetected results were qualified as estimated, J and UJ, on this basis.

MATRIX SPIKE/MATRIX SPIKE DUPLICATE RESULTS

Relative percent differences (RPDs) exceeded the upper quality control limit for four compounds in the volatile fraction. No qualifiers were assigned on this basis since the recoveries for these compounds were within the acceptance ranges.

RPDs exceeded the upper quality control limit for all compounds in the semivolatile fraction. MS/MSD recoveries were low for six of nine compounds in the MSD. Nondetected results for 2-chlorophenol, 1,4-dichlorobenzene, n-Nitroso-di-n-propylamine, 1,2,4-trichlorobenzene, 4-chloro-3-methylphenol, and 2,4-dinitrotoluene were qualified as estimated, UJ, in the unspiked sample DRMO-6MW6D-GW-12.

RPDs exceeded the upper quality control limit for anthracene, chrysene, and indeno(1,2,3-c,d)pyrene. Recovery of anthracene fell below the lower quality control limit in the MSD. The positive result for anthracene was qualified as estimated, J, in the unspiked sample DRMO-6MW6D-GW-12.

FIELD DUPLICATE RESULTS

The RPD exceeded 30% for anthracene in the field duplicate pair. Both results were less than the reporting limit. No action was required on this basis.

COMPOUND QUANITTATION

Positive results in the semivolatile fraction were calculated using the initial calibration average relative response factor (RRF) rather than the daily calibration RRF as per CLP protocol. No qualifiers were assigned on this basis.

ADDITIONAL COMMENTS

The laboratory did not report to the requested reporting limits in the Statement of Work for the semivolatile, PCB, and PAH fractions. The laboratory was contacted and resubmitted the Form Is for these results.

Positive results reported at concentrations below the CRQL were qualified as estimated, (J).

The following compounds were reported in both the volatile and semivolatile fractions. The volatile fraction had the lower reporting limit. No qualifiers were assigned on this basis.

1,2-Dichlorobenzene 1,3-Dchlorobenzene 1,4-Dichlorobenzene 1,2,4-Trichlorobenzene

The text of this report has been formulated to address only those problem areas affecting data quality.

OVERALL ASSESSMENT

Laboratory Performance: The laboratory was unable to obtain acceptable percent differences between initial and continuing calibration response factors for several volatile and semivolatile compounds. The laboratory was unable to obtain acceptable relative response factors for several volatile compounds.

Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to the Region I EPA "Volatile and Semivolatile Data Validation Functional Guidelines - Part II" (12/96).

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

TetraTech NUS

Linda Karsonovich
Chemist/Data Validator

TetraTech NUS

Joseph A. Samchuck
Data Validation Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Regional Worksheets
4. Appendix D - Support Documentation

NSB NEW LONDON

SDG 4962

TABLE I. Summary of Tentatively Identified Volatile Compounds

TIC	6MW10D	6MW10S	6MW11D	6MW11S
Unknown(s)		X	X	X
ethane, 1,2-dichloro-1,1,2-trifluoro	X			

NSB NEW LONDON

SDG 4962

TABLE II. Summary of Tentatively Identified Semivolatile Compounds

TIC	None Reported

FIELD DUPLICATE RESULTS

Fraction	Compound	DRMO-6MW6S-GW-12	GWFD06250101	RPD
Volatile		ND	ND	
Semivolatile	Bis(2-ethylhexyl)phthalate	1.5	1.9	23.5%
	Di-n-butyl phthalate	10 U	1.2	NC
Pest/PCB		ND	ND	
PAH	Anthracene	0.01	0.07	150%
	Acenaphthylene	0.5 U	0.12	NC

ND – Not Detected
NC – Not Calculated, positive result less than reporting limit.

APPENDIX A

QUALIFIED LABORATORY RESULTS

CTO2 NEW LONDON
WATER DATA
CHEMTECH CONSULTING GROUP
SDG: 4962

SAMPLE NUMBER:	DRMO-6MW01S-GW-12			DRMO-6MW10D-GW-12			DRMO-6MW10S-GW-12			DRMO-6MW11D-GW-12		
SAMPLE DATE:	06/23/01			06/24/01			06/24/01			06/22/01		
LABORATORY ID:	N4962-04			N4962-07			N4962-06			N4962-01		
QC_TYPE:	NORMAL			NORMAL			NORMAL			NORMAL		
% SOLIDS:	0.0 %			0.0 %			0.0 %			0.0 %		
UNITS:	UG/L			UG/L			UG/L			UG/L		
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
VOLATILES												
1,1,1-TRICHLOROETHANE	1	U		1	U		1	U		1	U	
1,1,2,2-TETRACHLOROETHANE	1	U		1	U		1	U		1	U	
1,1,2-TRICHLOROETHANE	1	U		1	U		1	U		1	U	
1,1-DICHLOROETHANE	1	U		1	U		1	U		1	U	
1,1-DICHLOROETHENE	1	U		1	U		1	U		1	U	
1,2,4-TRICHLOROBENZENE	1	UJ	C	1	UJ	C	1	UJ	C	1	UJ	C
1,2-DIBROMO-3-CHLOROPROPANE	1	UR	C	1	UR	C	1	UR	C	1	UR	C
1,2-DIBROMOETHANE	1	U		1	U		1	U		1	U	
1,2-DICHLOROBENZENE	1	U		1	U		1	U		1	U	
1,2-DICHLOROETHANE	1	U		1	U		1	U		1	U	
1,2-DICHLOROPROPANE	1	U		1	U		1	U		1	U	
1,3-DICHLOROBENZENE	1	U		1	U		1	U		1	U	
1,4-DICHLOROBENZENE	1	U		1	U		1	U		1	U	
2-BUTANONE	5	UR	C	5	UR	C	5	UR	C	5	UR	C
2-HEXANONE	5	UR	C	5	UR	C	5	UR	C	5	UR	C
4-METHYL-2-PENTANONE	5	UJ	C	5	UJ	C	5	UJ	C	5	UJ	C
ACETONE	5	UR	C	5	UR	C	5	UR	C	5	UR	C
BENZENE	1	U		1	U		1	U		1	U	
BROMOCHLOROMETHANE	1	U		1	U		1	U		1	U	
BROMODICHLOROMETHANE	1	U		1	U		1	U		1	U	
BROMOFORM	1	U		1	U		1	U		1	U	
BROMOMETHANE	1	U		1	U		1	U		1	U	
CARBON DISULFIDE	1	U		1	U		1	U		1	U	
CARBON TETRACHLORIDE	1	U		1	U		1	U		1	U	
CHLOROBENZENE	1	U		1	U		1	U		1	U	
CHLORODIBROMOMETHANE	1	U		1	U		1	U		1	U	
CHLOROETHANE	1	U		1	U		1	U		1	U	
CHLOROFORM	1	U		1	U		1	U		1	U	
CHLOROMETHANE	1	U		1	U		1	U		1	U	
CIS-1,2-DICHLOROETHENE	1	U		12			1.1			2.6		
CIS-1,3-DICHLOROPROPENE	1	U		1	U		1	U		1	U	
ETHYLBENZENE	1	U		1	U		1	U		1	U	

CTO257-NEW LONDON
WATER DATA
CHEMTECH CONSULTING GROUP
SDG: 4962

SAMPLE NUMBER:	DRMO-6MW01S-GW-12			DRMO-6MW10D-GW-12			DRMO-6MW10S-GW-12			DRMO-6MW11D-GW-12		
SAMPLE DATE:	06/23/01			06/24/01			06/24/01			06/22/01		
LABORATORY ID:	N4962-04			N4962-07			N4962-06			N4962-01		
QC_TYPE:	NORMAL			NORMAL			NORMAL			NORMAL		
% SOLIDS:	0.0 %			0.0 %			0.0 %			0.0 %		
UNITS:	UG/L			UG/L			UG/L			UG/L		
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
VOLATILES												
METHYLENE CHLORIDE	2	U	B	2	U	B	2	U	B	2	U	B
O-XYLENE	1	U		1	U		1	U		1	U	
STYRENE	1	U		1	U		1	U		1	U	
TETRACHLOROETHENE	1	U		1	U		1	U		1	U	
TOLUENE	1	U		1	U		1	U		1	U	
TOTAL XYLENES	1	U		1	U		1	U		1	U	
TRANS-1,2-DICHLOROETHENE	1	U		1	U		1	U		1	U	
TRANS-1,3-DICHLOROPROPENE	1	U		1	U		1	U		1	U	
TRICHLOROETHENE	1	U		2.8			1	U		1	U	
VINYL CHLORIDE	1	U		0.7	J	P	1	U		1	U	

SAMPLE NUMBER:	DRMO-6MW11S-GW-12			DRMO-6MW6D-GW-12			DRMO-6MW6S-GW-12			DRMO-6MW9S-GW-12		
SAMPLE DATE:	06/22/01			06/25/01			06/25/01			06/23/01		
LABORATORY ID:	N4962-02			N4962-09			N4962-08			N4962-05		
QC_TYPE:	NORMAL			NORMAL			NORMAL			NORMAL		
% SOLIDS:	0.0 %			0.0 %			0.0 %			0.0 %		
UNITS:	UG/L			UG/L			UG/L			UG/L		
FIELD DUPLICATE OF:							DRMO-6MW6S-GW-12-D					
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
VOLATILES												
1,1,1-TRICHLOROETHANE	1	U		1	U		1	U		1	U	
1,1,2,2-TETRACHLOROETHANE	1	U		1	U		1	U		1	U	
1,1,2-TRICHLOROETHANE	1	U		1	U		1	U		1	U	
1,1-DICHLOROETHANE	1	U		1	U		1	U		1	U	
1,1-DICHLOROETHENE	1	U		1	U		1	U		1	U	
1,2,4-TRICHLOROBENZENE	1	UJ	C	1	UJ	C	1	UJ	C	1	UJ	C
1,2-DIBROMO-3-CHLOROPROPANE	1	UR	C	1	UR	C	1	UR	C	1	UR	C
1,2-DIBROMOETHANE	1	U		1	U		1	U		1	U	
1,2-DICHLOROBENZENE	1	U		1	U		1	U		1	U	
1,2-DICHLOROETHANE	1	U		1	U		1	U		1	U	
1,2-DICHLOROPROPANE	1	U		1	U		1	U		1	U	
1,3-DICHLOROBENZENE	1	U		1	U		1	U		1	U	
1,4-DICHLOROBENZENE	1	U		1	U		1	U		1	U	
2-BUTANONE	5	UR	C	5	UR	C	5	UR	C	5	UR	C
2-HEXANONE	5	UR	C	5	UR	C	5	UR	C	5	UR	C
4-METHYL-2-PENTANONE	5	UJ	C	5	UJ	C	5	UJ	C	5	UJ	C
ACETONE	5	UR	C	5	UR	C	5	UR	C	5	UR	C
BENZENE	1	U		1	U		1	U		1	U	
BROMOCHLOROMETHANE	1	U		1	U		1	U		1	U	
BROMODICHLOROMETHANE	1	U		1	U		1	U		1	U	
BROMOFORM	1	U		1	U		1	U		1	U	
BROMOMETHANE	1	U		1	U		1	U		1	U	
CARBON DISULFIDE	1	U		1	U		1	U		1	U	
CARBON TETRACHLORIDE	1	U		1	U		1	U		1	U	
CHLOROBENZENE	1	U		1	U		1	U		1	U	
CHLORODIBROMOMETHANE	1	U		1	U		1	U		1	U	
CHLOROETHANE	1	U		1	U		1	U		1	U	
CHLOROFORM	1	U		1	U		1	U		1	U	
CHLOROMETHANE	1	U		1	U		1	U		1	U	
CIS-1,2-DICHLOROETHENE	1.6			5.5			1	U		1	U	
CIS-1,3-DICHLOROPROPENE	1	U		1	U		1	U		1	U	
ETHYLBENZENE	1	U		1	U		1	U		1	U	

CTO257-NEW LONDON
WATER DATA
CHEMTECH CONSULTING GROUP
SDG: 4962

SAMPLE NUMBER:	DRMO-6MW11S-GW-12			DRMO-6MW6D-GW-12			DRMO-6MW6S-GW-12			DRMO-6MW9S-GW-12		
SAMPLE DATE:	06/22/01			06/25/01			06/25/01			06/23/01		
LABORATORY ID:	N4962-02			N4962-09			N4962-08			N4962-05		
QC_TYPE:	NORMAL			NORMAL			NORMAL			NORMAL		
% SOLIDS:	0.0 %			0.0 %			0.0 %			0.0 %		
UNITS:	UG/L			UG/L			UG/L			UG/L		
FIELD DUPLICATE OF:							DRMO-6MW6S-GW-12-D					
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
VOLATILES												
METHYLENE CHLORIDE	2	U	B	2	U	B	2	U	B	2	U	B
O-XYLENE	1	U		1	U		1	U		1	U	
STYRENE	1	U		1	U		1	U		1	U	
TETRACHLOROETHENE	1	U		1	U		1	U		1	U	
TOLUENE	1	U		1	U		1	U		1	U	
TOTAL XYLENES	1	U		1	U		1	U		1	U	
TRANS-1,2-DICHLOROETHENE	1	U		1	U		1	U		1	U	
TRANS-1,3-DICHLOROPROPENE	1	U		1	U		1	U		1	U	
TRICHLOROETHENE	1	U		7.6			1	U		1	U	
VINYL CHLORIDE	0.6	J	P	1	U		1	U		1	U	

CTO2 NEW LONDON
WATER DATA
CHEMTECH CONSULTING GROUP
SDG: 4962

SAMPLE NUMBER:	DRMO-6WTB-062201	GWFD06250101		
SAMPLE DATE:	06/22/01	06/25/01	/ /	/ /
LABORATORY ID:	N4962-03	N4962-12		
QC_TYPE:	NORMAL	NORMAL		
% SOLIDS:	0.0 %	0.0 %	100.0 %	100.0 %
UNITS:	UG/L	UG/L		
FIELD DUPLICATE OF:		DRMO-6MW6S-GW-12		

	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
VOLATILES												
1,1,1-TRICHLOROETHANE	1	U		1	U							
1,1,2,2-TETRACHLOROETHANE	1	U		1	U							
1,1,2-TRICHLOROETHANE	1	U		1	U							
1,1-DICHLOROETHANE	1	U		1	U							
1,1-DICHLOROETHENE	1	U		1	U							
1,2,4-TRICHLOROBENZENE	1	UJ	C	1	UJ	C						
1,2-DIBROMO-3-CHLOROPROPANE	1	UR	C	1	UR	C						
1,2-DIBROMOETHANE	1	U		1	U							
1,2-DICHLOROBENZENE	1	U		1	U							
1,2-DICHLOROETHANE	1	U		1	U							
1,2-DICHLOROPROPANE	1	U		1	U							
1,3-DICHLOROBENZENE	1	U		1	U							
1,4-DICHLOROBENZENE	1	U		1	U							
2-BUTANONE	5	UR	C	5	UR	C						
2-HEXANONE	5	UR	C	5	UR	C						
4-METHYL-2-PENTANONE	5	UJ	C	5	UJ	C						
ACETONE	5	UR	C	5	UR	C						
BENZENE	1	U		1	U							
BROMOCHLOROMETHANE	1	U		1	U							
BROMODICHLOROMETHANE	1	U		1	U							
BROMOFORM	1	U		1	U							
BROMOMETHANE	1	U		1	U							
CARBON DISULFIDE	1	U		1	U							
CARBON TETRACHLORIDE	1	U		1	U							
CHLOROBENZENE	1	U		1	U							
CHLORODIBROMOMETHANE	1	U		1	U							
CHLOROETHANE	1	U		1	U							
CHLOROFORM	1	U		1	U							
CHLOROMETHANE	1	U		1	U							
CIS-1,2-DICHLOROETHENE	1	U		1	U							
CIS-1,3-DICHLOROPROPENE	1	U		1	U							
ETHYLBENZENE	1	U		1	U							

CTO257-NEW LONDON
WATER DATA
CHEMTECH CONSULTING GROUP
SDG: 4962

SAMPLE NUMBER:	DRMO-6WTB-062201	GWFD06250101		
SAMPLE DATE:	06/22/01	06/25/01	/ /	/ /
LABORATORY ID:	N4962-03	N4962-12		
QC_TYPE:	NORMAL	NORMAL		
% SOLIDS:	0.0 %	0.0 %	100.0 %	100.0 %
UNITS:	UG/L	UG/L		
FIELD DUPLICATE OF:		DRMO-6MW6S-GW-12		

	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
VOLATILES												
METHYLENE CHLORIDE	1.3	J	CP	2	U	B						
O-XYLENE	1	U		1	U							
STYRENE	1	U		1	U							
TETRACHLOROETHENE	1	U		1	U							
TOLUENE	1	U		1	U							
TOTAL XYLENES	1	U		1	U							
TRANS-1,2-DICHLOROETHENE	1	U		1	U							
TRANS-1,3-DICHLOROPROPENE	1	U		1	U							
TRICHLOROETHENE	1	U		1	U							
VINYL CHLORIDE	1	U		1	U							

CTO: NEW LONDON
WATER DATA
CHEMTECH CONSULTING GROUP
SDG: 4962

SAMPLE NUMBER:	DRMO-6MW01S-GW-12	DRMO-6MW10D-GW-12	DRMO-6MW10S-GW-12	DRMO-6MW11D-GW-12
SAMPLE DATE:	06/23/01	06/24/01	06/24/01	06/22/01
LABORATORY ID:	N4962-04	N4962-07	N4962-06	N4962-01
QC_TYPE:	NORMAL	NORMAL	NORMAL	NORMAL
% SOLIDS:	0.0 %	0.0 %	0.0 %	0.0 %
UNITS:	UG/L	UG/L	UG/L	UG/L
FIELD DUPLICATE OF:				

	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
SEMIVOLATILES												
1,2,4-TRICHLOROBENZENE	5	UJ	R	5	UJ	R	5	UJ	R	5	UJ	HR
1,2-DICHLOROBENZENE	5	UJ	R	5	UJ	R	5	UJ	R	5	UJ	HR
1,3-DICHLOROBENZENE	5	UJ	R	5	UJ	R	5	UJ	R	5	UJ	HR
1,4-DICHLOROBENZENE	5	UJ	R	5	UJ	R	5	UJ	R	5	UJ	HR
2,2'-OXYBIS(1-CHLOROPROPANE)	5	UJ	R	5	UJ	R	5	UJ	R	5	UJ	HR
2,4,5-TRICHLOROPHENOL	5	UJ	R	5	UJ	R	5	UJ	R	5	UJ	HR
2,4,6-TRICHLOROPHENOL	20	UJ	R	20	UJ	R	20	UJ	R	20	UJ	HR
2,4-DICHLOROPHENOL	5	UJ	R	5	UJ	R	5	UJ	R	5	UJ	HR
2,4-DIMETHYLPHENOL	5	UJ	R	5	UJ	R	5	UJ	R	5	UJ	HR
2,4-DINITROPHENOL	20	UJ	R	20	UJ	R	20	UJ	R	20	UJ	HR
2,4-DINITROTOLUENE	5	UJ	R	5	UJ	R	5	UJ	R	5	UJ	HR
2,6-DINITROTOLUENE	5	UJ	R	5	UJ	R	5	UJ	R	5	UJ	HR
2-CHLORONAPHTHALENE	5	UJ	R	5	UJ	R	5	UJ	R	5	UJ	HR
2-CHLOROPHENOL	5	UJ	R	5	UJ	R	5	UJ	R	5	UJ	HR
2-METHYLNAPHTHALENE	5	UJ	R	5	UJ	R	5	UJ	R	5	UJ	HR
2-METHYLPHENOL	5	UJ	R	5	UJ	R	5	UJ	R	5	UJ	HR
2-NITROANILINE	20	UJ	R	20	UJ	R	20	UJ	R	20	UJ	HR
2-NITROPHENOL	5	UJ	R	5	UJ	R	5	UJ	R	5	UJ	HR
3&4-METHYLPHENOL	5	UJ	R	5	UJ	R	5	UJ	R	5	UJ	HR
3,3'-DICHLOROBENZIDINE	5	UJ	R	5	UJ	R	5	UJ	R	5	UJ	HR
3-NITROANILINE	20	UJ	R	20	UJ	R	20	UJ	R	20	UJ	HR
4,6-DINITRO-2-METHYLPHENOL	20	UJ	R	20	UJ	R	20	UJ	R	20	UJ	HR
4-BROMOPHENYL PHENYL ETHER	5	UJ	R	5	UJ	R	5	UJ	R	5	UJ	HR
4-CHLORO-3-METHYLPHENOL	5	UJ	R	5	UJ	R	5	UJ	R	5	UJ	HR
4-CHLOROANILINE	5	UJ	R	5	UJ	R	5	UJ	R	5	UJ	HR
4-CHLOROPHENYL PHENYL ETHER	5	UJ	R	5	UJ	R	5	UJ	R	5	UJ	HR
4-NITROANILINE	20	UJ	R	20	UJ	R	20	UJ	R	20	UJ	HR
4-NITROPHENOL	20	UJ	R	20	UJ	R	20	UJ	R	20	UJ	HR
BENZOIC ACID	5	UJ	R	5	UJ	R	5	UJ	R	5	UJ	HR
BIS(2-CHLOROETHOXY)METHANE	5	UJ	R	5	UJ	R	5	UJ	R	5	UJ	HR
BIS(2-CHLOROETHYL)ETHER	5	UJ	R	5	UJ	R	5	UJ	R	5	UJ	HR
BIS(2-ETHYLHEXYL)PHTHALATE	19	J	R	5	UJ	R	1.5	J	PR	2.4	J	HPR

CTO257-NEW LONDON
WATER DATA
CHEMTECH CONSULTING GROUP
SDG: 4962

SAMPLE NUMBER:	DRMO-6MW01S-GW-12			DRMO-6MW10D-GW-12			DRMO-6MW10S-GW-12			DRMO-6MW11D-GW-12		
SAMPLE DATE:	06/23/01			06/24/01			06/24/01			06/22/01		
LABORATORY ID:	N4962-04			N4962-07			N4962-06			N4962-01		
QC_TYPE:	NORMAL			NORMAL			NORMAL			NORMAL		
% SOLIDS:	0.0 %			0.0 %			0.0 %			0.0 %		
UNITS:	UG/L			UG/L			UG/L			UG/L		
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
SEMIVOLATILES												
BUTYL BENZYL PHTHALATE	5	UJ	R	5	UJ	R	5	UJ	R	5	UJ	HR
CARBAZOLE	5	UJ	R	5	UJ	R	5	UJ	R	5	UJ	HR
DI-N-BUTYL PHTHALATE	5	UJ	R	5	UJ	R	5	UJ	R	5	UJ	HR
DI-N-OCTYL PHTHALATE	5	UJ	R	5	UJ	R	5	UJ	R	5	UJ	HR
DIBENZOFURAN	5	UJ	R	5	UJ	R	5	UJ	R	5	UJ	HR
DIETHYL PHTHALATE	5	UJ	R	5	UJ	R	5	UJ	R	5	UJ	HR
DIMETHYL PHTHALATE	5	UJ	R	5	UJ	R	5	UJ	R	5	UJ	HR
HEXACHLOROBENZENE	5	UJ	R	5	UJ	R	5	UJ	R	5	UJ	HR
HEXACHLOROBUTADIENE	5	UJ	R	5	UJ	R	5	UJ	R	5	UJ	HR
HEXACHLOROCYCLOPENTADIENE	5	UJ	R	5	UJ	R	5	UJ	R	5	UJ	HR
HEXACHLOROETHANE	5	UJ	R	5	UJ	R	5	UJ	R	5	UJ	HR
ISOPHORONE	5	UJ	R	5	UJ	R	5	UJ	R	5	UJ	HR
N-NITROSO-DI-N-PROPYLAMINE	5	UJ	R	5	UJ	R	5	UJ	R	5	UJ	HR
N-NITROSODIPHENYLAMINE	5	UJ	R	5	UJ	R	5	UJ	R	5	UJ	HR
NITROBENZENE	5	UJ	R	5	UJ	R	5	UJ	R	5	UJ	HR
PENTACHLOROPHENOL	20	UJ	R	20	UJ	R	20	UJ	R	20	UJ	HR
PHENOL	5	UJ	R	5	UJ	R	5	UJ	R	5	UJ	HR

CTO: NEW LONDON
WATER DATA
CHEMTECH CONSULTING GROUP
SDG: 4962

SAMPLE NUMBER:	DRMO-6MW11S-GW-12			DRMO-6MW6D-GW-12			DRMO-6MW6S-GW-12			DRMO-6MW9S-GW-12		
SAMPLE DATE:	06/22/01			06/25/01			06/25/01			06/23/01		
LABORATORY ID:	N4962-02			N4962-09			N4962-08			N4962-05		
QC_TYPE:	NORMAL			NORMAL			NORMAL			NORMAL		
% SOLIDS:	0.0 %			0.0 %			0.0 %			0.0 %		
UNITS:	UG/L			UG/L			UG/L			UG/L		
FIELD DUPLICATE OF:							DRMO-6MW6S-GW-12-D					
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
SEMIVOLATILES												
1,2,4-TRICHLOROBENZENE	5	UJ	HR	5	UJ	R	5	UJ	R	5	UJ	R
1,2-DICHLOROBENZENE	5	UJ	HR	5	UJ	R	5	UJ	R	5	UJ	R
1,3-DICHLOROBENZENE	5	UJ	HR	5	UJ	R	5	UJ	R	5	UJ	R
1,4-DICHLOROBENZENE	5	UJ	HR	5	UJ	R	5	UJ	R	5	UJ	R
2,2'-OXYBIS(1-CHLOROPROPANE)	5	UJ	HR	5	UJ	R	5	UJ	R	5	UJ	R
2,4,5-TRICHLOROPHENOL	5	UJ	HR	5	UJ	R	5	UJ	R	5	UJ	R
2,4,6-TRICHLOROPHENOL	20	UJ	HR	20	UJ	R	20	UJ	R	20	UJ	R
2,4-DICHLOROPHENOL	5	UJ	HR	5	UJ	R	5	UJ	R	5	UJ	R
2,4-DIMETHYLPHENOL	5	UJ	HR	5	UJ	R	5	UJ	R	5	UJ	R
2,4-DINITROPHENOL	20	UJ	HR	20	UJ	R	20	UJ	R	20	UJ	R
2,4-DINITROTOLUENE	5	UJ	HR	5	UJ	DR	5	UJ	R	5	UJ	R
2,6-DINITROTOLUENE	5	UJ	HR	5	UJ	R	5	UJ	R	5	UJ	R
2-CHLORONAPHTHALENE	5	UJ	HR	5	UJ	R	5	UJ	R	5	UJ	R
2-CHLOROPHENOL	5	UJ	HR	5	UJ	DR	5	UJ	R	5	UJ	R
2-METHYLNAPHTHALENE	5	UJ	HR	5	UJ	R	5	UJ	R	5	UJ	R
2-METHYLPHENOL	5	UJ	HR	5	UJ	R	5	UJ	R	5	UJ	R
2-NITROANILINE	20	UJ	HR	20	UJ	R	20	UJ	R	20	UJ	R
2-NITROPHENOL	5	UJ	HR	5	UJ	R	5	UJ	R	5	UJ	R
3&4-METHYLPHENOL	5	UJ	HR	5	UJ	R	5	UJ	R	5	UJ	R
3,3'-DICHLOROBENZIDINE	5	UJ	HR	5	UJ	R	5	UJ	R	5	UJ	R
3-NITROANILINE	20	UJ	HR	20	UJ	R	20	UJ	R	20	UJ	R
4,6-DINITRO-2-METHYLPHENOL	20	UJ	HR	20	UJ	R	20	UJ	R	20	UJ	R
4-BROMOPHENYL PHENYL ETHER	5	UJ	HR	5	UJ	R	5	UJ	R	5	UJ	R
4-CHLORO-3-METHYLPHENOL	5	UJ	HR	5	UJ	DR	5	UJ	R	5	UJ	R
4-CHLOROANILINE	5	UJ	HR	5	UJ	R	5	UJ	R	5	UJ	R
4-CHLOROPHENYL PHENYL ETHER	5	UJ	HR	5	UJ	R	5	UJ	R	5	UJ	R
4-NITROANILINE	20	UJ	HR	20	UJ	R	20	UJ	R	20	UJ	R
4-NITROPHENOL	20	UJ	HR	20	UJ	R	20	UJ	R	20	UJ	R
BENZOIC ACID	5	UJ	HR	5	UJ	R	5	UJ	R	5	UJ	R
BIS(2-CHLOROETHOXY)METHANE	5	UJ	HR	5	UJ	R	5	UJ	R	5	UJ	R
BIS(2-CHLOROETHYL)ETHER	5	UJ	HR	5	UJ	R	5	UJ	R	5	UJ	R
BIS(2-ETHYLHEXYL)PHTHALATE	5	UJ	HR	3.1	J	PR	1.9	J	PR	5	UJ	R

CTO257-NEW LONDON
WATER DATA
CHEMTECH CONSULTING GROUP
SDG: 4962

SAMPLE NUMBER:	DRMO-6MW11S-GW-12			DRMO-6MW6D-GW-12			DRMO-6MW6S-GW-12			DRMO-6MW9S-GW-12		
SAMPLE DATE:	06/22/01			06/25/01			06/25/01			06/23/01		
LABORATORY ID:	N4962-02			N4962-09			N4962-08			N4962-05		
QC_TYPE:	NORMAL			NORMAL			NORMAL			NORMAL		
% SOLIDS:	0.0 %			0.0 %			0.0 %			0.0 %		
UNITS:	UG/L			UG/L			UG/L			UG/L		
FIELD DUPLICATE OF:							DRMO-6MW6S-GW-12-D					
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
SEMIVOLATILES												
BUTYL-BENZYL PHTHALATE	5	UJ	HR	5	UJ	R	5	UJ	R	5	UJ	R
CARBAZOLE	5	UJ	HR	5	UJ	R	5	UJ	R	5	UJ	R
DI-N-BUTYL PHTHALATE	5	UJ	HR	1.5	J	PR	1.2	J	PR	5	UJ	R
DI-N-OCTYL PHTHALATE	5	UJ	HR	5	UJ	R	5	UJ	R	5	UJ	R
DIBENZOFURAN	5	UJ	HR	5	UJ	R	5	UJ	R	5	UJ	R
DIETHYL PHTHALATE	5	UJ	HR	5	UJ	R	5	UJ	R	5	UJ	R
DIMETHYL PHTHALATE	5	UJ	HR	5	UJ	R	5	UJ	R	5	UJ	R
HEXACHLOROBENZENE	5	UJ	HR	5	UJ	R	5	UJ	R	5	UJ	R
HEXACHLOROBUTADIENE	5	UJ	HR	5	UJ	R	5	UJ	R	5	UJ	R
HEXACHLOROCYCLOPENTADIENE	5	UJ	HR	5	UJ	R	5	UJ	R	5	UJ	R
HEXACHLOROETHANE	5	UJ	HR	5	UJ	R	5	UJ	R	5	UJ	R
ISOPHORONE	5	UJ	HR	5	UJ	R	5	UJ	R	5	UJ	R
N-NITROSO-DI-N-PROPYLAMINE	5	UJ	HR	5	UJ	DR	5	UJ	R	5	UJ	R
N-NITROSODIPHENYLAMINE	5	UJ	HR	5	UJ	R	5	UJ	R	5	UJ	R
NITROBENZENE	5	UJ	HR	5	UJ	R	5	UJ	R	5	UJ	R
PENTACHLOROPHENOL	20	UJ	HR	20	UJ	R	20	UJ	R	20	UJ	R
PHENOL	5	UJ	HR	5	UJ	R	5	UJ	R	5	UJ	R

CTO2 NEW LONDON
WATER DATA
CHEMTECH CONSULTING GROUP
SDG: 4962

SAMPLE NUMBER:	GWFD06250101											
SAMPLE DATE:	06/25/01			/ /			/ /			/ /		
LABORATORY ID:	N4962-12											
QC_TYPE:	NORMAL											
% SOLIDS:	0.0 %			100.0 %			100.0 %			100.0 %		
UNITS:	UG/L											
FIELD DUPLICATE OF:	DRMO-6MW6S-GW-12											
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
SEMIVOLATILES												
1,2,4-TRICHLOROBENZENE	5	UJ	R									
1,2-DICHLOROBENZENE	5	UJ	R									
1,3-DICHLOROBENZENE	5	UJ	R									
1,4-DICHLOROBENZENE	5	UJ	R									
2,2'-OXYBIS(1-CHLOROPROPANE)	5	UJ	R									
2,4,5-TRICHLOROPHENOL	5	UJ	R									
2,4,6-TRICHLOROPHENOL	20	UJ	R									
2,4-DICHLOROPHENOL	5	UJ	R									
2,4-DIMETHYLPHENOL	5	UJ	R									
2,4-DINITROPHENOL	20	UJ	R									
2,4-DINITROTOLUENE	5	UJ	R									
2,6-DINITROTOLUENE	5	UJ	R									
2-CHLORONAPHTHALENE	5	UJ	R									
2-CHLOROPHENOL	5	UJ	R									
2-METHYLNAPHTHALENE	5	UJ	R									
2-METHYLPHENOL	5	UJ	R									
2-NITROANILINE	20	UJ	R									
2-NITROPHENOL	5	UJ	R									
3&4-METHYLPHENOL	5	UJ	R									
3,3'-DICHLOROBENZIDINE	5	UJ	R									
3-NITROANILINE	20	UJ	R									
4,6-DINITRO-2-METHYLPHENOL	20	UJ	R									
4-BROMOPHENYL PHENYL ETHER	5	UJ	R									
4-CHLORO-3-METHYLPHENOL	5	UJ	R									
4-CHLOROANILINE	5	UJ	R									
4-CHLOROPHENYL PHENYL ETHER	5	UJ	R									
4-NITROANILINE	20	UJ	R									
4-NITROPHENOL	20	UJ	R									
BENZOIC ACID	5	UJ	R									
BIS(2-CHLOROETHOXY)METHANE	5	UJ	R									
BIS(2-CHLOROETHYL)ETHER	5	UJ	R									
BIS(2-ETHYLHEXYL)PHTHALATE	1.5	J	PR									

CTO257-NEW LONDON
WATER DATA
CHEMTECH CONSULTING GROUP
SDG: 4962

SAMPLE NUMBER:	GWFD06250101											
SAMPLE DATE:	06/25/01			/ /			/ /			/ /		
LABORATORY ID:	N4962-12											
QC_TYPE:	NORMAL											
% SOLIDS:	0.0 %			100.0 %			100.0 %			100.0 %		
UNITS:	UG/L											
FIELD DUPLICATE OF:	DRMO-6MW6S-GW-12											
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
SEMIVOLATILES												
BUTYL BENZYL PHTHALATE	5	UJ	R									
CARBAZOLE	5	UJ	R									
DI-N-BUTYL PHTHALATE	5	UJ	R									
DI-N-OCTYL PHTHALATE	5	UJ	R									
DIBENZOFURAN	5	UJ	R									
DIETHYL PHTHALATE	5	UJ	R									
DIMETHYL PHTHALATE	5	UJ	R									
HEXACHLOROBENZENE	5	UJ	R									
HEXACHLOROBUTADIENE	5	UJ	R									
HEXACHLOROCYCLOPENTADIENE	5	UJ	R									
HEXACHLOROETHANE	5	UJ	R									
ISOPHORONE	5	UJ	R									
N-NITROSO-DI-N-PROPYLAMINE	5	UJ	R									
N-NITROSODIPHENYLAMINE	5	UJ	R									
NITROBENZENE	5	UJ	R									
PENTACHLOROPHENOL	20	UJ	R									
PHENOL	5	UJ	R									

CTO2. IEW LONDON
WATER DATA
CHEMTECH CONSULTING GROUP
SDG: 4962

SAMPLE NUMBER:	DRMO-6MW01S-GW-12	DRMO-6MW10D-GW-12	DRMO-6MW10S-GW-12	DRMO-6MW11D-GW-12
SAMPLE DATE:	06/23/01	06/24/01	06/24/01	06/22/01
LABORATORY ID:	N4962-04	N4962-07	N4962-06	N4962-01
QC_TYPE:	NORMAL	NORMAL	NORMAL	NORMAL
% SOLIDS:	0.0 %	0.0 %	0.0 %	0.0 %
UNITS:	UG/L	UG/L	UG/L	UG/L
FIELD DUPLICATE OF:				

	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
POLYNUCLEAR AROMATIC HYDROCARBONS												
ACENAPHTHENE	0.016	U		0.016	U		0.51			0.016	UJ	H
ACENAPHTHYLENE	0.013	U		0.013	U		0.013	U		0.08	J	H
ANTHRACENE	0.1			0.12			0.03	U		0.05	J	H
BENZO(A)ANTHRACENE	0.012	U		0.012	U		0.012	U		0.012	UJ	H
BENZO(A)PYRENE	0.021	U		0.021	U		0.021	U		0.021	UJ	H
BENZO(B)FLUORANTHENE	0.02	U		0.02	U		0.02	U		0.02	UJ	H
BENZO(G,H,I)PERYLENE	0.009	U		0.009	U		0.009	U		0.009	UJ	H
BENZO(K)FLUORANTHENE	0.02	U		0.02	U		0.02	U		0.02	UJ	H
CHRYSENE	0.012	U		0.012	U		0.012	U		0.012	UJ	H
DIBENZO(A,H)ANTHRACENE	0.014	U		0.014	U		0.014	U		0.014	UJ	H
FLUORANTHENE	0.009	U		0.009	U		0.009	U		0.009	UJ	H
FLUORENE	0.007	U		0.007	U		0.007	U		0.007	UJ	H
INDENO(1,2,3-CD)PYRENE	0.008	U		0.008	U		0.008	U		0.008	UJ	H
NAPHTHALENE	0.008	U		0.008	U		0.008	U		0.008	UJ	H
PHENANTHRENE	0.004	U		0.004	U		0.004	U		0.004	UJ	H
PYRENE	0.008	U		0.008	U		0.008	U		0.21	J	H

CTO257-NEW LONDON
WATER DATA
CHEMTECH CONSULTING GROUP
SDG: 4962

SAMPLE NUMBER:	DRMO-6MW11S-GW-12			DRMO-6MW6D-GW-12			DRMO-6MW6S-GW-12			DRMO-6MW9S-GW-12		
SAMPLE DATE:	06/22/01			06/25/01			06/25/01			06/23/01		
LABORATORY ID:	N4962-02			N4962-09			N4962-08			N4962-05		
QC_TYPE:	NORMAL			NORMAL			NORMAL			NORMAL		
% SOLIDS:	0.0 %			0.0 %			0.0 %			0.0 %		
UNITS:	UG/L			UG/L			UG/L			UG/L		
FIELD DUPLICATE OF:							DRMO-6MW6S-GW-12-D					
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
POLYNUCLEAR AROMATIC HYDROCARBONS												
ACENAPHTHENE	0.016	UJ	H	0.016	U		0.016	U		0.016	U	
ACENAPHTHYLENE	0.013	UJ	H	0.013	U		0.013	U		0.013	U	
ANTHRACENE	0.18	J	H	0.18	J	D	0.01			0.31		
BENZO(A)ANTHRACENE	0.012	UJ	H	0.012	U		0.012	U		0.012	U	
BENZO(A)PYRENE	0.021	UJ	H	0.021	U		0.021	U		0.24		
BENZO(B)FLUORANTHENE	0.02	UJ	H	0.02	U		0.02	U		0.02	U	
BENZO(G,H,I)PERYLENE	0.009	UJ	H	0.009	U		0.009	U		0.009	U	
BENZO(K)FLUORANTHENE	0.02	UJ	H	0.02	U		0.02	U		0.27		
CHRYSENE	0.012	UJ	H	0.012	U		0.012	U		0.012	U	
DIBENZO(A,H)ANTHRACENE	0.014	UJ	H	0.014	U		0.014	U		0.014	U	
FLUORANTHENE	0.009	UJ	H	0.009	U		0.009	U		0.15		
FLUORENE	0.007	UJ	H	0.007	U		0.007	U		0.007	U	
INDENO(1,2,3-CD)PYRENE	0.008	UJ	H	0.008	U		0.008	U		0.008	U	
NAPHTHALENE	0.008	UJ	H	0.008	U		0.008	U		0.008	U	
PHENANTHRENE	0.004	UJ	H	0.004	U		0.004	U		0.004	U	
PYRENE	0.008	UJ	H	0.008	U		0.008	U		0.17		

CTO: NEW LONDON
WATER DATA
CHEMTECH CONSULTING GROUP
SDG: 4962

SAMPLE NUMBER:	GWFD06250101			
SAMPLE DATE:	06/25/01	/ /	/ /	/ /
LABORATORY ID:	N4962-12			
QC_TYPE:	NORMAL			
% SOLIDS:	0.0 %	100.0 %	100.0 %	100.0 %
UNITS:	UG/L			
FIELD DUPLICATE OF:	DRMO-6MW6S-GW-12			

	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
POLYNUCLEAR AROMATIC HYDROCARBONS												
ACENAPHTHENE	0.016	U										
ACENAPHTHYLENE	0.12											
ANTHRACENE	0.07											
BENZO(A)ANTHRACENE	0.012	U										
BENZO(A)PYRENE	0.021	U										
BENZO(B)FLUORANTHENE	0.02	U										
BENZO(G,H,I)PERYLENE	0.009	U										
BENZO(K)FLUORANTHENE	0.02	U										
CHRYSENE	0.012	U										
DIBENZO(A,H)ANTHRACENE	0.014	U										
FLUORANTHENE	0.009	U										
FLUORENE	0.007	U										
INDENO(1,2,3-CD)PYRENE	0.008	U										
NAPHTHALENE	0.008	U										
PHENANTHRENE	0.004	U										
PYRENE	0.008	U										

CTO257-NEW LONDON
WATER DATA
CHEMTECH CONSULTING GROUP
SDG: 4962

SAMPLE NUMBER:	DRMO-6MW01S-GW-12			DRMO-6MW10D-GW-12			DRMO-6MW10S-GW-12			DRMO-6MW11D-GW-12		
SAMPLE DATE:	06/23/01			06/24/01			06/24/01			06/22/01		
LABORATORY ID:	N4962-04			N4962-07			N4962-06			N4962-01		
QC_TYPE:	NORMAL			NORMAL			NORMAL			NORMAL		
% SOLIDS:	0.0 %			0.0 %			0.0 %			0.0 %		
UNITS:	UG/L			UG/L			UG/L			UG/L		
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
PESTICIDES/PCBs												
4,4'-DDD	0.02	U		0.02	U		0.02	U		0.02	U	
4,4'-DDE	0.02	U		0.02	U		0.02	U		0.02	U	
4,4'-DDT	0.02	U		0.02	U		0.02	U		0.02	U	
ALDRIN	0.01	U		0.01	U		0.01	U		0.01	U	
ALPHA-BHC	0.01	U		0.01	U		0.01	U		0.01	U	
ALPHA-CHLORDANE	0.01	U		0.01	U		0.01	U		0.01	U	
AROCLOR-1016	0.2	U		0.2	U		0.2	U		0.2	U	
AROCLOR-1221	0.4	U		0.4	U		0.4	U		0.4	U	
AROCLOR-1232	0.2	U		0.2	U		0.2	U		0.2	U	
AROCLOR-1242	0.2	U		0.2	U		0.2	U		0.2	U	
AROCLOR-1248	0.2	U		0.2	U		0.2	U		0.2	U	
AROCLOR-1254	0.2	U		0.2	U		0.2	U		0.2	U	
AROCLOR-1260	0.2	U		0.2	U		0.2	U		0.2	U	
BETA-BHC	0.01	U		0.01	U		0.01	U		0.01	U	
DELTA-BHC	0.01	U		0.01	U		0.01	U		0.01	U	
DIELDRIN	0.02	U		0.02	U		0.02	U		0.02	U	
ENDOSULFAN I	0.01	U		0.01	U		0.01	U		0.01	U	
ENDOSULFAN II	0.02	U		0.02	U		0.02	U		0.02	U	
ENDOSULFAN SULFATE	0.02	U		0.02	U		0.02	U		0.02	U	
ENDRIN	0.02	U		0.02	U		0.02	U		0.02	U	
ENDRIN ALDEHYDE	0.02	U		0.02	U		0.02	U		0.02	U	
ENDRIN KETONE	0.02	U		0.02	U		0.02	U		0.02	U	
GAMMA-BHC (LINDANE)	0.01	U		0.01	U		0.01	U		0.01	U	
GAMMA-CHLORDANE	0.01	U		0.01	U		0.01	U		0.01	U	
HEPTACHLOR	0.01	U		0.01	U		0.01	U		0.01	U	
HEPTACHLOR EPOXIDE	0.01	U		0.01	U		0.01	U		0.01	U	
METHOXYCHLOR	0.1	U		0.1	U		0.1	U		0.1	U	
TOXAPHENE	1	U		1	U		1	U		1	U	

CTO2 NEW LONDON
WATER DATA
CHEMTECH CONSULTING GROUP
SDG: 4962

SAMPLE NUMBER:	DRMO-6MW11S-GW-12			DRMO-6MW6D-GW-12			DRMO-6MW6S-GW-12			DRMO-6MW9S-GW-12		
SAMPLE DATE:	06/22/01			06/25/01			06/25/01			06/23/01		
LABORATORY ID:	N4962-02			N4962-09			N4962-08			N4962-05		
QC_TYPE:	NORMAL			NORMAL			NORMAL			NORMAL		
% SOLIDS:	0.0 %			0.0 %			0.0 %			0.0 %		
UNITS:	UG/L			UG/L			UG/L			UG/L		
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
PESTICIDES/PCBs												
4,4'-DDD	0.02	U		0.02	U		0.02	U		0.02	U	
4,4'-DDE	0.02	U		0.02	U		0.02	U		0.02	U	
4,4'-DDT	0.02	U		0.02	U		0.02	U		0.02	U	
ALDRIN	0.01	U		0.01	U		0.01	U		0.01	U	
ALPHA-BHC	0.01	U		0.01	U		0.01	U		0.01	U	
ALPHA-CHLORDANE	0.01	U		0.01	U		0.01	U		0.01	U	
AROCLOR-1016	0.2	U		0.2	U		0.2	U		0.2	U	
AROCLOR-1221	0.4	U		0.4	U		0.4	U		0.4	U	
AROCLOR-1232	0.2	U		0.2	U		0.2	U		0.2	U	
AROCLOR-1242	0.2	U		0.2	U		0.2	U		0.2	U	
AROCLOR-1248	0.2	U		0.2	U		0.2	U		0.2	U	
AROCLOR-1254	0.2	U		0.2	U		0.2	U		0.2	U	
AROCLOR-1260	0.2	U		0.2	U		0.2	U		0.2	U	
BETA-BHC	0.01	U		0.01	U		0.01	U		0.01	U	
DELTA-BHC	0.01	U		0.01	U		0.01	U		0.01	U	
DIELDRIN	0.02	U		0.02	U		0.02	U		0.02	U	
ENDOSULFAN I	0.01	U		0.01	U		0.01	U		0.01	U	
ENDOSULFAN II	0.02	U		0.02	U		0.02	U		0.02	U	
ENDOSULFAN SULFATE	0.02	U		0.02	U		0.02	U		0.02	U	
ENDRIN	0.02	U		0.02	U		0.02	U		0.02	U	
ENDRIN ALDEHYDE	0.02	U		0.02	U		0.02	U		0.02	U	
ENDRIN KETONE	0.02	U		0.02	U		0.02	U		0.02	U	
GAMMA-BHC (LINDANE)	0.01	U		0.01	U		0.01	U		0.01	U	
GAMMA-CHLORDANE	0.01	U		0.01	U		0.01	U		0.01	U	
HEPTACHLOR	0.01	U		0.01	U		0.01	U		0.01	U	
HEPTACHLOR EPOXIDE	0.01	U		0.01	U		0.01	U		0.01	U	
METHOXYCHLOR	0.1	U		0.1	U		0.1	U		0.1	U	
TOXAPHENE	1	U		1	U		1	U		1	U	

CTO257-NEW LONDON
WATER DATA
CHEMTECH CONSULTING GROUP
SDG: 4962

SAMPLE NUMBER:	GWFD06250101											
SAMPLE DATE:	06/25/01			/ /			/ /			/ /		
LABORATORY ID:	N4962-12											
QC_TYPE:	NORMAL											
% SOLIDS:	0.0 %			100.0 %			100.0 %			100.0 %		
UNITS:	UG/L											
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
PESTICIDES/PCBs												
4,4'-DDD	0.02	U										
4,4'-DDE	0.02	U										
4,4'-DDT	0.02	U										
ALDRIN	0.01	U										
ALPHA-BHC	0.01	U										
ALPHA-CHLORDANE	0.01	U										
AROCLOR-1016	0.2	U										
AROCLOR-1221	0.4	U										
AROCLOR-1232	0.2	U										
AROCLOR-1242	0.2	U										
AROCLOR-1248	0.2	U										
AROCLOR-1254	0.2	U										
AROCLOR-1260	0.2	U										
BETA-BHC	0.01	U										
DELTA-BHC	0.01	U										
DIELDRIN	0.02	U										
ENDOSULFAN I	0.01	U										
ENDOSULFAN II	0.02	U										
ENDOSULFAN SULFATE	0.02	U										
ENDRIN	0.02	U										
ENDRIN ALDEHYDE	0.02	U										
ENDRIN KETONE	0.02	U										
GAMMA-BHC (LINDANE)	0.01	U										
GAMMA-CHLORDANE	0.01	U										
HEPTACHLOR	0.01	U										
HEPTACHLOR EPOXIDE	0.01	U										
METHOXYCHLOR	0.1	U										
TOXAPHENE	1	U										

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO:	**C. RICH**	**DATE:**	**AUGUST 20, 2001**
FROM:	**ERIN M. FAUST**	**COPIES:**	**DV FILE**

SUBJECT: **INORGANIC DATA VALIDATION – TAL METALS**
CTO-257 NSB NEW LONDON
SAMPLE DELIVERY GROUP (SDG) – 4962

SAMPLES: 9/Aqueous/

DRMO-6MW01S-GW-12	DRMO-6MW10D-GW-12
DRMO-6MW10S-GW-12	DRM0-6MW11D-GW-12
DRMO-6MW11S-GW-12	DRMO-6MW6D-GW-12
DRMO-6MW6S-GW-12	DRMO-6MW9S-GW-12
GWFD06250101	

Overview

The sample set for CTO 257, NSB New London, SDG 4962, consists of nine (9) aqueous environmental samples. One (1) field duplicate pair (GWFD06250101 / DRMO-6MW6S-GW-12) is included within this SDG.

All samples were analyzed for target analyte list (TAL) metals. The samples were collected by TetraTech NUS from June 22-25, 2001 and analyzed by Chemtech Consulting Group under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. Metals analyses, with the exception of mercury, were conducted using Contract Laboratory Program (CLP) method ILM04.1. Mercury analyses were conducted using EPA method 245.1.

All metals analyses, with the exception of mercury, were conducted using Inductively Coupled Plasma (ICP) methodologies. Mercury analyses were conducted using Cold Vapor Atomic Absorption (CVAA).

These data were evaluated based on the following parameters:

* • Data Completeness
* • Holding Times
• Calibration Recoveries
• Laboratory Blank Analyses
* • Laboratory Control Sample Results
• ICP Interference Check Sample Results
* • Matrix Spike Results
* • Laboratory Duplicate Results
• Field Duplicate Results
* • ICP Serial Dilution Results
• Sample Quantitation
* • Detection Limits

* - All quality control criteria were met for this parameter.

Calibration Recoveries

The contract required detection limit (CRDL) percent recovery for mercury was < 80% quality control limit. Nondetected results reported for mercury were qualified as estimated, "UJ".

The CRDL percent recovery for selenium was >120% quality control limit. Positive and nondetected results reported for selenium were qualified as estimated, "J" and "UJ", respectively.

Laboratory Blank Analyses

The following contaminants were detected in the laboratory method blanks at the following maximum concentrations:

Analyte	Maximum Concentration	Action Level
Aluminum	85.8 µg/L	429 µg/L
Antimony	4.5 µg/L	22.5 µg/L
Beryllium	0.20 µg/L	1.0 µg/L
Calcium	89.3 µg/L	446.5 µg/L
Copper	3.1 µg/L	15.5 µg/L
Iron	45.4 µg/L	227 µg/L
Magnesium	82.7 µg/L	413.5 µg/L
Potassium	177.8 µg/L	889 µg/L
Sodium	589.2 µg/L	2946 µg/L

An action level of 5X the maximum concentration was used to evaluate the sample data for blank contamination. Sample aliquot and dilution factors were taken into consideration when evaluating for blank contamination. Positive results less than the blank action levels for aluminum, antimony, beryllium, copper, potassium and sodium were qualified, "U", as a result of blank contamination.

ICP Interference Check Sample Results

The interfering analyte magnesium was present in sample DRM0-6MW10D-GW-12 at a concentration that was comparable to the level of magnesium in the Interference Check Sample (ICS) solution. Several analytes namely cobalt, manganese, potassium and vanadium were present in the ICS solution at concentrations which exceeded 2X the Instrument Detection Limit (IDL). Interference affects exist for vanadium in the affected sample. The nondetected result reported for vanadium was qualified as estimated, "UJ".

The interfering analyte magnesium was present in sample DRM0-6MW11D-GW-12 at a concentration that was comparable to the level of magnesium in the Interference Check Sample (ICS) solution. Several analytes namely cobalt, manganese, potassium and vanadium were present in the ICS solution at concentrations which exceeded 2X the Instrument Detection Limit (IDL). Interference affects exist for cobalt and vanadium in the affected sample. The positive results reported for cobalt and vanadium were qualified as estimated, "J".

Field Duplicate Results

Field duplicate imprecision (RPD>30%) was noted for sodium. Positive results reported for sodium were qualified as estimated, "J".

Sample Quantitation

Due to uncertainty near the IDL, all positive results less than two times the IDL for barium, chromium, cobalt, manganese, nickel, silver, thallium, vanadium and zinc were qualified as estimated, "J".

Notes

The chain-of-custody lists total and dissolved metals to be performed on the samples in this SDG. The laboratory was instructed by the project manager to analyze the total metals only.

Executive Summary

Laboratory Performance: Several analytes were present in the laboratory method blanks. Mercury and selenium were qualified due to calibration noncompliance.

Other Factors Affecting Data Quality: Several analytes were qualified due to uncertainty near the IDL. Field duplicate imprecision was noted for sodium. The interfering analyte magnesium was present in two samples.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Review", February 1989 and the NFESC document entitled "Navy IRCDQM" (September 1999).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

Erin M Faust

Tetra Tech NUS
Erin M. Faust
Environmental Scientist

TetraTech NUS
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Regional Worksheets
4. Appendix D - Support Documentation

APPENDIX A
QUALIFIED ANALYTICAL RESULTS

Qualifier Codes:

A = Lab Blank Contamination
B = Field Blank Contamination
C = Calibration (i.e., % RSDs, %Ds, ICVs, CCVs, RPDs, RRFs, etc.) Noncompliance
D = MS/MSD Noncompliance
E = LCS/LCSD Noncompliance
F = Lab Duplicate Imprecision
G = Field Duplicate Imprecision
H = Holding Time Exceedance
I = ICP Serial Dilution Noncompliance
J = GFAA PDS - GFAA MSA's $r < 0.995$
K = ICP Interference - include ICSAB % R's
L = Instrument Calibration Range Exceedance
M = Sample Preservation
N = Internal Standard Noncompliance
N01 = Internal Standard Noncompliance Dioxins
N02 = Recovery Standard Noncompliance Dioxins
N03 = Clean-up Standard Noncompliance Dioxins
O = Poor Instrument Performance (i.e., base-time drifting)
P = Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
Q = Other problems (can encompass a number of issues)
R = Surrogates Recovery Noncompliance
S = Pesticide/PCB Resolution
T = % Breakdown Noncompliance for DDT and Endrin
U = Pest/PCD% between columns for positive results
V = Non-linear calibrations, tuning $r < 0.995$ (correlation coefficient)
W = EMPC result
X = Signal to noise response drop
Y = Percent solids <30%
Z = Uncertainty at 2 sigma deviation is less than sample activity

CTO257-NEW LONDON
WATER DATA
CHEMTECH CONSULTING GROUP
SDG: 4962

SAMPLE NUMBER:	DRMO-6MW01S-GW-12			DRMO-6MW10D-GW-12			DRMO-6MW10S-GW-12			DRMO-6MW11D-GW-12		
SAMPLE DATE:	06/23/01			06/24/01			06/24/01			06/22/01		
LABORATORY ID:	N4962-04			N4962-07			N4962-06			N4962-01		
QC_TYPE:	NORMAL			NORMAL			NORMAL			NORMAL		
% SOLIDS:	0.0 %			0.0 %			0.0 %			0.0 %		
UNITS:	UG/L			UG/L			UG/L			UG/L		
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
INORGANICS												
ALUMINUM	45.7	U		45.7	U		45.7	U		45.7	U	
ANTIMONY	3.7	U		3.7	U		3.7	U		3.7	U	
ARSENIC	5.0	U		5.0	U		5.0	U		12.7		
BARIUM	2.0	J	P	40.6			48.4			197		
BERYLLIUM	0.10	U		0.10	U		0.16	U	A	0.10	U	
CADMIUM	3.0	U		3.0	U		3.0	U		3.0	U	
CALCIUM	18700			147000			57500			239000		
CHROMIUM	5.0	U		5.0	U		5.0	U		9.8	J	KP
COBALT	1.8	U		1.8	U		1.8	J	P	10.3		
COPPER	2.2	U		2.2	U		10.9	U	A	10.8	U	A
IRON	11.8	U	A	983			569			7890		
LEAD	3.0	U		3.0	U		3.0	U		3.0	U	
MAGNESIUM	40500			327000			106000			656000		
MANGANESE	2.4	J	P	542			313			1160		
MERCURY	0.20	UJ	C	0.20	UJ	C	0.20	UJ	C	0.20	UJ	C
NICKEL	4.0	U		4.0	U		6.6	J	P	10.6		
POTASSIUM	34300			138000			55400			388000		
SELENIUM	5.0	UJ	C	5.0	UJ	C	5.0	UJ	C	5.0	UJ	C
SILVER	5.0	U		5.0	U		5.0	U		6.9	J	P
SODIUM	630000	J	G	2910000	J	G	1400000	J	G	8940000	J	G
THALLIUM	5.7	U		5.7	U		6.9	J	P	7.0	J	P
VANADIUM	3.2	U		3.2	UJ	K	30.2			12.9	J	K
ZINC	16.2	J	P	63.1			47.7			8.5	U	

CTO257 W LONDON
WATER D[illegible]A
CHEMTECH CONSULTING GROUP
SDG: 4962

SAMPLE NUMBER:	DRMO-6MW11S-GW-12			DRMO-6MW6D-GW-12			DRMO-6MW6S-GW-12			DRMO-6MW9S-GW-12		
SAMPLE DATE:	06/22/01			06/25/01			06/25/01			06/23/01		
LABORATORY ID:	N4962-02			N4962-09			N4962-08			N4962-05		
QC_TYPE:	NORMAL			NORMAL			NORMAL			NORMAL		
% SOLIDS:	0.0 %			0.0 %			0.0 %			0.0 %		
UNITS:	UG/L			UG/L			UG/L			UG/L		
FIELD DUPLICATE OF:							DRMO-6MW6S-GW-12-D					
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
INORGANICS												
ALUMINUM	45.7	U		63.9	U	A	122	U	A	286	U	A
ANTIMONY	7.7	U	A	3.7	U		3.7	U		7.1	U	A
ARSENIC	12.6			5.0	U		5.0	U		5.0	U	
BARIUM	39.2			69.1			43.8			14.7		
BERYLLIUM	0.10	U		0.82	U	A	0.91	U	A	0.20	U	A
CADMIUM	3.0	U		3.0	U		3.0	U		3.0	U	
CALCIUM	40900			95500			18800			2030		
CHROMIUM	5.0	U		5.0	U		5.0	U		5.0	U	
COBALT	3.6	J	P	4.8			1.8	U		2.0	J	P
COPPER	2.9	U	A	8.6	U	A	5.8	U	A	6.0	U	A
IRON	340			955			7.0	U		7.0	U	
LEAD	3.0	U		3.0	U		3.0	U		3.0	U	
MAGNESIUM	85100			74900			3930			490		
MANGANESE	228			3800			1.2	J	P	113		
MERCURY	0.20	UJ	C	0.20	UJ	C	0.20	UJ	C	0.20	UJ	C
NICKEL	4.0	U		12.1			4.0	U		4	U	
POTASSIUM	84700			27900			2750			777	U	A
SELENIUM	5.0	UJ	C	5.0	UJ	C	5.3	J	C	5.0	UJ	C
SILVER	17.1			5.0	U		5.0	U		5.0	U	
SODIUM	1700000	J	G	633000	J	G	28900	J	G	2530	U	A
THALLIUM	7.7	J	P	8.2	J	P	5.7	U		5.7	U	
VANADIUM	21.1			5.5	J	P	3.7	J	P	3.2	U	
ZINC	143			28.5			27.0			133		

CTO257-NEW LONDON
WATER DATA
CHEMTECH CONSULTING GROUP
SDG: 4962

SAMPLE NUMBER:	GWFD06250101			
SAMPLE DATE:	06/25/01	/ /	/ /	/ /
LABORATORY ID:	N4962-12			
QC_TYPE:	NORMAL			
% SOLIDS:	0.0 %	100.0 %	100.0 %	100.0 %
UNITS:	UG/L			
FIELD DUPLICATE OF:	DRMO-6MW6S-GW-12			

	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
INORGANICS												
ALUMINUM	53.0	U	A									
ANTIMONY	3.7	U										
ARSENIC	5.0	U										
BARIUM	35.6											
BERYLLIUM	0.36	U	A									
CADMIUM	3.0	U										
CALCIUM	17900											
CHROMIUM	5.0	U										
COBALT	1.8	U										
COPPER	3.3	U	A									
IRON	7.0	U										
LEAD	3.0	U										
MAGNESIUM	4010											
MANGANESE	1.2	U										
MERCURY	0.20	UJ	C									
NICKEL	4.0	U										
POTASSIUM	3540											
SELENIUM	5.0	UJ	C									
SILVER	5.0	U										
SODIUM	42300	J	G									
THALLIUM	5.7	U										
VANADIUM	3.2	U										
ZINC	29.0											

APPENDIX C

STATISTICAL ANALYSIS INFORMATION

C.1 TABLES

C.2 SAMPLE CALCULATIONS

C-1 TABLES

TABLE C-1
COEFFICIENTS A_i FOR W TEST OF NORMALITY FOR N=2 to 50

i/n	2	3	4	5	6	7	8	9	10
1	0.7071	0.7071	0.6872	0.6646	0.6431	0.6233	0.6052	0.5888	0.5739
2			0.1677	0.2413	0.2806	0.3031	0.3164	0.3244	0.3291
3					0.0875	0.1401	0.1743	0.1976	0.2141
4							0.0561	0.0947	0.1224
5									0.0399

i/n	11	12	13	14	15	16	17	18	19	20
1	0.5601	0.5475	0.5359	0.5251	0.5150	0.5056	0.4968	0.4886	0.4808	0.4734
2	0.3315	0.3325	0.3325	0.3318	0.3306	0.3290	0.3273	0.3253	0.3232	0.3211
3	0.2260	0.2347	0.2412	0.2460	0.2495	0.2521	0.2540	0.2553	0.2561	0.2565
4	0.1429	0.1586	0.1707	0.1802	0.1878	0.1939	0.1988	0.2027	0.2059	0.2085
5	0.0695	0.0922	0.1099	0.1240	0.1353	0.1447	0.1524	0.1587	0.1641	0.1686
6		0.0303	0.0539	0.0727	0.0880	0.1005	0.1109	0.1197	0.1271	0.1334
7				0.0240	0.0433	0.0593	0.0725	0.0837	0.0932	0.1013
8						0.0196	0.0359	0.0496	0.0612	0.0711
9								0.0163	0.0303	0.0422
10										0.0140

i/n	21	22	23	24	25	26	27	28	29	30
1	0.4643	0.4590	0.4542	0.4493	0.4450	0.4407	0.4366	0.4328	0.4291	0.4254
2	0.3185	0.3156	0.3126	0.3098	0.3069	0.3043	0.3018	0.2992	0.2968	0.2944
3	0.2578	0.2571	0.2563	0.2554	0.2543	0.2533	0.2522	0.2510	0.2499	0.2487
4	0.2119	0.2131	0.2139	0.2145	0.2148	0.2151	0.2152	0.2151	0.2150	0.2148
5	0.1736	0.1764	0.1787	0.1807	0.1822	0.1836	0.1848	0.1857	0.1864	0.1870
6	0.1399	0.1443	0.1480	0.1512	0.1539	0.1563	0.1584	0.1601	0.1616	0.1630
7	0.1092	0.1150	0.1201	0.1245	0.1283	0.1316	0.1346	0.1372	0.1395	0.1415
8	0.0804	0.0878	0.0941	0.0997	0.1046	0.1089	0.1128	0.1162	0.1192	0.1219
9	0.0530	0.0618	0.0696	0.0764	0.0823	0.0876	0.0923	0.0965	0.1002	0.1036
10	0.0263	0.0368	0.0459	0.0539	0.0610	0.0672	0.0728	0.0778	0.0822	0.0862
11		0.0122	0.0228	0.0321	0.0403	0.0476	0.0540	0.0598	0.0650	0.0697
12				0.0107	0.0200	0.0284	0.0358	0.0424	0.0483	0.0537
13						0.0094	0.0178	0.0253	0.0320	0.0381
14								0.0084	0.0159	0.0227
15										0.0076

i/n	31	32	33	34	35	36	37	38	39	40
1	0.4220	0.4188	0.4156	0.4127	0.4096	0.4068	0.4040	0.4015	0.9689	0.3964
2	0.2921	0.2898	0.2876	0.2854	0.2834	0.2813	0.2794	0.2774	0.2755	0.2737
3	0.2475	0.2463	0.2451	0.2439	0.2427	0.2415	0.2403	0.2391	0.2380	0.2368
4	0.2145	0.2141	0.2137	0.2132	0.2127	0.2121	0.2116	0.2110	0.2104	0.2098
5	0.1874	0.1878	0.1880	0.1882	0.1883	0.1883	0.1883	0.1881	0.1880	0.1878
6	0.1641	0.1651	0.1660	0.1667	0.1673	0.1678	0.1683	0.1686	0.1689	0.1691
7	0.1433	0.1449	0.1463	0.1475	0.1487	0.1496	0.1503	0.1513	0.1520	0.1526
8	0.1243	0.1265	0.1284	0.1301	0.1317	0.1331	0.1344	0.1356	0.1366	0.1376
9	0.1066	0.1093	0.1118	0.1140	0.1160	0.1179	0.1196	0.1211	0.1225	0.1237
10	0.0899	0.0931	0.0961	0.0988	0.1013	0.1036	0.1056	0.1075	0.1092	0.1108
11	0.0739	0.0777	0.0821	0.0844	0.0873	0.0900	0.0924	0.0947	0.0967	0.0986
12	0.0585	0.0629	0.0669	0.0706	0.0739	0.0770	0.0798	0.0824	0.0848	0.0870
13	0.0435	0.0485	0.0530	0.0572	0.0610	0.0645	0.0677	0.0706	0.0733	0.0759
14	0.0289	0.0344	0.0395	0.0441	0.0484	0.0523	0.0559	0.0592	0.0622	0.0651
15	0.0144	0.0206	0.0262	0.0314	0.0361	0.0404	0.0444	0.0481	0.0515	0.0546
16		0.0068	0.0131	0.0187	0.0239	0.0287	0.0331	0.0372	0.0409	0.0444
17				0.0062	0.0119	0.0172	0.0220	0.0264	0.0305	0.0343
18						0.0057	0.0110	0.0158	0.0203	0.0244
19								0.0053	0.0101	0.0146
20										0.0049

i/n	41	42	43	44	45	46	47	48	49	50
1	0.3940	0.3917	0.3894	0.3872	0.3850	0.3830	0.3808	0.3789	0.3770	0.3751
2	0.2719	0.2701	0.2684	0.2667	0.2651	0.2635	0.2620	0.2604	0.2589	0.2574
3	0.2357	0.2345	0.2334	0.2323	0.2313	0.2302	0.2291	0.2281	0.2271	0.2260
4	0.2091	0.2085	0.2078	0.2072	0.2065	0.2058	0.2052	0.2045	0.2038	0.2032
5	0.1876	0.1874	0.1871	0.1868	0.1865	0.1862	0.1859	0.1855	0.1851	0.1847
6	0.1693	0.1694	0.1695	0.1695	0.1695	0.1695	0.1695	0.1693	0.1692	0.1691
7	0.1531	0.1535	0.1539	0.1542	0.1545	0.1548	0.1550	0.1551	0.1553	0.1554
8	0.1384	0.1392	0.1398	0.1405	0.1410	0.1415	0.1420	0.1423	0.1427	0.1430
9	0.1249	0.1259	0.1269	0.1278	0.1286	0.1293	0.1300	0.1306	0.1312	0.1317
10	0.1123	0.1136	0.1149	0.1160	0.1170	0.1180	0.1189	0.1197	0.1205	0.1212
11	0.1004	0.1020	0.1035	0.1049	0.1062	0.1073	0.1085	0.1095	0.1105	0.1113
12	0.0891	0.0909	0.0927	0.0943	0.0959	0.0972	0.0986	0.0998	0.1010	0.1020
13	0.0782	0.0804	0.0824	0.0842	0.0860	0.0876	0.0892	0.0906	0.0919	0.0932
14	0.0677	0.0701	0.0724	0.0745	0.0775	0.0785	0.0801	0.0817	0.0832	0.0846
15	0.0575	0.0602	0.0628	0.0651	0.0673	0.0694	0.0713	0.0731	0.0748	0.0764
16	0.0476	0.0506	0.0534	0.0560	0.0584	0.0607	0.0628	0.0648	0.0667	0.0685
17	0.0379	0.0411	0.0442	0.0471	0.0497	0.0522	0.0546	0.0568	0.0588	0.0608
18	0.0283	0.0318	0.0352	0.0383	0.0412	0.0439	0.0465	0.0489	0.0511	0.0532
19	0.0188	0.0227	0.0263	0.0296	0.0328	0.0357	0.0385	0.0411	0.0436	0.0459
20	0.0094	0.0136	0.0175	0.0211	0.0245	0.0277	0.0307	0.0335	0.0361	0.0386
21		0.0045	0.0087	0.0126	0.0163	0.0197	0.0229	0.0259	0.0288	0.0314
22				0.0042	0.0081	0.0188	0.0153	0.0185	0.0215	0.0244
23						0.0039	0.0076	0.0111	0.0143	0.0174
24								0.0037	0.0071	0.0104
25										0.0350

TABLE C-2
PERCENTAGE POINTS OF THE W TEST FOR N=3 to 50

n	0.01	0.05
3	0.753	0.767
4	0.687	0.748
5	0.686	0.762
6	0.713	0.788
7	0.730	0.803
8	0.749	0.818
9	0.764	0.829
10	0.781	0.842
11	0.792	0.850
12	0.805	0.859
13	0.814	0.866
14	0.825	0.874
15	0.835	0.881
16	0.844	0.887
17	0.851	0.892
18	0.858	0.897
19	0.863	0.901
20	0.868	0.905
21	0.873	0.908
22	0.878	0.911
23	0.881	0.914
24	0.884	0.916
25	0.888	0.918
26	0.891	0.920
27	0.894	0.923
28	0.896	0.924
29	0.898	0.926
30	0.900	0.927

n	0.01	0.05
31	0.902	0.929
32	0.904	0.930
33	0.906	0.931
34	0.908	0.933
35	0.910	0.934
36	0.912	0.935
37	0.914	0.936
38	0.916	0.938
39	0.917	0.939
40	0.919	0.940
41	0.920	0.941
42	0.922	0.942
43	0.923	0.943
44	0.924	0.944
45	0.926	0.945
46	0.927	0.945
47	0.928	0.946
48	0.929	0.947
49	0.929	0.947
50	0.930	0.947

TABLE C-3
95th PERCENTILES OF F-DISTRIBUTION WITH v_1 and v_2 DEGREES OF FREEDOM

v_1/v_2	1	2	3	4	5	6	7	8	9	10	12	15	20	24	30	40	60	120
1	161.4	199.5	215.7	224.6	230.2	234.0	236.8	238.9	240.5	241.9	243.9	245.9	248.0	249.1	250.1	251.1	252.2	253.3
2	18.51	19.00	19.16	19.25	19.30	19.33	19.35	19.37	19.38	19.40	19.41	19.43	19.45	19.45	19.46	19.47	19.48	19.49
3	10.13	9.55	9.28	9.12	9.01	8.94	8.89	8.85	8.81	8.79	8.74	8.70	8.66	8.64	8.62	8.59	8.57	8.55
4	7.71	6.94	6.59	6.39	6.26	6.16	6.09	6.04	6.00	5.96	5.91	5.86	5.80	5.77	5.75	5.72	5.69	5.66
5	6.61	5.79	5.41	5.19	5.05	4.95	4.88	4.82	4.77	4.74	4.68	4.62	4.56	4.53	4.50	4.46	4.43	4.40
6	5.99	5.14	4.76	4.53	4.39	4.28	4.21	4.15	4.10	4.06	4.00	3.94	3.87	3.84	3.81	3.77	3.74	3.70
7	5.59	4.74	4.35	4.12	3.97	3.87	3.79	3.73	3.68	3.64	3.57	3.51	3.44	3.41	3.38	3.34	3.30	3.27
8	5.32	4.46	4.07	3.84	3.69	3.58	3.50	3.44	3.39	3.35	3.28	3.22	3.15	3.12	3.08	3.04	3.01	2.97
9	5.12	4.26	3.86	3.63	3.48	3.37	3.29	3.23	3.18	3.14	3.07	3.01	2.94	2.90	2.86	2.83	2.79	2.72
10	4.96	4.10	3.71	3.48	3.33	3.22	3.14	3.07	3.02	2.98	2.91	2.85	2.77	2.74	2.70	2.66	2.62	2.58
11	4.84	3.98	3.59	3.36	3.20	3.09	3.01	2.95	2.90	2.85	2.79	2.72	2.65	2.61	2.57	2.53	2.49	2.45
12	4.75	3.89	3.49	3.26	3.11	3.00	2.91	2.85	2.80	2.75	2.69	2.62	2.54	2.51	2.47	2.43	2.38	2.34
13	4.67	3.81	3.41	3.18	3.03	2.92	2.83	2.77	2.71	2.67	2.60	2.53	2.46	2.42	2.38	2.34	2.30	2.25
14	4.60	3.74	3.34	3.11	2.96	2.85	2.76	2.70	2.65	2.60	2.53	2.46	2.39	2.35	2.31	2.27	2.22	2.18
15	4.54	3.68	3.29	3.06	2.90	2.79	2.71	2.64	2.59	2.54	2.48	2.40	2.33	2.29	2.25	2.20	2.16	2.11
16	4.49	3.63	3.24	3.01	2.85	2.74	2.66	2.59	2.54	2.49	2.42	2.35	2.28	2.24	2.19	2.15	2.11	2.06
17	4.45	3.59	3.20	2.96	2.81	2.70	2.61	2.55	2.49	2.45	2.38	2.31	2.23	2.19	2.15	2.10	2.06	2.01
18	4.41	3.55	3.16	2.93	2.77	2.66	2.58	2.51	2.46	2.41	2.34	2.27	2.19	2.15	2.11	2.06	2.02	1.97
19	4.38	3.52	3.13	2.90	2.74	2.63	2.54	2.48	2.42	2.38	2.31	2.23	2.16	2.11	2.07	2.03	1.98	1.93
20	4.35	3.49	3.10	2.87	2.71	2.60	2.51	2.45	2.39	2.35	2.28	2.20	2.12	2.08	2.04	1.99	1.95	1.90
21	4.32	3.47	3.07	2.84	2.68	2.57	2.49	2.42	2.37	2.32	2.25	2.18	2.10	2.05	2.01	1.96	1.92	1.87
22	4.30	3.44	3.05	2.82	2.66	2.55	2.46	2.40	2.34	2.30	2.23	2.15	2.07	2.03	1.98	1.94	1.89	1.84
23	4.28	3.42	3.03	2.80	2.64	2.53	2.44	2.37	2.32	2.27	2.20	2.13	2.05	2.01	1.96	1.91	1.86	1.81
24	4.26	3.40	3.01	2.78	2.62	2.51	2.42	2.36	2.30	2.25	2.18	2.11	2.03	1.98	1.94	1.89	1.84	1.79
25	4.24	3.39	2.99	2.76	2.60	2.49	2.40	2.34	2.28	2.24	2.16	2.09	2.01	1.96	1.92	1.87	1.82	1.77
26	4.23	3.37	2.98	2.74	2.59	2.47	2.39	2.32	2.27	2.22	2.15	2.07	1.99	1.95	1.90	1.85	1.80	1.75
27	4.21	3.35	2.96	2.73	2.57	2.46	2.37	2.31	2.25	2.20	2.13	2.06	1.97	1.93	1.88	1.84	1.79	1.73
28	4.20	3.34	2.95	2.71	2.56	2.45	2.36	2.29	2.24	2.19	2.12	2.04	1.96	1.91	1.87	1.82	1.77	1.71
29	4.18	3.33	2.93	2.70	2.55	2.43	2.35	2.28	2.22	2.18	2.10	2.03	1.94	1.90	1.85	1.81	1.75	1.70
30	4.17	3.32	2.92	2.69	2.53	2.42	2.33	2.27	2.21	2.16	2.09	2.01	1.93	1.89	1.84	1.79	1.74	1.68
40	4.08	3.23	2.84	2.61	2.45	2.34	2.25	2.18	2.12	2.08	2.00	1.92	1.84	1.79	1.74	1.69	1.64	1.58
60	4.00	3.15	2.76	2.53	2.37	2.25	2.17	2.10	2.04	1.99	1.92	1.84	1.75	1.70	1.65	1.59	1.53	1.47
120	3.92	3.07	2.68	2.45	2.29	2.17	2.09	2.02	1.96	1.91	1.83	1.75	1.66	1.61	1.55	1.50	1.43	1.35

NOTE: v_1: Degrees of Freedom for numerator
v_2: Degrees of freedom for denominator

C-2 SAMPLE CALCULATIONS

TETRA TECH NUS, INC. **CALCULATION WORKSHEET**

CLIENT: New London	JOB NUMBER: 2863
SUBJECT: Sample Calculations of Statistical Analysis	
BASED ON: Downgradient Calcium Results Rnds 9-12	DRAWING NUMBER:
BY: TSK / CHECKED BY: BEL	APPROVED BY: / DATE: 10/9/01

THE DATA USED FOR THE FOLLOWING SAMPLE CALCULATIONS ARE THE CALCIUM RESULTS COLLECTED FROM DOWNGRADIENT GROUND WATER RESULTS ROUNDS NINE THROUGH TWELVE

Well	Round	Value	Qual	Type
6MW1S	09	79300		Down
6MW1S	10	42000		Down
6MW01S	11	43500		Down
6MW01S	12	18700		Down
6MW2D	09	278000		Down
6MW2D	10	277000		Down
6MW2D	11	288000		Down
6MW2D	12	232000		Down
6MW2S	09	193000		Down
6MW2S	10	226000		Down
6MW2S	11	156000		Down
6MW2S	12	80500		Down
6MW10D	09	165000		Down
6MW10D	10	169000		Down
6MW10D	11	179000		Down
6MW10D	12	147000		Down
6MW10S	09	83400		Down
6MW10S	10	155000		Down
6MW10S	11	93800		Down
6MW10S	12	57500		Down
6MW11D	09 (AVG)	312500		Down
6MW11D	10	202000		Down
6MW11D	11	221000		Down
6MW11D	12	239000		Down
6MW11S	09	102000		Down
6MW11S	10	150000		Down
6MW11S	11	82300		Down
6MW11S	12	40900		Down

CLIENT	JOB NUMBER		
NEW LONDON	2863		
SUBJECT: SAMPLE CALCULATIONS OF STATISTICAL ANALYSIS			
BASED ON: DOWNGRADIENT CALCIUM RESULTS RNDS 9-12		DRAWING NUMBER	
BY: TSK	CHECKED BY: BEL	APPROVED BY	DATE: 10/9/01

① CALCULATE THE ARITHMATIC MEAN ($\bar{x}$):

$$\bar{x} = \sum_{i=1}^{n} x_i / n$$

$$\sum_{i=1}^{28} = 79300 + 42000 + 43500 + 18700 + 278000 + 277000 + 288000 + 232000 + 193000 + 226000 + 156000 + 80500 + 165000 + 169000 + 179000 + 147000 + 83400 + 155000 + 93800 + 57500 + 312500 + 202000 + 221000 + 239000 + 102000 + 150000 + 82300 + 40900$$

$$\sum_{i=1}^{28} = 4313400 \qquad \bar{x} = \sum_{i=1}^{28} x_i / n = \frac{4313400}{28} = 154050$$

② CALCULATE THE STANDARD DEVIATION (S_x):

$$S_x = \sqrt{\frac{\sum_{i=1}^{n} (x_i - \bar{x})^2}{n-1}}$$

$$\sum_{i=1}^{28} (x_i - \bar{x})^2 = (79300-154050)^2 + (42000-154050)^2 + (43500-154050)^2 + (18700-154050)^2 + (278000-154050)^2 + (277000-154050)^2 + (288000-154050)^2 + (232000-154050)^2 + (193000-154050)^2 + (226000-154050)^2 + (156000-154050)^2 + (80500-154050)^2 + (165000-154050)^2 + (169000-154050)^2 + (179000-154050)^2 + (147000-154050)^2 + (83400-154050)^2 + (155000-154050)^2 + (93800-154050)^2 + (57500-154050)^2 + (312500-154050)^2 + (202000-154050)^2 + (221000-154050)^2 + (239000-154050)^2 + (102000-154050)^2 + (150000-154050)^2 + (82300-154050)^2 + (40900-154050)^2$$

$$= (-74750)^2 + (-112050)^2 + (-110550)^2 + (-135350)^2 + (123950)^2 + (122950)^2 + (133950)^2 + (77950)^2 + (38950)^2 + (71950)^2 + (1950)^2 + (-73550)^2 + (10950)^2 + (14950)^2 + (24950)^2 + (-7050)^2 + (-70650)^2 + (950)^2 + (-60250)^2 + (-96550)^2 + (158450)^2 + (47950)^2 + (66950)^2 + (84950)^2 + (-52050)^2 + (-4050)^2 + (-71750)^2 + (-113150)^2$$

CLIENT: New London	JOB NUMBER: 2863
SUBJECT: Sample Calculations based on Statistical Analysis	
BASED ON: Downgradient Calcium Results Rnos 9-12	DRAWING NUMBER:
BY: TSK / CHECKED BY: BCL	APPROVED BY: / DATE: 10/9/01

$$= (5587562500)+(12555202500)+(1222130 2500)+(1831962 2500)$$
$$+(1536360 2500)+(1511670 2500)+(1794260 2500)+(607620 2500)$$
$$+(151710 2500)+(5176302500)+(38 02500)+(540960 2500)+(11990 2500)$$
$$+(2235 02500)+(6225 02500)+(4970 2500)+(4991422500)+(90 2500)$$
$$+(3630062500)+(9321902500)+(2510640 2500)+(2299202500)$$
$$+(4482302500)+(7216502500)+(2709202500)+(16402500)$$
$$+(5148062500)+(1280292 2500)$$

$$\sum_{i=1}^{28}(x_i-\bar{x})^2 = 194{,}031{,}000{,}000$$

$$S_x = \sqrt{\frac{\sum(x_i-\bar{x})^2}{n-1}} = \sqrt{\frac{194{,}031{,}000{,}000}{27}} = \sqrt{7186333704}$$

$$S_x = 84772.24607$$

③ Calculate the Shapiro-Wilk W Statistic (W_{CALC}):

$$W_{CALC} = \left(\frac{b}{S_x\sqrt{n-1}}\right)^2$$

Calculate b by creating the following table:

Column 1: Results ordered by smallest to largest (R_i)
Column 2: Results ordered by largest to smallest (R_{n-i+1})
Column 3: Column 2 − Column 1 ($R_{n-i+1} - R_i$)
Column 4: Coefficient a_i from sample calculation Table 1
Column 5: Column 3 × Column 4 = b_i = $a_i(R_{n-i+1} - R_i)$

$$b = \sum_{i=1}^{K} b_i = \sum_{i=1}^{14} b_i$$

* where K is the greatest integer less than or equal to $n/2$. So, $K \rightarrow n/2 = 28/2 = 14$

Sample Calculations Table 1
COEFFICIENTS A_i FOR W TEST OF NORMALITY FOR N=2 to 50

i/n	2	3	4	5	6	7	8	9	10
1	0.7071	0.7071	0.6872	0.6646	0.6431	0.6233	0.6052	0.5888	0.5739
2			0.1677	0.2413	0.2806	0.3031	0.3164	0.3244	0.3291
3					0.0875	0.1401	0.1743	0.1976	0.2141
4							0.0561	0.0947	0.1224
5									0.0399

i/n	11	12	13	14	15	16	17	18	19	20
1	0.5601	0.5475	0.5359	0.5251	0.5150	0.5056	0.4968	0.4886	0.4808	0.4734
2	0.3315	0.3325	0.3325	0.3318	0.3306	0.3290	0.3273	0.3253	0.3232	0.3211
3	0.2260	0.2347	0.2412	0.2460	0.2495	0.2521	0.2540	0.2553	0.2561	0.2565
4	0.1429	0.1586	0.1707	0.1802	0.1878	0.1939	0.1988	0.2027	0.2059	0.2085
5	0.0695	0.0922	0.1099	0.1240	0.1353	0.1447	0.1524	0.1587	0.1641	0.1686
6		0.0303	0.0539	0.0727	0.0880	0.1005	0.1109	0.1197	0.1271	0.1334
7				0.0240	0.0433	0.0593	0.0725	0.0837	0.0932	0.1013
8						0.0196	0.0359	0.0496	0.0612	0.0711
9								0.0163	0.0303	0.0422
10										0.0140

i/n	21	22	23	24	25	26	27	28	29	30
1	0.4643	0.4590	0.4542	0.4493	0.4450	0.4407	0.4366	0.4328	0.4291	0.4254
2	0.3185	0.3156	0.3126	0.3098	0.3069	0.3043	0.3018	0.2992	0.2968	0.2944
3	0.2578	0.2571	0.2563	0.2554	0.2543	0.2533	0.2522	0.2510	0.2499	0.2487
4	0.2119	0.2131	0.2139	0.2145	0.2148	0.2151	0.2152	0.2151	0.2150	0.2148
5	0.1736	0.1764	0.1787	0.1807	0.1822	0.1836	0.1848	0.1857	0.1864	0.1870
6	0.1399	0.1443	0.1480	0.1512	0.1539	0.1563	0.1584	0.1601	0.1616	0.1630
7	0.1092	0.1150	0.1201	0.1245	0.1283	0.1316	0.1346	0.1372	0.1395	0.1415
8	0.0804	0.0878	0.0941	0.0997	0.1046	0.1089	0.1128	0.1162	0.1192	0.1219
9	0.0530	0.0618	0.0696	0.0764	0.0823	0.0876	0.0923	0.0965	0.1002	0.1036
10	0.0263	0.0368	0.0459	0.0539	0.0610	0.0672	0.0728	0.0778	0.0822	0.0862
11		0.0122	0.0228	0.0321	0.0403	0.0476	0.0540	0.0598	0.0650	0.0697
12				0.0107	0.0200	0.0284	0.0358	0.0424	0.0483	0.0537
13						0.0094	0.0178	0.0253	0.0320	0.0381
14								0.0084	0.0159	0.0227
15										0.0076

i/n	31	32	33	34	35	36	37	38	39	40
1	0.4220	0.4188	0.4156	0.4127	0.4096	0.4068	0.4040	0.4015	0.9689	0.3964
2	0.2921	0.2898	0.2876	0.2854	0.2834	0.2813	0.2794	0.2774	0.2755	0.2737
3	0.2475	0.2463	0.2451	0.2439	0.2427	0.2415	0.2403	0.2391	0.2380	0.2368
4	0.2145	0.2141	0.2137	0.2132	0.2127	0.2121	0.2116	0.2110	0.2104	0.2098
5	0.1874	0.1878	0.1880	0.1882	0.1883	0.1883	0.1883	0.1881	0.1880	0.1878
6	0.1641	0.1651	0.1660	0.1667	0.1673	0.1678	0.1683	0.1686	0.1689	0.1691
7	0.1433	0.1449	0.1463	0.1475	0.1487	0.1496	0.1503	0.1513	0.1520	0.1526
8	0.1243	0.1265	0.1284	0.1301	0.1317	0.1331	0.1344	0.1356	0.1366	0.1376
9	0.1066	0.1093	0.1118	0.1140	0.1160	0.1179	0.1196	0.1211	0.1225	0.1237
10	0.0899	0.0931	0.0961	0.0988	0.1013	0.1036	0.1056	0.1075	0.1092	0.1108
11	0.0739	0.0777	0.0821	0.0844	0.0873	0.0900	0.0924	0.0947	0.0967	0.0986
12	0.0585	0.0629	0.0669	0.0706	0.0739	0.0770	0.0798	0.0824	0.0848	0.0870
13	0.0435	0.0485	0.0530	0.0572	0.0610	0.0645	0.0677	0.0706	0.0733	0.0759
14	0.0289	0.0344	0.0395	0.0441	0.0484	0.0523	0.0559	0.0592	0.0622	0.0651
15	0.0144	0.0206	0.0262	0.0314	0.0361	0.0404	0.0444	0.0481	0.0515	0.0546
16		0.0068	0.0131	0.0187	0.0239	0.0287	0.0331	0.0372	0.0409	0.0444
17				0.0062	0.0119	0.0172	0.0220	0.0264	0.0305	0.0343
18						0.0057	0.0110	0.0158	0.0203	0.0244
19								0.0053	0.0101	0.0146
20										0.0049

i/n	41	42	43	44	45	46	47	48	49	50
1	0.3940	0.3917	0.3894	0.3872	0.3850	0.3830	0.3808	0.3789	0.3770	0.3751
2	0.2719	0.2701	0.2684	0.2667	0.2651	0.2635	0.2620	0.2604	0.2589	0.2574
3	0.2357	0.2345	0.2334	0.2323	0.2313	0.2302	0.2291	0.2281	0.2271	0.2260
4	0.2091	0.2085	0.2078	0.2072	0.2065	0.2058	0.2052	0.2045	0.2038	0.2032
5	0.1876	0.1874	0.1871	0.1868	0.1865	0.1862	0.1859	0.1855	0.1851	0.1847
6	0.1693	0.1694	0.1695	0.1695	0.1695	0.1695	0.1695	0.1693	0.1692	0.1691
7	0.1531	0.1535	0.1539	0.1542	0.1545	0.1548	0.1550	0.1551	0.1553	0.1554
8	0.1384	0.1392	0.1398	0.1405	0.1410	0.1415	0.1420	0.1423	0.1427	0.1430
9	0.1249	0.1259	0.1269	0.1278	0.1286	0.1293	0.1300	0.1306	0.1312	0.1317
10	0.1123	0.1136	0.1149	0.1160	0.1170	0.1180	0.1189	0.1197	0.1205	0.1212
11	0.1004	0.1020	0.1035	0.1049	0.1062	0.1073	0.1085	0.1095	0.1105	0.1113
12	0.0891	0.0909	0.0927	0.0943	0.0959	0.0972	0.0986	0.0998	0.1010	0.1020
13	0.0782	0.0804	0.0824	0.0842	0.0860	0.0876	0.0892	0.0906	0.0919	0.0932
14	0.0677	0.0701	0.0724	0.0745	0.0775	0.0785	0.0801	0.0817	0.0832	0.0846
15	0.0575	0.0602	0.0628	0.0651	0.0673	0.0694	0.0713	0.0731	0.0748	0.0764
16	0.0476	0.0506	0.0534	0.0560	0.0584	0.0607	0.0628	0.0648	0.0667	0.0685
17	0.0379	0.0411	0.0442	0.0471	0.0497	0.0522	0.0546	0.0568	0.0588	0.0608
18	0.0283	0.0318	0.0352	0.0383	0.0412	0.0439	0.0465	0.0489	0.0511	0.0532
19	0.0188	0.0227	0.0263	0.0296	0.0328	0.0357	0.0385	0.0411	0.0436	0.0459
20	0.0094	0.0136	0.0175	0.0211	0.0245	0.0277	0.0307	0.0335	0.0361	0.0386
21		0.0045	0.0087	0.0126	0.0163	0.0197	0.0229	0.0259	0.0288	0.0314
22				0.0042	0.0081	0.0188	0.0153	0.0185	0.0215	0.0244
23						0.0039	0.0076	0.0111	0.0143	0.0174
24								0.0037	0.0071	0.0104
25										0.0350

TETRA TECH NUS, INC. **CALCULATION WORKSHEET**

CLIENT: New London	JOB NUMBER: 2863
SUBJECT: Sample Calculation of Statistical Analysis	
BASED ON: Downgradient Calcium Results Rnds 9-12	DRAWING NUMBER:
BY: TSK / CHECKED BY: BGL	APPROVED BY: / DATE: 10/9/01

R_i	R_{n-i+1}	$R_{n-i+1} - R_i$	a_i	b_i	i
18700	312500	293800	0.4328	127156.64	1
40900	288000	247100	0.2992	73932.32	2
42000	278000	236000	0.2510	59236	3
43500	277000	233500	0.2151	50225.85	4
57500	239000	181500	0.1857	33704.55	5
79300	232000	152700	0.1601	24447.27	6
80500	226000	145500	0.1372	19962.6	7
82300	221000	138700	0.1162	16116.94	8
83400	202000	118600	0.0965	11444.9	9
93800	193000	99200	0.0778	7717.76	10
102000	179000	77000	0.0598	4604.6	11
147000	169000	22000	0.0424	932.8	12
150000	165000	15000	0.0253	379.5	13
155000	156000	1000	0.0084	8.4	14
156000	155000				15
165000	150000				16
169000	147000				17
179000	102000				18
193000	93800				19
202000	83400				20
221000	82300				21
226000	80500				22
232000	79300				23
239000	57500				24
277000	43500				25
278000	42000				26
288000	40900				27
312500	18700			+	28
				$b = 429870.13$	

CLIENT: NEW LONDON	JOB NUMBER: 2863
SUBJECT: SAMPLE CALCULATION OF STATISTICAL ANALYSIS	
BASED ON: DOWNGRADIENT CALCIUM RESULTS RMDS 9-12	DRAWING NUMBER:
BY: TSK / CHECKED BY: BGL	APPROVED BY: / DATE: 10/9/01

$$W_{CALC} = \left(\frac{b}{S_x\sqrt{n-1}}\right)^2 = \left(\frac{429870.13}{84772.24607\sqrt{27}}\right)^2 = \left(\frac{429870.13}{440489.5118}\right)^2$$

$$= (0.975892)^2$$

$$W_{CALC} = 0.9524$$

DETERMINE W_{TEST} AT A 5% LEVEL OF SIGNIFICANCE FROM TABLE 2:

$$W_{TEST} = 0.924$$

COMPARE W_{CALC} TO W_{TEST}:

$$W_{CALC} = 0.9524 > 0.924 = W_{TEST}$$

SINCE $W_{CALC} > W_{TEST}$, WE ACCEPT THE NULL HYPOTHESIS THAT THE DATA SET HAS A NORMAL DISTRIBUTION.

TABLE 2
PERCENTAGE POINTS OF THE W TEST FOR N=3 to 50

n	0.01	0.05
3	0.753	0.767
4	0.687	0.748
5	0.686	0.762
6	0.713	0.788
7	0.730	0.803
8	0.749	0.818
9	0.764	0.829
10	0.781	0.842
11	0.792	0.850
12	0.805	0.859
13	0.814	0.866
14	0.825	0.874
15	0.835	0.881
16	0.844	0.887
17	0.851	0.892
18	0.858	0.897
19	0.863	0.901
20	0.868	0.905
21	0.873	0.908
22	0.878	0.911
23	0.881	0.914
24	0.884	0.916
25	0.888	0.918
26	0.891	0.920
27	0.894	0.923
28	0.896	0.924
29	0.898	0.926
30	0.900	0.927

n	0.01	0.05
31	0.902	0.929
32	0.904	0.930
33	0.906	0.931
34	0.908	0.933
35	0.910	0.934
36	0.912	0.935
37	0.914	0.936
38	0.916	0.938
39	0.917	0.939
40	0.919	0.940
41	0.920	0.941
42	0.922	0.942
43	0.923	0.943
44	0.924	0.944
45	0.926	0.945
46	0.927	0.945
47	0.928	0.946
48	0.929	0.947
49	0.929	0.947
50	0.930	0.947

CLIENT New London	JOB NUMBER 2863
SUBJECT Sample Calculation of Statistical Analysis	
BASED ON Downgradient Calcium Results Rnds 9-12	DRAWING NUMBER
BY TSK / CHECKED BY BEL	APPROVED BY / DATE 10/9/01

THE FOLLOWING DATA SET WILL BE USED FOR THE WILCOXON RANK SUM TEST SAMPLE CALCULATION. THIS DATA SET IS OF UPGRADIENT CALCIUM RESULTS:

WELL	ROUND	VALUE	QUAL	TYPE
6MW6D	09	65500		UP
6MW6D	10	66300		UP
6MW6D	11 (AVG)	72600		UP
6MW6D	12	95500		UP
6MW6S	09	13400		UP
6MW6S	10 (AVG)	16000		UP
6MW6S	11	15900		UP
6MW6S	12 (AVG)	18350		UP
6MW9S	09	2730		UP
6MW9S	10	3950		UP
6MW9S	11	4890		UP
6MW9S	12	2030		UP

(4) PERFORM THE WILCOXEN RANK-SUM NON-PARAMETRIC ANOVA.

a) RANK RESULTS FROM LOWEST TO HIGHEST

* RANK ADJUSTED FOR TIES BY USING THE MEDIAN (MIDDLE) RANK OF THE TIED RANKS FOR ALL TIED VALUES. (NO TIES IN OUR DATA)

CLIENT: New London	JOB NUMBER: 2863
SUBJECT: Sample Calculation of Statistical Analysis	
BASED ON: Downgradient Calcium Results Rows 9-12	DRAWING NUMBER:
BY: TSK / CHECKED BY: BGL	APPROVED BY: / DATE: 10/9/01

Value	Type	Rank	Adjusted Rank*	Value	Type	Rank	Adjusted Rank*
2030	UP	1	1	93800	DOWN	21	21
2730	UP	2	2	95500	UP	22	22
3950	UP	3	3	102000	DOWN	23	23
4890	UP	4	4	147000	DOWN	24	24
13400	UP	5	5	150000	DOWN	25	25
15900	UP	6	6	155000	DOWN	26	26
16000	UP	7	7	156000	DOWN	27	27
18350	UP	8	8	165000	DOWN	28	28
18700	DOWN	9	9	169000	DOWN	29	29
40900	DOWN	10	10	179000	DOWN	30	30
42000	DOWN	11	11	193000	DOWN	31	31
43500	DOWN	12	12	202000	DOWN	32	32
57500	DOWN	13	13	221000	DOWN	33	33
65500	UP	14	14	226000	DOWN	34	34
66300	UP	15	15	232000	DOWN	35	35
72600	UP	16	16	239000	DOWN	36	36
79300	DOWN	17	17	277000	DOWN	37	37
80500	DOWN	18	18	278000	DOWN	38	38
82300	DOWN	19	19	288000	DOWN	39	39
83400	DOWN	20	20	312500	DOWN	40	40

CLIENT: NEW LONDON	JOB NUMBER: 2863
SUBJECT: SAMPLE CALCULATIONS OF STATISTICAL ANALYSIS	
BASED ON: DOWNGRADIENT CALCIUM RESULTS RNDS 9-12	DRAWING NUMBER:
BY: TSK / CHECKED BY: BGL	APPROVED BY: / DATE: 10/9/01

B) SUM THE RANKS (ADJ) OF THE DOWNGRADIENT AND UPGRADIENT RESULTS:

$$WRS = \sum_{i=1}^{28} R_{(ADJ)_{DOWN}} = 9+10+11+12+13+17+18+19+20+21+23+24+25+26+27+28+29+30+31+32+33+34+35+36+37+38+39+40$$

$$WRS_{DOWN} = 717$$

$$SUM_{UP} = \sum_{i=1}^{12} R_{(ADJ)_{UP}} = 1+2+3+4+5+6+7+8+14+15+16+22$$

$$SUM_{UP} = 103$$

✓ RANK SUMS $\quad WRS_{DOWN} + SUM_{UP} = \sum_{i=1}^{40} i = n/2\,(n+1)$

$$717 + 103 = 1+2+3+\ldots+39+40 = 40/2\,(40+1)$$

$$820 = 820$$

C) CALCULATE THE WRS_{DOWN} Z-SCORE (Z_{RS}):

$$Z_{RS} = \frac{WRS_{DOWN} - \frac{n_1(n+1)}{2}}{\sqrt{\frac{[n_1(n_2)(n+1)]}{12}}}$$

WHERE

$n_1 = 28$ = # OF DOWNGRADIENT RESULTS

$n_2 = 12$ = # OF UPGRADIENT RESULTS

$n = 40$ = # OF TOTAL RESULTS = $n_1 + n_2$

CLIENT: New London	JOB NUMBER: 2863
SUBJECT: Sample Calculations of Statistical Analysis	
BASED ON: Downgradient Calcium Results Rnds 9-12	DRAWING NUMBER:
BY: TSK / CHECKED BY: BGL	APPROVED BY: / DATE: 10/9/01

$$Z_{RS} = \frac{717 - \frac{28(41)}{2}}{\sqrt{\frac{(28)(12)(41)}{12}}}$$

$$= \frac{717 - 574}{\sqrt{\frac{13776}{12}}}$$

$$= \frac{143}{\sqrt{1148}} = \frac{143}{33.882} = 4.2205$$

$Z_{RS} = 4.2205$

From Sample Calc Table 3 A Z_{RS} score of 4.2205 corresponds to a P-level of 0.0001

Because $0.0001 < 0.05$ we find that we reject our null hypothesis that our downgradient calcium results are not statistically higher than our upgradient calcium results. At a 95% confidence limit.

Sample Calculation Table ~~5~~ 3
p Levels from Z Scores for 2 Sided Tests

Z	p	Z	p	Z	p	Z	p	Z	p	Z	p	Z	p	Z	p
0.00	1.0000	0.50	0.6171	1.00	0.3173	1.50	0.1336	2.00	0.0455	2.50	0.0124	3.00	0.0027	3.50	0.0005
0.01	0.9920	0.51	0.6101	1.01	0.3125	1.51	0.1310	2.01	0.0444	2.51	0.0121	3.01	0.0026	3.51	0.0004
0.02	0.9840	0.52	0.6031	1.02	0.3077	1.52	0.1285	2.02	0.0434	2.52	0.0117	3.02	0.0025	3.52	0.0004
0.03	0.9761	0.53	0.5961	1.03	0.3030	1.53	0.1260	2.03	0.0424	2.53	0.0114	3.03	0.0024	3.53	0.0004
0.04	0.9681	0.54	0.5892	1.04	0.2983	1.54	0.1236	2.04	0.0414	2.54	0.0111	3.04	0.0024	3.54	0.0004
0.05	0.9601	0.55	0.5823	1.05	0.2937	1.55	0.1211	2.05	0.0404	2.55	0.0108	3.05	0.0023	3.55	0.0004
0.06	0.9522	0.56	0.5755	1.06	0.2891	1.56	0.1188	2.06	0.0394	2.56	0.0105	3.06	0.0022	3.56	0.0004
0.07	0.9442	0.57	0.5687	1.07	0.2846	1.57	0.1164	2.07	0.0385	2.57	0.0102	3.07	0.0021	3.57	0.0004
0.08	0.9362	0.58	0.5619	1.08	0.2801	1.58	0.1141	2.08	0.0375	2.58	0.0099	3.08	0.0021	3.58	0.0003
0.09	0.9283	0.59	0.5552	1.09	0.2757	1.59	0.1118	2.09	0.0366	2.59	0.0096	3.09	0.0020	3.59	0.0003
0.10	0.9203	0.60	0.5485	1.10	0.2713	1.60	0.1096	2.10	0.0357	2.60	0.0093	3.10	0.0019	3.60	0.0003
0.11	0.9124	0.61	0.5419	1.11	0.2670	1.61	0.1074	2.11	0.0349	2.61	0.0091	3.11	0.0019	3.61	0.0003
0.12	0.9045	0.62	0.5353	1.12	0.2627	1.62	0.1052	2.12	0.0340	2.62	0.0088	3.12	0.0018	3.62	0.0003
0.13	0.8966	0.63	0.5287	1.13	0.2585	1.63	0.1031	2.13	0.0332	2.63	0.0085	3.13	0.0017	3.63	0.0003
0.14	0.8887	0.64	0.5222	1.14	0.2543	1.64	0.1010	2.14	0.0324	2.64	0.0083	3.14	0.0017	3.64	0.0003
0.15	0.8808	0.65	0.5157	1.15	0.2501	1.65	0.0989	2.15	0.0316	2.65	0.0080	3.15	0.0016	3.65	0.0003
0.16	0.8729	0.66	0.5093	1.16	0.2460	1.66	0.0969	2.16	0.0308	2.66	0.0078	3.16	0.0016	3.66	0.0003
0.17	0.8650	0.67	0.5029	1.17	0.2420	1.67	0.0949	2.17	0.0300	2.67	0.0076	3.17	0.0015	3.67	0.0002
0.18	0.8572	0.68	0.4965	1.18	0.2380	1.68	0.0930	2.18	0.0293	2.68	0.0074	3.18	0.0015	3.68	0.0002
0.19	0.8493	0.69	0.4902	1.19	0.2340	1.69	0.0910	2.19	0.0285	2.69	0.0071	3.19	0.0014	3.69	0.0002
0.20	0.8415	0.70	0.4839	1.20	0.2301	1.70	0.0891	2.20	0.0278	2.70	0.0069	3.20	0.0014	3.70	0.0002
0.21	0.8337	0.71	0.4777	1.21	0.2263	1.71	0.0873	2.21	0.0271	2.71	0.0067	3.21	0.0013	3.71	0.0002
0.22	0.8259	0.72	0.4715	1.22	0.2225	1.72	0.0854	2.22	0.0264	2.72	0.0065	3.22	0.0013	3.72	0.0002
0.23	0.8181	0.73	0.4654	1.23	0.2187	1.73	0.0836	2.23	0.0257	2.73	0.0063	3.23	0.0012	3.73	0.0002
0.24	0.8103	0.74	0.4593	1.24	0.2150	1.74	0.0819	2.24	0.0251	2.74	0.0061	3.24	0.0012	3.74	0.0002
0.25	0.8026	0.75	0.4533	1.25	0.2113	1.75	0.0801	2.25	0.0244	2.75	0.0060	3.25	0.0012	3.75	0.0002
0.26	0.7949	0.76	0.4473	1.26	0.2077	1.76	0.0784	2.26	0.0238	2.76	0.0058	3.26	0.0011	3.76	0.0002
0.27	0.7872	0.77	0.4413	1.27	0.2041	1.77	0.0767	2.27	0.0232	2.77	0.0056	3.27	0.0011	3.77	0.0002
0.28	0.7795	0.78	0.4354	1.28	0.2005	1.78	0.0751	2.28	0.0226	2.78	0.0054	3.28	0.0010	3.78	0.0002
0.29	0.7718	0.79	0.4295	1.29	0.1971	1.79	0.0735	2.29	0.0220	2.79	0.0053	3.29	0.0010	3.79	0.0002
0.30	0.7642	0.80	0.4237	1.30	0.1936	1.80	0.0719	2.30	0.0214	2.80	0.0051	3.30	0.0010	3.80	0.0001
0.31	0.7566	0.81	0.4179	1.31	0.1902	1.81	0.0703	2.31	0.0209	2.81	0.0050	3.31	0.0009	3.81	0.0001
0.32	0.7490	0.82	0.4122	1.32	0.1868	1.82	0.0688	2.32	0.0203	2.82	0.0048	3.32	0.0009	3.82	0.0001
0.33	0.7414	0.83	0.4065	1.33	0.1835	1.83	0.0672	2.33	0.0198	2.83	0.0047	3.33	0.0009	3.83	0.0001
0.34	0.7339	0.84	0.4009	1.34	0.1802	1.84	0.0658	2.34	0.0193	2.84	0.0045	3.34	0.0008	3.84	0.0001
0.35	0.7263	0.85	0.3953	1.35	0.1770	1.85	0.0643	2.35	0.0188	2.85	0.0044	3.35	0.0008	3.85	0.0001
0.36	0.7188	0.86	0.3898	1.36	0.1738	1.86	0.0629	2.36	0.0183	2.86	0.0042	3.36	0.0008	3.86	0.0001
0.37	0.7114	0.87	0.3843	1.37	0.1707	1.87	0.0615	2.37	0.0178	2.87	0.0041	3.37	0.0008	3.87	0.0001
0.38	0.7039	0.88	0.3789	1.38	0.1676	1.88	0.0601	2.38	0.0173	2.88	0.0040	3.38	0.0007	3.88	0.0001
0.39	0.6965	0.89	0.3735	1.39	0.1645	1.89	0.0588	2.39	0.0168	2.89	0.0039	3.39	0.0007	3.89	0.0001
0.40	0.6892	0.90	0.3681	1.40	0.1615	1.90	0.0574	2.40	0.0164	2.90	0.0037	3.40	0.0007	3.90	0.0001
0.41	0.6818	0.91	0.3628	1.41	0.1585	1.91	0.0561	2.41	0.0160	2.91	0.0036	3.41	0.0006	3.91	0.0001
0.42	0.6745	0.92	0.3576	1.42	0.1556	1.92	0.0549	2.42	0.0155	2.92	0.0035	3.42	0.0006	3.92	0.0001
0.43	0.6672	0.93	0.3524	1.43	0.1527	1.93	0.0536	2.43	0.0151	2.93	0.0034	3.43	0.0006	3.93	0.0001
0.44	0.6599	0.94	0.3472	1.44	0.1499	1.94	0.0524	2.44	0.0147	2.94	0.0033	3.44	0.0006	3.94	0.0001
0.45	0.6527	0.95	0.3421	1.45	0.1471	1.95	0.0512	2.45	0.0143	2.95	0.0032	3.45	0.0006	3.95	0.0001
0.46	0.6455	0.96	0.3371	1.46	0.1443	**1.96**	**0.0500**	2.46	0.0139	2.96	0.0031	3.46	0.0005	3.96	0.0001
0.47	0.6384	0.97	0.3320	1.47	0.1416	1.97	0.0488	2.47	0.0135	2.97	0.0030	3.47	0.0005	3.97	0.0001
0.48	0.6312	0.98	0.3271	1.48	0.1389	1.98	0.0477	2.48	0.0131	2.98	0.0029	3.48	0.0005	3.98	0.0001
0.49	0.6241	0.99	0.3222	1.49	0.1362	1.99	0.0466	2.49	0.0128	2.99	0.0028	3.49	0.0005	3.99	0.0001

CLIENT		JOB NUMBER	
New London		2863	
SUBJECT: Sample Calculation of Statistical Analysis			
BASED ON: Downgradient Calcium Results Rnds 9-12		DRAWING NUMBER	
BY: TSK	CHECKED BY	APPROVED BY	DATE: 10/9/01

⑤ Perform the Parametric ANOVA:

$$X = \sum_{i=1}\left[\sum_{j=1}\right] X_{ij} = 2030 + 2730 + 3950 + 4890 + 13400 + 15900 + 16000 + 18350 + 18700 + 40900 + 42000 + 43500 + 57500 + 65500 + 66300 + 72600 + 79300 + 80500 + 82300 + 83400 + 93800 + 95500 + 102000 + 147000 + 150000 + 155000 + 156000 + 165000 + 169000 + 179000 + 193000 + 202000 + 221000 + 226000 + 232000 + 239000 + 277000 + 278000 + 288000 + 312500$$

$$= 4690550$$

$$N = n_1 + n_2 = 28 + 12 = 40$$

$$\bar{X} = X/N = \frac{4690550}{40} = 117263.75$$

Now find $X_i = \sum_{j=1}^{n} x_{ij}$ and $\bar{X}_i = X_i/n_i$

$$X_1 \text{ (Down)} = 79300 + 42000 + 43500 + 18700 + 278000 + 277000 + 288000 + 232000 + 193000 + 226000 + 156000 + 80500 + 165000 + 169000 + 179000 + 147000 + 83400 + 155000 + 93800 + 57500 + 312500 + 202000 + 221000 + 239000 + 102000 + 150000 + 82300 + 40900$$

$$= 4313400$$

$$\bar{X}_1 = 4313400/28 = 154050$$

$$X_2 \text{ (UP)} = 4890 + 65500 + 66300 + 72600 + 95500 + 13400 + 16000 + 15900 + 18350 + 2730 + 3950 + 2030$$

$$= 377150$$

$$\bar{X}_2 = 377150/12 = 31429.167$$

CLIENT: New London	JOB NUMBER: 2863
SUBJECT: Sample Calculations of Statistical Analysis	
BASED ON: Downgradient Calcium Results Rnds 9-12	DRAWING NUMBER:
BY: TSK / CHECKED BY:	APPROVED BY: / DATE: 10/9/01

i	$\bar{X}_i$	$\bar{X}$	n_i	$(\bar{X}_i-\bar{X})$	$(\bar{X}_i-\bar{X})^2$	$n_i(\bar{X}_i-\bar{X})^2$
1	154050	117263.75	28	36786.25	1353228189	37890389290
2	31429.167	117263.75	12	-85834.583	7367575639	88410907670

$N = 40$ $SS_{SAMPLE} = 126301297000$

$$SS_{SAMPLE} = \sum_{i=1}^{k=2} n_i(\bar{X}_i-\bar{X})^2$$

$$SS_{TOTAL} = \sum_{i=1}^{k}\sum_{j=1}^{n_i}(X_{ij}-\bar{X})^2$$

$= (2030-117263.75)^2+(2730-117263.75)^2+(3950-117263.75)^2+(4890-117263.75)^2$
$+(13400-117263.75)^2+(15900-117263.75)^2+(16000-117263.75)^2+(18350-117263.75)^2$
$+(18700-117263.75)^2+(40900-117263.75)^2+(42000-117263.75)^2+(43500-117263.75)^2$
$+(57500-117263.75)^2+(65500-117263.75)^2+(66300-117263.75)^2+(72600-117263.75)^2$
$+(79300-117263.75)^2+(80500-117263.75)^2+(82300-117263.75)^2+(83400-117263.75)^2$
$+(93800-117263.75)^2+(95500-117263.75)^2+(102000-117263.75)^2+(147000-117263.75)^2$
$+(150000-117263.75)^2+(155000-117263.75)^2+(156000-117263.75)^2+(165000-117263.75)^2$
$+(169000-117263.75)^2+(179000-117263.75)^2+(193000-117263.75)^2+(202000-117263.75)^2$
$+(224000-117263.75)^2+(226000-117263.75)^2+(232000-117263.75)^2+(239000-117263.75)^2$
$+(277000-117263.75)^2+(278000-117263.75)^2+(288000-117263.75)^2+(3125000-117263.75)^2$

$= (-115233.75)^2+(-114533.75)^2+(-113313.75)^2+(-112373.75)^2+(-103863.75)^2$
$+(-101363.75)^2+(-101263.75)^2+(-98913.75)^2+(-98563.75)^2+(-76363.75)^2$
$+(-75263.75)^2+(-73763.75)^2+(-59763.75)^2+(-51763.75)^2+(-50963.75)^2$
$+(-44663.75)^2+(-37963.75)^2+(-36763.75)^2+(-34963.75)^2+(-33863.75)^2$
$+(-23463.75)^2+(-21763.75)^2+(-15263.75)^2+(29736.25)^2+(32736.25)^2+(37736.25)^2$
$+(38736.25)^2+(47736.25)^2+(51736.25)^2+(61736.25)^2+(75736.25)^2+(84736.25)^2$
$+(103736.25)^2+(108736.25)^2+(114736.25)^2+(121736.25)^2$
$+(159736.25)^2+(160736.25)^2+(170736.25)^2+(195236.25)^2$

CLIENT New London		JOB NUMBER 2863	
SUBJECT Sample Calculation of Statistical Analysis			
BASED ON Downgradient Calcium Results Rnds 9-12		DRAWING NUMBER	
BY TSK	CHECKED BY	APPROVED BY	DATE 10/9/01

$= 1327881739 + 1311797889 + 1284000 5939 + 1267785968 9 + 1078767856 4$
$+ 1027460981 4 + 1025434706 4 + 978392993 9 + 971481281 4 + 583142231 4$
$+ 566463206 4 + 544109081 4 + 357170581 4 + 267948581 4 + 259730381 4$
$+ 199485056 4 + 144124631 4 + 135157331 4 + 122246381 4 + 114675356 4$
$+ 550547564.1 + 473660814.1 + 232982064.1 + 884244564.1 + 107166206 4$
$+ 142402456 4 + 150049706 4 + 227874956 4 + 267663956 4 + 381136456 4$
$+ 573597956 4 + 718023206 4 + 1076120956 4 + 1182357206 4 + 1316440706 4$
$+ 1481971456 4 + 2551566956 4 + 2583614206 4 + 2915086706 4 + 3811719331 4$

$= 33263200000 = SS_{TOTAL}$

Source of Variation	Sums of Squares	Degrees of Freedom	Mean Squares	F-Value
Effect (Between Wells)	$SS_{SAMPLE} = 126301297000$	$V_1 = K-1 = 2-1 = 1$	$MS_{EFFECT} = 126301297000$	$= 23.261$
Error (Between Wells)	$SS_{ERROR} = 206330703000$	$V_2 = N-K = 38$	$MS_{ERROR} = 5429755342$	
Total	$SS_{TOTAL} = 33263200000$	$N-1 = 39$		

* WHERE

$SS_{TOTAL} - SS_{SAMPLE} = SS_{ERROR}$ $\qquad SS_{ERROR}/N-K = MS_{ERROR}$

$SS_{SAMPLE}/K-1 = MS_{EFFECT}$ $\qquad F = MS_{EFFECT}/MS_{ERROR}$

CLIENT New London	JOB NUMBER 2863
SUBJECT Sample Calculations of Statistical Analysis	
BASED ON Downgradient Calcium Results Rnds 9-12	DRAWING NUMBER
BY TSK / CHECKED BY	APPROVED BY / DATE 10/9/01

From Sample Calc Table 4, the F-statistic for $V_1 = 1$ and $V_2 = 39$ is 251.0

$$F_{VALUE} = 23.261 < 251.0 = F_{STATISTIC}$$

Since $F_{VALUE} < F_{STATISTIC}$ we accept the null hypothesis of equal group means and conclude there is no statistically significant difference between the calcium downgradient wells and the upgradient wells

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT NEW LONDON	JOB NUMBER
SUBJECT ADDENDUM TO SAMPLE CALCULATIONS	
BASED ON	DRAWING NUMBER
BY BEL / CHECKED BY GSK	APPROVED BY / DATE 03/28/02

TWO SAMPLE TEST OF PROPORTIONS

THE DATA USED FOR THE FOLLOWING SAMPLE CALCULATIONS ARE THE TRICHLOROETHENE RESULTS:

	DOWNGRADIENT (UG/L)		UPGRADIENT (UG/L)	
1	4		10	
2	2.8		10	
$k_d=3$ 3	2.8		7.6	
4	1	J — C = 1.01	$k_u=4$ 5.8	
5	1		1	U — C = 1.01
6	1	U	1	U
7	1	U	1	U
8	1	U	0.77	J
9	1	U	0.5	J
10	1	U	0.47	J
11	1	U	0.26	J
12	1	U	$12_M=12$ 0.25	J
13	1	U		
14	1	U		
15	1	U		
16	1	U		
17	1	U		
18	1	U		
19	1	U		
20	1	U		
21	1	U		
22	1	U		
23	0.34	J		
24	0.27	J		
25	0.2	J		
26	0.14	J		
27	0.13	J		
$n=28$ 28	0.1	J		

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT NEW LONDON	JOB NUMBER
SUBJECT ADDENDUM TO SAMPLE CALCULATIONS	
BASED ON	DRAWING NUMBER
BY BEL / CHECKED BY TSK	APPROVED BY / DATE 03/28/02

FOR PARAMETERS WITH GREATER THAN 50% NON-DETECTS ASSESS IF A LARGER PROPORTION OF DOWNGRADIENT COMPARED TO UPGRADIENT HAD CONCENTRATIONS GREATER THAN A SPECIFIED CUT-OFF CONCENTRATION, C.

1. SET C TO A VALUE GREATER THAN THE LARGEST UPGRADIENT NON-DETECT:

$$C = 1.01 \text{ UG/L}$$

2. COMPUTE $P_d = k_d / n$, THE ESTIMATED PROPORTION OF THE TRUE DISTRIBUTION OF POTENTIAL DOWNGRADIENT MEASUREMENTS THAT EXCEED C:

$$P_d = 3/28 = 0.107$$

3. COMPUTE $P_u = k_u / m$, THE ESTIMATED PROPORTION OF THE TRUE DISTRIBUTION OF POTENTIAL UPGRADIENT MEASUREMENTS THAT EXCEED C:

$$P_u = 4/12 = 0.333$$

4. COMPUTE $P = (K_d + K_u)/(n+m)$

$$P = (3+4)/(28+12) = 7/40 = 0.175$$

5. COMPUTE THE TEST STATISTIC:

$$Z_p = (P_d - P_u) / [P(1-P)(1/n + 1/m)]^{1/2}$$

$$Z_p = (0.107 - 0.333) / [(0.175)(0.825)(\tfrac{1}{28} + \tfrac{1}{12})]^{1/2}$$

$$Z_p = -0.226 / 0.131 = -1.72$$

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT NEW LONDON		JOB NUMBER	
SUBJECT ADDENDUM TO SAMPLE CALCULATIONS			
BASED ON		DRAWING NUMBER	
BY BEL	CHECKED BY SK	APPROVED BY	DATE 03/28/02

SINCE $Z_p = -1.72 < +1.645$, THERE IS NOT ENOUGH EVIDENCE TO CONCLUDE THAT DOWNGRADIENT CONCENTRATIONS ARE GREATER THAN THE UPGRADIENT CONCENTRATIONS

APPENDIX D

RESPONSES TO EPA's COMENTS

GENERAL COMMENTS

Comment 1

The monitoring program adheres closely to the Groundwater Monitoring Plan, and appears to be moving forward in routine fashion. The monitoring data continue to support the conclusion that the soil removal and cap installation are successful in limiting transport of site contaminants to groundwater. The groundwater met all primary monitoring criteria in Rounds 9 through 12. Secondary criteria are exceeded for a few SVOCs present at relatively low levels, and for several inorganics. According to the Groundwater Monitoring Plan Decision Diagram, monitoring frequency can be reduced to twice a year when four consecutive rounds of representative monitoring have been performed with results below monitoring criteria.

Response

Agreed. The monitoring program is proceeding in routine fashion and there have only been a few compounds detected at concentrations that exceeded secondary criteria. The monitoring data support the conclusion that the soil removal and cap installation are successful in limiting transport of site contaminants to groundwater.

Figure 4-10 (i.e., Groundwater Monitoring Plan Decision Diagram) does indicate that the monitoring frequency can be reduced to twice a year when four consecutive rounds of representative monitoring have been performed with results below monitoring criteria. However, because 12 rounds of quarterly sampling have been completed at the DRMO site and the results have all been below the primary monitoring criteria, it is recommended in the report that the monitoring frequency be reduced from quarterly to annual, instead of biannual. The USEPA indicates their agreement with this recommendation in Comment No. 15. Therefore, no changes are recommended in response to this comment.

Comment 2

Statistics are used in the annual report to analyze whether compounds are present in the groundwater above upgradient levels. The Groundwater Monitoring Plan was finalized in February of 1998. Since that time, a number of detailed guidance documents for performing statistical comparisons using environmental data have been published by a variety of agencies. It appears that some of the statistical procedures currently used in this annual groundwater monitoring report do not fully comply with procedures recommended in these more current guidance documents. However, based on the Groundwater Monitoring Plan Decision Diagram, it does not appear that the errors identified in the statistics used in this monitoring program would change the recommendations presented in the annual report. Comments related to the statistics are provided in Attachment A to assist in developing statistical evaluation procedures that are in line with currently recommended guidance.

Response

Agreed. The Navy's recommendations for revised statistical methods are provided in the response for General Comment 3.

Comment 3

As described in §4.3.1.1, in the statistical analysis of the ground water data, non-detects have been replaced with one-half the sample quantitation limit. This section also states: "...The amount of data that are below the detection limit play an important role in selecting the statistical method of addressing the detection limit problem...." According to USEPA guidance (USEPA, 1992), parametric ANOVAs should not be used in the event nondetects exceed 50% of the data set. In addition, for analyses using the Wilcoxon Rank Sum Test, several environmental statistics guidance documents limit the percent of nondetects allowable in the test data sets to 50% (US Navy 1998) or even 40% (US DD, US DOE, USEPA, USNRC 2000).

REFERENCES:

US Department of Defense, US Department of Energy, US Environmental Protection Agency, and US Nuclear Regulatory Commission, 2000, *Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM),* Revision 1 (includes replacement pages dated June 2001), NUREG-1575, EPA/402/R-97/016, DOE/EH-0624, August.

US Navy, 1998, *Procedural Guidance for Statistically Analyzing Environmental Background Data,* Naval Facilities Engineering Command, Southwest Division and Engineering Field Activities, West, September.

US Environmental Protection Agency, 1992, *Statistical Analysis of Ground Water Monitoring Data at RCRA Facilities*: Addendum to Interim Guidance

The data sets for a number of the parameters evaluated in this document contained more than 50% nondetects for either the upgradient wells, the down gradient wells or both. For example, for the constituents trans-1,2-dichloroethene, vinyl chloride, phenanthrene, arsenic, lead and silver the frequency of detection for each of these constituents in upgradient wells was zero out of twelve samples. Based on guidance provided in the aforementioned guidance documents, these constituents should not have been subject to statistical evaluation procedures using either ANOVA or Wilcoxon Rank-Sum tests. As such, the conclusions regarding the statistical comparisons presented in Section 5.1 (page 5-2, first full paragraph) are erroneous for the listed constituents. No statistical comparisons between the upgradient and downgradient wells can be performed using ANOVA or Wilcoxon Rank-Sum tests for these constituents. To ensure the validity of the statistical comparisons performed in the monitoring program, the Navy should confirm that the assumptions regarding the frequency of detection for each test are met for each constituent analyzed by either the ANOVA or the Wilcoxon Rank-Sum procedures.

One of the main assumptions in a parametric ANOVA is that the data sets being compared have homogeneity of variance. There is no mention of this in the text and no evidence that this assumption was checked in the tables. If homogeneity of variance cannot be demonstrated then ANOVAs are not the appropriate statistic to apply. Rather, the Wilcoxon Rank Sum Test should be used for comparison purposes. In this report, homogeneity of variance should be confirmed for data analyzed using the ANOVA techniques using the F-test for homogeneity of variance or a similar statistic. If homogeneity of variance cannot be confirmed then data sets should be tested with techniques for unequal variances.

Response to Original Comment (January 8, 2002)

Agreed. The statistical methodology used to evaluate the Year 3 data from the DRMO is the same method that has been used since the Year 1 analysis. This methodology failed to include:

- Homogeneity of variance between the upgradient and downgradient data sets as a requirement for performing the parametric ANOVA.
- A contingency for not performing ANOVA when nondetects exceed 50% of the data set.

Revisions are necessary to the statistical methodology performed on the analytical data. Because the conclusions of the Year 3 analysis would be unaffected by such changes, it is recommended that the following steps be incorporated into the statistical analysis performed for Year 4:

- Levene's Test of Homogeneity of Variance
- Two-Sample Test of Proportions

EPA Rebuttal (January 30, 2002)

General Comment 3 and Specific Comment 4: Although the recommended statistical steps are reasonable to address the comment, based on the reduction in sampling frequency and the elimination of the three deep wells, it is unclear how the Navy plans to use ANOVA techniques to compare upgradient wells to downgradient wells in year 4 and beyond. Two upgradient wells and five downgradient wells will be sampled one time each year. This number of data points is not sufficient to perform an ANOVA test. Please describe in greater detail how the comparison on this limited data will performed.

It should be noted that to date, the comparison of upgradient and downgradient wells has been something of an academic exercise since no primary monitoring criteria have been exceeded.

Response to Rebuttal

Agree with Clarification. Regarding the original comment about the inappropriateness of completing statistical comparison between upgradient and downgradient wells for the parameters trans-1,2-dichloroethene, vinyl chloride, phenanthrene, arsenic, lead and silver, the commentor is correct. To address this problem, new statistical evaluations were completed on the Year 3 data set following the new methodology provided in the response to the original comment. This change was necessary so that the conclusions and recommendations of the report were based on technically defensible statistical information. The results of the new evaluation (text and tables) are provided in the final report. As noted in the rebuttal, the comparison of upgradient and downgradient wells has been something of an academic exercise since no primary monitoring criteria have been exceeded. It should also be noted that the new statistical evaluation did not result in any changes to the conclusions or recommendations of the report.

Regarding the EPA's rebuttal, the commentor is correct in stating that the statistical methodologies suggested by the Navy for use in the future may not be suitable for evaluating analytical data from a single annual sampling event. However, the suggested methodologies would be appropriate for use under the other groundwater monitoring programs at the Area A Landfill and Goss Cove Landfill sites at Naval Submarine Base-New London, Groton, Connecticut. Quarterly sampling is still being conducted at those sites. The suggested methodologies will be incorporated, as appropriate, into the statistical evaluations completed for those monitoring programs.

The following methodology will be adopted for use for the DRMO groundwater monitoring program in the future.

> The Parametric ANOVA and the tests of it's assumptions (Shapiro-Wilk Test of Normality and Levene's Test of Homogeneity of Variance) will no longer be performed. Either a Wilcoxon Rank-Sum analysis (if 4 or more of the 7 concentrations are positive detections) or a Test of Proportions (if 3 or less of the 7 concentrations are positive detections) will be performed. Due to the small size of the data sets, these tests will have limited statistical power.
>
> Since the site has proven to be rather benign over the last three years, attention will be concentrated on determining if conditions are changing at the site by performing trend analysis. The Mann-Kendall Test (Gilbert, p. 208) will be used on the average concentrations for each COPC over all rounds to test for an upward trend. Those COPCs exhibiting an upward trend according to the test will be plotted as a function of time. Linear regression best-fit lines with confidence bands will also be plotted. If it becomes evident that the trend is not linear but rather follows another function the regression plot will be the function that best fits the shape of the data. If there are any COPCs that show trends indicating that the primary monitoring criteria is likely to be exceeded in the near future, additional methods may be used to confirm/verify the results.

Comment 4

As noted in previous reviews, it is noted that the secondary monitoring criterion for arsenic (0.14 µg/L, based human-health considerations for consumption of organisms), is well below the laboratory detection limits achieved (typically a few µg/L). Therefore, no meaningful comparisons can be made to this monitoring criterion. Nonetheless, this criterion appears to be rather conservative, particularly in view of the "background" value adopted (3.6 micrograms per liter); *i.e.*, "typical" NSBNL groundwater exceeds the secondary monitoring criterion.

Response to Original Comment (January 8, 2002)

Agreed. The secondary monitoring criteria for arsenic (0.14 µg/L) is below the laboratory detection limit for arsenic, and in general no meaningful comparisons can be made to this criterion. This

secondary criterion was agreed to by the Navy and regulators several years ago during development of the Groundwater Monitoring Program for the DRMO. Since the laboratory detection limit for arsenic is not low enough to allow for a meaningful comparison and the background concentration of arsenic determined for NSB-NLON is 1.92 µg/L, as presented in the Basewide Groundwater Operable Unit Remedial Investigation (TtNUS, 2001), the use of the secondary criterion should be reconsidered. It is recommended that the background concentration for arsenic be adopted as the secondary monitoring criterion for arsenic during future groundwater monitoring efforts at the DRMO. In addition, it is recommended that the background concentrations of the other inorganics of concern at the DRMO (i.e., barium, chromium, copper, lead, and zinc) also be adopted as the secondary monitoring criteria for future groundwater monitoring efforts at the DRMO.

It should be noted that the "background" concentration of 3.6 µg/L stated in the comment is not the background groundwater concentration presented in the subject report; however, it was erroneously presented as such in previous reports. The background concentration of arsenic determined for NSB-NLON is 1.92 µg/L, as presented in the Basewide Groundwater Operable Unit Remedial Investigation (TtNUS, 2001).

EPA Rebuttal (January 30, 2002)

General Comment 4: Regarding the comparison to arsenic secondary monitoring criterion, please expand the comparison table to include background values and discuss the limitations of the secondary monitoring criterion in the text.

Response to Rebuttal

Agree. The secondary criteria for inorganics were maintained and the analytical summary table (Table 4-1) was expanded by one column to include background concentrations for inorganics. In addition, the columns that include the criterion and background values were conditionally formatted, as appropriate, to indicate the criteria that was exceeded by the detected chemical concentrations. The second paragraph in Section 4.1 was revised to include a discussion on the limitations of the secondary monitoring criteria.

SPECIFIC COMMENTS

Comment 1: p. 1-1, §1.1

The text reads, "... to determine whether surface water protection have been attained ..."...Please check.

Response

The sentence will be corrected to read, "...to determine whether surface water protection criteria have been attained..." The basis for this sentence is that the groundwater at the DRMO is not used as a drinking water source and the only way receptors can come into contact with the groundwater is after it discharges to the Thames River (i.e., after it essentially becomes surface water).

Comment 2: p. 2-8, §2.3.5

The text states that the regression on the average arsenic concentrations performed after Year 1 of the monitoring program indicated a decline, and that this "... contradicted the results of the statistical evaluation." This contradiction is not apparent in the summary of results given here. The statistical evaluation established that arsenic concentrations were higher in downgradient wells than in upgradient wells. The trend analysis suggested a trend of declining concentrations in the downgradient area. Downgradient arsenic could have been declining, while still remaining higher than upgradient arsenic. Please clarify the argument for a contradiction in these analyses. In any case, it is agreed that the trend may not be meaningful, in view of the low confidence in the fit, as well as the possible influence of the reporting of "non-detects" and variable laboratory detection limits discussed previously.

Response to Original Comment (January 8, 2002)

Agreed. The paragraph in question will be revised as follows:

"A statistical evaluation of the data indicated that upgradient and downgradient concentrations of both organic and inorganic COCs were found to be similar except for arsenic. *The statistical evaluation established that arsenic concentrations were higher in downgradient wells than in upgradient wells.* The average arsenic concentrations for all downgradient monitoring wells for each round were plotted as a function of round to determine the trend of the concentrations. The regression line fit to the average arsenic concentrations showed a decreasing trend, which contradicted the results of the statistical evaluation. The confidence in the regression line fit to the data was low and it is likely the line did not represent the true trend in the data."

<u>EPA Rebuttal (January 30, 2002)</u>

Specific Comment 2: The suggested text does not address the comment. Trend analysis and the statistical analysis are not at odds with each other, as they are evaluating two independent issues. It is possible to have a statistically higher level of arsenic in downgradient wells and at the same time have a downward trend in these wells. While I agree that the trend analysis is somewhat inconclusive, this is not from a contradiction with the results of the statistical comparison. Although the proposed text is an improvement, please eliminate the phrase, "which contradicted the results of the statistical evaluation."

<u>Response to Rebuttal</u>

Agreed. The phrase was deleted.

Comment 3: p. 4-1, §4.1

Table 4-1 indicates that arsenic was detected at 6MW11S at 12.6 micrograms per liter in Round 12 (June 2001). This is a striking anomaly, in that arsenic has been non-detect at this location for the previous 11 rounds. Please check field records, chain-of-custody records, etc., to verify to the extent possible that the sample analyzed for this round was indeed collected from well 11S, rather than from 11D, which exhibits

nearly identical arsenic (12.7 micrograms per liter). (It is noted that other inorganic analytes appear to be distinctly different; e.g., iron was analyzed at 340 micrograms per liter for 11S and at 7890 micrograms per liter for 11D, arguing against a duplicate analysis.) Also, the lab should be asked to verify that there were no errors in entering data in the reporting tables.

Response to Original Comment (January 8, 2002)

Agree. The arsenic result for 6MW11S appears to be an anomaly; however, as discussed below, the cause of the anomaly is not apparent and there is no justification for changing the result. Therefore, the result will be maintained and a sentence will be added to the report that identifies the anomaly. Future monitoring results will help determine if this result is truly an anomaly.

Based on a review of the raw data, the result as reported by the laboratory of 12.6 µg/L is correct. All of the metals results for this sample were also compared to others in the same sample-delivery-group (SDG) and it does appear to be a different sample than any of the others that are in this SDG. The only thing noticeable from looking at the raw data relates to the fact that two replicates were done for the Inductively Coupled Plasma (ICP) analysis and the results were averaged. Some labs do more than two replicates but it is common practice to perform multiple replicate analyses for each analyte and report the average. The replicate analyses are done within seconds of each other and make for a more accurate result. In this case, the first replicate was 9.77 µg/L and the second one was 15.5 µg/L with a percent relative standard deviation (%RSD) of 32.086. The difference between the two replicate results can be due to several things such as sample matrix or instrumental problems. However, many of the other analytes in this sample had better %RSDs so it does not appear that there were any general instrument problems with this analysis.

The result could also be a false positive due to contamination from a variety of different sources. In addition, an instrumental baseline for arsenic might have fluctuated slightly from sample to sample or something present in the sample (either from the laboratory or the field) could change the sample matrix enough so that the replicates showed the poor reproducibility.

Another explanation could be due to the high levels of sodium that were present in the sample. Sodium is not an interfering analyte; however, it is possible that the high levels of sodium might have interfered with some of the analytes, producing false positives. If there is a large amount of any one analyte present, it could cause a "loading effect" on the plasma and interfere with the reading of other analytes. This could have happened in this case with arsenic. If this is the case, then the arsenic result could be reported from the 10X dilution for sodium, giving a result of 50 U.

<u>EPA Rebuttal (January 30, 2002)</u>

Specific Comment 3: It is not appropriate to calculate %RSD for two data points. Relative Percent Difference (RPD) would be more meaningful. In this case, the RPD between the two replicates is 45%. A high variation between replicates is frequently caused by improper peaking of the instrument or a broad-based interference in the vicinity of the analytical line of interest. In this instance the later is more likely since this level of arsenic is not expected. Improper peaking would explain a high variance between sample replicates but it would not account for the relatively high level of arsenic that was measured. A further review of the raw data associated with the sample to determine whether a matrix spike or analytical spike was

run on the sample could illuminate the issue. These would have been impacted by either of the data quality issues discussed above.

Response to Rebuttal

The initial result of 12.6 micrograms per liter for arsenic in sample DRMO-6MW11S-GW-12 as reported by the laboratory was verified by reviewing all of the associated raw data. There were no matrix spikes, post digestion spikes, sample duplicates, or serial dilutions performed by the laboratory on this sample to evaluate. The only information that could be evaluated was the raw data analysis for this sample. It is nearly impossible to determine without a doubt the cause of the anomaly based on the raw data. The scenarios presented in the initial response were possibilities that could have caused an erroneous result, in addition to those presented in Specific Comment 3.

The high variance between the two replicates for arsenic for this sample was not meant to explain the high level of arsenic that was measured for this sample. It was noted to present the possibility that there could have been some factors present that could have caused an erroneous result. All of the numbers mentioned in the original response came from the raw data. The laboratory's software associated with the analytical instrument calculates, from the two measured replicates, the average, standard deviation and %RSD. The average of the results is what is reported as the final value. These numbers, from the instrumental raw data analysis, are the only things that were available. Based on this limited information, there is no way to determine precisely what may have occurred at what stage to produce this high result for arsenic.

Based on a review of the available field data (sample log sheet, turbidity data, and chain-of-custody), it is not apparent that the anomalous result was the result of a field problem.

As stated previously in the original response, the result will be maintained and a sentence will be added to the report that identifies the anomaly. Future monitoring results will help determine if this result is truly an anomaly.

Comment 4: p. 4-4, §4.3.1, ¶ 2

The fourth sentence in this paragraph states: "Parametric ANOVA tests assume that the data are normally or lognormally distributed." Please expand the text here to include other important assumptions that parametric ANOVA methods make. For example, parametric methods assume that the data sets being compared not only have a normal or lognormal distribution, but that the data sets have the same distribution type and variance.

Response to Original Comment (January 8, 2002)

The suggested text was not included because the methodology was not testing the assumption of homogeneity of variance. The paragraph will be changed in future reports (i.e., Year 4 and subsequent reports) to the following:

"The Analysis of Variance (ANOVA) technique was the basic approach used to compare data from upgradient and downgradient monitoring well locations. The ANOVA technique is used to test whether there is statistically significant evidence of contamination. There are two types of ANOVA tests: parametric and non-parametric. The parametric ANOVA method makes two important assumptions: 1) the data are both normally (or both lognormally) distributed, and 2) the group variances are homogeneous. If either of these crucial assumptions to the parametric ANOVA are violated, a non-parametric test can be conducted using the ranks of the observations rather than the original observations themselves. These assumptions can be checked using the Shapiro-Wilk Test of Normality and Levene's test of Homogeneity of Variance, respectively. If the analysis of the data demonstrated that these assumptions, critical to the parametric ANOVA, were violated, non-parametric ANOVA techniques were conducted using the ranks of the observations rather than the observations themselves. The Wilcoxon Rank-Sum test (also known as the Mann-Whitney U test) was employed as the non-parametric ANOVA for comparing the downgradient results to the upgradient results."

EPA Rebuttal (January 30, 2002)

General Comment 3 and Specific Comment 4: Although the recommended statistical steps are reasonable to address the comment, based on the reduction in sampling frequency and the elimination of the three deep wells, it is unclear how the Navy plans to use ANOVA techniques to compare upgradient wells to downgradient wells in year 4 and beyond. Two upgradient wells and five downgradient wells will be sampled one time each year. This number of data points is not sufficient to perform an ANOVA test. Please describe in greater detail how the comparison on this limited data will performed.

It should be noted that to date, the comparison of upgradient and downgradient wells has been something of an academic exercise since no primary monitoring criteria have been exceeded.

Response to Rebuttal

Please refer to the response provided to the EPA's rebuttal to the original response to General Comment 3. The Year 3 data were evaluated using the new statistical approach. Extensive revisions were made to the text and tables associated with Section 4.3 of the report to address the comment. The text changes suggested in the original response to the comment were incorporated as appropriate.

Comment 5: p. 4-5, §4.3.2.1

The last sentence of the paragraph beginning "A 'W' statistic ..." states: "...If $W_{calc}<W_{test}$, then the null hypothesis is rejected, H_A is accepted, the data are not assumed to be normally distributed (or not lognormally distributed if log transformed data are tested)...." However, Tables 4-4 and 4-5 indicate that lognormality was selected as the distribution type if the test for normality failed regardless of whether W_{calc} was greater than or less than W_{test} for the transformed data. Please clarify this apparent discrepancy.

Response to Original Comment (January 8, 2002)

The paragraph will be changed to the following:

"A 'W' statistic (W_{calc}) is computed for a data set and compared to a test statistic (W_{test}). If $W_{calc} \geq W_{test}$, then the null hypothesis is not rejected and the data are assumed to be normally distributed. If $W_{calc} < W_{test}$, then the null hypothesis is rejected, H_A is accepted, the data are not assumed to be normally distributed. Another 'W' statistic is computed for the log-transformed data set and compared to the test statistic as described above. If both the normal and lognormal W_{calc} are greater than or equal to the W_{test} then the underlying distribution is considered to be that one producing the highest W_{calc} value. If neither 'W' statistic is greater than or equal to the test statistic the underlying distribution is defaulted to lognormal. This is because "EPA's experience with environmental concentration data, and groundwater data in particular, suggests that the Lognormal distribution is generally more appropriate as a default statistical model than the Normal distribution... " (EPA, 1992)."

EPA Rebuttal (January 30, 2002)

Specific Comment 5: Please clarify the suggested text. The first sentence of the proposed text indicates that if Wcalc for the untransformed data is greater than or equal to Wtest, then the data are assumed to be normally distributed. However, the text goes on to say "...If both the normal and lognormal Wcalc are greater than or equal to the Wtest then the underlying distribution is considered to be that one producing the highest Wcalc value...." Please clarify this conflict.

Response to Rebuttal

The paragraph will be changed to the following:

"A 'W' Statistic (W_{calc}) will be computed and compared to the test statistic (W_{test}) for both the data set and the log transformed data set. If both the normal and lognormal W_{calc} are greater than or equal to the W_{test} then the underlying distribution is considered to be the one producing the highest W_{calc} value. If only one W_{calc} value exceeds the W_{test} value the underlying distribution is the one that exceeds the W_{test} value. If neither 'W' statistic is greater than or equal to the test statistic or if the W_{calcs} are equal for normal and lognormal, the underlying distribution is defaulted to lognormal. This is because "EPA's experience with environmental concentration data, and groundwater data in particular, suggests that the Lognormal distribution is generally more appropriate as a default statistical model than the Normal distribution..." (EPA, 1992).

Comment 6: p. 4-7, §4.3.2.2

The five equations at the bottom of the page are not in the correct order. Please move the equation for the grand mean to the end of the list.

Response to Original Comment (January 8, 2002)

Disagree. The equations are correct and their order is arbitrary. No changes are suggested in response to this comment.

EPA Rebuttal (January 30, 2002)

Specific Comment 6: Reordering the equations would be clearer because the equation for the grand mean uses variables that, as the text is written, have not yet been defined. However, since the technical conclusions of the document are not affected, the no change is required.

Response to Rebuttal

Agree. The equations will be reordered as requested.

Comment 7: p. 4-8, §4.3.2.2

The table at the bottom of the page appears to have some errors:
1. The first entry in the "Sum of Squares" column should read SS_{sample}.
2. The entries in the "Degrees of Freedom" column should just be "k-1", "N-k", and "N-1" respectively.
3. The "Mean Squares" column should read "$MS_{sample}=SS_{sample}/(k-1)$" in the first row and "$MS_{Error}=SS_{Error}/(N-k)$" in the second row.

Response

The typographical errors will be corrected. In the future, the table will appear as follows:

ONE-WAY PARAMETRIC ANOVA TABLE

Source of Variation	Sums of Squares	Degrees of Freedom	Mean Squares	F
Between Locations	SS_{Well}	k-1	$MS_{Well}=SS_{Well}/(k-1)$	$F=MS_{Well}/MS_{Error}$
Error (within Locations)	SS_{Error}	N-k	$MS_{Error}=SS_{Error}/(N-k)$	
Total	SS_{Total}	N-1		

Comment 8: p. 4-9, §4.3.2.3, ¶ 2

The second sentence in this paragraph states: "However, parametric ANOVA methods make a key assumption; the results are normally (or lognormally) distributed." Please expand the text here to include other important assumptions that parametric ANOVA methods make. For example, parametric methods assume that the data sets being compared not only have a normal or lognormal distribution, but that the data sets have the same distribution type and variance.

Response

As explained in an earlier response, this wording was not included because the methodology was not testing the assumption of homogeneity of variance. This sentence will be expanded to the following:

> "However, parametric ANOVA methods make two key assumptions: 1) the data are both normally (or both lognormally) distributed, and 2) the group variances are homogeneous."

Comment 9: p. 4-11, §4.3.3

The text notes that the statistical analysis indicates that only TCE shows a significant change from upgradient to downgradient wells, and that TCE *decreases*. This is due to detections of TCE at 6MW6D, the upgradient, bedrock well. Although well below the primary and secondary monitoring criteria, this detection may bear on upgradient detections of chlorinated solvents (Area A Downstream Watercourses). It is appropriate that this well should remain in the monitoring program, as recommended on p. 5-3. Alternatively, at some point, it may be reasonable to move this well to long-term monitoring for another program.

Response

Comment noted.

Comment 10: p. 4-12, §4.3.3

In addressing the potential impact of the site on arsenic in groundwater, the Report notes that most of the elevated arsenic downgradient of the site is in the deep wells, and that the vertical gradients at these locations are upward, arguing against any influence of the site. This is a compelling argument; it is agreed that this, along with the observation that there is an intervening, silty, semi-confining layer, certainly suggests that the deep arsenic cannot reflect a site impact.

Response

Agreed. The data indicate that the significant concentrations of arsenic have been found in the deep downgradient wells and do not suggest an impact by the site. The deep downgradient wells have been recommended for elimination from the groundwater monitoring program to eliminate unnecessary monitoring.

Comment 11: p. 4-13, §4.3.3

The Report states that Year 3 data continue to show a difference in ORP between shallow upgradient wells and shallow downgradient wells, but also notes that significant differences in inorganics concentrations were not found. The Report concludes that "... the chemical data does not suggest that there are any anthropogenic sources influencing the mobility of metals." It is agreed that whatever redox impacts the site may exert on groundwater do not seem to be triggering significant impacts to metals. However, while impacts on the inorganics of potential concern are minimal, it is an overstatement to claim, "This data does not indicate any influence of landfill leachate on downgradient groundwater." There certainly seems to be a significant difference in ORP across the site, and, as noted in the text, in pH, as well. The ORP change is from moderately oxidizing conditions in shallow upgradient wells to strongly reducing conditions in shallow downgradient wells. This change may be due to interaction of groundwater with organic materials beneath the cap; it is also possible that this is simply a result of passing through the domain of organic-rich, estuarine sediments beneath the site, and would occur independent of the historic site use. In this regard, it is noted that 6MW1S, which is south of the cover, shows ORP comparable to the upgradient wells (e.g., 104.3 mV in Round 12, compared to 85.1 mV and 147.2 mV at 6MW9S and 6MW6S, respectively). This certainly leaves open the possibility that the low ORP observed in downgradient wells west of the cap reflects an influence of the site. It is also noted that the cap itself will tend to perpetuate these conditions, as it inhibits recharge of oxygenated water to the shallow aquifer. The text also notes that pH increases across the site (e.g., 5.55–6.03 in 6MW6S and 6MW9S, upgradient, compared to 6.99–7.86 in 6MW10S and 6MW11S, west of the cap; Table A-1), and states that this supports the conclusion that the groundwater does not show indications of landfill leachate. This conclusion is less convincing; landfill leachates do not consistently lower pH, as implied in the text. Another interpretation of the data is simply that water on the upgradient side of the site is recently infiltrated (showing, e.g., the effects of acid rain), and that it is buffered along the flow path beneath the cap.

Response

The comment provides several valid reasons for the distribution of ORP found in the groundwater at the DRMO and provides alternative interpretations of the data as compared to the report. This information will be incorporated into the text of the final report to provide a thorough interpretation of the data. However, it is important to note that the points made in the comment do not contradict the main conclusion of the report (i.e., the remaining landfill material at the DRMO is not enhancing the mobility of metals or increasing the migration of metals from the site) or suggest that further evaluation of ORP is necessary. The USEPA provides concurrence with this statement in Comment No. 15.

Comment 12: p. 4-14, §4.3.3

The text concludes, "The correlations for arsenic and barium are moderate at best and are not indicative of a significant cause/effect relationship between metals concentrations and the low ORP detected in downgradient wells. Therefore, the low ORP values appear to be related to natural conditions at the DRMO and not anthropogenic influences." The last statement does not follow from the first. The correlation between ORP and metals concentrations does not indicate anything with regard to the origin of the low ORP conditions in the downgradient wells. It is acknowledged that it is difficult to draw unequivocal conclusions with regard to the origin of the decreasing ORP across the site. However, the fact that 6MW1S, which is close to the

Thames shoreline, but south of the cap, shows ORP comparable to the upgradient shallow wells certainly suggests that the presence of buried organics (whether anthropogenic or natural) and the cutoff of recharge result in depletion of oxygen beneath the cap. The statistical analysis of correlations between ORP and metals cannot elucidate the relationship between the site and redox conditions. However, the analysis does seem to suggest that metals concentrations are not significantly impacted by the ORP change across the site. In the deep wells (e.g., 6MW11D), elevated arsenic does appear to be associated with reducing conditions (12.7 micrograms per liter As in Round 12, 7890 micrograms per liter iron, ORP -140.7 mV, DO 0.11 mg/L). Under the conditions observed in shallow downgradient wells, iron (and associated arsenic) would be expected to be mobile, if present in the system. Their relatively low levels in shallow, downgradient groundwater might suggest that they simply are not present in significant quantities in sorbed phases on the aquifer solids. (Note that iron is non-detect in the high-ORP wells (6MW01S, 6MW06S, and 6MW09S), and present at measurable concentrations, but still quite low, in the highly reducing, shallow, downgradient wells (6MW10S, 6MW11S). Arsenic is correspondingly non-detect in all of these wells, regardless of ORP, as reflected in the statistical analysis. An exception is 6MW11S, which showed an anomalous detection of As in Round 12 only. (Please see related Specific Comment.)

Response

The last sentence will be changed as follows:

> "Therefore, the low ORP values in the downgradient wells, whether caused by natural or anthropogenic influences, do not seem to be enhancing the mobility of metals or the migration of them from the site."

Comment 13: Table 4-1

The second page of this table does not have a column listing the chemical parameters. Please revise the table.

Response

Agreed. The table will be corrected and provided in the final version of the report.

Comment 14: Tables 4-4 & 4-5

The last column in both of these tables is labeled "95% UCL." In actuality, the numbers in this column appear to be the lesser of the maximum detected value and the 95% UCL. These numbers would typically be used as estimates of the exposure point concentrations (EPCs). Please change the column header to more appropriately identify the numbers listed. It is also unclear what these numbers are used for in the analysis.

Response to Original Comment (January 8, 2002)

Agree with clarification. The term exposure point concentration has been used for these values on other projects. Some reviewers have objected to this term because it has a risk assessment

connotation to it. If USEPA is comfortable with the nomenclature, it will be used in the future. These values are presented for comparison purposes only.

EPA Rebuttal (January 30, 2002)

Specific Comment 14: Please indicate on future tables that the number in the column is the lesser of the maximum detected value and the 95% UCL. This can be accomplished by adding a footnote to the last column that is currently entitled "95% UCL."

Response to Rebuttal

Agreed. A footnote will be added to the tables.

Comment 15: §5.2

Section 5.2 presents recommendations for changes in the monitoring program. The following are comments on these recommendations:

The Report recommends reduction in sampling frequency from quarterly to annual. This is well motivated. No primary monitoring criteria have been exceeded for any COC in the first three years of monitoring. The system as a whole appears to be changing very slowly, if at all, at this time. Annual monitoring is adequate to verify continued low levels of site COCs.

The Report recommends re-evaluation of the monitoring frequency after two more years of annual sampling. The Five-Year Review is an appropriate time to assess the extent and frequency of monitoring necessary for the ensuing period.

The Report recommends that deep monitoring wells 6MW2D, -10D, and -11D be dropped from the program. It is agreed that these wells have not shown evidence of site impacts, and are not likely to show such impacts. The wells are screened quite deep (between 77-87, 43.4-53.4, and 75-85 ft bgs, respectively), below what appears to be a semi-confining layer. Any contaminants related to the DRMO site (with the exception of DNAPL, for which there has been no evidence) would be expected to remain in shallow groundwater, due to the underlying silty confining layer and the close proximity of groundwater discharge to the Thames River. It is also agreed that 6MW6D, the bedrock well on the upgradient side of the DRMO site, should remain in the monitoring program. This well has shown historical low-level detections of chlorinated VOCs (5.5 — 10 micrograms per liter TCE and 3.2 — 7.0 micrograms per liter cis-1,2-DCE in Rounds 9 — 12), and may provide significant insight into chlorinated VOC issues upgradient of this area in the Area A Downstream Watercourses.

The Report recommends that analysis of inorganics and ORP be discontinued. It is agreed that a good effort has been made to investigate this question, and that it has yielded improved understanding of controls on mobility of inorganics at the site. The overall conceptual model for the predominant transport processes at the site is unlikely to be changed significantly by further evaluations of the sort already undertaken. This is particularly justified to the extent that inorganics have not proven to be an obstacle to meeting the primary monitoring criteria established for the DRMO. These criteria have been met consistently for the first 12 rounds of monitoring over the past three years.

Response

Comment noted. The Navy will continue to discuss the extent and frequency of the monitoring program at the DRMO with the USEPA and CTDEP. The recommendations provided in the Year 3 Annual Report will be implemented during the next (i.e., 14th) round of sampling at the DRMO. Because the 13th Round of sampling was completed in September 2001 and the monitoring frequency will change from quarterly to annual, the 14th Round of sampling will be conducted in September 2002.

Comment 16: Table A-1

It is noted that Table A-1, which summarizes field parameters from Rounds 9–12, as been added to the Report, and that it highlights suspect results (*e.g.*, a number of DO measurements in Round 10). This is a useful reference table, and acknowledges clearly the questionable DO data noted in a previous EPA review.

Original Response (January 8, 2002)

Comment noted. This table will be provided in subsequent annual groundwater monitoring reports.

Additional Response

Table A-1 was revised for the final report to provide a complete summary of water quality data collected for the groundwater monitoring program at DRMO. The table now includes water quality data collected during Rounds 1 through 12.