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DRAFT FINAL

Work Plan Addendum
Supplemental Remedial Investigation

for

Site 08, Naval Undersea Systems Center (NUSC) Disposal Area

Naval Station Newport, Rhode Island

Naval Facilities Engineering Command Mid-Atlantic

Contract Number N62470-08-D-1001
Contract Task Order WE19

June 2010

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WORK PLAN ADDENDUM
SUPPLEMENTAL REMEDIAL INVESTIGATION

FOR

SITE 08, NAVAL UNDERSEA SYSTEMS CENTER (NUSC)
DISPOSAL AREA

NAVAL STATION NEWPORT, RHODE ISLAND

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

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ACRONYMS AND ABBREVIATIONS

bgs	below ground surface
CCC	critical continuous concentration
CLEAN	Comprehensive Long -Term Environmental Action Navy
CSM	conceptual site model
CTO	Contract Task Order
CUST	concrete underground storage tank
DCA	1,1-dichloroethane
DCE	1,1-dichloroethene
DEC	direct exposure criteria
DPT	Direct Push Technology
ETPH	extractable total petroleum hydrocarbons
ERA	Ecological Risk Assessment
FS	Feasibility Study
FWEC	Foster Wheeler Environmental Corporation
GA	classification for groundwater presumed to be suitable for drinking
GRO	gasoline range organics
HCN	hydrogen cyanide
HHRA	Human Health Risk Assessment
IDW	investigation-derived wastes
IR	Installation Restoration
K	conductivity
LNAPL	light non-aqueous phase liquid
MCL	maximum contaminant level
MDL	method detection limit
MIDLANT	Mid-Atlantic
NAVFAC	Naval Facilities Engineering Command
NAVSTA	Naval Station
NOAA	National Oceanic and Atmospheric Administration
NUSC	Naval Undersea Systems Center
NUWC	Naval Undersea Warfare Center
ORNL	Oak Ridge National Laboratory
ORP	oxidation reduction potential
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PCE	tetrachloroethylene
PDB	passive diffusion bag
PGDN	propylene glycol dinitrate
PID	photoionization detector
PM	Project Manager
PQL	project quantitation limit
PTF	Propulsion Test Facility
PVC	polyvinyl chloride
QA	quality assurance
QC	quality control
RI	Remedial Investigation
RIDEM	Rhode Island Department of Environmental Management
RPM	Remedial Project Manager
RSL	Regional Screening Level
SI	Site Investigation
SSO	Site Safety Officer
SVOC	semi-volatile organic compound
TAL	Target Analyte List
TECG	The Environmental Compliance Group, Inc.
TCA	trichloroethane

TCE	trichloroethene
TCL	Target Compound List
TOC	total organic carbon
TPH	total petroleum hydrocarbons
TRC	TRC Environmental Corporation
TtNUS	Tetra Tech NUS, Inc
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
UST	underground storage tank
VC	vinyl chloride
VOC	volatile organic compound

1.0 INTRODUCTION

This Work Plan Addendum was prepared by Tetra Tech NUS, Inc. (TtNUS) to perform additional activities under Contract Task Order (CTO) WE19, the ongoing Remedial Investigation and Feasibility Study (RI/FS) of the Naval Undersea Systems Center (NUSC) Disposal Area (Installation Restoration [IR] Site 08) at Naval Station (NAVSTA) Newport, Rhode Island. This addendum is a supplement to the *Work Plan for Remedial Investigation Revision 2 for Site 08 – NUSC Disposal Area, Naval Station Newport, Middletown, Rhode Island* (TtNUS, January 2007), and will be used to guide TtNUS personnel in performing additional site characterization activities which will be documented upon completion in a Supplemental RI Report. The sections in this addendum correspond to sections in the above-named work plan, with section-specific text added for activities to be conducted as part of the supplemental investigation of the NUSC Disposal Area/Building 179 Concrete Underground Storage Tank (CUST) Area. This work is being conducted at the request of the U.S. Department of Navy (Navy) under the Comprehensive Long-Term Environmental Action Navy (CLEAN) Contract No. N62470-08-D-1001, pursuant to the request for modification dated September 8, 2009, which increases the scope of work under CTO WE19.

1.1 BACKGROUND

This addendum to the RI Work Plan was prepared in accordance with general United States Environmental Protection Agency (USEPA) guidance and the Federal Facilities Agreement between the USEPA, Rhode Island Department of Environmental Management (RIDEM), and the United States Navy. The purpose of the RI is to determine the nature and extent of contamination associated with the past use and disposal of chemicals and chemical wastes at the NUSC Disposal Area, IR Site 08 (the Site). Additional background information pertinent to the supplemental investigation being conducted under this Work Plan Addendum is presented below.

During implementation of the RI at Site 08, it became apparent that groundwater underlying the NUSC Disposal Area is being impacted by the presence of contamination associated with historical releases from the Building 179 CUST Area, located immediately upgradient (south) of the Site. In order to address the co-located and nearby contamination associated with the Building 179 CUST Area and the NUSC Disposal Area, the current IR Site 08 investigation is being expanded to include the Building 179 CUST Area. The revised site boundary which includes the NUSC Disposal Area as well as the Building 179 CUST Area is presented in Figure 1-1.

This Work Plan Addendum includes the supplemental investigation to be conducted in order to update and further characterize contamination associated with the Building 179 CUST Area, as well as the

collection of other information described below. The overall objectives of this NUSC Disposal Area-Building 179 CUST Area supplemental investigation are: (1) to determine the current nature and extent of contamination at the Building 179 CUST Area, located upgradient of the NUSC Disposal Area, the original focus of the RI investigation; and (2) to acquire additional environmental contamination data at the NUSC Disposal Area in order to support the FS. The tasks included under this addendum are summarized below.

Building 179 CUST Area (area south of Building 185 complex):

- Install one bedrock groundwater monitoring well;

- Conduct groundwater sampling and analysis of new and selected existing wells, including Target Compound List (TCL) volatile organic compounds (VOCs) at all wells, and at selected wells: 1,4-dioxane; the Otto Fuel component, propylene glycol dinitrate (PGDN); cyanide; and natural attenuation (biodegradation) parameters;

- Collect surface water and sediment samples from Deerfield Creek in the Building 179 CUST area (upstream [south] of the Building 185 Complex), and analyze for TCL semi-volatile organic compounds (SVOCs) and VOCs; and

- Advance soil borings and collect confirmatory soil samples in the areas of the former CUST and the former Interceptor Tank; analyze soil samples for TCL VOCs, SVOCs, and pesticides/(polychlorinated biphenyls) PCBs, as well as TAL metals and PGDN. Collect groundwater samples from one boring and analyze for TCL VOCs, 1,4-dioxane; PGDN; cyanide; and natural attenuation parameters.

NUSC Disposal Area (Building 185 Complex and north):

Building 185 Complex to North Meadow (not including North Meadow):

- Install one bedrock monitoring well and conduct groundwater sampling and analysis of new and selected existing wells, including TCL VOCs at all wells, and at selected wells: 1,4-dioxane; PGDN; cyanide; and natural attenuation (biodegradation) parameters;

- Conduct subsurface soil sampling at four (4) locations in Area 1 of the Building 185 Complex to investigate the historical release of Otto Fuel in the area; analyze soil samples for TCL VOCs, SVOCs, and pesticides/PCBs, as well as TAL metals and PGDN;

- Conduct subsurface soil sampling at two locations in Area 3 of the Building 185 Complex to investigate the potential presence of contaminants in soil: analyze soil samples for TCL VOCs, SVOCs, and pesticides/PCBs, as well as TAL metals and PGDN; and

- Collect groundwater samples from one boring, from either Area 1 or Area 3, and analyze for TCL VOCs, 1,4-dioxane; PGDN; cyanide; and natural attenuation parameters.

North Meadow Area: conduct a limited bedrock groundwater investigation, including installing bedrock monitoring wells, conducting borehole geophysics, and sampling groundwater from new and selected existing monitoring wells, and from two diffusion bag locations, for TCL VOCs at all locations, and at selected wells: 1,4-dioxane, PGDN, and natural attenuation parameters.

Additional background information was presented in the *Work Plan for Remedial Investigation Revision 2 for Site 08 – NUSC Disposal Area* (TtNUS, January 2007).

1.2 RI WORK PLAN FORMAT

No changes were made to Section 1.2 in this Work Plan Addendum, with the exception of the description of Section 5.0 of this RI Work Plan Addendum.

Section 5.0, Reporting, presents a general outline of the Supplemental RI Report that will be prepared to present the findings of the supplemental investigation to be conducted at the NUSC Disposal Area/Building 179 CUST Area.

1.3 PROJECT ORGANIZATION AND COMMUNICATION RESPONSIBILITIES

Navy personnel from the Naval Facilities Engineering Command (NAVFAC) Mid-Atlantic (MIDLANT) will be responsible for administrative and technical oversight of the program, project management, and coordination between state and federal regulatory agencies, while Navy personnel from Naval Undersea Warfare Center (NUWC) and NAVSTA Newport will be responsible for on-site coordination with TtNUS.

TtNUS will be responsible for the overall management of the project, including the performance of field activities presented in this Work Plan Addendum.

Key Navy personnel supporting this project are as follows:

- Winoma Johnson, P.E., Remedial Project Manager (RPM)
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- Cornelia Mueller, IR Program Manager
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Key TtNUS personnel supporting this project are as follows:

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- Lucy Guzman, Lead Chemist, Program Quality Assurance Manager
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- Matt Soltis, CLEAN Health and Safety Manager
  TtNUS, Pittsburgh, Pennsylvania Phone: (412) 921-8912 FAX: (412) 921-4040

The TtNUS Project Manager (PM) will have the primary responsibility for implementing and managing the supplemental RI investigation and will also be responsible for notifying regulatory agencies of field activities or schedule modifications. Technical support will be provided for historical Site knowledge.

The Lead Hydrogeologist will advise the PM and Field Operations Leader (FOL) regarding the interpretation of the subsurface materials encountered, location of borings and wells to be installed, and behavior of contaminants based on those subsurface materials and anticipated groundwater movement.

The FOL will be responsible for directing on-site field activities and will report directly to the PM. The FOL will coordinate efforts of the field sampling staff, the subcontractors, and the lead technical staff and will be responsible for identifying problem areas and bringing them to the attention of the PM for resolution.

The Lead Risk Assessment personnel will be responsible for reviewing the sampling program to ensure it is adequate for meeting the objectives of the study, and for assimilating the data into a format amenable to manipulations required for the qualitative risk evaluations to be performed with the data generated from the supplemental field investigation.

The Lead Chemist will advise the PM on technical requirements of the chemical data, prepare laboratory specifications for analysis of samples collected, oversee the subcontracted analytical laboratories, and review or oversee the validation of the analytical reports prepared.

The Quality Assurance Manager is responsible for QA/QC requirements for the TtNUS CLEAN program. This individual reviews data and deliverable documents, and performs system audits to ensure contract QA/QC goals are met.

The CLEAN Health and Safety Manager is responsible for reviewing health and safety plans for all CLEAN operations, and performs Site audits to ensure compliance with program and Site health and safety requirements.

A Site Safety Officer (SSO) will be designated by the FOL prior to field activities and will be responsible for ensuring adherence to the Site-specific Health and Safety Plan. The SSO reports directly to the CLEAN Health and Safety Manager and the PM.

In addition to the above personnel, TtNUS program personnel will provide overall support in subcontracting, cost tracking, progress reporting, and supervising the PM. The program personnel include:

- John Trepanowski, P.E., Program Manager
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- Garth Glenn, P.E., Deputy Program Manager
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1.4 CHANGES TO THE WORK PLAN

No changes were made to Section 1.4 in this Work Plan Addendum.

1.5 SCHEDULE AND REGULATORY OVERSIGHT

No changes were made to Section 1.5 in this Work Plan Addendum.

2.0 BACKGROUND INFORMATION

Background information presented in the *Work Plan for RI Revision 2 for Site 08 – NUSC Disposal Area (*TtNUS, January 2007) is updated in this work plan amendment in order to incorporate information for the Building 179 CUST Area, which is being combined with the NUSC Disposal Area - Site 8 investigation, as discussed in Section 1.0 of this amendment.

Included within the background information discussed in this section for the Building 179 CUST Area are the site location and description (Section 2.1), site history (Section 2.2), surface hydrology (Section 2.3), regional and site-specific geology (Section 2.4), hydrogeology (Section 2.5), ecological conditions (Section 2.6), background studies (Section 2.7), conceptual site model (Section 2.8) and problem definition and data use evaluation (Section 2.9) are presented.

2.1 SITE LOCATION AND DESCRIPTION

As shown in Figure 2-1, Building 179 itself is located approximately 420 feet south of the Building 185 Complex, the southern portion of the NUSC Disposal Area, and east of Cunningham Street, near the northeastern boundary of the NUWC. Surface topography in the immediate vicinity of Building 179 is relatively flat. The land slopes gradually downward to the east to a wetland area and Deerfield Creek, which flows to the north. The maximum total relief between the area immediately west of Building 179 and Deerfield Creek to the east is approximately 10 feet.

The original Building 179 was constructed in 1961 and was used to test torpedo propulsion systems as part of the Propulsion Test Facility (PTF) at NUWC. The associated concrete underground storage tank (CUST), which was closed in place in December 1998, is located approximately 20 feet north of the northeast corner of Building 179. The Building 179 CUST Area consists of approximately 2 acres of land, including a heavily vegetated wetland adjacent to a small stream, Deerfield Creek, in the eastern portion of the property, and a heavily developed area in the western portion, much of which is paved, with a number of above- and below-ground process structures to support PTF functions. Plans of Building 179 and environs from 1999 also indicate: a "6,000 gallon steel hazardous waste above ground storage tank" located west of the CUST; a 1,500-gallon double-wall containment fuel-water separator (underground Tank B) northwest of the CUST; a "500-gallon oil-water separator (Tank B-1)" north-northwest of the CUST; as well as another underground fuel-water separator and oil-water separator (Tanks A and A-1, respectively), east of Building 178, further north of Building 179.

In the vicinity of Building 179 to the west and north are other NUWC Buildings, 1303, 438, 1192, and 178, which are bordered by Cunningham Street to the west. Beyond these buildings to the north is the access

road to the Building 185 Complex at the NUSC Disposal Area. Other NUWC Buildings 1180 and 1301 are immediately to the south and southeast of Building 179. According to the Building 179 CUST RI Report, Buildings 179, 438, 1180, 1301, and 1303 form a significant portion of the PTF at NUWC (TRC, 1999).

As a result of the addition of the Building 179 CUST Area to the RI study area, the former Site boundary is being extended, both to the southwest and to the southeast, as shown in Figure 2-1. Toward the southwest, the former Site boundary is being extended by the addition of the area bounded approximately by Building 179 to the south, Deerfield Creek to the east, and Cunningham Street to the west. Toward the southeast, the former Site boundary is being extended to include an approximate 1-acre area that has been used for disposal of debris fill and possibly contaminated fill, based on soil sample location SB153 results from the 2008 RI field investigation. The proposed site boundary adjustment in this area is as follows: the southern boundary terminates at the edge of the grassy field located approximately 400 feet to the south of the Building 185 Complex; the western extent of the site boundary in this area is the tree line (shown on Figure 2-1); and the eastern extent of the adjusted site boundary in this area is approximately the crushed-stone roadway.

2.2 SUMMARY OF BUILDING 179 CUST SITE HISTORY AND CHARACTERIZATION OF CONTAMINATION

This section presents a summary of available historical information for the Building 179 CUST Area as well as a summary characterization of contamination for soil, groundwater, surface water, and sediment.

2.2.1 Building 179 CUST Site History

Prior to the 1961 construction of Building 179, the area appeared to be undeveloped farmland (TRC, 1999). In 1961, Building 179 and the associated 2,000 gallon CUST were constructed to support the Navy through the testing of torpedo propulsion systems. The CUST was constructed as two separate compartments separated by a concrete wall and covered with a steel plate. The CUST compartments were historically referred to as concrete "pits" and were used to collect byproducts generated from propulsion system testing. The materials temporarily held in the concrete pits included water mixed with engine oil, small amounts of cleaning fluids (mineral spirits and other solvent-based cleaners, including 1,1,1-trichloroethane [1,1,1-TCA]); Otto Fuel; and combustion byproduct mixtures composed mostly of carbon with trace amounts of hydrogen cyanide (HCN) and cadmium. The HCN is a combustion product of Otto Fuel, while the cadmium was generated from engine component wear and tear during testing. Building floor drains collected waste materials such as those listed above and conveyed them to the smaller, 500-gallon-capacity compartment within the CUST. The larger 1,500-gallon-capacity compartment was used as a quench tank for water-soluble exhaust gases resulting from the torpedo test

emissions. The contents from this compartment were pumped into a 6,000-gallon above-ground hazardous waste storage tank at the conclusion of each test. Based on information from tank and piping removal activities conducted immediately north of the CUST, an underground "Interceptor Tank" (now removed) connected to the CUST and had a discharge pipe extending approximately 50 feet east toward the wetland/Deerfield Creek (TECG, 1995; TRC, 1999).

The following history of Building 179 is presented in approximate chronological order:

In 1992, two double-walled stainless steel tanks were placed inside the two CUST compartments: a 500-gallon capacity tank on the west side and a 1,500-gallon tank capacity on the east side.

On February 24, 1995, a torpedo test failure and explosion occurred at Building 179 causing damage to the building and requiring the curtailing of activities. Reconstruction of Building 179 was required in order to reestablish full torpedo testing operational status.

In March 1995, in response to a request by NUWC to remove the CUST from RIDEM's list of registered USTs, RIDEM requested a Closure Assessment of the CUST to evaluate whether a release had ever occurred.

From June through October 1995, in support of the Closure Assessment, The Environmental Compliance Group, Inc. (TECG) advanced four soil borings, installed three overburden groundwater monitoring wells, and collected three soil and three groundwater samples, all of which were analyzed for VOCs, cyanide, cadmium and PGDN. VOCs were detected in soil. Chlorinated VOCs were present in all three groundwater samples, with total VOCs ranging from 10,400 to 333,000 µg/L. The "UST Closure Assessment, Building 179 Concrete Pits, Naval Undersea Warfare Center" concluded that a release had occurred in the vicinity of the CUST, and soil and groundwater contamination were present (TECG, 1995). Between August and October 1995, three additional rounds of groundwater sampling and analysis were conducted by TECG to confirm groundwater results presented in the UST Closure Assessment Report. The October 1995 event also analyzed groundwater for SVOCs, petroleum, and metals. In considering all four groundwater sampling events, maximum concentrations of several compounds were as follows: 1,1,1-TCA at 310,000 µg/L; 1,1-dichloroethane (DCA) at 4,600 µg/L; chloroethane at 23,500 µg/L; PGDN at 470 µg/L; and the SVOCs naphthalene and 4-methylphenol at 6,000 J and 5,000 J µg/L, respectively.

In a letter dated October 4, 1995, based on the identified soil and groundwater contamination, RIDEM instructed NUWC to perform an RI, in accordance with Section 8.0 of RIDEM's "Rules and Regulations for the Investigation and Remediation of Hazardous Materials Releases".

From November 1995 to April 1996, TRC Environmental Corporation (TRC) conducted investigative activities to support the Building 179 Reconstruction Program, under contract to NUWC. Soil boring and groundwater monitoring well installation activities were conducted, including groundwater and soil sample collection and analysis, with soils analyzed up to 6 feet in depth. The purpose was to determine whether contamination would be encountered within the area that may be disturbed during reconstruction of Building 179. Soil and groundwater samples were analyzed for VOCs, SVOCs, cyanide, total petroleum hydrocarbons (TPH), and PGDN, and contamination was identified in both soil and groundwater. In groundwater, 1,1,1-TCA was detected at 72,000 µg/L, exceeding RIDEM's GA groundwater standard. Other groundwater contaminants included 1,1-DCA at 6,500 µg/L; TPH at 91,000 µg/L; PGDN at 116,000 µg/L; and cyanide at 400 µg/L. In soil, eleven VOCs were detected, with a maximum of 292,600 µg/kg total VOCs. The maximum concentrations of VOCs in soil were: 1,1,1-TCA at 130,000 µg/kg; 1,1-DCA at 31,000 µg/kg; 1,2,4-trimethylbenzene at 64,000 µg/kg; n-butylbenzene at 22,000 µg/kg; and naphthalene at 10,000 µg/kg. Also, TPH was detected in soil up to 8,400 mg/kg.

In April 1996, also as part of the Building 179 Reconstruction Program, TRC conducted a Sub-Slab Investigation including additional soil sampling and analysis to evaluate soil directly beneath Building 179. One soil sample was collected at each of nine soil borings advanced through the floor of the building. Soil contaminants including VOCs, 1,1,1-TCA, ethylbenzene, and xylene were present. Maximum concentrations in soils were reported for the following: 1,1,1-TCA at least 24,000 µg/kg (value is from a diluted sample); total xylene up to 25,000 µg/kg; TPH at 7,500 mg/kg; cyanide at 18,900 µg/kg; and PGDN at 81,000 µg/kg. The soils with the highest concentrations of PGDN and chlorinated solvents were located in the northeastern area of the building footprint. On the basis of this preconstruction data, TRC prepared a conceptual design for bulk excavation of contaminated soil and installation of wells within the building footprint.

In October 1996, the Building 179 CUST Remedial Investigation Work Plan was prepared by TRC. The RI objective was to assess the nature and extent of contamination in the vicinity of the CUST, adjacent to Building 179. The investigation was conducted in three phases: Phase IA in December 1996, Phase IB in September and October 1998, and Phase II from July through December 1999, as summarized in chronological order with other events below.

In December 1996, Phase IA of the CUST RI was conducted by TRC, including a Geoprobe investigation with 34 soil borings, from which 28 groundwater samples were collected and analyzed for VOCs in a mobile on-site laboratory. Duplicate portions of six of the 28 groundwater samples were also shipped for laboratory analysis by Method 8260, for comparison to mobile on-site laboratory results. The Geoprobe sample locations for Phase IA were confined to the vicinity of the CUST and Building 179. Groundwater contamination was identified in the overburden. A discussion of RI findings is presented under the December 1999 entry below, the date of publication of the RI Report.

In July 1997, the Building 179 Reconstruction Incidental Cleanup Work Plan was prepared by Foster Wheeler Environmental Corporation (FWEC).

From November 1997 through April 1998, remedial activities were conducted by FWEC under the Building 179 Reconstruction Program primarily within the footprint of the Building 179 reconstruction (primarily in grids numbered 1 through 18). The associated remedial activities conducted by FWEC were reported in the "Final Project Close-Out Report for Building 179 Remediation," prepared by FWEC in March 2000.

Contaminated groundwater from excavations was pumped, treated on site, and discharged to the POTW. Railroad tracks, ties, and ballast materials were removed and disposed of. Approximately 220 tons of concrete flooring were removed and disposed off site. Most of the floor slab was contaminated with 1,1,1-TCA and was classified as hazardous waste. Within the excavation grid, soil was removed to meet the RIDEM Industrial/Commercial DEC. Within the building footprint, soil was excavated to the top of competent bedrock.

For restoration of the area within the footprint of the new building construction, a liner system (high-density polyethylene liner and concrete pad) and two groundwater extraction wells were installed. The extraction wells were installed to provide a means to remove and treat groundwater during reconstruction; it is not known if the wells were used. The liner system was installed to limit migration of any contaminant vapors into the newly reconstructed Building 179. In February 1998, post-excavation soil samples were collected from the floor and sidewalls of the Grid 1 through 18 excavations; the results are discussed below in Section 2.2.2.

Activities related to the CUST closure (considered part of Grid 19), which was closed in place, and to the Interceptor Tank closure, are summarized below.

From October through December 1998, FWEC conducted additional activities (described as Building 179 Final Phase Remediation) related to the CUST closure (considered part of Grid 19), which was closed in place, and to the Interceptor Tank closure. The associated remedial activities conducted by FWEC were reported in the Final Project Closure Report for Building 179 Tank Closures, dated October 1999.

These activities were conducted under a Work Plan Addendum to the July 1997 Building 179 Reconstruction Incidental Cleanup Work Plan. Activities included dewatering and treatment of groundwater, removal of contaminated soil adjacent to the CUST and Interceptor Tank, and confirmatory sampling from within the excavations.

CUST/Grid 19 - The CUST contents were removed and the tank compartments were cleaned. Soil excavation exposed the north, south, and east exterior walls of the CUST, where soils were removed to a depth of 9.5 feet below ground surface (bgs), exposing the bottom of the CUST. Also soils were removed from around the top and the sides of the CUST prior to closing the tank in place. (The inner stainless steel tanks from within the CUST had been previously cleaned, removed, and relinquished for recycling.) A total of 11 post-excavation soil samples were collected in the Grid 19/CUST excavation: nine sidewall samples and two floor samples. These samples were collected to confirm that the RIDEM Industrial/Commercial DEC had been achieved; soil confirmation results are discussed below in Section 2.2.2, and sample locations are included in Figure 3-3.

The CUST was closed in place by filling the concrete vault with a flowable fill material, a non-shrinking inert solid composed of sand, gravel, water, cement, and a plasticizing agent to increase flowability. The CUST was then capped with a 3,000 psi concrete slab, reinforced with a 6-inch on-center wire mat (FWEC, October 1999).

Interceptor Tank - Historically, the Interceptor Tank appeared to have been connected to the CUST. An inspection indicated the Interceptor Tank had one inlet coming from the direction of the CUST and one outfall pipeline, extending approximately 50 feet eastward into the wetlands of Deerfield Creek. The tank was approximately three-fourths filled with wastewater and bottom sludge. The Interceptor Tank closure included removal of the tank's residual contents. Approximately 1,100 gallons of fluid, bottom sludges, and residual product were removed. Following the removal of bottom sludges and steam cleaning of the tank interior, one confirmatory sludge sample submitted for analysis contained PGDN at 1.52 mg/L. Additional waste characterization samples were collected from roll-offs and drums containing wastes generated during the removal of the Interceptor Tank. Associated sludge samples exhibited 1,1,1-TCA concentrations of 10,000 mg/kg and 15,000 mg/kg. Soils above and next to the Interceptor Tank were excavated, and the tank was crushed and removed. Post-excavation soil samples were collected from the excavation bottom and sidewalls (FWEC, October 1999). Sample locations are included on Figure 3-3.

On April 17, 1998, RIDEM issued comments on the October 1996 Building 179 Concrete UST (CUST) Remedial Investigation Work Plan" including a request to further define the nature and extent of overburden groundwater contamination that was identified during the Phase IA RI activities conducted in December 1996.

In September and October 1998, TRC conducted Phase IB of the CUST RI, including a Geoprobe investigation with 71 soil borings, from which 56 groundwater samples were collected and analyzed for VOCs (there was insufficient groundwater in other locations). Analysis took place in a mobile on-site laboratory, with duplicate portions of seven of the 56 groundwater samples also shipped for laboratory analysis by Method 8260, for comparison to mobile on-site laboratory results. Phase IB Geoprobe

locations were in areas extending beyond those of Phase IA, to further evaluate overburden groundwater contaminant nature and extent. (Geoprobe groundwater sampling locations from Phase IA and Phase IB are shown on Figure 2-2.) Five surface water samples were also collected and analyzed for VOCs during Phase IB in October 1998 (summarized below in December 1999 entry).

From July through December 1999, Phase II of the CUST RI was conducted by TRC including:

- A seismic refraction survey conducted to assess subsurface conditions and to profile the bedrock surface.
- A total of 25 soil samples collected from borings and analyzed for VOCs, SVOCs, cyanide and TPH (locations shown on Figure 2-2).
- A total of 13 groundwater samples (from eight overburden and five bedrock monitoring wells) collected and analyzed for the compounds listed above (locations shown on Figure 2-2).
- Three surface water/sediment sample pairs collected and analyzed for the parameters listed above.
- In situ hydraulic conductivity tests (slug tests).
- Three rounds of groundwater level measurements (October, November and December 1999).

In October 1999, Final Project Closure Report for Building 179 Tank Closures was issued by FWEC. This report documented Grid 19 excavation and Interceptor Tank and piping removal and excavation.

In December 1999, the Building 179 Concrete UST Remedial Investigation Report was issued by TRC, summarizing activities and data from all three phases of the RI, including Phase IA (December 1996), Phase IB (September through October 1998), and Phase II (July through December 1999). The focus of the RI was on the identification of the nature and extent of groundwater contamination.

Neither a human health risk assessment nor an ecological risk assessment was conducted as part of the Building 179 CUST RI. The RI Report recommended additional groundwater investigation of the bedrock aquifer to fully define its nature and extent of contamination, along with further data analysis and risk assessment to develop groundwater objectives under a RIDEM Remediation Regulations Method 2 or Method 3 approach. In addition, the RI Report also included a brief description of four remedial alternatives developed to address the observed groundwater contamination.

In March 2000, the Final Project Close-Out Report for Building 179 Remediation was prepared by FWEC. This report summarized the Grids 1 through 18 excavations.

On November 28, 2000, the Building 179 Concrete UST RI Report was submitted to RIDEM.

2.2.2 Building 179 CUST Area - Characterization of Contamination Summary

This section presents a summary characterization of contamination for soil, groundwater, surface water, and sediment at the Building 179 CUST Site based on the results provided in the CUST RI Report (TRC, 1999), the Building 179 Tank Closures Report (FWEC, 1999), and the Building 179 Remediation Report (FWEC, 2000).

2.2.2.1 Soil Contamination Characterization Summary

As discussed above, remedial activities including tank closure and removal and soil excavation and removal have been performed at the Building 179 CUST Area. The Building 179 residual soil characterization is based on the results of the post-excavation soil confirmation sampling conducted at Grids 1 through 19, as reported in the Building 179 Tank Closures Report (FWEC, 1999) and the Building 179 Remediation Report (FWEC, 2000) and for soil borings collected during the CUST RI (TRC, 1999).

For Grids 1 through 18, which were underneath or immediately adjacent to the Building 179 footprint or the adjacent concrete pad with rails, the post-excavation soil samples consisted of 18 samples collected from the excavation floor and 11 samples collected from the excavation sidewalls. Samples were analyzed for VOCs, SVOCs, TPH, total cyanide, and PGDN. Positive detections were presented in a summary table, however, associated analytical laboratory data reports were not included in the report (FWEC, 1999). The table below provides Grids 1 through 18 post-excavation soil positive detection results for PGDN and for analytes exceeding the RIDEM Industrial/Commercial Direct Exposure Criteria (I/C DECs).

	I/C DEC	179-Grid-1 Post	179-Grid-11 Duplicate	179-Grid-11 Post	179-Grid-11 Sidewall 2 Post	179-Grid-11 Sidewall 4 Post	179-Grid-14 Post
EXPLOSIVES (MG/KG)							
PGDN	na	NA	NA	31	NA	NA	NA
VOLATILES (UG/KG)							
1,1-DICHLOROETHENE	9500	-	10000	-	-	-	-
SEMIVOLATILES (UG/KG)							
BENZO(A)PYRENE	800	1900	NA	-	-	-	-
PETROLEUM HYDROCARBONS (MG/KG)							
TPH	2500	82	NA	5900	3500	5600	4000

Source: Building 179 Remediation Report (FWEC, 2000).
I/C DEC RIDEM Industrial Commercial Direct Exposure Criteria
na not applicable
NA not analyzed
SW sidewall
"-" not detected
shaded exceeds criterion

As shown, only two exceedances of the Industrial/Commercial DECs for VOCs or SVOCs were reported. The VOC, 1,1-dichloroethene (1,1-DCE), at 10,000 µg/kg, slightly exceeds its criterion of 9,500 µg/kg in the Grid 11 excavation floor sample. The SVOC benzo(a)pyrene soil concentration in the Grid 1 excavation floor sample at 1,900 µg/kg exceeds the criterion (800 µg/kg). Also, the TPH Industrial/Commercial DEC of 2,500 mg/kg was exceeded in three Grid 11 samples at concentrations ranging from 3,500 to 5,900 mg/kg and in one Grid 14 sample at 4,000 mg/kg. Also, PGDN was reported at 31 mg/kg in Grid 11.

For Grid 19, a total of eleven post-excavation soil samples were collected in the Grid 19/CUST excavation: nine sidewall samples and two floor samples. A description of some of the analytical results for the Grid 19/CUST post-excavation samples was included in the text of the report, however, neither a positive detections summary table nor the associated analytical laboratory data reports were included (FWEC, 1999). It was reported that all eleven samples contained VOCs, primarily acetone and 2-butanone (both common laboratory contaminants), but there were no exceedances of the RIDEM Industrial/Commercial DEC. In addition, cyanide was not detected. Information regarding SVOC results was not included in the Tank Closures Report. Also, it was reported that TPH exceeded the RIDEM Industrial/Commercial DEC (2,500 mg/kg) at two sidewall samples at 3,300 mg/kg and 4,700 mg/kg (FWEC, October 1999).

At the Interceptor Tank, nine post-excavation soil samples were collected from the excavation bottom and sidewalls and analyzed for VOCs, mineral spirits, PAHs, and total cyanide. In addition, four of the soil samples were also analyzed for PGDN to evaluate potential Otto Fuel contamination in the area of the Interceptor Tank. The report states PGDN was not detected. Neither a positive detections summary table nor the associated analytical laboratory data reports were included (FWEC, October 1999).

During the Building 179 CUST RI, 25 soil samples were collected from 23 borings located throughout the associated study area (beyond the soil excavation grids). Both soil and groundwater sample locations from the Building 179 CUST RI are included on Figure 2-2. Soil samples were analyzed by fixed-base laboratories: for VOCs, by Severn Trent Laboratories, Monroe, Connecticut; and for SVOCs, cyanide, TPH and TOC, by Mitkem Corporation, Warwick, Rhode Island. Summary tables as well as the associated analytical laboratory data reports for soil samples were included in the Building 179 CUST RI. RIDEM's Residential DEC was not exceeded for any of the VOC compounds detected in these samples as reported in Table 6 of the CUST RI Report. In addition, no SVOCs, TPH, or cyanide detections in the soil samples exceeded the RIDEM Residential DEC as reported in Tables 7 and 8 of the CUST RI Report.

2.2.2.2 Groundwater Contamination Characterization Summary

The Building 179 groundwater characterization is based on the results of the groundwater sampling from Geoprobes and monitoring wells during the Building 179 CUST RI (sample locations are included on Figure 2-2). VOCs were the primary groundwater contaminants detected during the Building 179 CUST RI. Total

VOC concentrations in groundwater samples from the bedrock aquifer ranged from 10 to 25,980 micrograms per liter (µg/L). The maximum total VOC concentrations were detected at bedrock monitoring well MW-7B, located approximately 15 feet north of the former CUST. For overburden groundwater, total VOC concentrations ranged from non-detect to 4,656 ppb, with the greatest concentrations at MW-7A. Five chlorinated VOCs (1,1,1-TCA; 1,1-DCE; 1,2,4-trichlorobenzene; tetrachloroethylene [PCE]; and methylene chloride) were detected in groundwater samples in excess of established groundwater standards. In general, highest concentrations of VOCs were detected in bedrock groundwater at MW-7B, with significantly lower concentrations detected at MW-9B located north/northeast of the CUST. The primary compounds detected in bedrock groundwater at MW-9B were 1,1,1-TCA and 1,1-dichloroethane (DCA). These compounds were found in groundwater at concentrations significantly higher than in NUSC Disposal Area groundwater samples.

The chlorinated ethane groundwater plume originates in the area of the former CUST and Building 179, where higher concentrations of 1,1,1-TCA and 1,1-DCA are present.

The VOC 1,2,4-trichlorobenzene was detected infrequently in groundwater, and was reported at the highest level at MW-7B (120 J), immediately adjacent to the CUST. It was present at trace levels of 1 to 2 J ug/L at MW-6B (upgradient of Building 179) and MW--8A, downgradient of Building 179, immediately across the stream. The likely source, based on its high detection location, is also the former CUST/Building 179.

The highest concentrations of PCE were detected in very shallow groundwater samples (maximum depth was 5.5 feet bgs) from locations at the northern portion of the Building 179 CUST RI study area, south of Building 185 and east of Deerfield Creek. These locations, sampled during their 1998 Phase 1B geoprobe investigation were GP-148, GP-134, and GP-148A, with PCE at 50, 41, and 9.4 ug/L, respectively. PCE was also detected in groundwater samples from monitoring wells in this area (MW-12 and MW-13B, at 9 and 5 ug/L, respectively). The Building 179 CUST RI indicates that this detected PCE to the north of their study area may represent a source separate from the source of the plume migrating from the CUST area. However, it is also noted that trace levels of PCE were reported to the south: in groundwater from GP-26 (0.27 ug/L) located east of Building 438 and north of Building 179; and in soil duplicate samples from MW-7B, adjacent to the former CUST, and B26-S2, directly east of GP-26 and east of Deerfield Creek (approximately 1 ug/kg). (These soil samples were collected below the water table and are likely impacted by groundwater).

Methylene chloride was listed as one of the chemicals that was detected in some soils that were excavated from Grids 13, 14, 15, 17, and 18. It was reported that this chemical may have resulted from spills of the spent solvent that was historically used in small quantities at this location for its solvent properties (Final Project Closure Report for Building 179 Tank Closures, Foster Wheeler Environmental

Corporation, October 1999, see Appendix L – "Waste Classifications" [Table 1]). Although methylene chloride can also be a common laboratory contaminant and was reported in several "blank" QA/QC samples, it is stated in the Building 179 CUST RI that "its presence cannot ... be solely attributed to laboratory-induced contamination" due to the elevated level at MW-7B and other detections. Some sampling events where methylene chloride was reported in "blank" samples include June and July 1995 (soil and groundwater sampling, respectively), December 1996, and July and August 1999 (soil and surface water sampling, respectively).

Benzene, toluene, ethylbenzene and xylene (BTEX compounds) were also detected at one location, GP-95, located less than 10 feet north of the former Interceptor Tank outfall pipe. The Building 179 CUST RI stated that these chemicals may be attributable to a possible oily discharge from the former Interceptor Tank outfall pipe, and that discolored (black) soil/sediment was observed near this location.

The chlorinated ethane groundwater plume originates from the former CUST and Building 179 area and extends from the Building 179 CUST Area, generally following the alignment of Deerfield Creek, nearly to the northern side of the South Meadow. This plume consists primarily of 1,1,1-TCA and its breakdown products, 1,1-DCA and chloroethane. Cyanide contamination was also detected in groundwater samples collected in 1999 during the Building 179 CUST Area RI.

The chlorinated ethane plume is migrating northerly and into the Building 185/Paved Storage Area. As this plume migrates downgradient with groundwater flow, additional chemicals from non-point-source releases from the disposal and operations in the Paved Storage Area and in the Building 185 Complex co-mingle with the plume. The extent of this bedrock plume to the west has not been adequately defined. Additional groundwater investigation of the Building 179 CUST Area is recommended based on the following:

- Building 179 CUST Area groundwater characterization is based on data collected ten years ago; current concentrations and distribution of contaminants in groundwater must be established to adequately evaluate potential remedial responses. As stated in the Draft NUSC Disposal Area RI Report the source of chlorinated ethanes, including 1,1,1-TCA and its breakdown products, 1,1-DCA, and chloroethane, is believed to be releases from the upgradient Building 179 Site.

- Groundwater in the Building 179 CUST Area has not been analyzed for 1,4–dioxane, a chemical that was historically added to some chlorinated solvents. The extent of 1,4-dioxane contamination (if any) in groundwater within the Building 179 CUST Area chlorinated ethane plume is unknown.

- Groundwater in the Building 179 CUST Area has not been analyzed for cyanide since approximately ten years ago. Cyanide had been previously detected in a limited number of groundwater samples, but was not analyzed during the 2008 RI investigation. The extent of cyanide contamination (if any) in groundwater within the Building 179 CUST Area is unknown.

- The Otto Fuel component PDGN was detected at the Building 179 Site but was not analyzed for in groundwater. The extent of PGDN contamination (if any) in groundwater within the Building 179 CUST Area chlorinated ethane plume is unknown.

2.2.2.3 Surface Water and Sediment Contamination Characterization Summary

In the CUST RI, surface water and sediment contaminant concentrations were compared to National Oceanic and Atmospheric Administration (NOAA) critical continuous concentration (CCC) values, which were used for comparative purposes only, in absence of specific RIDEM surface water/sediment criteria.

Several VOCs were reported in one or more of the three Deerfield Creek surface water samples, with the highest levels reported for 1,1,1-TCA (200 µg/L) and 1,1-DCA (230 µg/L). The maximum "total VOCs" reported in surface water was 550 µg/L. None of the detected VOCs exceeded the available (NOAA CMC/CCC) comparison criteria. Cyanide was detected at 5.2 µg/L, and TPH was not detected in surface water (TRC, 1999).

Analytes reported in sediment samples from Deerfield Creek included VOCs, SVOCs, TPH, and cyanide. SVOCs in the sediment samples at concentrations greater than at least one of the NOAA sediment standards included the PAHs pyrene, benzo(a)anthracene, and chrysene. The maximum TPH and cyanide concentrations in sediment (280 mg/kg and 1.2 mg/kg, respectively), were detected in Deerfield Creek approximately 90 feet east of the CUST.

Additional investigation of the Building 179 CUST Area surface water and sediment is recommended as the current surface water and sediment characterization is based on data collected ten years ago; current concentrations and distribution of contaminants in surface water and sediment must be established to adequately evaluate potential remedial responses for the NUSC Disposal Area/Building 179 CUST Area.

2.2.2.4 Evaluation of Additional Potential Sources of Contamination

A review was conducted of available analytical results for soil and groundwater samples collected in the vicinity of four structures north of Building 179 to evaluate whether or not these structures may represent sources of contamination. As shown in Figure 2-2, the four structures from south to north include: the 1500-gallon fuel-water separator (Tank B) located about 30 feet northwest of the former CUST; the 500-

gallon oil-water separator (Tank B-1) located about 70 feet southeast of Building 438; the water tank east of Building 1192; and the fuel-water separator and oil-water separator (Tanks A and A-1, respectively) east of Building 178. Additional information regarding these structures is presented in Table 2-1. In general, analytical results for sample locations that are within approximately 40 feet of each structure or tank were evaluated, however, if few samples were collected in the immediate vicinity, sample locations beyond 40 feet are included to provide additional information. The results that were evaluated for each structure are presented in Table 2-2 for soils and Table 2-3 for groundwater. The sample locations are shown in Figure 2-2.

The soil and groundwater data evaluated are from the Building 179 Concrete Underground Storage Tank (CUST) Remedial Investigation (RI) conducted by TRC Environmental Corporation (TRC), as summarized in the associated RI Report dated December 1999. Groundwater samples from the associated Phase IA and Phase IB geoprobe investigations ("GP"- samples) were collected in December 1996 and September/ October 1998, respectively. Groundwater samples from monitoring wells ("MW" - samples) were collected in August 1999. Soil samples from borings (e.g., B10- and MW9-, etc.) were collected in July 1999.

This evaluation determined that the results are not indicative of additional separate source areas at any of the four tanks/structures. With respect to soils, as part of the Building 179 CUST RI, a total of eight soil samples have been collected from seven locations in the vicinity (within approximately 40 feet) of the four structures. As shown in Table 2-2, for each of the four structures, VOC concentrations in soil samples collected from the nearest locations crossgradient and/or upgradient of each of the structures are higher than concentrations from the nearest locations downgradient of the structures. It is noted that some soils collected below the water table or near the fluctuation zone have likely been impacted by contamination within the groundwater.

With respect to groundwater samples evaluated and shown in Table 2-3, the distribution pattern and concentrations of groundwater contaminants are consistent with the contaminant source being the originally-identified single source area: the Building 179/CUST area, where contaminated soils were previously excavated. The groundwater contaminants that originate at the Building 179 and former CUST source area migrate in groundwater, forming a contaminant plume that follows the general groundwater flow pattern to the north and/or northeast, and disperses somewhat laterally with distance from the source, but is generally bounded to the east by Deerfield Creek. The groundwater flow pattern in the area is also influenced by the flow path of Deerfield Creek, which flows generally north and then bends sharply to the west, in the general area that is approximately east of Building 178. Groundwater in this more northern area likely takes on a more northwesterly flow direction, depending on the specific location, influenced by the flow path of Deerfield Creek. The evaluated tanks and structures and associated sample locations are well within the bounds of this groundwater contaminant plume.

Evidence of a single source area and a resulting clear pattern of contaminant migration and degradation through reductive dechlorination (in overburden groundwater, in this example) is exhibited in the VOCs results for confirmation duplicate (split) samples from four locations, summarized below. These split sample results are selected for specific examples in this discussion because they are all from the fixed-base laboratory, Mitkem Corporation of Warwick, Rhode Island (Mitkem), and are therefore more accurately compared to each other than if comparing mobile lab results to Mitkem results. As seen in Figure 2-2, the pattern of contaminant migration and degradation in groundwater is shown to extend from the Building 179/CUST source area in the south, at MW-7A, continuing with groundwater flow to the north, at GP-100A, GP-130, and GP-150. The concentrations of 1,1,1-trichloroethane (1,1,1-TCA) and its breakdown products, 1,1-dichloroethane (1,1-DCA) and chloroethane are summarized below and on Figure 2-2, at locations extending from south to north.

Location ID	Distance north of Building 179	1,1,1-TCA (ug/L)	1,1-DCA (ug/L)	Chloroethane (ug/L)	Total of these VOCs (ug/L)
MW-7A	45 feet	3,600	780	73 J	4,453
GP-100A	150 feet	760	590	470	1,820
GP-130	285 feet	500	330	54	884
GP-150	390 feet	380	310	94	784

The locations and concentrations of contaminants are consistent with the expected dilution, dispersion, and degradation of the source contaminants as they migrate downgradient, dissolved within groundwater.

In conclusion, the results of both soil and groundwater samples collected from locations in the vicinity of each of the four evaluated structures are consistent with and attributable to a single source area - Building 179 and the associated former CUST and Interceptor Tank. Each of the structures is within the bounds of the dissolved contaminant plume (also shown in Figures 2-1 and 2-2) that migrates with groundwater flow downgradient from the source, and results from nearby sample locations do not indicate additional or unexpected contaminants or concentrations. The results are not indicative of an additional source of contamination at any of these structures.

2.3 SURFACE HYDROLOGY

Section 2.3 is amended by the addition of the following text.

Deerfield Creek is located about 80 feet east of the former CUST. This portion of Deerfield Creek is surrounded by low-lying areas some of which are delineated as wetlands, to the southeast, east, and northeast of the former concrete UST. Deerfield Creek flows onto the NUWC property south of the Building 179 property. Several storm water outlets originate from NUWC and feed Deerfield Creek.

2.4 GEOLOGY

Section 2.4 is amended by the addition of the following text.

Overburden thickness ranges from about three to 9 feet at the Building 179 CUST area. Overburden materials and underlying bedrock are described below.

2.4.1 Fill

Section 2.4.1 is amended by the addition of the following text.

At the Building 179 CUST area the fill unit encountered was a brown sand and gravel with various quantities of silt. This unit was encountered in five borings at thicknesses ranging from one to seven feet, generally in developed portions of the site. Some fill may have been placed on grade to allow construction of buildings and roads in low-lying areas. Concrete debris was encountered in one area.

2.4.2 Peat/Loam

Section 2.4.2 is amended by the addition of the following text.

The peat/loam unit at the Building 179 CUST area consists of either a brown, fibrous peat or a dark brown silty loam and was observed in the wetland area and the grassy landscaped areas. This unit was encountered in 16 borings and ranged in thickness from several inches to one foot.

2.4.3 Silt and Sand

Section 2.4.3 is amended by the addition of the following text.

The silt and sand unit was observed at the Building 179 CUST area in almost all of the borings. This unit consists of grey silt with various quantities of fine sand and is present beneath the fill or peat/loam and above the till. This unit varies from about one foot to six feet in thickness.

2.4.4 Till

Section 2.4.4 is amended by the addition of the following text.

The Building 179 CUST area till unit consists of a heterogeneous mixture of silt, sand, shale fragments and gravel. This unit is present in most of the borings and lies directly above bedrock, and ranged in thickness from about one to four feet.

The bedrock beneath the Building 179 CUST Area has been characterized as shale. The uppermost bedrock has been characterized as degraded and weathered shale, which is underlain by a competent shale.

2.4.5 Bedrock

Section 2.4.5 is amended by the addition of the following text.

The Building 179 CUST area bedrock surface elevations beneath the site range from about 50 feet at the southwestern corner of the site to 40 feet at the northeastern portion of the site adjacent to the Deerfield Creek channel. The bedrock surface topography typically follows the ground surface topography, showing a gradual slope towards the wetland and Deerfield Creek.

Degraded, severely weathered shale was encountered at the bedrock/overburden interface in nearly all the borings advanced for the Building 179 CUST RI. Degraded bedrock (characterized as bedrock that was penetrated with a split spoon, has a rock-like fabric and composition, but crumbles easily with hand pressure) was encountered at depths between 2.5 to 9 feet below ground surface and ranged from approximately one to five feet thick.

The competent bedrock consists of gray shale, with small sections of conglomerate and white quartzite intrusions. The upper portion of the bedrock has many water-bearing coarse fractures evident. Fractures and iron staining were also observed deeper in the bedrock but were not as prevalent as in the upper two to four feet. Fractures were both high- and low-angle orientations.

2.5 HYDROGEOLOGY

Section 2.5 is amended by the addition of the following text.

The water table beneath the Building 179 CUST Area is shallower closer to Deerfield Creek, where it occurs in the overburden, but west of the former CUST the groundwater table occurs in the bedrock. Groundwater flow in both the overburden and bedrock generally mimics ground surface topography and is in a north-northeasterly direction, generally towards Deerfield Creek. Groundwater flows from the location of the former CUST to Deerfield Creek and the associated wetland area.

2.5.1 Hydraulic Gradients

Section 2.5.1 is amended by the addition of the following text.

At the Building 179 CUST Area, the horizontal hydraulic gradients for groundwater flow in overburden ranged from 0.005 ft/ft to 0.023 ft/ft, and in bedrock the gradients ranged from 0.001 ft/ft to 0.013 ft/ft. Horizontal gradients are generally in the higher range closer to Deerfield Creek and the northern portion of the Building 179 CUST Area.

Vertical hydraulic gradients between overburden and bedrock are downward in the area of the former CUST, at well clusters both west and east of Deerfield Creek (MW-7A/7B and MW-6A/6B, west of the Creek, and MW8A/8B and MW13A/13B, east of the Creek).

2.5.2 Hydraulic Conductivity

Section 2.5.2 is amended by the addition of the following text.

Hydraulic conductivities (K) of overburden and bedrock at the Building 179 CUST Area were estimated using in situ hydraulic conductivity tests (slug tests) and grain size analysis. The average K of overburden materials ranged from 1.48 to 1.62 ft/day using slug tests, and was 0.014 ft/day using grain size analysis. The average K of bedrock was between 0.47 and 0.50 ft/day using slug test data.

2.5.3 Groundwater Seepage Velocities

Section 2.5.3 is amended by the addition of the following text.

Average seepage velocities in the Building 179 CUST Area were estimated. In the overburden, seepage velocities were estimated to be between 0.015 and 0.7 ft/day. The average seepage velocity in the bedrock was estimated to be between 0.01 and 0.16 ft/day.

2.6 ECOLOGICAL CONDITIONS

Section 2.6 is amended by the addition of the following text.

The ecological setting of the Building 179 CUST Area is taken to be similar to the ecological setting of the adjoining NUSC Disposal Area, as described in the Draft RI.

2.7 BACKGROUND STUDIES

Section 2.7 is amended by the addition of the following text.

The dataset from the background soil investigation for the NUSC Site (TtNUS, 2006), which is part of the basewide background study (TtNUS, 2008), was used to perform a statistical comparison with the Site soil data. This comparison is provided in Appendix E of the Draft RI for the NUSC site. Results of this dataset statistical comparison are incorporated into the HHRA (Section 6.0) and the ERA (Section 7.0) of the RI. Background soil investigation data will also be used during the supplemental RI investigation to the extent practicable.

2.8 CONCEPTUAL SITE MODEL

Section 2.8 is replaced by the following text.

Using the information provided in the SASE, the NUSC Disposal Area RI findings, and in the Building 179 CUST RI Report, the conceptual site model (CSM) has been revised to better understand how contaminants discharged at and near the Site would likely behave and interact with the surrounding soil, sediment, water (ground and surface), and bedrock. This understanding will direct the development of the supplemental RI investigation, and the plan for that investigation.

2.8.1 Physical Setting

This section provides a brief summary of the physical setting and the groundwater and surface water systems at the Site.

The Building 179 portion of the Site is developed and consists of a series of buildings adjacent to a wetland area and Deerfield Creek. After Deerfield Creek flows under the access road to Building 185, it quickly loses elevation, and bedrock outcrops in the streambed. The Paved Storage Area, South Meadow and North Meadow are situated on the elevated stream bank and fill area east of Deerfield Creek and NUWC Pond. The adjacent lowland portion of the Site includes two streams (Deerfield Creek and the unnamed stream that flows onto the Site from the adjoining golf course to the east) and NUWC Pond.

The stratigraphy at the Site consists of a thin veneer of overburden, consisting primarily of fill, sand and silt, and till. Groundwater beneath the Site is primarily within the bedrock, but in places is present in overburden just above the bedrock. Bedrock primarily consists of a low-grade metamorphic rock, phyllite, or shale. There is some preferential groundwater flow through bedrock fractures. The general orientation of those fractures is north-south with a long linear zone of water-bearing fractures and highly degraded

bedrock that extends from MW112B in the northern portion of the South Meadow, through the North Meadow and northeasterly at least to the northern edge of NUWC Pond (MW119B). In the North Meadow, the bedrock is extremely degraded and weathered and has a high hydraulic conductivity. In contrast, bedrock in the Paved Storage Area is competent and has low hydraulic conductivities.

Vertical hydraulic gradients are downward from the overburden or the uppermost degraded bedrock to the more competent bedrock. Adjacent to Deerfield Creek, however, vertical hydraulic gradients are upward. The fill and natural material on top of the bedrock generally does not impede the downward flow of groundwater, with the exception of the eastern corner of the Paved Gated Storage Area where a silt layer overlies the bedrock and an upward hydraulic gradient exists.

Horizontal groundwater flow directions are strongly influenced by the surface water bodies at the Site. Groundwater on the Site flows in the direction of NUWC Pond and Deerfield Creek. As shown on Figure 2-1, some of the Site is west of Deerfield Creek, where groundwater flow is generally northeasterly. Most of the Site is east of Deerfield Creek, where groundwater flow is generally northwesterly. Both overburden and bedrock groundwater flow discharges into Deerfield Creek and NUWC Pond from the east and the west.

The surface water at the Site consists of Deerfield Creek, the unnamed stream that flows from the adjoining golf course located to the east, and NUWC Pond. In addition, storm water is discharged to NUWC Pond and Deerfield Creek through three outfalls from the NUWC facility storm drain network from the west. The two streams are shallow and generally less than 4 feet in width. The stream channel in the area of Building 179 is not well defined and is associated with wetlands. Adjacent to the Building 185 portion of the Site the stream substrates are a combination of bedrock, cobble, gravel, and sand. High flow conditions in this portion of the stream channel, and in the unnamed stream, have scoured and removed much of the fine-grained material from the streambeds and deposited them in the low energy/ wetland environment at the lower end of Deerfield Creek and in NUWC Pond.

2.8.2 Contaminant Sources

Sources of contaminants at the Site and the general distribution of contamination are described briefly in this section. Generally, a contaminant is only discussed in this CSM if it is above screening criteria identified within the NUSC RI and/or the Building 179 CUST RI. There are several broad categories of contaminant sources at the Site, including:

Debris Fill - Large portions of the Site have historically been used for disposal of debris. The areas where debris fill has been identified at the Site are the southeastern corner of the Site, the Paved Storage Areas, the area between the Paved Storage Area and Deerfield Creek, the South Meadow, a small portion of the

North Meadow and just north of NUWC Pond (Figure 2-1). The location of this debris fill generally coincides with contamination of PAHs, PCBs, and metals in soil.

Former Building 179 and CUST/Interceptor Tank Area – Two underground storage tanks (USTs) were formerly operational at the Building 179 Area: a CUST and an interceptor tank. These tanks were used for storage of chemicals and as a quench tank. These tanks were used to capture/ store oil, water, cleaning fluids, Otto Fuel, and combustion byproducts. The quench tank was used to absorb water-soluble exhaust gases from torpedo exhaust emissions. A discharge pipe from the interceptor tank towards the wetland/ Deerfield Creek was formerly operated. After the initial soil and groundwater investigations were conducted in the area of the tanks, additional investigations were conducted as part of Building 179 reconstruction activities. These investigations were conducted to evaluate the condition of soils underlying and in the immediate area of Building 179 that could be affected during the upcoming building reconstruction activities, and to plan for the proper handling and management of impacted soils and groundwater.

Remediation, including tank closure (the CUST was closed in place and the interceptor tank was removed) and soil excavation and removal has been performed on this portion of the Site. The former Building 179 concrete foundation was also removed (Figure 3-3 shows soil removal areas). However, residual contamination by VOCs and/or Otto Fuel or petroleum product exists in this area. The chlorinated ethane groundwater plume that originates from these USTs extends from the Building 179 CUST Area nearly to the northern side of the South Meadow, generally following the alignment of Deerfield Creek. In the area west-southwest of the Building 185 Complex, this chlorinated ethane plume is estimated to be approximately 150 feet wide, including the area of MW101B to the west extending to MW124B to the east, and including MW100B, where LNAPL was also detected.

Elevated arsenic is also present in groundwater in this southern portion of the Site, as in much of the Site groundwater. Cyanide contamination was also detected in groundwater samples collected in 1999 during the Building 179 CUST Area RI. Hydrogen cyanide is a combustion product of Otto Fuel.

Because this data is ten years old, the current concentrations and distribution of contaminants in groundwater due to this release will be investigated as part of this Work Plan Addendum.

The Building 185 Area – This operational area consists of a series of four structures with low concrete berms, historically used for storage of various materials, including Otto Fuel and hazardous chemicals, and is currently used for the storage of Otto Fuel and inert materials. Two components of Otto Fuel have been detected in groundwater in this area. In addition, chlorinated VOCs are present in groundwater beneath this portion of the Site. Otto Fuel components (PGDN and dibutyl sebacate) are present in groundwater adjacent to Area No. 1 of the Building 185 Complex in MW124B. The apparent source of

this is the historical release of Otto Fuel discovered during a 2004 upgrade to Area No. 1. The distribution of Otto Fuel components in soil and groundwater will be further investigated as part of this Work Plan Addendum. Chlorinated and aromatic VOCs are also present in groundwater in this area.

Just west of the Building 185 Complex LNAPL is present in the subsurface based on measurements made in monitoring well MW100B. This LNAPL is comprised of petroleum constituents, including ETPH and aromatic VOCs. The LNAPL was discovered in this one well in 2008, at which time the well was bailed until the product was not detected in the well. The current status of LNAPL in this well is not known and will be investigated as part of this Work Plan Addendum.

A generalized area of dissolved ETPH in groundwater exists beneath the Building 185 Complex, much of the Paved Storage Area and much of the Building 179 CUST Area. Other than the location of the LNAPL (MW100B), the highest concentration of ETPH occurs adjacent to the Building 185 Complex in the same location where Otto Fuel components are in groundwater (MW124B).

The Paved Storage Area/South Meadow – This area includes the South Meadow, the Paved Open Storage Area, the Paved Gated Storage Area, and the strip of land between the Paved Open Storage Area and Deerfield Creek. This area has historically been filled and contains significant amounts of debris fill. The historical disposal in this area has resulted in the presence of SVOCs (primarily PAHs), metals, ETPH, and PCBs at concentrations above state and/or federal screening criteria. Carcinogenic PAHs, PCBs, and arsenic are present in soil in these areas at concentrations that are of concern.

Two discrete areas were previously excavated because they formerly contained buried metal containers or drums. As indicated on Figure 2-1, the former "buried metal container area" (or "buried paint can area") is west-northwest of the Building 185 Complex at the break in slope going down to Deerfield Creek, and the former "drum excavation area" is in the South Meadow. In the area of the former buried paint can area, the maximum concentrations of lead in both exposed subsurface soil and in sediment were detected at SB106 and SD100, respectively. SB106 is located just beyond the southernmost extent of the excavation, where it had been terminated in order to avoid undercutting of the adjacent road culvert. Sediment sample SD100 is located in Deerfield Creek, adjacent to and immediately southwest of the buried paint can excavation area. In addition to lead, SB106 is also the location of the maximum concentrations of five additional metals, including iron and cobalt. These analytical results indicate that metals-impacted soil remains in this area.

In the "drum excavation area" and the area immediately west of the northwest corner of the Paved Open Storage Area, PAHs are present at especially high concentrations. The carcinogenic PAHs benzo(a)pyrene and dibenzo(a,h)anthracene are the two PAHs most frequently reported. Arsenic is frequently present in soils at concentrations well above screening criteria and is particularly high within the

Paved Storage Area. Additional drums have been identified scattered within the debris fill in the South Meadow and metallic and plastic items are present beneath the Paved Storage Area.

PCE, trichloroethene (TCE), and their breakdown products, as well as arsenic, and benzo(b)fluoranthene are elevated in groundwater in this area. The source appears to be the disposal of debris within this area and operations within the Paved Storage Area.

The North Meadow - The groundwater contamination in the North Meadow is primarily limited to contamination by chlorinated ethenes: TCE and its breakdown products. However, groundwater in the North Meadow has not been analyzed for 1,4 –dioxane, a chemical that was historically added to some chlorinated solvents. In order to assess this data gap, groundwater samples from the North Meadow will be analyzed for 1,4-dioxane as part of this Work Plan Addendum. Although no documented releases have occurred in the North Meadow, the distribution of contaminants suggests that the source of the chlorinated ethenes is a release(s) of TCE to the ground near the center of the North Meadow. Lacking any other information regarding releases of chlorinated solvents in this area, it appears that historical dumping of quantities of pure solvent or a mixture of solvents occurred in the North Meadow. The lack of TCE concentrations above screening levels in unsaturated soils indicates no remaining source in Site soil.

Elevated arsenic in groundwater, which is widespread at the Site, is also present in this area.

Deerfield Creek/ NUWC Pond - This area includes the surface water and sediment associated with Deerfield Creek, NUWC Pond, and the unnamed stream that flows onto the Site from the Wanumetonomy Golf Course.

Pesticides in sediment and surface water exceed screening criteria. The pesticides at the Site are manufactured chemicals that were historically used as pesticides in the United States. Pesticides are commonly applied to agricultural areas and golf courses. These pesticides are very persistent in the environment. Pesticide impact at the Site is related to agricultural use at the Site and surrounding properties.

Surface water samples collected at the Site had very few exceedances of screening criterion. Metals (barium, manganese, iron, and lead) are in surface water at concentrations above criteria. Some of this impact is due to sediment entrained in the surface water samples.

Sediment at the Site has been impacted by Site activities and/or disposal. Many PAHs are present above screening criteria in most locations in deep water and shallow water. In addition, numerous metals are present in sediment above screening criteria. PAHs and metals are a contamination problem at the Site.

Areas of elevated PAHs and PCBs not related to onsite disposal activities are present adjacent to the Site, West of NUWC Pond at locations adjacent to stormwater outfalls from the Base surface soil contains PAH contamination. The elevated concentrations of PAHs in sediments are likely a result of a combination of sources including contaminated surface water and/or sediment discharged from one or more of the three stormwater outfalls located west of NUWC Pond, as evidenced by PAH concentrations in surface soil.

Sediment and surface water samples from Deerfield Creek in the southernmost portion of the Site (the Building 179 Area) are about ten years old. In order to have current sediment and surface water contaminant data, these media will be re-sampled in this portion of the Site and analyzed for SVOCs. This sampling and analysis is described in Section 3.0 of this Work Plan Addendum.

2.8.3 Contaminant Transport and Migration Pathways

This section briefly describes the contaminant transport and migration pathways, if any, for the broad sources of contamination at the Site.

Debris Fill – The PAHs, metals, and PCBs associated with the debris fill are generally fairly immobile. These compounds, particularly PAHs and PCBs, sorb strongly to soil particles and are not readily dissolved in groundwater or surface water. The general transport mechanism for PAHs, metals, and PCBs at the Site is in the particulate phase, and erosion of contaminant sources that are exposed to surface water and direct precipitation. Metals, however, can be in the dissolved phase in groundwater and surface water and be transported in the dissolved and particulate phases.

Building 179 CUST Area - The chlorinated ethane plume originating in the Building 179 CUST Area consists primarily of 1,1,1-TCA and its breakdown products, 1,1-DCA, and chloroethane. As part of this Work Plan Addendum, groundwater in this portion of the Site will also be analyzed for 1,4-dioxane, which was a common additive to chlorinated solvents.

The chlorinated ethane plume is migrating northerly and onto the Building 185/ Paved Storage Area. As this plume migrates downgradient with groundwater flow, additional chemicals from non point source releases from the disposal and operations in the Paved Storage Area and in the Building 185 Complex co-mingle with the plume. Figure 2-1 shows the interpreted areal extent of the 1,1-DCA plume extending from the Building 179 CUST Area to the Building 185 Complex, the Paved Storage Area, and the South Meadow. The extent of this bedrock plume to the west has not been adequately defined. As described in Section 3.0, additional wells will be installed to obtain more information regarding the western extent of this plume.

There is evidence that reductive dechlorination is occurring to the 1,1,1-TCA plume, and the data also show that through time the concentration of the chlorinated ethane plume is decreasing, likely through transformation, dispersion, and sorption. Dispersion and advective transport, however, have increased the footprint of the plume to the north, northeast, and northwest.

Residual soil contamination present in this area may be a continuing source of groundwater contamination. The possible presence of residual soil contamination in the Building 179 CUST Area will be investigated by the advancement of borings and the collection and analysis of soil samples.

Building 185 Area - The presence of the LNAPL is limited to the area around MW100B. LNAPL was not detected in surrounding wells. The hydraulic conductivity of individual fracture zones within the bedrock in the vicinity of the LNAPL (in wells MW124B, MW125B, MW126B, and MW109) was not measurable using packer testing techniques. This indicates that the hydraulic conductivity within the bedrock in this vicinity is low and the interconnectedness of fractures is limited. Furthermore, the ETPH in groundwater surrounding MW100B is of limited extent, suggesting LNAPL is trapped within a fracture or set of fractures, rendering it immobile.

Even if the LNAPL is trapped and immobile, the LNAPL phase has a mass that is typically several orders of magnitude greater than normally present in sorbed, water, or vapor states, implying the potential for long-term impacts if the LNAPL is mobilized in the future. Following its discovery in 2008, LNAPL was purged from this MW100B, reducing the potential for continuing impacts.

Otto Fuel components have not been detected in soil at concentrations that suggest an ongoing source to groundwater. Furthermore, when the Otto Fuel release was discovered in 2004, soil remediation occurred, removing some mass of Otto Fuel contaminated soil and reducing the potential for migration from the soil to the groundwater. Although it is not anticipated that soil remains that is an ongoing source of Otto Fuel components to groundwater, the Otto Fuel components present in groundwater are likely being transported dissolved in groundwater in a northerly direction at the Site. To test this hypothesis and determine the extent of groundwater contamination by Otto Fuel, additional groundwater samples will be collected as part of this Supplemental RI Investigation, and analyzed for the Otto Fuel component PGDN.

Because it is unclear if residual soil contamination from the Otto Fuel release remains below Area No. 1 of the Building 185 Complex, soil samples will be collected from beneath this Area. Furthermore, because Otto Fuel was reportedly historically stored in Area No. 3 of the Building 185 Complex, soil samples will also be collected from Area No. 3. These sampling activities are described in Section 3.2.1 of this RI Work Plan Addendum.

The Paved Storage Area/ South Meadow – The predominant contaminants in this portion of the Site are VOCs and petroleum LNAPL. VOCs have not been found in soil at concentrations that suggest an ongoing source. Chlorinated VOCs including PCE are present in this area at fairly low concentrations, but above MCLs. In addition, one distinguishable source of these chlorinated VOCs has not been identified, but it is assumed that they are related to debris disposal and operations within this area.

The distribution of ETPH in soil in this portion of the Site does indicate scattered locations where ETPH is present above the state screening criterion. These locations are related to disposal and operations within this area rather than a point source of contamination.

The North Meadow - After deposition on the ground surface at the North Meadow, the TCE quickly made its way down to the water table within the shallow bedrock zone. Following the release of the TCE to the ground surface, some of the solvent volatilized. Since the time of the suspected TCE release(s), most of the TCE that did not volatilize has migrated through the unsaturated zone and into the bedrock groundwater. After the dissolved TCE reached the groundwater, it migrated by advective transport in a northwesterly direction towards NUWC Pond. TCE and its breakdown products also spread out by molecular dispersion and preferential flow in a northerly direction along the fractured bedrock zone. Some amount of reductive dechlorination reduced the concentrations of TCE and resulted in the presence of its breakdown products (1,2-DCE and to a lesser extent vinyl chloride) within this plume (detected in the shallow groundwater samples collected at the edge of NUWC Pond).

The three-dimensional extent of the TCE plume has not been fully delineated. In order to better assess the extent of the plume for decision making during the FS, additional groundwater monitoring wells will be installed and sampled in the North Meadow.

Deerfield Creek/ NUWC Pond - Dissolved-phase contaminants in Site surface water are transported primarily by advection in the streams onsite and also by mechanical dispersion and diffusion in the NUWC Pond. Contaminant transformation in surface water occurs by photolysis (abiotic degradation), biological degradation, and sorption.

Sediments being transported suspended in surface water can be deposited in the low energy environments at the southern portion of the Site and at the wetland area just south of NUWC Pond. Once sediment is deposited, part of the sediment bed can be eroded and transported again when surface water flow is high.

PCBs migrate onto the Site from offsite, but they also migrate from onsite soil into the streams and NUWC Pond sediment. Because PCBs are nearly insoluble in water and sorb strongly to soil, most of the PCBs mass in soils likely remain bound in the soils, and it is expected to remain immobile. The PCBs in Site

stream and pond sediments would also be sorbed to the soil/sediment grains that could settle out in streambeds or pond bottoms under low velocity flows. These sorbed PCBs could be remobilized during higher flow periods, entrained in the surface water column and transported downstream, settling out in lower-flow velocity areas, such as where Deerfield Creek flows into NUWC Pond.

It is likely that pesticides in surface water primarily enter the Site from upstream areas of Deerfield Creek, sorbed to particles that are entrained in the water column. Like the PCBs, these pesticides settle out in low energy environments, such as in the wetland area just south of NUWC Pond, and in NUWC Pond. In particular, the more northern areas of the Pond, such as those just south of the dam, are areas where sediments are continuously submerged, and are also in a low flow-velocity area, allowing the highest opportunity for contaminants suspended in the water column to deposit and accumulate.

Some elevated concentrations of lead in Site media are likely related to the former paint can removal area, near the Paved Storage Area portion of Deerfield Creek. Lead in soil and sediment is associated with the former paint can disposal area. Lead concentrations in sediment in this area are approximately 150 to 760 times the screening criterion. The next highest concentrations of lead in sediment were from a wetland portion of Deerfield Creek. Wetland soils that are periodically inundated by surface water likely receive contaminants from suspended solids in the surface water column, as do stream sediments.

With the exception of lead in some areas, the distribution of metals in Site media suggests that their presence is partially not Site-related. In addition, the higher concentrations of some metals in sediments in the northern portion of NUWC Pond are related to the fact that this is also a low velocity flow area, just above the dam. Low velocity environments allow settling of suspended solids and accumulating in sediments in this environment.

2.8.4 Risk Assessments

The baseline Human Health Risk Assessment (HHRA) presented in the Draft RI evaluated exposures to exposed and paved surface soil, exposed and paved subsurface soil, groundwater, surface water, sediment, and fish (fish fillets). Industrial workers, adolescent trespassers, and recreational users were the current evaluated receptors. Although the future land use at the Site is planned to be the same as current land use, the following future hypothetical receptors were evaluated: construction workers, child residents and adult residents.

The Ecological Risk Assessment (ERA) reported in the Draft RI evaluated ecological risks to the terrestrial, benthic, and aquatic receptors exposed to contaminants at the Site. This ERA evaluated surface soil, sediment, surface water, fish tissue, and earthworm tissue, along with soil and sediment toxicity test data and benthic community data.

Soil Risks - The HHRA found that soil contamination poses unacceptable human health risks to current workers, recreational users, and trespassers due to carcinogenic PAHs and arsenic. These contaminants are also at concentrations that may pose unacceptable human health risks to future construction workers and residents. In addition, the ERA found that there are potential risks to insectivorous mammals and birds from metals in surface soil.

Groundwater Risks - The HHRA determined that groundwater poses unacceptable non-carcinogenic risks for future construction workers, hypothetical child residents, and hypothetical adult residents due to VOCs and metals. Unacceptable cancer risks are projected as a result of domestic use of groundwater by future residents (child, adult, and lifelong due to PCE, TCE, VC, benzo(b)fluoranthene, and arsenic).

Surface Water Risks - The HHRA determined that risks to health for adolescent trespassers and recreational users exposed to surface water did not exceed USEPA or RIDEM risk management benchmarks. The ERA determined that no chemicals are likely to impact aquatic organisms at the Site based on the measured concentrations of chemicals in the surface water compared to screening levels.

Sediment Risks - The HHRA determined that chemicals in sediment pose unacceptable cancer risks for lifelong recreational users due primarily to levels of carcinoginic PAHs and arsenic.

Risks to sediment invertebrates in NUWC Pond and the streams were evaluated through sediment toxicity testing and a benthic community investigation. The benthic community in NUWC Pond appears to have been impacted by a combination of organic chemicals. Although impacts to sediment invertebrates in the stream are not expected to be significant and there were poor dose-response relationships, No Observed Effect Concentrations (NOECs) or Lowest Observed Effect Concentrations (LOECs) were developed for the stream samples, based on the toxicity test data.

Risks from Ingestion of Fish - NUWC Pond fish tissue was found to have metals, pesticides, and PCBs at concentrations significantly greater then the reference location fish tissue concentrations. Ingestion of NUWC Pond fish poses and unacceptable cancer risk for recreational users (child, adult, and lifelong). PCBs, 4,4'-DDE, dieldrin, and aldrin were the major cancer risk contributors.

Risks from Vapor Intrusion - The HHRA determined that adverse non-carcinogenic effects are not anticipated for residential and industrial exposures via vapor intrusion

Risks from Lead - Exposure to lead in soil, measured through blood lead models, was found to be below EPA's level of concern.

2.8.5 Data Gaps

Several data gaps have been identified in this CSM. It has been determined that these data gaps will be investigated in order to have sufficient data to make decisions necessary in the FS. These data gaps are being addressed in the supplemental RI work described within Section 3.0 of this Work Plan Addendum:

The vertical and horizontal distributions of the chlorinated solvent plume in the North Meadow have not been sufficiently characterized, and additional groundwater monitoring is proposed.

The nature and extent of bedrock groundwater contamination in the Building 179 Area is not adequately characterized; in particular, the western extent of the 1,1-DCA plume has not been defined and will be addressed in this supplemental RI investigation. Furthermore, the current plume delineation is partially based upon groundwater data that is ten years old. New groundwater samples will be collected and analyzed in order to obtain a better definition of the nature and extent of this plume.

Sediment and surface water samples from the Building 179 CUST Area are also ten years old, and these media will therefore be re-sampled and analyzed.

The extent of 1,4-dioxane and cyanide contamination (if any) will be determined in groundwater within the Building 179 contaminant plume area, and the extent of 1,4-dioxane contamination (if any) will be determined in groundwater within the North Meadow chlorinated solvent plume.

The extent of the PGDN contamination in groundwater as a result of the release(s) in the Building 185 and Building 179 CUST Areas will be determined.

The potential for residual soil contamination due to the release(s) in the Building 179 CUST Area will be investigated by soil sampling and analysis. Residual concentrations (if any) of PGDN and VOCs (and other contaminants) will be investigated.

Contamination of soil beneath Areas 1 and 3 of the Building 185 Complex (if any) has not been adequately defined and will be sampled and tested for PGDN and other contaminants.

2.9 PROBLEM DEFINITION AND DATA USE EVALUATION

Section 2.9 is amended by the changes to Sections 2.9.1 through 2.9.5 as presented below.

2.9.1 Statement of the Problem

Section 2.9.1 is amended by the addition of the following text.

Data gaps for the NUSC Disposal Area RI were identified during the evaluation of the 2008 investigation findings and as a result of the addition of the Building 179 CUST Area to the study area. The NUSC Disposal Area HHRA identified unacceptable risks from groundwater and soil requiring the development and evaluation of remedial alternatives. The supplemental investigation will mainly address data gaps for groundwater within and beyond the previously investigated areas as necessary to develop and evaluate remedial alternatives. In addition, the supplemental investigation will address soil data gaps for the Building 185 Complex and the Building 179 CUST Area.

The hydrogeologic investigation identified three main areas of groundwater contamination consisting of the North Meadow/NUWC Pond Area TCE plume, the Paved Storage Area vicinity, and the Building 179 CUST Area VOC plume. A summary of groundwater contamination for those areas as presented in the RI Report and the associated data gaps are discussed below.

North Meadow/NUWC Pond Area TCE plume - At the North Meadow/NUWC Pond Area, groundwater with TCE concentrations ranging up to 350 µg/L is discharging from the bedrock through the overburden to southeastern NUWC Pond. The maximum TCE concentration detected during the 2008 investigation (730 µg/L) occurs in the bedrock groundwater at this location. The source of the TCE and its breakdown products is conceptualized as a yet to be located release to the ground surface in the North Meadow, separate from the Paved Storage Area sources discussed below. Volatilization and mobilization of the TCE to the groundwater has occurred, so the contaminants are no longer present in soil at the North Meadow. The existing monitoring wells and diffusion bag array did not define the horizontal and vertical limits of the plume, representing a data gap for the FS. Therefore, additional characterization is required to delineate the TCE groundwater contamination source in the North Meadow and to determine the extent to which the TCE has migrated.

Paved Storage Area vicinity - Groundwater in and around the Paved Storage Area is contaminated with PCE, TCE, and their breakdown products, cis-1,2-DCE and VC; arsenic; and the PAH benzo(k)fluoranthene. In addition, LNAPL, primarily comprised of ETPH and GRO, was discovered in a monitoring well located near the Building 185 Complex. Benzo(k)fluoranthene and low concentrations of Otto Fuel components were found in groundwater, immediately south of the Building 185 Complex. Multiple sources for the Paved Storage Area groundwater contamination are probable, including the buried drums and containers previously removed and the reported chemical disposal areas. Also, a possible source is the Building 185 Complex Area No. 1, where an historical Otto Fuel release occurred. In

addition, some groundwater contamination detected in the southwest portion of the Paved Storage Area is attributed to a release at the Building 179 CUST Area, as discussed below.

Building 179 CUST Area VOC plume - A groundwater contamination plume originating in the Building 179 CUST area and consisting primarily of 1,1,1-TCA and its breakdown products, 1,1-DCA, and chloroethane, as well as ETPH, is migrating, dissolved in groundwater, onto the NUSC Disposal Area. As this plume migrates downgradient with groundwater flow, additional chemicals from probable releases from the Paved Storage Area in the vicinity of the Building 185 Complex are detected in groundwater. Figure 2-1 shows the areal extent of 1,1-DCA contamination in groundwater extending from the Building 179 CUST Area to the NUSC Disposal Area, west of the Paved Storage Area and the South Meadow. The Building 179 CUST Area is also an area of elevated arsenic concentrations.

As discussed in Section 2.8, the existing characterization of groundwater contamination at the Building 179 CUST Area is primarily based on sampling and analysis conducted in 1999. The 2008 NUSC Disposal Area investigation sampled select upgradient wells in the Building 179 CUST Area, to the south. Those results indicate that the major source of 1,1,1-TCA (and its breakdown products 1,1-DCA and chloroethane) in groundwater at the NUSC Disposal Area is the Building 179 CUST Area where these contaminants are found in groundwater at concentrations significantly higher than in downgradient groundwater at the Paved Storage Area. The Building 179 CUST RI Report recommended additional bedrock investigation to determine the extent of bedrock contamination in the area of the CUST, and additional groundwater sampling to determine the nature and extent of groundwater contamination (TRC, 1999). Development and evaluation of remedial action alternatives to address these contaminants is dependant on an adequate, current understanding of existing groundwater conditions, including the current distribution of these contaminants in groundwater, and the existing distribution (if any) of residual soil contamination. Therefore, the data gaps for the Building 179 CUST Area are the current extent of groundwater contamination and the current degree of residual soil contamination (if any).

In addition to the groundwater contamination update, surface water and sediment samples will be collected from Deerfield Creek in the Building 179 Area, upstream (south) of the Building 185 Complex, to provide a current characterization of these media.

Additional groundwater investigation to support remedial alternative development and evaluation will also include characterization of the potential Site contaminants 1,4-dioxane, the Otto Fuel component PGDN, and cyanide, that were not part of the groundwater analyses conducted during the 2008 investigation. The chemical 1,4-dioxane is a concern at the Site because of the discovery of the 1,1,1-TCA plume at the NUSC Disposal Area during the 2008 investigation. The compound 1,4-dioxane is an emerging contaminant used primarily as a stabilizer for chlorinated solvents, and is frequently detected in groundwater contaminated with the solvent 1,1,1-TCA, and sometimes the solvent TCE, when the source

was such a solvent. 1,4-dioxane may move rapidly from soil to groundwater and migrate rapidly in groundwater in advance of the chlorinated solvent plume, tending to impact an aquifer system to a much larger extent. 1,4-dioxane, a probable carcinogen, biodegrades very slowly in the subsurface. It does not respond to conventional groundwater treatment technologies such as air stripping or granular activated carbon treatment, however it has been successfully treated using advanced oxidation processes involving hydrogen peroxide and ultraviolet light or ozone. Therefore, the presence and level of 1,4-dioxane in Site groundwater is an important consideration for the FS and represents a data gap.

The Otto Fuel component, PGDN, is also a potential Site contaminant requiring additional characterization. Although testing of select groundwater and soil samples for Otto Fuel components was planned for the 2008 investigation, commercial laboratories having the analytical capabilities for Otto Fuel components were not available. Further groundwater characterization for Otto Fuel components is warranted because an historical Otto Fuel release at Area No. 1 at Building 185 has been documented, as discussed below; and the two major Otto Fuel components, PGDN and dibutyl sebacate, were reported in the analytical search for tentatively identified compounds (TICs), in a groundwater sample collected from a well located immediately south of Building 185 Complex. Because the primary and most toxic component of Otto Fuel is PGDN, it will serve as the indicator chemical for the Otto Fuel characterization.

Cyanide is another possible Site contaminant requiring additional characterization. The 2,000-gallon CUST associated with Building 179 was used to collect byproducts generated from propulsion system testing. Among the various materials temporarily held in the CUST were Otto Fuel and its combustion byproduct mixtures, which included hydrogen cyanide (HCN), a combustion product of Otto Fuel. Cyanide was detected at 400 µg/L in groundwater sampled during the Building 179 Reconstruction Program, conducted to determine whether contamination would be encountered within the area that may be disturbed during reconstruction of Building 179. Further groundwater characterization for cyanide is warranted, based on its previous detection in groundwater at Building 179.

A data gap for the RI soil investigation is the extent of residual subsurface Otto Fuel contamination in soil resulting from an historical release in the Building 185 Complex Area No. 1. Following the 2008 field investigation, it was learned that an historical Otto Fuel release had been discovered at the Building 185 Complex Area No. 1 during a 2004 renovation. In response to that discovery, Otto-Fuel-contaminated soil (approximately 1.3 tons) and concrete (approximately 0.7 tons) had been removed and disposed of off site. However, no post-excavation confirmation soil samples were collected. The Otto Fuel release from Area No. 1 may be the source of Otto Fuel components detected in a groundwater sample collected from a well immediately south of Building 185. In addition, it was reported that Otto Fuel was historically stored in Area No. 3. The possibility that a past release may have occurred from Area No. 3 will be more fully investigated. As discussed above, PGDN (a volatile liquid with a disagreeable odor) will serve as the indicator chemical for the investigation of the historical Otto Fuel release.

2.9.2 Identification of the Decision

Section 2.9.2 is amended by the addition of the following text.

The NUSC Disposal Area RI risk assessments evaluated human health and ecological risks and determined that risks are unacceptable for human receptors and ecological receptors. Therefore, an FS will be conducted to evaluate remedial actions to address those risks. In addition, the Building 179 CUST RI presented several groundwater remedial alternatives primarily addressing overburden groundwater contamination only, and pending further groundwater investigation. The decision rule for the FS is to determine if the data is adequate to support the development and evaluation of remedial alternatives. These decisions include the following:

- Locate the source of TCE groundwater contamination in the North Meadow and determine if the source requires remedial action.
- Determine the vertical and horizontal extent of the TCE groundwater plume in the North Meadow.
- Determine the current nature and extent of overburden and bedrock groundwater contamination in the Building 179 Area, including the possible presence of cyanide.
- Determine the levels (if any) of residual soil contamination in the Building 179 CUST Area.
- Determine the level and extent of 1,4-dioxane in Site groundwater and, if present, whether remedial action is necessary to address this contaminant.
- Determine the level and extent of PGDN in Site groundwater and whether remedial action is necessary to address this contaminant.
- Determine the extent of PGDN subsurface soil contamination at the Building 185 Complex Areas No. 1 and 3.

2.9.3 Inputs to the Decision

Section 2.9.3 is amended by the addition of the following text.

The following information has been added and will be acquired as part of the supplemental investigation to address the Decision Statements in Section 2.9.2:

- Chemical analysis for 1,4-dioxane in groundwater to a detection level based on current toxicological assessment information.
- Chemical analysis for PGDN in groundwater and soil to detection levels based on current toxicological assessment information and analytical laboratory capabilities.

- Chemical analysis for cyanide in groundwater to a detection level based on current toxicological assessment information.

2.9.4 Definition of the Site Boundaries

Section 2.9.4 is amended by the addition of the following text.

As a result of the addition of the Building 179 CUST Area to the Site 8 RI study area and, based on the evaluation of the 2008 investigation findings, the RI Site boundaries have been adjusted, as described below.

To the southwest, the Site boundary is adjusted by the addition of the area bounded by the NUWC Disposal Area to the north, Deerfield Creek to the east, Building 179 to the south, and Cunningham Street to the west.

An area extending southeast from the current Site boundary has been included in the new adjusted Site boundary. Based on the RI field investigation findings, including the analytical results for soil sample SB153 located on the western edge of this area, this area has been used for disposal of debris fill and possibly contaminated fill. Therefore, this approximately 1-acre area is added to the NUSC Disposal Area, extending the Site boundary accordingly. The proposed Site boundary adjustment is as follows:

The southern boundary terminates at the grassy field located approximately 400 feet to the southeast of the southeast corner. The western extent of this section is the tree line shown on Figure 1-1, and the eastern extent coincides approximately with the crushed-stone roadway.

The investigation areas for the data to be applied to the supplemental RI decisions are as follows:

North Meadow TCE groundwater contamination source and extent – This investigation area is bounded by the NUWC Pond to the west, the NUWC property line to the north, and the unnamed stream to the south.

Building 179 CUST Area groundwater contamination extent – This investigation area is bounded by the NUWC Disposal Area to the north, Deerfield Creek to the east, Building 179 to the south, and Cunningham Street to the west.

1,4-dioxane groundwater contamination presence and extent – This investigation area includes the extent of the 1,1,1-TCA plume (Building 179 CUST Area) and the TCE plume (North Meadow). Since this chemical migrates rapidly in groundwater in advance of the host solvent, it will be investigated at the downgradient portions of the plumes.

PGDN groundwater contamination presence and extent – This investigation area includes the extent of the 1,1,1-TCA plume (Building 179 Area) and the area downgradient of the Area No. 1 Otto Fuel release, as this chemical migrates rapidly in groundwater.

Otto Fuel subsurface soil contamination at the Building 185 Complex– This investigation area is in and around the western section of Area No. 1, the area of the historical Otto Fuel release, and in Area No. 3.

2.9.5 Decision Rule

Section 2.9.5 is amended by the addition of the following text.

The decision rule defines the requirements of the FS to evaluate remedial actions that will address unacceptable risks identified by the RI. For this supplemental RI investigation, the sampling and analysis will be conducted to answer the following additional questions:

4. Does the 1,4-dioxane groundwater concentration (if present) exceed the action level? The Project Action Limit of 0.354 µg/L is a calculated EPA Regional Screening Level (RSL), determined using the proposed toxicity values for this chemical and EPA's RSL calculator. The groundwater data will be compared to this screening level. EPA released a recent draft reassessment of 1,4-dioxane which proposes more conservative toxicity values than those associated with the current RSL for 1,4-dioxane (which is 6.1 µg/L, based on a 1 in 10^{-6} lifetime excess cancer risk). The proposed carcinogenic toxicity value is 19 times more toxic than the current value. Information used in the calculation of the Project Action Limit is attached to this Work Plan Addendum as Appendix A. There are no federal drinking water standards for 1,4-dioxane.

5. Does the cyanide groundwater concentration (if present) exceed the action level? The EPA freshwater NRWQC and the RIDEM freshwater AWQC for cyanide is 5.2 µg/L. The groundwater data will be compared to this ecological criterion, which is more conservative than the EPA MCL, RSL, and the RIDEM GA groundwater criterion for cyanide.

6. Does the PGDN groundwater concentration (if present) exceed the action level? The Project Action Limit of 0.57 µg/L is the EPA RSL for PGDN in tap water. The groundwater data will be compared to this screening level.

7. Does the PGDN soil concentration (if present) exceed the action level? The Project Action Limit of 60 mg/kg is the RSL for direct contact residential (DCR) for PGDN in soil. The soil data will be compared to this screening level.

2.9.6 Limits on Decision Errors

No changes were made to Section 2.9.6 in this Work Plan Addendum.

2.9.7 Design for Obtaining Data

No changes were made to Section 2.9.7 in this Work Plan Addendum.

3.0 SAMPLING AND ANALYSIS PLAN

Section 3.0 is amended as indicated below.

3.1 INTRODUCTION

Section 3.1 is amended by the addition of the following text.

This section of the Work Plan Addendum has been prepared to direct the collection of additional data under the supplemental investigation to be conducted to further characterize contamination associated with the Building 179 CUST Area and to acquire additional environmental data at the NUSC Disposal Area to support the FS.

The data will be used to supplement the evaluation of the nature and extent of contamination and the fate and transport of contaminants, as presented in the Final Remedial Investigation Report, Site 08, NUSC Disposal Area (TtNUS, January 2010), and to support the FS. The data will be used in qualitative human health and ecological risk assessments and must be of adequate quality and quantity to support these risk assessment activities.

Figures 3-1, 3-2 and 3-3 present the proposed sample locations. Table 3-1A lists proposed soil boring locations and purpose. Table 3-1B lists the proposed monitoring wells/groundwater sample locations with the purpose of each location. Table 3-1C lists proposed surface water/sediment sample locations and purpose. Table 3-2 presents proposed analyses and number of samples and field quality control samples for each sample area and medium. Table 3-3 presents the proposed analytical methods and associated sample volume requirements, preservatives, and holding times.

3.2 SAMPLING ACTIVITIES

The primary activities to be conducted to achieve the sampling program goals include:

- a geologic and hydrogeologic investigation (Section 3.2.1),
- sediment sampling (Section 3.2.2), and
- surface water sampling (Section 3.2.3),

These activities are described in the sections below.

3.2.1 Geologic and Hydrogeologic Investigation

No changes were made to Section 3.2.1 in this Work Plan Addendum.

3.2.1.1 Site Utility Clearance

No changes were made to Section 3.2.1.1 in this Work Plan Addendum.

3.2.1.2 Geophysical Investigation

Surface geophysics will not be performed as part of this Supplemental Investigation.

Bedrock borehole geophysics will be performed to provide data that will be used to evaluate the properties of the bedrock and to help meet the objectives of the bedrock investigation. These objectives include further defining the nature, extent, and migration rates of Site contaminants in the bedrock aquifer in and downgradient of two areas of concern: the North Meadow (identified as the "TCE plume"); and the Building 179 CUST Area (identified as the "1,1-DCA plume"). Borehole geophysics will be performed in seven open-hole bedrock well locations: five locations to assist in delineation of the TCE plume in the area of the North Meadow, and two locations to assist in delineation of the 1,1-DCA plume, north of the Building 179 CUST. As indicated on Figure 3-1, bedrock well locations selected for borehole geophysics are as follows:

TCE Plume - North Meadow

Three existing open-hole bedrock wells: MW-116B, MW-117B, and MW-118B;

Two bedrock wells proposed to be installed, one in the North Meadow - MW-128B, and one to the north of the Meadow - MW-127B.

1,1-DCA Plume – North of Building 179 CUST Area

Two bedrock wells proposed to be installed, one north of the Building 179 CUST - MW-129B, and one further north and west of this location - MW-130B.

Borehole logging will be conducted to characterize the bedrock fracturing, locate water-bearing fractures, and identify zones that may transport contaminants. The borehole surveys will include fluid temperature, fluid resistivity, caliper, acoustic televiewer, and heat-pulse flow meter logging under both ambient and induced-flow conditions and gamma logging.

The logging methodologies and interpretation will be documented in a letter report. A draft log will be provided during each day of logging. The geophysical information will be reviewed and used to select intervals for the PVC screens to be set in the wells in the North Meadow and to select intervals for collecting low flow groundwater samples in the open borehole wells in the Building 179 CUST area.

3.2.1.3 General Approach for Borings and Monitoring Well Installations

The subsurface investigation in this Work Plan Addendum will address the areas of concern discussed in Section 2. Conventional soil and rock drilling methods will be used to advance the new installations to be conducted under this Supplemental Investigation. Four borings will be advanced through overburden and into bedrock, with associated well installation and groundwater sampling. Nine additional borings will be advanced into overburden using Direct Push Technology (DPT) for the primary purpose of soil sample collection. At two of these DPT locations, groundwater samples will also be collected: one at a location to be selected at the Building 185 Complex, and one to be selected at the Building 179 CUST/Interceptor Tank area.

At those locations to be advanced into bedrock, continuous soil sampling will be performed using split-spoon sampling techniques throughout the overburden; headspace analysis will be performed in the field for all soil samples using a portable photoionization detector (PID). In the North Meadow area, the borehole geophysical results from MW-116B, MW-117B, and MW-118B will be used to finalize the proposed locations of the two new bedrock boreholes to be installed in and north of the North Meadow (MW-128B and MW-127B, respectively). These two new bedrock boreholes are planned to be completed with PVC screen as two nested wells in each borehole. The borehole geophysics results will also be used to select screen intervals for the wells which are to be built in the open-hole bedrock boreholes MW-116B, MW-117B, MW-118B, MW-127B, and MW-128B, and in the shallow bedrock wells to be advanced adjacent to MW-116B, MW-117B, and MW-118B.

To investigate the area of the 1,1-DCA plume to the south, the proposed new bedrock boreholes, MW-129B and MW-130B, will be installed north of the Building 179 CUST Area. These borings are planned to remain as open-hole wells, based on the nature of the bedrock in this southern portion of the Site, where the hydraulic conductivity of the bedrock is low and groundwater is generally found in discrete non-interconnected fractures. Previous discrete-interval sampling in the southern portion of the Site was unsuccessful, due to the nature of the bedrock. The installation of open borehole wells in this area is proposed to maximize the probability for successfully meeting groundwater sampling objectives. The borehole geophysical results from these two locations will be used to assist in selecting pump depths for groundwater sampling at these two locations.

At the Building 185 Complex, Areas 1 and 3, DPT methods will be used to advance soil borings for soil sample collection purposes (the soil sample location rationale is provided on Table 3-1A). One of these locations will also be selected for the collection of groundwater samples. Four soil borings in Area No. 1 and two borings in Area No. 3 of the Building 185 Complex will be advanced with continuous soil sample collection. In these two areas, the proposed DPT borings will be advanced at locations most likely to have been impacted by the historical Otto Fuel release (Area No. 1) or hypothetical release (Area No. 3), described further in Section 3.2.1.4. Proposed soil boring locations at the Building 185 Complex are presented in Figure 3-2.

In the vicinity of Building 179, three DPT borings will be advanced near the closed-in-place CUST and the former Interceptor Tank, also for soil sample collection purposes (see Table 3-1A for purpose of these locations). One of these locations will also be selected for the collection of groundwater samples. Continuous soil samples will also be collected in these borings which will be advanced to provide additional data on the extent of possible residual contamination from the former tanks in this area. Proposed boring locations in this area are presented in Figure 3-3, as well as the locations of post-excavation soil samples that were collected in December 1998 as part of the tank closure activities. It is also noted that the three proposed boring locations are subject to change, due to the possible presence of grounding cables in the area.

3.2.1.4 Advancement of Borings

The bedrock field investigation activities include the advancement of borings for bedrock characterization and for monitoring well construction. As noted above, the objectives of the bedrock investigation are to define the nature, extent, and migration rates of the Site contaminants in the bedrock aquifer in two areas of concern: the North Meadow TCE plume and the Building 179 CUST Area 1,1-DCA plume. Specific objectives of the bedrock boring locations and the associated groundwater samples are described in Table 3-1B.

Four bedrock borings will be advanced at locations shown on Figure 3-1. In the southern portion of the study area, in the area of Building 179 and the 1,1-DCA plume, and in the area west of the Building 185 Complex, bedrock locations MW-129B and MW-130B are selected to determine the western extent of groundwater contamination in these two areas. The proposed location of MW-129B is east of Building 178, approximately 10 feet east of the southeasternmost corner of the associated paved area. This location is about 210 feet north of the former CUST. The main objective of the MW-129B location is to put some control on the western extent of the plume in this area.

The proposed location of MW-130B is to the north and west, about 10 feet north of the western portion of Building 180, which is east of Cunningham Street and north of the access road to the Building 185

Complex. This location is about 420 feet north-northwest of the former CUST. The main objective of the MW-130B location is to put some control on the western extent of the plume in this more northern area. These locations could be adjusted in the field following utility clearance.

In the North Meadow, the proposed bedrock wells MW-127B and MW-128B are located to obtain more information regarding the north and northeastern extent and the vertical extent of the TCE plume observed in this area. The locations are based on the observed distribution of chlorinated solvents, the groundwater flow patterns, and the bedrock fracture orientations in the North Meadow. Two nested bedrock wells will be installed within each of these new boreholes, MW-127B-D1/D2 and MW-128B-D1/D2, to monitor both shallow and deep bedrock groundwater quality. The proposed locations of these borings will be reevaluated following borehole geophysics that will be performed in existing open-hole bedrock wells MW-116B, MW-117B, and MW-118B. If review of borehole geophysical results indicates revising either location for MW-127B and MW-128B, this adjustment will be made by the TtNUS Lead Hydrogeologist and will be documented in a Field Modification Record (FMR).

PVC wells will be installed in the three existing open-hole bedrock wells MW-116B, MW-117B, and MW118B, with screened intervals to be selected following borehole geophysics in these wells. Adjacent to each of these three existing wells, a more shallow bedrock boring will be advanced an estimated 30 feet into bedrock (to be based on borehole geophysics results) and a PVC bedrock well will be installed in each borehole, resulting in a shallow and deeper bedrock well cluster at each of the three locations.

Within Area No. 1 of the Building 185 Complex, four DPT borings, B185A1-SB1, B185A1-SB2, B185A1-SB3, and B185A1-SB4, will be advanced at the approximate locations shown on Figure 3-2. The Navy had removed Otto-Fuel-contaminated soil and concrete from Area No. 1 in 2004, however, no information recording the specific area of soil removal has been located, and no post-excavation soil samples were collected. In an attempt to collect soil samples in areas most likely to have been impacted by the previous Otto Fuel release, locations were selected to be: (1) in the topographically lowest areas of the enclosure, toward which a spill would be expected to migrate; and (2) in areas adjacent to roof support penetrations, which could have been preferential pathways of spilled material to underlying soils. These areas are visible as asphalt patches in the floor of the enclosure.

Two DPT borings, B185A3-SB1 and B185A3-SB2, will be advanced within Area No. 3 of the Building 185 Complex. The purpose of these borings is to attempt to collect soil samples in areas which would most likely have been impacted by a hypothetical Otto Fuel release in Area No. 3. One boring, B185A3-SB1, will be advanced in the area of a possible former drain (Figure 3-2). Boring location B185A3-SB2 will be field-determined, based on visual observations of locations that may have been most likely to have accumulated a hypothetical release.

Three DPT borings, B179-SB1, B179-SB2, and B179–SB3 will be advanced in the vicinity of the former Building 179 CUST that was closed in place, and the former Building 179 Interceptor Tank, at the approximate locations shown on Figure 3-3.

Boring B179-SB1 is located immediately east of the former CUST excavation area, and is placed close to a former soil and groundwater sample that had elevated VOCs, as described here: during the 1995 Closure Assessment by The Environmental Compliance Group, Inc. (TECG), four borings were advanced within approximately five feet of the edge of the CUST, and three were completed as monitoring wells (north, east, and south of the CUST). Proposed boring B179-SB1 is near the former TECG boring/well "B-2/MW-2", (immediately east of the former CUST), which had the highest levels of VOCs in soil and groundwater sampled during their 1995 investigation, and where odors and yellow discoloration were observed in groundwater during development.

Boring B179-SB2 will be advanced downgradient of both the closed-in-place CUST and the former Interceptor Tank, to assess current soil conditions.

Boring B179-SB3 will be advanced in the area between the two borings described above, also downgradient of the CUST.

It is noted that the area to the west of the CUST is inaccessible for soil boring advancement, as previously reported by TECG in their 1995 report. The TECG report stated that investigatory activities could not be performed west of the CUST since this area was inaccessible to drilling equipment due to the presence of process equipment and multiple underground utilities located there.

3.2.1.5 Soil Sample Acquisition

During DPT Drilling: Continuous soil sampling is planned at all DPT soil boring locations, using a MacroCore sampler. Samples will be field-screened for total volatile organic compounds (TVOCs) using a jar headspace technique (TtNUS SOP SF-1.5) with a portable PID and will be visually examined for evidence of staining, moisture, etc., described and logged using the Unified Soil Classification System (USCS). If sufficient sample volume is recovered, two aliquots will be collected: one for jar headspace screening and one for potential laboratory analysis. All soil samples selected for laboratory analysis will be analyzed for TCL VOCs, TCL SVOCs, TCL pesticides/PCBs, TAL metals, and the Otto Fuel component, PGDN. During collection of soil samples for potential laboratory analysis, excluding the fractions for VOC analysis, the sample aliquot will be homogenized in a stainless steel bowl and set aside, pending the selection of samples to be shipped for laboratory analysis. If insufficient sample volume is recovered, a second boring will be advanced adjacent to the first for the collection of additional sample volume.

At the Building 185 Complex, two soil samples from each of the four DPT borings in Area No. 1 and from both of the DPT borings in Area No. 3 will be selected for analytical laboratory analysis. These sample intervals for laboratory analysis will be selected as follows:

- The 2-foot interval from 1 to 3 feet below the base material on which the storage area was constructed. Samples will not be collected from the 0 to 1 foot interval below the base material unless there is field instrument, visual, or olfactory evidence of contamination.

- A 2-foot interval between 3 and 10 feet below the base material on which the storage area was constructed but above the water table, targeting the soil intervals exhibiting the highest (TVOC) concentrations in jar headspace screening results using a portable PID, and/or depth to water and visual or olfactory evidence of contamination.

At the Building 179 area, two soil samples from each of the three borings at the former CUST/Interceptor Tank area will also be selected for laboratory analysis. It is anticipated that the borings in this area will be advanced to a depth of approximately 2 feet into the saturated zone, however soil samples will be collected above the water table. The sample intervals for laboratory analysis will be selected as follows:

Unpaved surfaces:

- The 1-foot interval from 0 to 1 foot below ground surface (ft-bgs).

- A 2-foot interval between 1 and 10 feet bgs or between 1 foot bgs and the water table (if encountered less than 10 feet bgs), targeting the soil intervals exhibiting the highest TVOC concentrations in jar headspace screening results using a portable PID, and/or based on visual or olfactory evidence of contamination. Depth to the water table will be considered in order to ensure soil samples are collected above the groundwater at each location.

Paved surfaces:

- The 2-foot interval from 1 to 3 feet below the pavement base material. Samples will not be collected from the 0 to 1 foot interval below the base material unless there is field instrument, visual, or olfactory evidence of contamination.

- A 2-foot interval between 3 and 10 feet below the base material but above the water table, targeting the soil intervals exhibiting the highest TVOC concentrations in jar headspace screening results using a portable PID, and/or based on visual or olfactory evidence of contamination. Depth to the water table will be considered in order to ensure soil samples are collected above the groundwater at each location.

During Conventional Drilling: During advancement of the two nested bedrock borings in the North Meadow, soil samples will be collected and screened for total VOCs, and an estimated two samples per boring (four total soil samples, plus QA/QC) will be selected for laboratory analysis of VOCs, based on jar headspace screening results using a portable PID, and/or based on visual or olfactory evidence of contamination. Depth to the water table will be considered in order to ensure soil samples for laboratory analysis are collected above the groundwater at each location.

3.2.1.6 Bedrock Drilling

Bedrock will be drilled using air hammer or air rotary drilling techniques. The drill casing (6-inch or 4-inch inside diameter, depending on location) will be grouted at least 2 feet into the bedrock surface to isolate the bedrock aquifer. The bedrock drilling will continue an estimated 80 feet in North Meadow wells MW-127B and MW-128B, and an estimated 30 to 50 feet in the Building 179 CUST Area wells, to be determined based on characterization of the bedrock during drilling. Rock cuttings will be logged during drilling by the TtNUS field geologist. Where possible, features such as rock type, grain size, color, and hardness of the rock will be recorded.

3.2.1.7 Monitoring Well Installation

Nested monitoring wells will be constructed in two new open-hole wells in the North Meadow (MW-127B and MW-128B), and single screen PVC wells will be constructed in MW-116B-D1 and –D2, MW-117B-D1 and –D2, and MW-118B-D1 and –D2. Starting from the bottom of the open-hole to the top, the wells will be constructed at depths selected by the lead hydrogeologist, based upon the results of the borehole geophysics. Each monitoring well will be constructed with five- to ten-foot sections of one-inch diameter (MW-127B and MW-128B) or 1.5-inch diameter (MW-116B-D1/D2, MW-117B-D1/D2, MW-118B-D1/D2), schedule 40, polyvinyl chloride (PVC) slotted (10 slot or 20 slot) screen, flush-threaded to PVC riser pipe. A sand pack will be placed in the annular space around the well screen and to 2 feet above the top of the well screen. A bentonite seal, 2 feet in thickness, will be placed above the sand pack. Each of the new bedrock monitoring wells will be installed in accordance with TtNUS SOP GH-2.8.

3.2.1.8 Well Development

Prior to low flow groundwater sampling, newly installed wells will be developed and existing Building 179 CUST Area wells will be inspected and redeveloped. Well development will proceed in accordance with the Final RI Work Plan.

3.2.1.9 Discrete Interval Sampling

No changes were made to Section 3.2.1.9 in this Work Plan Addendum. Additional discrete interval packer sampling will not be performed in the Supplemental Investigation.

3.2.1.10 Hydraulic Conductivity Tests

No changes were made to Section 3.2.1.10 in this Work Plan Addendum. Additional hydraulic conductivity tests will not be performed in the Supplemental Investigation.

3.2.1.11 Groundwater Sampling

All 12 newly installed wells and 20 existing wells will undergo low-flow groundwater sample collection. Three of these wells, R179-MW1, R179-MW2, and R179-MW3, installed in November 1995, will require re-developing at least 7 days prior to sampling. In addition, two groundwater samples will be collected during DPT drilling at two DPT locations: one to be selected at the Building 185 Complex (GW-B185A#-SB#) and one to be selected at the Building 179 CUST/Interceptor Tank area (GW-B179-SB#). The final identification numbers will depend on the selected DPT locations for groundwater sampling.

Also, two shallow groundwater samples (DW15 and DW16) will be collected using passive diffusion bags (PDBs) installed along the edge of NUWC Pond, north of existing PDB sample location DW14. Groundwater samples will be submitted to the analytical laboratory for analysis. All groundwater samples will include analysis of TCL VOCs. A subset of groundwater samples from the monitoring wells will be analyzed for the following: 1,4-dioxane, PGDN, the main component of Otto Fuel; cyanide; and natural attenuation/biodegradation parameters, which include ammonia, methane, ethane, ethene, ferrous iron, phosphate, nitrate, nitrite, sulfate, sulfide, and total organic carbon (TOC). The number of samples, the location of the samples, and the number and type of quality control samples are provided on Table 3-2. The required sample containers, preservatives, and holding time requirements are provided on Table 3-3 of this Work Plan Amendment, and the corresponding Table 3-3 of the Final RI Work Plan. The low-flow procedures in the Final RI Work Plan will be followed.

On the first day of groundwater sampling a synoptic water level measurement round will be conducted, including new and existing monitoring wells. An oil-water interface probe will also be used to determine the potential presence of NAPL at each well. (If present, NAPL will be sampled for analysis.) The locations of all newly installed wells will be determined in accordance with the procedures in Section 3.3.1 of the Final RI Work Plan. These data will be combined with the water level measurement data and used to construct a water table map and bedrock potentiometric map. The groundwater elevation data will also be evaluated to determine the vertical gradients between the overburden and bedrock as well as within bedrock at the Site.

3.2.2 Sediment Sampling

Section 3.2.2 is amended by the addition of the following text.

Three sediment samples will be collected from Deerfield Creek in the area where the Creek traverses the Building 179 CUST Area, south/upgradient of the NUSC Disposal Area. All sediment samples will be collected for TCL SVOC analysis and two sediment samples, SD-B179-02 and SD-B179-04, will also be collected for low concentration TCL VOCs analysis. This sampling and analysis will better characterize the present levels and extent of contaminants, particularly PAHs, in this portion of the Creek. The two samples for VOCs analysis are located near and downstream of the former interceptor tank discharge pipe, near the area where oily soils were reportedly previously observed and where low concentrations of BTEX compounds were previously detected in groundwater. Sampling will be conducted in accordance with TtNUS SOP SA-1.2. Three surface water samples will be collocated with these sediment samples.

Sediment samples will be collected in a downstream to upstream order. At each location, attempts will be made to dig a hole from the sediment surface to approximately 1 foot deep. If visual evidence of contamination is observed in a particular interval within this 1-foot sediment section, the sediment sample will be collected from that interval. Otherwise, the samples will be surface sediments, to be collected from approximately the 0- to 6-inch depth interval, as measured from the sediment surface. Sediment samples will be collected from depositional areas (silt, silty sand, etc.), assuming depositional areas can be found at or within a reasonable distance from the planned sampling locations (presented in Figure 3-1). These locations may be adjusted based on field observations of depositional areas at the time of sampling.

It is anticipated that a stainless steel shovel or auger or will be used for sediment sample collection. At the two locations to be sampled for VOCs analysis, this fraction will be collected as soon as possible after the sediment is retrieved and will not be homogenized. (The sampling method is presented in full in Work Plan Revision 2, TtNUS, January 2007.) After collecting the VOC sample portion (where applicable), the remaining portion of the sediment sample will be homogenized in a decontaminated stainless steel bowl and then transferred to the appropriate sample container. The overlying water from each of the sediment samples will also be transferred to an appropriate sample container and analyzed for pH, dissolved oxygen, ammonia, temperature, conductivity, hardness, and alkalinity.

A rationale for selection of the proposed sampling stations is provided in Table 3-1C. Table 3-2 lists the number and types of samples and field quality control samples to be collected and the analyses to be performed. Table 3-3 presents the analytical methods proposed and associated volume requirements, preservatives, and holding times.

3.2.3 Surface Water Sampling

Section 3.2.3 is amended by the addition of the following text.

Three surface water samples will be co-located with the three sediment sample locations from Deerfield Creek in the area of the Building 179 Site, as described above and shown in Figure 3-1. Similar to sediment samples, the surface water locations may be adjusted based on field observations of depositional sediment areas at the time of sampling, and will correspond with the final sediment sample locations. The surface water samples will be collected for analysis of TCL SVOCs and will be collected in a downstream to upstream order. Sampling will be conducted in accordance with TtNUS SOP SA-1.2.

It is anticipated that surface water samples will be collected by directly dipping the sample bottle or dipping a disposable, pre-cleaned, glass transfer jar. The temperature, pH, specific conductance, dissolved oxygen, oxidation reduction potential (ORP), and turbidity of the surface water at each sample location will be measured using a water quality meter such as a Horiba U-22 or equivalent device.

A rationale for selection of the proposed surface water sampling stations is provided on Table 3-1C. Table 3-2 lists the number and type of samples and field quality control samples to be collected, and the analyses to be performed, and Table 3-3 presents the analytical methods proposed and associated volume requirements, preservatives, and holding times.

3.2.4 Invertebrate Toxicity Tests

No changes were made to Section 3.2.4 in this Work Plan Addendum.

3.2.5 Benthic Macroinvertebrate Sampling

No changes were made to Section 3.2.5 in this Work Plan Addendum.

3.2.6 Fish Tissue Sampling

No changes were made to Section 3.2.6 in this Work Plan Addendum.

3.3 SUPPORT EFFORTS

Section 3.3 is amended by the addition of the following text.

Addition efforts will be conducted to support the Supplemental RI data collection activities described in the preceding sections. These efforts include the land survey, management of investigation-derived wastes (IDW), cleaning and decontamination of equipment, and other tasks common to the individual sampling programs.

3.3.1 Land Survey

Section 3.3.1 is amended by the addition of the following text.

Following the supplemental RI investigative work, a survey will be performed by a State of Rhode Island registered surveyor to identify locations of sample points and other significant features identified during the activities covered in this Work Plan Addendum.

The survey will be conducted to establish relative locations of sample points and to provide updated locations and elevations of site features in the area of Building 179, in order to extend the area and detail of the existing project base map toward the south, to include Building 179 and environs. All features will be tied in to the existing base map for the NUSC Disposal Area Site.

At a minimum, it is expected that the following features will be surveyed:

- Buildings, structures, and above-ground features at Building 179 CUST Area.
- Soil sample and monitoring well locations and elevations.
- Deerfield Creek channel in the area east of Building 179 CUST Area.
- Other select site features.

Any additional sample collection points that are established during the investigation will also be surveyed.

3.3.2 Wetlands Delineation

No changes were made to Section 3.3.2 in this Work Plan Addendum.

3.3.3 Management of Investigation-Derived Waste (IDW)

No changes were made to Section 3.3.3 and Sections 3.3.3.1 through 3.3.3.3 in this Work Plan Addendum.

3.3.4 Cleaning and Decontamination of Equipment

No changes were made to Section 3.3.4 in this Work Plan Addendum.

3.3.5 Field Equipment Calibration

No changes were made to Section 3.3.5 in this Work Plan Addendum.

3.3.6 Inspection and Acceptance Requirements for Supplies/Sample Containers

No changes were made to Section 3.3.6 in this Work Plan Addendum.

4.0 QUALITY ASSURANCE/QUALITY CONTROL

Achieving the study objectives for this supplemental investigation requires that the data collected from the field conform to an appropriate level of quality, adequate to be used for risk assessment purposes. The quality of a data set is measured by certain characteristics of the data, which are described in this section. Section 4.0 is amended by the changes to Sections 4.2 and 4.9.2, as presented below. All other subsections within Section 4 remain unchanged in this work plan amendment.

4.1 PROJECT QUALITY OBJECTIVES

No changes were made to Section 4.1 in this Work Plan Addendum.

4.2 PROJECT ACTION LIMITS

Section 4.2 is amended by the addition of the following text.

As part of the supplemental investigation, three additional chemicals that were not previously analyzed as part of the RI are to be analyzed in groundwater or in soil:

- In groundwater: 1,4-dioxane; PGDN, the main component of Otto Fuel; and cyanide
- In soil: PGDN

Revised Tables 4-1B, 4-1D, and 4-2B present project action limits (PALs) that will serve as target concentrations for the chemical data provided by the fixed analytical laboratories for these additional chemicals.

For groundwater, project action limits for the three additional chemicals to be analyzed were selected using the lowest screening values (where available) from: 1) MCLs, 2) EPA Regional Screening Levels (RSLs) for tap water, 3) RIDEM GA groundwater criteria, 4) EPA's vapor intrusion screening levels, and 5) ecological criteria for surface water.

For soil, the PAL for PGDN was selected using the lowest risk-based or regulatory screening values (where available) from: 1) EPA RSLs for direct contact residential soils, (2) RIDEM direct exposure criteria for residential soils, 3) RIDEM leachability criteria, and 4) ecological criteria for surface soils.

The sources of the project action limits for the additional chemicals are provided as footnotes in the tables listed above and are presented below.

- The project action limit for 1,4-dioxane in groundwater is 0.354 µg/L. This value is a calculated EPA RSL for 1,4-dioxane, derived using the proposed toxicity values for this chemical (USEPA, May 2009) and EPA's online screening level calculator. Information used in the calculation is shown in the output page from the online calculator, attached to this Work Plan Addendum as Appendix A. There are no federal drinking water standards for 1,4-dioxane.

- The project action limit for cyanide in groundwater is 5.2 µg/L. This value is the EPA NRWQC and the RIDEM AWQC for cyanide in freshwater.

The values which will serve as the action concentrations for PGDN in groundwater and soil for the data provided by the fixed analytical laboratory are provided below along with the sources of these project action limits.

- The project action limit for PGDN in groundwater is 0.57 µg/L. This value is the RSL for PGDN in tap water. There are no federal drinking water standards or state groundwater objectives for PGDN.

- The project action limit for PGDN in soil is 60 mg/kg. This value is the RSL for direct contact residential (DCR) for PGDN in soil. There are no state direct exposure criteria or leachability criteria for PGDN.

For the analysis of PGDN, TtNUS subcontracted the analytical laboratory, APPL, Inc., to conduct a method detection limit (MDL) study in support of the upcoming supplemental investigation at the NUSC Disposal Area. The resulting MDL Report and a synopsis of the results are provided as Appendix B-1. The resulting PDGN MDLs are 0.083 mg/kg in soil matrices and 0.083 µg/L in aqueous matrices. These MDLs for PGDN are adequate for the project-specific action levels listed above. APPL provided level-of-quantitation information for this chemical in early June 2010. This information is included as Appendix B-2, and applicable limits are presented on Tables 4-1B and 4-2B. The Department of Defense (DoD) Environmental Laboratory Accreditation Program (ELAP) certification for APPL, Inc. is also included in Appendix B-2.

4.3 MEASUREMENT AND PERFORMANCE CRITERIA

No changes were made to Section 4.3 in this work plan addendum.

4.4 SAMPLE IDENTIFICATION AND TRACKING SYSTEM

No changes were made to Section 4.4 in this work plan addendum.

4.5 SAMPLE HANDLING, TRACKING, AND CUSTODY REQUIREMENTS

No changes were made to Section 4.5 in this work plan addendum.

4.6 DOCUMENTATION OF FIELD ACTIVITIES

No changes were made to Section 4.6 in this work plan addendum.

4.7 FIXED LABORATORY ANALYTICAL METHOD REQUIREMENTS

No changes were made to Section 4.7 in this work plan addendum.

4.8 DATA DOCUMENTATION AND RECORDS MANAGEMENT

No changes were made to Section 4.8 in this work plan addendum.

4.9 VERIFICATION AND VALIDATION PROCEDURES

This section describes the procedures that will be followed to meet the data verification and validation requirements for this project.

4.9.1 Verification

No changes were made to Section 4.9.1 in this Work Plan Addendum.

4.9.2 Validation

Section 4.9.2 is amended by the addition of the following text.

TtNUS will validate the 1,4-dioxane and PGDN analytical data at a Tier II level, in accordance with the Region I, EPA-New England Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses. TtNUS will validate the cyanide analytical data at a Tier II level, in accordance with the Region

I EPA-New England Data Validation Functional Guidelines for Evaluating Environmental Analyses, Part IV: Inorganic Data Validation Functional Guidelines, November 2008.

4.10 QA MANAGEMENT REPORTS

No changes were made to Section 4.10 in this work plan addendum.

5.0 REPORTING

This section is revised to provide additional text describing the presentation of the NUSC Disposal Area/Building 179 Site supplemental investigation results in a Supplemental RI Report. The Supplemental RI Report will be prepared in accordance with EPA RI/FS Guidance as appropriate, providing all new data and findings generated during the supplemental investigation. Together the NUSC Disposal Area RI Report and the NUSC Disposal Area/Building 179 Site Supplemental RI Report will provide characterization of the nature and extent of contamination associated with the past use and disposal of chemicals and chemical wastes at the NUSC Disposal Area/Building 179 Site and the associated risks to possible human and ecological receptors. The NUSC Disposal Area RI Report will be referenced for background information and previous sampling efforts. New findings regarding the site physical characteristics, nature and extent of contamination, and fate and transport of contaminants will be reported in the Supplemental RI Report. The supplemental investigation data will be evaluated in screening level human health and ecological risk assessments and these results along with revised conclusions based on the supplemental investigation findings will be provided in the Supplemental RI Report. Information to be included in the Supplemental RI Report sections is discussed in the subsections below.

5.1 BACKGROUND AND FINDINGS OF THE REMEDIAL INVESTIGATION

Section 1.0 of the Supplemental RI Report will describe the purpose of the report. Additional background information discovered during this supplemental investigation and during activities at the Site since the publication of the RI report will be presented.

Section 2.0 of the Supplemental RI Report will describe the additional Site investigations that are the focus of this Work Plan Addendum. Specifically, this section will be based on Section 3.0 of the Work Plan Addendum and on any modifications to the field work, if applicable, during the period of activity.

Section 3.0 of the Supplemental RI Report will describe any new findings related to the physical characteristics of the Site as they exist at the time of the additional investigation. New findings regarding major surface features and subsurface features (geology, hydrogeology, soil types, and soil depths) will be described as determined by field work explorations. Existing figures depicting aerial and/or cross-sectional views of Site features will be revised. New figures may be prepared as necessary to depict the new supplemental investigation data and findings.

Section 4.0 of the Supplemental RI Report will provide revisions to the description of the nature and extent of the contaminants based on the supplemental investigation results (as discussed in Section 2.0). The focus of the revisions will be the following:

- Building 179 CUST Area groundwater, surface water, soil and sediment contamination distribution, including possible cyanide and PGDN in groundwater.
- NUSC Disposal Area groundwater contamination, including possible PGDN and cyanide in groundwater.
- Site-wide levels and distribution of 1,4-dioxane in groundwater.
- North Meadow TCE groundwater contamination - source, and vertical and horizontal extent of TCE plume in bedrock.
- Building 185 Complex - Area 1 historical Otto Fuel release and possible Area 3 release - subsurface soil contamination extent.

The conceptual site model presented in Section 2.0 of this Work Plan Addendum will be updated to describe how the supplemental investigation findings resolve any of the as-yet-unknown contaminant sources and types. Any additional source areas identified will be added, and/or eliminated, based on data obtained during the supplemental RI. All the chemical analytical data generated from supplemental investigation field work will be presented in this section. Also, any new primary site contaminants will be identified based on frequency of detection and concentrations found. RI Report Section 4.0 summary data tables will be updated for all of the matrices sampled during the supplemental investigation. Select Section 4.0 figures providing contaminant concentrations and sample locations will be updated based on the new data, and additional figures providing 1,4-dioxane, PGDN, and possibly cyanide concentrations and sample locations will be presented.

Section 5.0 of the Supplemental RI Report will update the description of the expected fate and transport mechanisms available to the primary site contaminants. The focus of the discussion will likely be the discharge and leachability of the contaminants associated with the Building 179 Area release: 1,1,1-TCA and its breakdown products (1,1-DCA and chloroethane); 1,4-dioxane; PGDN; cyanide; and arsenic.

Section 6.0 of the Supplemental RI Report will consist of an evaluation of the supplemental investigation data in a screening level human health risk assessment.

Section 7.0 of the Supplemental RI Report will consist of an evaluation of the supplemental investigation data in a screening level ecological risk assessment.

Section 8.0 of the Supplemental RI Report will provide a summary of the supplemental RI activities, findings, and conclusions, and any revisions to the RI report findings and conclusions.

5.2 HUMAN HEALTH RISK ASSESSMENT

This section is modified by addition of the following text describing the screening level human health risk evaluation of the data generated during the supplemental investigation.

The screening level human health risk assessment (HHRA) will be performed by comparing the chemical concentrations in the supplemental soil, groundwater, surface water, and sediment samples to PALs, USEPA RSLs, USEPA MCLs, and RIDEM criteria. Chemical concentrations in the supplemental samples will also be compared to the results of the existing human health risk assessment presented in the RI Report to give an approximate estimation of risks associated with the supplemental samples. In addition, where there is supporting laboratory data and the data are still considered representative, historical soil data will also be evaluated in the screening level HHRA.

5.3 ECOLOGICAL RISK ASSESSMENT

This section is modified by addition of the following text describing the screening level ecological risk evaluation of the data generated during the supplemental investigation.

The analytical results of the surface water and sediment sampling will be evaluated by first comparing the results to the sediment and surface water screening values and background concentrations. Chemicals with concentrations exceeding the screening levels and background concentrations will then be compared to the concentrations in the previously collected samples to determine whether concentrations were similar to the concentrations that were evaluated in the RI Report baseline ERA. If the concentrations are similar (or lower), then the conclusions from the baseline ERA will not change. If the concentrations in the new samples are greater than the previous concentrations, the data will be further evaluated to determine whether the risks would change significantly from the baseline ERA.

In addition to surface water and sediment data, where there is supporting laboratory data and the data are still considered representative, historical surface soil data will also be included in the screening level ecological risk evaluation.

TABLES

TABLE 2-1
BUILDING 179 AREA TANK STRUCTURE SUMMARY
WORK PLAN ADDENDUM
SUPPLEMENTAL REMEDIAL INVESTIGATION
SITE 08, NUSC DISPOSAL AREA
NAVSTA NEWPORT, RHODE ISLAND

Tank Size/Type	Location	Construction	Installation Date	Comments
6,000-gallon Aboveground Storage Tank	East of Building 1301 and south of Building 179	Carbon steel primary tank with a 6,600-gallon steel secondary containment	2009(1)	This currently operating tank system regulated under the RCRA program provides 90-day storage of spent Otto fuel from test facilities associated with Building 179 and 1303. Spent Otto fuel may contain up to 200 parts per million (ppm) of cyanide, therefore it is characterized as a hazardous waste under 40 CFR 261.3" (SAIC, January 2010). According to NUWC representatives and the Hazardous Waste Tank Installation Certification Report for the 6,000-gallon AST (SAIC, January 2010), the AST replaced a former tank taken out of service in February 2009. The new cylindrical primary tank is anchored within a 6,600-gallon capacity, steel secondary-containment dike tank, which features a rain shield to divert precipitation away from the secondary-containment dike structure. The tank system (including piping that is part of the tank system) is monitored for leaks on a daily basis. Inlet piping from the test facilities is supported on pipe supports. The former tank system was in operation for approximately 15 years (SAIC, January 2010). The former CUST was used to capture water mixed with engine oil, small amounts of cleaning fluids (mineral spirits and other solvent-based cleaners, including 1,1,1-trichloroethane [1,1,1-TCA]); Otto Fuel; and torpedo test combustion byproduct mixtures composed mostly of carbon with trace amounts of hydrogen cyanide (HCN) and cadmium. After each test ended, the tank contents were pumped to the aboveground hazardous waste storage tank. The former AST's concrete foundation was utilized for the new AST, as its footprint was similar and it appeared that the foundation had sufficient thickness and steel reinforcement to support the new AST system and resist frost action. The existing foundation was visually inspected prior to installation of the new tank. According to the Tank Installation Report, no visible cracking or settlement of the concrete surface was observed. In addition, the former aboveground tank system components did not contact soil, and featured a secondary containment system (dike) that would contain a leak, allowing such an event to be easily detected. Therefore, it appears unlikely that the former AST was a source of subsurface contamination.
1,500-Gallon Fuel-Water Separator (Tank B)	Adjacent to the north of 6,000 gallon hazardous waste AST	Double-walled sti-p_3(2) type steel tank, with leak detection system	1986(3)	Installed as "emergency spill" tank for Building 179 (Weapons Component s Testing) and 438 (Electric Propulsion Testing). Floor drains in Building 179 and 438 drain to the FWS. No spills have occurred in Building 179 or 438 and floor drains in Building 179 have been capped since 1997. Based on the FWS double walled construction, presence of leak detection system and lack of documented spills, it appears unlikely that this FWS is a source of subsurface contamination.
500-Gallon Oil-Water Separator (Tank B-1)	55 feet north of 1,500 gallon FWS (described above)	Double walled sti-p_3(2) type steel tank	1986(3)	Installed as a secondary "emergency spill" tank for Building 179 and 438. Effluent from the 1,500 gallon FWS flows into the 500 gallon OWS, solids and oily material are retained in the OWS and water flows into sanitary sewer system. No spills have occurred in Building 179 or 438 and floor drains in Building 179 have been capped since 1997. Based on the OWS double walled construction and lack of documented spills, it appears unlikely that this OWS is a source of subsurface contamination.
Water Tank	East of Building 1192	Steel (insulated)	Between 1995 and 1999(4)	Installed to supply non-potable water for a closed loop system used for the Ocean Water Simulator, located in Building 438. Based on the contents of the tank and closed loop system design, it appears unlikely this AST is a source of subsurface contamination.
500-gallon Oil-Water Separator (Tank A-1)	East of Building 178 (adjacent to the north 1,500-gallon FWS (described below)	Double walled sti-p_3(2) type steel tank	1993(5)	Installed as secondary containment tank for the adjacent 1,500-gallon FWS. No spills have occurred in Building 178. Sump pump in FWS transfers fluid to the 500-gallon OWS, water is separated from solids/oil and discharges into sanitary sewer. Based on the FWS double walled construction, presence of leak detection system and lack of documented spills, it appears unlikely that this FWS is a source of subsurface contamination.
1,500-gallon Fuel-Water Separator (Tank A)	East of Building 178 (adjacent to the south 500-gallon OWS (described above)	Double-walled sti-p_3(2) type steel tank, with leak detection system	1993(5)	Installed as "emergency spill" tank for Building 178. Floor drains in Building 178 (Torpedo Component Testing) drain to this FWS. No spills have occurred in Building 178. Based on the FWS double walled construction, presence of leak detection system and lack of documented spills, it appears unlikely that this FWS is a source of subsurface contamination.

Notes:
(1) Report entitled "Tank Installation Report, 6,000 gallon Hazardous Waste Storage Tank, Propulsion Test Facility", Dated January 2010, prepared by SAIC.
(2) Double walled storage tank includes dielectric exterior coating and nylon bushings in all openings.
(3) Provided by NUWC personnel
(4) Provided by NUWC personnel and determined using existing drawings
(5) "As-Built drawings" provided by NUWC
FWS Fuel Water Separator
OWS Oil Water Separator
AST Aboveground Storage Tank

TABLE 2-2
SOIL RESULTS FOR BUILDING 179 AREA TANKS/STRUCTURES
WORK PLAN ADDENDUM
SUPPLEMENTAL REMEDIAL INVESTIGATION
SITE 08, NUSC DISPOSAL AREA
NAVSTA NEWPORT, RHODE ISLAND

Structure	**1,500-Gallon Fuel-Water Separator (Tank B)**				**500-Gallon Oil-Water Separator (Tank B-1)**						**Water Tank (east of Building 1192)**			**Fuel-Water Separator (Tank A) and Oil-Water Separator (Tank A-1) (east of Building 178)**	
Boring	B10-S4	B11-S4	MW7B-S4 (1)	MW7B-S6 (weathered bedrock sample)	MW7B-S4 (1)	MW7B-S6 (weathered bedrock sample)	B10-S4	B11-S4	B20-S3 (1)	B21-S3	B20-S3 (1)	B21-S3	B30-S3 (2)	B30-S3 (2)	MW9-S2
Sample Depth Interval (feet bgs)	7 to 9	6 to 8	6.5 to 8.5 (per boring log)	10.5 to 11.25 (per boring log)	6.5 to 8.5 (per boring log)	10.5 to 11.25 (per boring log)	7 to 9	6 to 8	5 to 7 (per boring log)	4 to 6	5 to 7 (per boring log)	4 to 6	4 to 6	4 to 6	2 to 4
Compounds Detected (µg/kg)															
1,1,1-TCA	8		81	140	81	140	8			6		6			
1,1-DCA	0.9 J		17	53	17	53	0.9 J		1 JB	6	1 JB	6			
Chloroethane				4 J		4 J									
Tetrachloroethene			0.85 J	2 J	0.85 J	2 J									
Trichloroethene				3 J		3 J									
cis-1,2-DCE				0.6 J		0.6 J									
1,1-DCE			1 J	3 J	1 J	3 J									
Carbon Disulfide				2 J		2 J									
1,2,4-Trichlorobenzene															
1,2,3-Trichlorobenzene															
Benzene		0.2 J		0.2 JB	0.3 JB	0.2 JB		0.2 J	0.3 J	0.2 J	0.3 J	0.2 J			
Toluene		0.4 J	0.75 JB	0.5 JB	0.75 JB	0.5 JB		0.4 J		0.4 J		0.4 J			
Ethylbenzene				0.3 J		0.3 J									
Xylene			5	5	5	5									
TPH			77000		77000										
Cyanide				470		470									
Dichlorodifluoromethane													1 J	1 J	

Notes:

Source: TRC, December 1999. Building 179 Concrete UST Remedial Investigation. Naval Undersea Warfare Center Division, Newport, Rhode Island. U.S. Department of the Navy.
Results for VOCs, TPH, and cyanide are presented. Results for common laboratory contaminants, including methylene chloride, acetone, and 2-butanone, are not included.

A blank space indicates compound was not detected above the detection limit.

"J" indicates result is estimated.

"B" indicates compound also detected in blank sample.
All samples collected from overburden unless stated otherwise.

(1) For VOCs, value is the average of duplicate results reported by analytical laboratory, Severn Trent Laboratories of Monroe, Connecticut; if detected in only one of duplicate samples, that value is reported.

(2) The Building 179 CUST RI states that boring B-30 was located immediately east of a subsurface utility line originating east of Building 178 to assess potential presence of soil contamination adjacent to aforementioned utility line.

TABLE 2-3
GROUNDWATER RESULTS FOR BUILDING 179 AREA TANKS/STRUCTURES
WORK PLAN ADDENDUM
SUPPLEMENTAL REMEDIAL INVESTIGATION
SITE 08, NUSC DISPOSAL AREA
NAVSTA NEWPORT, RHODE ISLAND

1,500-Gallon Fuel-Water Separator (Tank B)	GP-21	GP-32	GP-32A	GP-32B	GP-80	MW-7A (by Mitkem)	MW-7B - Bedrock (by Mitkem)	Data Evaluation
	Upgradient (southwest)	Crossgradient (west)	Crossgradient (northwest)	Downgradient (north)	Downgradient (northeast)	Crossgradient (east)	Crossgradient (east)	
Compounds Detected (µg/L)								Groundwater results from sampling locations in the vicinity of the 1,500-gallon fuel-water separator are not indicative of this structure being a source of contamination. The concentrations of 1,1,1-TCA and 1,1-DCA at GP-32B, immediately downgradient and closest to the structure, are comparable to those that are cross-gradient (GP-32A). The concentrations at GP-80 are somewhat higher, which is consistent with its location being closer to and more directly downgradient of the CUST source area. MW-7A and -7B, with the highest concentrations, are the sampling locations closest to the Building 179/CUST source area. The pattern and concentrations of groundwater contaminants in this area are consistent with and attributable to the known Building 179 and CUST source area, to the south and southeast. Previous contaminated soils that were excavated in and around the former Building 179 footprint were upgradient of this structure, some within 25 feet, and are the likely source of groundwater contamination in this area. The former CUST is also a major source of groundwater contamination observed in locations to the north/northeast, the estimated direction of groundwater flow in this area.
1,1,1-TCA	0.77	17.3	49	20	98	3,600	23,000 E	
1,1-DCA	9.91		16	21	140	780	1,400	
Chloroethane						73 J		
1,1-DCE	4.05					76 J	310 J	
1,2,4-Trichlorobenzene							120 J	
1,2,3-Trichlorobenzene							150 J	
TPH							400	
Cyanide						612		

500-Gallon Oil-Water Separator (Tank B-1)	GP-32A	GP-32B	GP-80	GP-90	GP-90A	GP-26	Data Evaluation
	Upgradient (southwest)	Up/Crossgradient (south-	Up/Crossgradient (southeast)	Crossgradient (east)	Crossgradient (east)	Downgradient (north)	
Compounds Detected (µg/l)							Groundwater results from sampling locations in the vicinity of the 500-gallon oil-water separator (Tank B-1) are not indicative of this structure being a source of contamination. While the concentration of 1,1,1-TCA at GP-26 is higher than the levels of this compound reported at crossgradient and upgradient locations in the immediate vicinity, the cumulative concentrations of 1,1,1-TCA and its breakdown product, 1,1-DCA, at the crossgradient locations are comparable to or slightly exceeding the GP-26 concentration, where no 1,1-DCA was reported. Groundwater contaminants in the area of the 500-gallon oil-water separator are consistent with and attributable to the known Building 179/CUST source area to the south and southeast.
1,1,1-TCA	49	20	98	100	120	235	
1,1-DCA	16	21	140	100	130		
TCE						5.8	

Water Tank (east of Bldg. 1192)	GP-100A (1)	GP-110	GP-110A	GP-120	GP-120A	Data Evaluation
	Upgradient (south)	Up/Crossgradient (southeast)	Up/Crossgradient (southeast)	Down/Crossgradient (northeast)	Downgradient (north-northeast)	
Compounds Detected (µg/l)						Groundwater results from sampling locations in the vicinity of the water tank do not indicate this structure is a source of contamination. The concentrations of 1,1,1-TCA and other compounds at locations that are approximately upgradient/crossgradient of the water tank are higher than those reported downgradient. The levels and pattern of contaminants observed are consistent with and attributable to the Building 179/CUST source area to the south.
1,1,1-TCA	180	22	130		87	
1,1-DCA	200		160	12	95	
1,1-DCE						
TCE	7.4		6.4			
Chloroethane						
Vinyl Chloride						

Fuel-Water Separator (Tank A) and Oil-Water Separator (Tank A-1) (east of Bldg. 178)	GP-120A	GP-120	GP-130A	GP-130 (1, 2)	GP-131	MW-9B Bedrock (by Mitkem)	Data Evaluation
	Upgradient (south)	Up/Crossgradient (southeast)	Downgradient (north-northwest)	Downgradient (north)	Down/Crossgradient (northeast)	Down/Crossgradient (northeast)	
Compounds Detected (µg/l)							Groundwater results in the vicinity of the fuel-water separator and oil-water separator are not indicative of this structure being a source of contamination. Results from upgradient and downgradient locations analyzed by the mobile lab (all "GP-" results) are comparable (downgradient GP-130 total is less than 1.5 times the upgradient total at GP-120A). Also, it is noted that results from MW-9B are from the offsite fixed laboratory, Mitkem, and are not directly comparable to the mobile lab results (GP- samples). The sampling locations near these structures are within the bounds of the groundwater contaminant plume that originates at Bldg. 179 and the adjacent former CUST. The detected contaminants and levels are consistent with and attributable to that source area.
1,1,1-TCA	87		12	125	110	250 E	
1,1-DCA	95	12	21	125	120	140	
1,1-DCE						16	
TCE				7.35	4.8	2 J	
Chloroethane						4 J	

Notes:
Source: TRC, December 1999. Building 179 Concrete UST Remedial Investigation. Naval Undersea Warfare Center Division, Newport, Rhode Island. U.S. Department of the Navy.
Results for VOCs presented, and for TPH and cyanide where available (only "MW-" groundwater samples analyzed for TPH and cyanide, by Mitkem). Results for common laboratory contaminants, including methylene chloride, acetone, and 2-butanone, are not included.
A blank space indicates compound was not detected or, in some cases, was not analyzed (e.g., the onsite mobile lab - Mykrowaters, Inc., during Phase IB and Target Environmental Services during Phase IA - did not analyze for all VOCs or for other compounds).
"E" indicates result exceeds calibration curve range.
"J" indicates result is estimated.
"GP" indicates groundwater sample from geoprobe, analyzed by onsite mobile laboratory. "MW" indicates sample from monitoring well, analyzed by offsite fixed lab, Mitkem Corporation. All samples collected from overburden unless stated otherwise.
(1) A confirmation duplicate (split) sample was also sent to the fixed-base lab, Mitkem Corporation (used EPA Method 8260), as part of the QA/QC.
(2) Value is the average of duplicate results reported by analytical laboratory, Mitkem Corporation.

TABLE 3-1A
PROPOSED SOIL BORING LOCATIONS AND PURPOSE
WORK PLAN ADDEDUM
SUPPLEMENTAL REMEDIAL INVESTIGATION
SITE 08, NUSC DISPOSAL AREA
NAVSTA NEWPORT, RHODE ISLAND

Boring ID	Location	Purpose
B185A1-SB1	Building 185 Complex, Area No. 1, center of southwest section	Investigate historical Otto Fuel release
B185A1-SB2	Building 185 Complex, Area No. 1, eastern corner of southwest section, low end of sloped floor near former drain	Investigate historical Otto Fuel release
B185A1-SB3	Building 185 Complex, Area No. 1, southern corner of northeast section, low end of sloped floor near former drain	Investigate historical Otto Fuel release
B185A1-SB4	Building 185 Complex, Area No. 1, center of northeast section	Investigate historical Otto Fuel release
B185A3-SB1	Building 185 Complex, Area No. 3, center of floor	Investigate former Otto Fuel storage area
B185A3-SB2	Building 185 Complex, Area No. 3, location to be determined based on visual inspection	Investigate former Otto Fuel storage area
B179-SB1	Building 179 Area, east of former Concrete Underground Storage Tank (CUST, now closed in place)	Determine extent of residual soil contamination near former excavation area
B179-SB2	Building 179 Area, northeast of former Interceptor Tank (removed)	Determine extent of residual soil contamination near former excavation area
B179-SB3	Building 179 Area, northeast of former CUST (closed in place)	Determine extent of residual soil contamination near former excavation area

TABLE 3-1B
PROPOSED MONITORING WELL INSTALLATIONS AND PURPOSE
WORK PLAN ADDENDUM
SUPPLEMENTAL REMEDIAL INVESTIGATION
SITE 08, NUSC DISPOSAL AREA
NAVSTA NEWPORT, RHODE ISLAND

Location/Well ID	Description	Purpose
North Meadow ("TCE Plume")		
MW-116B-D1 and -D2	Existing open hole bedrock well MW-116B to be converted to PVC-screened well; adjacent, more shallow, PVC-screened bedrock well to be drilled/installed to create shallow/deep bedrock well cluster	Determine vertical distribution of contaminants and groundwater flow pattern
MW-117B-D1 and -D2	Existing open hole bedrock well MW-117B to be converted to PVC-screened well; adjacent, more shallow, PVC-screened bedrock well to be drilled/installed to create shallow/deep bedrock well cluster	Determine vertical distribution of contaminants and groundwater flow pattern
MW-118B-D1and -D2	Existing open hole bedrock well MW-118B to be converted to PVC-screened well; adjacent, more shallow, PVC-screened bedrock well to be drilled/installed to create shallow/deep bedrock well cluster	Determine vertical distribution of contaminants and groundwater flow pattern
MW-127B-D1 and -D2	Proposed bedrock well MW-127B, north of the North Meadow, to be completed as two nested wells	Determine vertical distribution and plume control to the north of the TCE plume in the North Meadow; assess hydraulic gradients
MW-128B-D1 and -D2	Proposed bedrock well MW-128B, to be completed as two nested wells	In the area of the TCE plume in the North Meadow: determine vertical distribution of groundwater contaminants and plume control to the north and east; assess hydraulic gradients
North of Building 179 CUST Area ("1,1-DCA Plume")		
MW-129B	Proposed open hole bedrock well, north of Bldg. 179, east of Building 178	In the area of the 1,1-DCA plume, provide plume control to the west
MW-130B	Proposed open hole bedrock well, northwest of MW-129B, immediately north of Bldg. 180	In the area of the 1,1-DCA plume, provide plume control to the west

TABLE 3-1C
PROPOSED SURFACE WATER AND SEDIMENT SAMPLE LOCATIONS AND PURPOSE
WORK PLAN ADDENDUM,
SUPPLEMENTAL REMEDIAL INVESTIGATION
SITE 08, NUSC DISPOSAL AREA
NAVAL STATION NEWPORT, RHODE ISLAND

Sample ID	Location	Purpose[1]
SW/SD-B179-01	In Deerfield Creek, in the area where the Creek traverses the wetland area. Approximately adjacent to Building 179 but upstream of the former discharge pipe outlet from the former Interceptor Tank, and upstream of the CUST.	Assess the local sediment and surface water conditions in the area upstream of the CUST and Interceptor Tank locations.
SW/SD-B179-02	In Deerfield Creek, in the area where the Creek traverses the wetland area adjacent to the Building 179 Site. In the area of a former discharge pipe outlet from the former Interceptor Tank at Building 179.	Assess the local sediment and surface water conditions that may have been impacted from the former Interceptor Tank discharge and CUST.
SW/SD-B179-04	In Deerfield Creek, in the area where the Creek traverses the wetland area. Downstream of the Building 179 area, upstream of the Building 185 Complex and culvert.	Assess the local sediment and surface water conditions downstream of the former Interceptor Tank discharge and Building 179 CUST area, and upstream of the Building 185 Complex.

(1) All surface water and sediment samples will be collected for TCL SVOC analysis to better characterize the present levels and extent of contaminants, particularly PAHs, in this portion of the Creek. In addition, sediments from two locations, SD-B179-02 and SD-B179-04, will also be sampled and analyzed for low concentration TCL VOCs to evaluate potential impacts from the former Interceptor Tank discharge (VOCs for two sediments only; surface water not to be analyzed for VOCs) .

TABLE 3-2
FIELD QUALITY CONTROL SAMPLE SUMMARY
WORK PLAN ADDENDUM
SUPPLEMENTAL REMEDIAL INVESTIGATION
SITE 08, NUSC DISPOSAL AREA
NAVAL STATION NEWPORT, RHODE ISLAND
PAGE 1 OF 3

Media	Location		Analyses	Field Samples	Field Duplicates	Rinsate Blanks(1)	Trip Blanks(2)	Source Blanks(3)	Total Quantity
GROUNDWATER									
B179/CUST Area Monitoring Wells and DPT Groundwater Sample	MW-6A (V)	MW-129B (V/X/P/B)	TCL VOCs	15	2	1	4	1	23
	MW-6B (V)	R179-MW1	1,4-Dioxane	10	1	1	0	1	13
	MW-7A	R179-MW2	PGDN	11	2	0	0	0	13
	MW-7B	R179-MW3 (V/P/C)	Cyanide	10	1	1	0	0	12
	MW-8A (V)	GW-B179-SB#	Ammonia	9	1	0	0	0	10
	MW-8B (V)		Methane/Ethene/Ethane	9	1	0	0	0	10
	MW-9A		Ferrous Iron	9	1	0	0	0	10
	MW-11		Phosphate/ Nitrate/ Nitrite/Sulfate	9	1	0	0	0	10
	MW-12		Sulfide	9	1	0	0	0	10
	MW-13B (V/X/P/C)		TOC	9	1	0	0	0	10
NUSC Disposal Area Monitoring Wells and DPT Groundwater Sample	MW-04B (V/X)	MW-105B (V/X/P/B)	TCL VOCs	8	1	1	3	1	14
	MW-101B	MW-122 (V/X/P)	1,4-Dioxane	7	1	1	0	1	10
	MW-103B	MW-130B (V/P)	PGDN	7	1	0	0	0	8
	MW-104B (V/X/P)	GW-B185A#-SB#	Cyanide	3	1	0	0	0	4
			Ammonia	4	1	0	0	0	5
			Methane/Ethene/Ethane	4	1	0	0	0	5
			Ferrous Iron	4	1	0	0	0	5
			Phosphate/ Nitrate/ Nitrite/Sulfate	4	1	0	0	0	5
			Sulfide	4	1	0	0	0	5
			TOC	4	1	0	0	0	5
North Meadow Monitoring Wells	MW-03B	MW-128B-D1 (V/X/B)	TCL VOCs	11	2	1	4	1	19
	MW-116B-D1 (V)	MW-128B-D2 (V/X/B)	1,4 Dioxane	7	1	1	0	1	10
	MW-116B-D2 (V)		PGDN	1	1	0	0	0	2
	MW-117B-D1 (V/X/B)		Ammonia	7	1	0	0	0	8
	MW-117B-D2 (V/X/B)		Methane/Ethene/Ethane	7	1	0	0	0	8
	MW118B-D1 (V)		Ferrous Iron	7	1	0	0	0	8
	MW-118B-D2 (V)		Phosphate/ Nitrate/ Nitrite/Sulfate	7	1	0	0	0	8
	MW-127B-D1 (V/X/B)		Sulfide	7	1	0	0	0	8
	MW-127B-D2 (VX/B)		TOC	7	1	0	0	0	8

TABLE 3-2
FIELD QUALITY CONTROL SAMPLE SUMMARY
WORK PLAN ADDENDUM
SUPPLEMENTAL REMEDIAL INVESTIGATION
SITE 08, NUSC DISPOSAL AREA
NAVAL STATION NEWPORT, RHODE ISLAND
PAGE 2 OF 3

Media	Location		Analyses	Field Samples	Field Duplicates	Rinsate Blanks(1)	Trip Blanks(2)	Source Blanks(3)	Total Quantity
North Meadow Diffusion Bags	DW-15		TCL VOCs	2	1	1	1	1	6
	DW-16		1,4 Dioxane	2	1	1	0	1	5
SOIL – DPT DRILLING									
B179 CUST Area Soil Borings	B179-SB1 (4)		TCL VOCs	6	1	1	1	1	10
	B179-SB2 (4)		TCL SVOCs	6	1	1	0	1	9
	B179-SB3 (4)		TCL Pesticides	6	1	1	0	1	9
			TCL PCBs	6	1	1	0	1	9
			TAL Metals	6	1	1	0	1	9
			PGDN	6	1	0	0	0	7
B185 Complex Area Nos. 1 and 3 Soil Borings	B185A1-SB1(4)		TCL VOCs	12	2	1	1	1	17
	B185A1-SB2(4)		TCL SVOCs	12	2	1	0	1	16
	B185A1-SB3(4)		TCL Pesticides	12	2	1	0	1	16
	B185A1-SB4(4)		TCL PCBs	12	2	1	0	1	16
	B185A3-SB1(4)		TAL Metals	12	2	1	0	1	16
	B185A3-SB2(4)		PGDN	12	2	0	0	0	14
SOIL – CONVENTIONAL DRILLING									
	B(MW)-127B(4)	B(MW)-128B(4)	TCL VOCs	4	1	1	1	1	8
SURFACE WATER									
B179 CUST Area Deerfield Creek	SW-B179-01		TCL SVOCs	3	1	1	0	1	6
	SW-B179-02								
	SW-B179-04								
SEDIMENT									
B179 CUST Area Deerfield Creek	SD-B179-01 ***(SVOCs only)***		TCL SVOCs	3	1	1	0	1	6
	SD-B179-02		TCL VOCs (low concentration)	2	1	1	1	1	6
	SD-B179-04								

TABLE 3-2
FIELD QUALITY CONTROL SAMPLE SUMMARY
WORK PLAN ADDENDUM
SUPPLEMENTAL REMEDIAL INVESTIGATION
SITE 08, NUSC DISPOSAL AREA
NAVAL STATION NEWPORT, RHODE ISLAND

NOTES

Monitoring well and DPT groundwater samples will be collected for all analytes listed in the associated group unless the location identifier is followed by one or more of the following, indicating which analyses apply to the associated location/well: (V) indicates VOCs; (X) indicates 1,4-dioxane; (P) indicates PGDN; [C] indicates cyanide; and (B) indicates the biodegradation parameters: ammonia, methane/ethane/ethane, ferrous iron, phosphate/nitrate/nitrite/sulfate, sulfide, and TOC.

(1) One rinsate blank per type of tool or sampling procedure used, such as a stainless steel trowel or bowl. If pre-cleaned, dedicated, or disposable equipment are used, such as plastic scoopulas or scoops, one rinsate blank will be collected as a "batch blank" per type of equipment used.
(2) One trip blank will be included in every discrete shipping container (i.e. cooler) that transports a sample for determination of volatile organics.
(3) Source water blanks will be generated at a rate of one per sampling event (the water source for decontamination water, e.g. deionized ultra-filtered water [DIUF]).
(4) Two soil samples per boring location will be analyzed for VOCs.

B179 Building 179
B185 Building 185
PCBs polychlorinated biphenyls
PGDN propylene glycol dinitrate
SVOCs semivolatile organic compounds
TCL Target Compound List
TAL Target Analyte List
TOC total organic carbon
VOCs volatile organic compounds
GW-B179-SB# The "#" in location identifiers indicates "to be determined" (location to be selected)

TABLE 3-3
SAMPLE CONTAINER, PRESERVATIVE, AND HOLDING TIME REQUIREMENTS
WORK PLAN ADDENDUM
SUPPLEMENTAL REMEDIAL INVESTIGATION
SITE 08, NUSC DISPOSAL AREA
NAVAL STATION NEWPORT, RHODE ISLAND

Sample Medium	Analysis (Method Reference)	Sample Container	Preservative	Holding Time
Soils	PGDN (SW846 Method 8330B)	8 oz amber jar	Cool to 4° C	14 days to extraction, 40 days from extraction to analysis
Groundwater	1,4-Dioxane (SW 846 Method 8270D SIM)	1 liter amber glass	Cool to 4° C	7 days to extraction, 40 days from extraction to analysis
	Cyanide (9012B)	500 ml plastic	NaOH to pH > 12 Cool to 4° C	14 days
	PGDN (SW846 Method 8330B)	1 liter amber glass	Cool to 4° C	7 days to extraction, 40 days from extraction to analysis

Notes:
PGDN propylene glycol dinitrate

TABLE 4-1B
GROUNDWATER SEMIVOLATILE AND OTHER ORGANIC CONTAMINANTS OF CONCERN
WORK PLAN ADDENDUM
SUPPLEMENTAL REMEDIAL INVESTIGATION
SITE 08, NUSC DISPOSAL AREA
NAVAL STATION NEWPORT, RHODE ISLAND

Analytes	Previously Detected in any Media on Site	Previously Identified as Groundwater or Surface Water COPCs	Project Action Limit (ug/L)	Source of Project Action Limit (1)	Project Quantitation Limit (ug/L)(4)
1,4-dioxane	not analyzed	No	0.354	(2)	1
propylene glycol dinitrate (PGDN)	Yes	No	0.57	(3)	0.20

Notes:

(1) Project Action Limits were selected as the lowest of the USEPA MCLs or Regional Screening Levels (RSLs) for tapwater, the RIDEM GA Groundwater Objectives, EPA vapor intrusion screening levels, and ecological criteria for surface water.

(2) This value is a calculated EPA Regional Screening Level (RSL) for 1,4-dioxane, calculated using the proposed toxicity values for this chemical and EPA's online RSL calculator. Information used in the calculation is attached to this Work Plan Addendum as Appendix A.

(3) EPA RSL for tap water.

(4) Positive results below the Project Quantitation Limit will be reported down to the Limit of Detected (LOD), which is 0.10 ug/L and flagged with a "J" qualifier.

Shaded cells indicate that the Project Quantitation Limit is greater than the Project Action Limit, however the MDLs are generally below the Project Action Limit.

TABLE 4-1D
GROUNDWATER INORGANIC CONTAMINANTS OF CONCERN
WORK PLAN ADDENDUM
SUPPLEMENTAL REMEDIAL INVESTIGATION
SITE 08, NUSC DISPOSAL AREA
NAVAL STATION NEWPORT, RHODE ISLAND

Analytes	Previously Detected in any Media on Site	Previously Identified as Groundwater or Surface Water COPCs	Project Action Limit (ug/L)	Source of Project Action Limit (1)	Project Quantitation Limit (ug/L) (3)
Cyanide	Yes	No		(2)	10

Notes:

(1) Project Action Limits were selected as the lowest of the USEPA MCLs or Regional Screening Levels (RSLs) for tapwater, the Ecological Screening Values, and the RIDEM GA Groundwater Objectives.

(2) This value is the EPA NRWQC and the RIDEM AWQC for cyanide in freshwater.

(3) Positive results below the Project Quantitation Limit will be reported down to the Method Detection Limit (MDL) and flagged with a “J” qualifier.

Shaded cells indicate that the Project Quantitation Limit is greater than the Project Action Limit, however the MDLs are generally below the Project Action Limit.

TABLE 4-2B
SOIL SEMIVOLATILE AND OTHER ORGANIC CONTAMINANTS OF CONCERN
WORK PLAN ADDENDUM
SUPPLEMENTAL REMEDIAL INVESTIGATION
SITE 08, NUSC DISPOSAL AREA
NAVAL STATION NEWPORT, RHODE ISLAND

Analytes	Previously Detected in any Media on Site	Previously Identified as Soil COPCs	Project Action Limit (ug/kg)	Source of Project Action Limit (1)	Project Quantitation Limit (ug/kg) (3)
propylene glycol dinitrate (PGDN)	Yes	No	60,000	(2)	750

Notes:

(1) The Project Action Limit was selected as the lowest of the RSL for direct contact residential soil, RIDEM Direct Exposure Criteria for residential soils, leachability or ecological criteria.

(2) RSL for direct contact residential soil.

(3) Positive results below the Project Quantitation Limit will be reported down to the Limit of Detection (LOD) for PGDN, which is 500 ug/kg, and flagged with a “J” qualifier.

FIGURES

ACAD: \02124\PP.WP\NUSC_SITE_LOC.DWG 12/03/09 DWM

TETRA TECH NUS, INC.

NUSC DISPOSAL AREA SITE LOCATION
SITE 08, NUSC DISPOSAL AREA
WORK PLAN ADDENDUM
SUPPLEMENTAL REMEDIAL INVESTIGATION
NAVAL STATION NEWPORT, RHODE ISLAND

SCALE	AS NOTED
FILE	\..\NUSC_SITE_LOC.DWG
REV	0
DATE	12/03/09
FIGURE NUMBER	1-1

NOTES AND REFERENCES

1. BASE PLAN PRODUCED BY LOUIS FEDERICI AND ASSOCIATES.

2. VERTICAL DATUM = NGVD 1929, SEE PLAN PROVIDED BY CLIENT ENTITLED "BUILDING 179 REMEDIAL INVESTIGATION FIGURE 2 EXISTING CONDITIONS PLAN", DATED 12/3/99, BY THE NAVAL UNDERSEA WARFARE CENTER DIVISION, PUBLISHED BY TRC, 12/99.

3. BENCH MARK FOUND SE CORNER O.W.S., SCRIBED X MARK TOP SE CORNER SLAB ABOVE BURIED OIL WATER SEPARATOR, ELEV. = 57.55, NGVD'29, AS DESCRIBED ABOVE.

4. HORIZONTAL DATUM = NAD 1983.

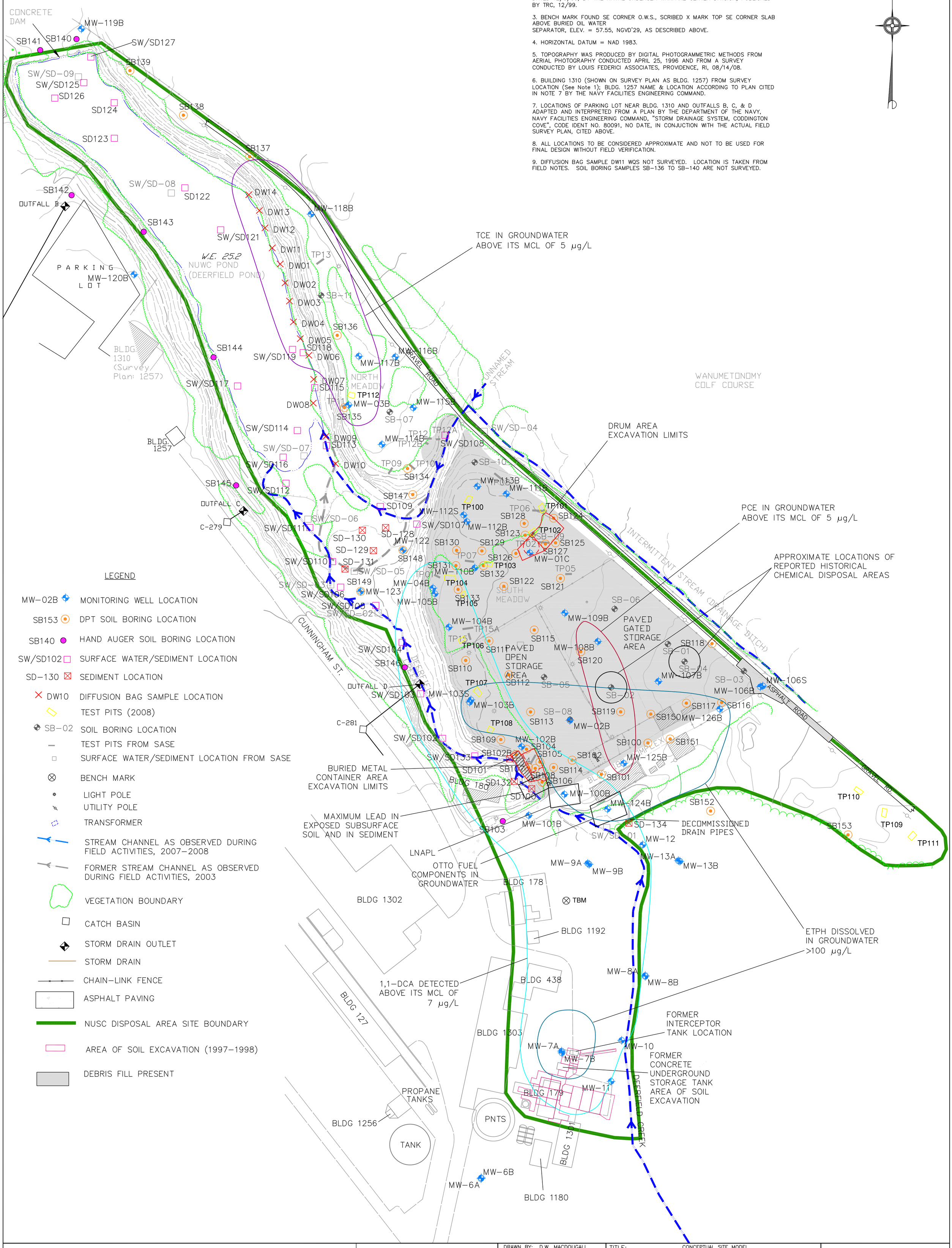
5. TOPOGRAPHY WAS PRODUCED BY DIGITAL PHOTOGRAMMETRIC METHODS FROM AERIAL PHOTOGRAPHY CONDUCTED APRIL 25, 1996 AND FROM A SURVEY CONDUCTED BY LOUIS FEDERICI ASSOCIATES, PROVIDENCE, RI, 08/14/08.

6. BUILDING 1310 (SHOWN ON SURVEY PLAN AS BLDG. 1257) FROM SURVEY LOCATION (See Note 1); BLDG. 1257 NAME & LOCATION ACCORDING TO PLAN CITED IN NOTE 7 BY THE NAVY FACILITIES ENGINEERING COMMAND.

7. LOCATIONS OF PARKING LOT NEAR BLDG. 1310 AND OUTFALLS B, C, & D ADAPTED AND INTERPRETED FROM A PLAN BY THE DEPARTMENT OF THE NAVY, NAVY FACILITIES ENGINEERING COMMAND, "STORM DRAINAGE SYSTEM, CODDINGTON COVE", CODE IDENT NO. 80091, NO DATE, IN CONJUCTION WITH THE ACTUAL FIELD SURVEY PLAN, CITED ABOVE.

8. ALL LOCATIONS TO BE CONSIDERED APPROXIMATE AND NOT TO BE USED FOR FINAL DESIGN WITHOUT FIELD VERIFICATION.

9. DIFFUSION BAG SAMPLE DW11 WQS NOT SURVEYED. LOCATION IS TAKEN FROM FIELD NOTES. SOIL BORING SAMPLES SB-136 TO SB-140 ARE NOT SURVEYED.



GRAPHIC SCALE
60' 0' 60' 120'

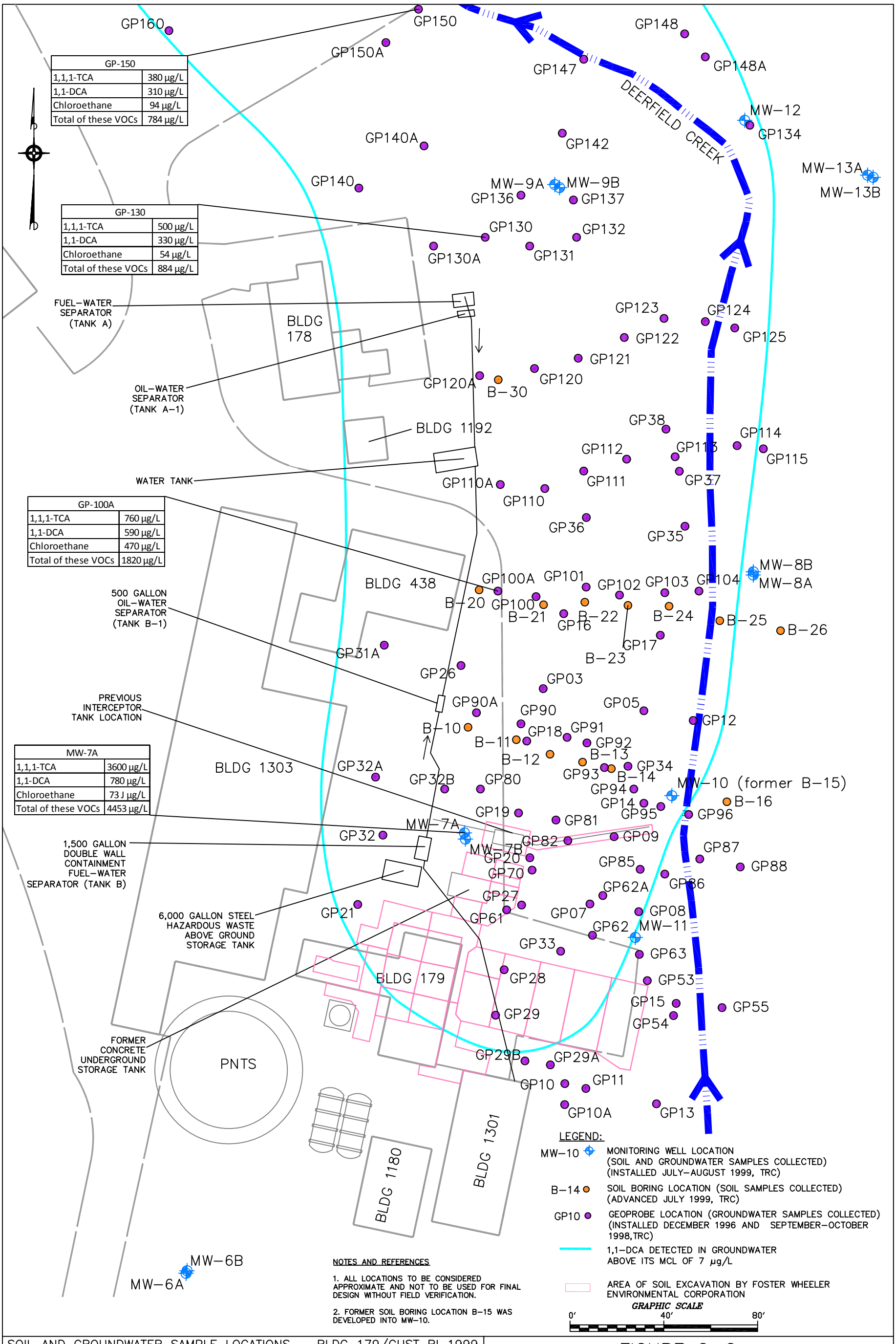
DRAWN BY:	D.W. MACDOUGALL
PREPARED BY:	D. SEIKEN
CHECKED BY:	D. SEIKEN
PROJECT MANAGER:	D. SEIKEN
PROGRAM MANAGER:	J. TREPANOWSKI

TITLE: CONCEPTUAL SITE MODEL
SITE 08, NUSC DISPOSAL AREA
WORK PLAN ADDENDUM, SUPPLEMENTAL REMEDIAL INVESTIGATION
NAVAL STATION NEWPORT, RHODE ISLAND

SOURCE: PLAN PRODUCED BY LOUIS FEDERICI AND ASSOCIATES (SEE NOTES)

SCALE:	DATE:	PROJ. NO:
AS SHOWN	DECEMBER 7, 2009	02124
DRAWING NO: 2-1	ACFILE NAME: \02124\PP.WP\NUSC_CONC_SITE_MODEL.DWG	REV: 0

TETRA TECH NUS, INC.
55 JONSPIN ROAD
WILMINGTON, MASSACHUSETTS 01887
(978)658-7899



NOTES AND REFERENCES

1. ALL LOCATIONS TO BE CONSIDERED APPROXIMATE AND NOT TO BE USED FOR FINAL DESIGN WITHOUT FIELD VERIFICATION.

2. FORMER SOIL BORING LOCATION B-15 WAS DEVELOPED INTO MW-10.

SOIL AND GROUNDWATER SAMPLE LOCATIONS – BLDG 179/CUST RI 1999
SITE 08, NUSC DISPOSAL AREA
WORK PLAN ADDENDUM
SUPPLEMENTAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, RHODE ISLAND

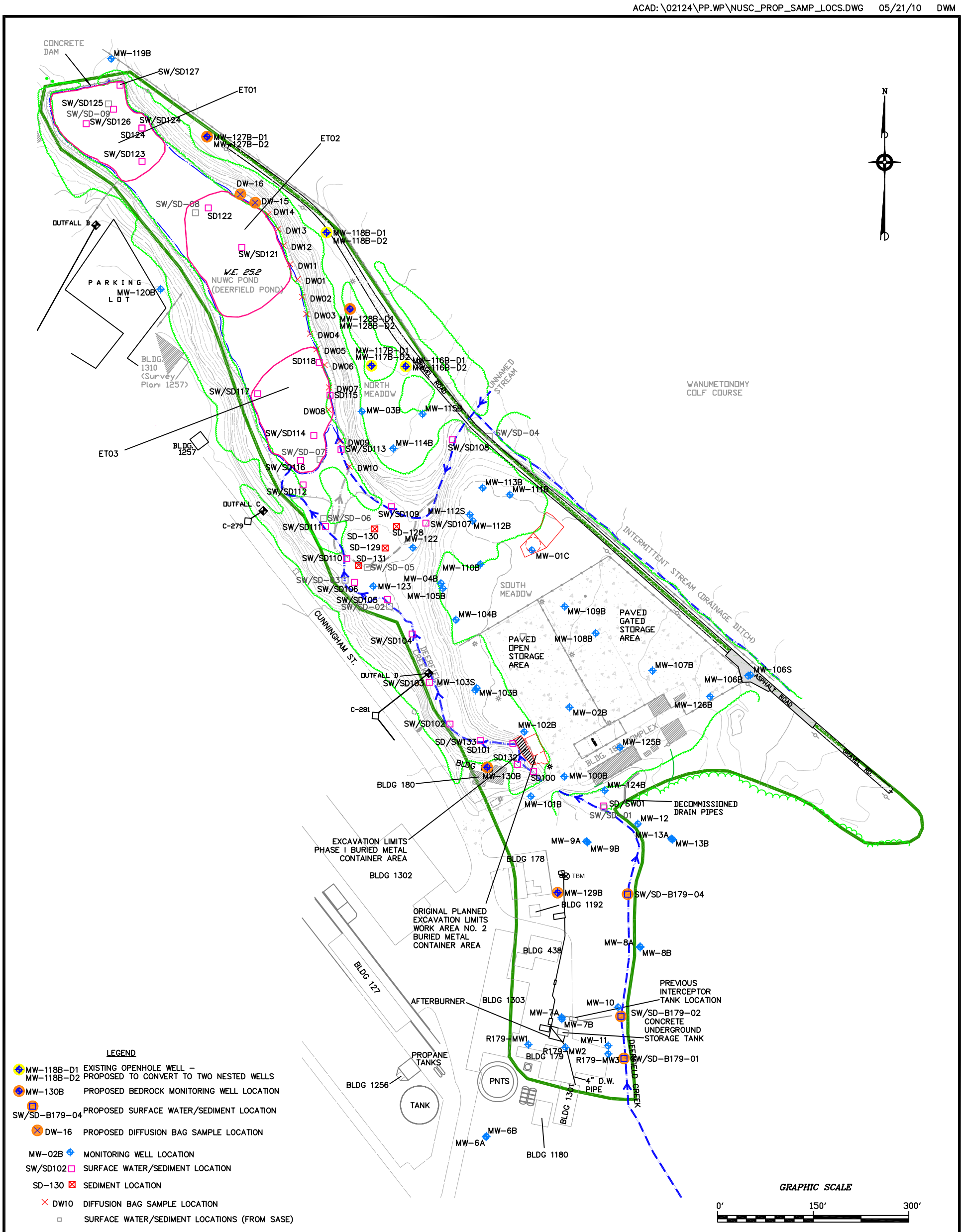
FIGURE 2-2

DRAWN BY:	D.W. MACDOUGALL	REV.:	0
CHECKED BY:	R. O'NEILL	DATE:	MAY 21, 2010
SCALE:	AS NOTED	FILE NO.:	\02124\PP.WP\NUSC_SITE_8.DWG

TETRA TECH NUS, INC.

55 Jonspin Road Wilmington, MA 01887
(978)658-7899

ACAD:\02124\PP.WP\NUSC_PROP_SAMP_LOCS.DWG 05/21/10 DWM



LEGEND

- MW-118B-D1 / MW-118B-D2 — EXISTING OPENHOLE WELL – PROPOSED TO CONVERT TO TWO NESTED WELLS
- MW-130B — PROPOSED BEDROCK MONITORING WELL LOCATION
- SW/SD-B179-04 — PROPOSED SURFACE WATER/SEDIMENT LOCATION
- DW-16 — PROPOSED DIFFUSION BAG SAMPLE LOCATION
- MW-02B — MONITORING WELL LOCATION
- SW/SD102 — SURFACE WATER/SEDIMENT LOCATION
- SD-130 — SEDIMENT LOCATION
- DW10 — DIFFUSION BAG SAMPLE LOCATION
- SURFACE WATER/SEDIMENT LOCATIONS (FROM SASE)
- BENCH MARK
- LIGHT POLE
- UTILITY POLE
- TRANSFORMER
- STREAM CHANNEL AS OBSERVED DURING FIELD ACTIVITIES, 2007–2008
- FORMER STREAM CHANNEL AS OBSERVED DURING FIELD ACTIVITIES, 2003
- VEGETATION BOUNDARY
- CATCH BASIN
- STORM DRAIN OUTLET
- STORM DRAIN
- CHAIN-LINK FENCE
- ASPHALT PAVING
- NUSC DISPOSAL AREA SITE BOUNDARY

NOTES AND REFERENCES

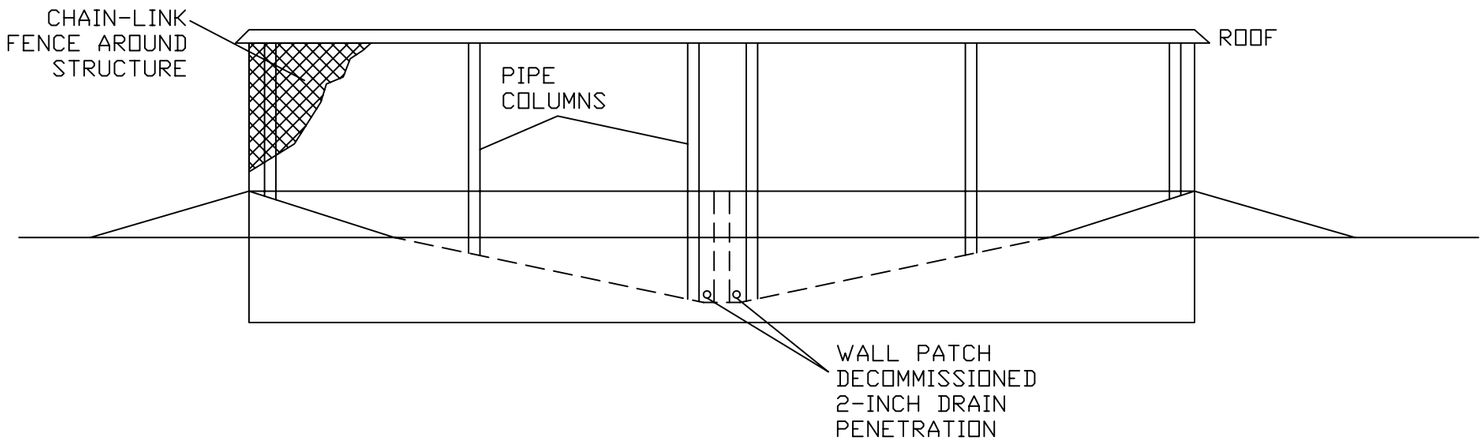
1. BASE PLAN PRODUCED BY LOUIS FEDERICI AND ASSOCIATES.
2. VERTICAL DATUM = NGVD 1929, SEE PLAN PROVIDED BY CLIENT ENTITLED "BUILDING 179 REMEDIAL INVESTIGATION FIGURE 2 EXISTING CONDITIONS PLAN", DATED 12/3/99, BY THE NAVAL UNDERSEA WARFARE CENTER DIVISION, PUBLISHED BY TRC, 12/99.
3. BENCH MARK FOUND SE CORNER O.W.S., SCRIBED X MARK TOP SE CORNER SLAB ABOVE BURIED OIL WATER SEPARATOR, ELEV. = 57.55, NGVD'29, AS DESCRIBED ABOVE.
4. HORIZONTAL DATUM = NAD 1983.
5. TOPOGRAPHY WAS PRODUCED BY DIGITAL PHOTOGRAMMETRIC METHODS FROM AERIAL PHOTOGRAPHY CONDUCTED APRIL 25, 1996 AND FROM A SURVEY CONDUCTED BY LOUIS FEDERICI ASSOCIATES, PROVIDENCE, RI, 08/14/08.
6. BUILDING 1310 (SHOWN ON SURVEY PLAN AS BLDG. 1257) FROM SURVEY LOCATION (See Note 1); BLDG. 1257 NAME & LOCATION ACCORDING TO PLAN CITED IN NOTE 7 BY THE NAVY FACILITIES ENGINEERING COMMAND.
7. LOCATIONS OF PARKING LOT NEAR BLDG. 1310 AND OUTFALLS B, C, & D ADAPTED AND INTERPRETED FROM A PLAN BY THE DEPARTMENT OF THE NAVY, NAVY FACILITIES ENGINEERING COMMAND, "STORM DRAINAGE SYSTEM, CODDINGTON COVE", CODE IDENT NO. 80091, NO DATE, IN CONJUCTION WITH THE ACTUAL FIELD SURVEY PLAN, CITED ABOVE.
8. ALL LOCATIONS TO BE CONSIDERED APPROXIMATE AND NOT TO BE USED FOR FINAL DESIGN WITHOUT FIELD VERIFICATION.
9. DIFFUSION BAG SAMPLE DW11 WQS NOT SURVEYED. LOCATION IS TAKEN FROM FIELD NOTES. SOIL BORING SAMPLES SB-136 TO SB-140 ARE NOT SURVEYED.

TETRA TECH NUS, INC.

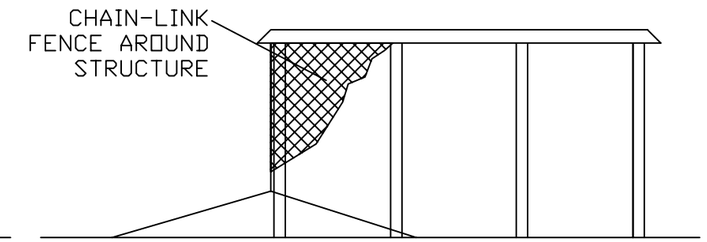
PROPOSED SAMPLE LOCATIONS:
WELLS, DIFFUSION BAGS,
AND SURFACE WATER/SEDIMENT
WORK PLAN ADDENDUM
SUPPLEMENTAL REMEDIAL INVESTIGATION
SITE 08, NUSC DISPOSAL AREA
NAVAL STATION NEWPORT, RHODE ISLAND

FILE	SCALE
\..\NUSC_PROP_SAMP_LOCS.DWG	AS NOTED
FIGURE NUMBER 3-1	REV 0 / DATE 05/21/10

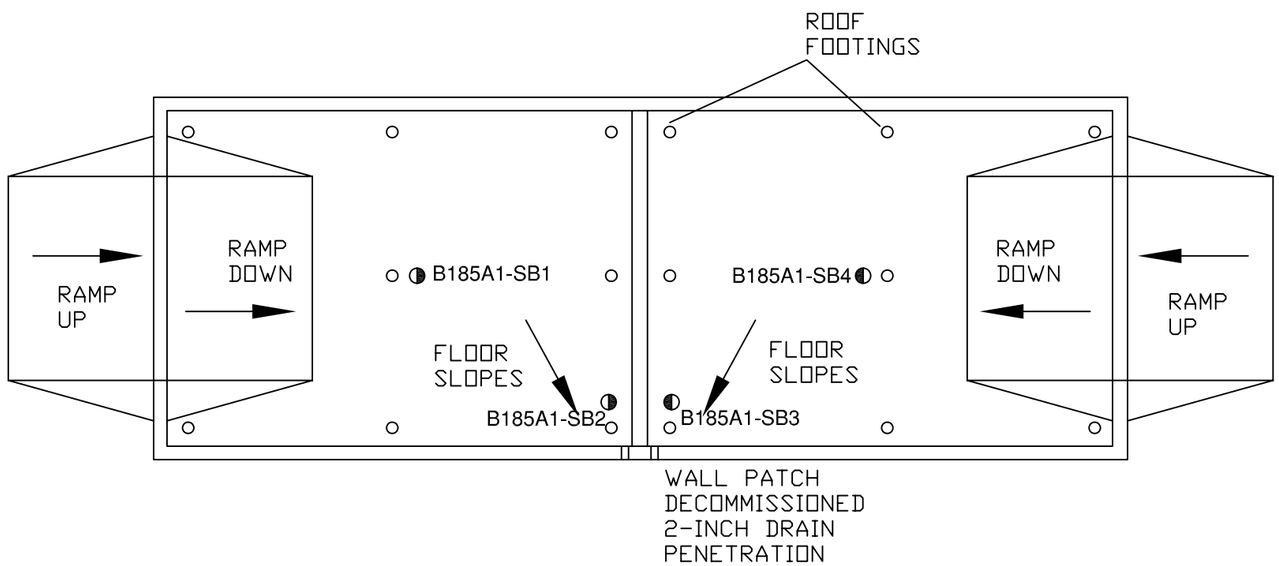
ACAD:\02124\PP.WP\NUSC_BLDG_185_1&3.DWG 01/18/10 DWM



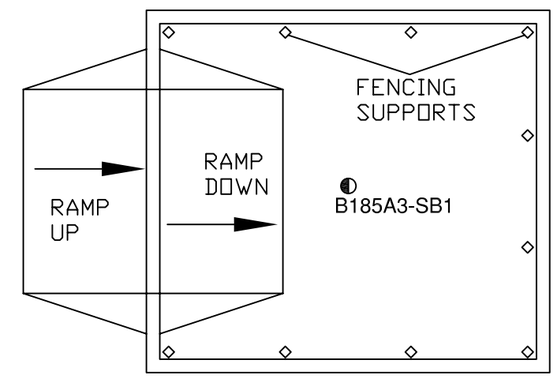
AREA NO. 1 SOUTH ELEVATION



AREA NO. 3 SOUTH ELEVATION



AREA NO. 1 PLAN VIEW



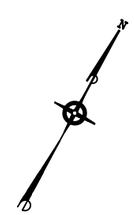
AREA NO. 3 PLAN VIEW

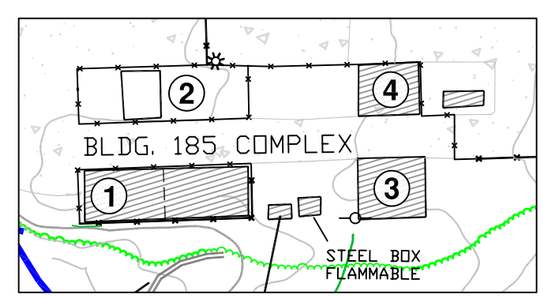
B185A3-SB2 LOCATION TO BE FIELD DETERMINED

LEGEND

◑ B185A1-SB1 PROPOSED SOIL BORING LOCATION

GRAPHIC SCALE 0' 10'



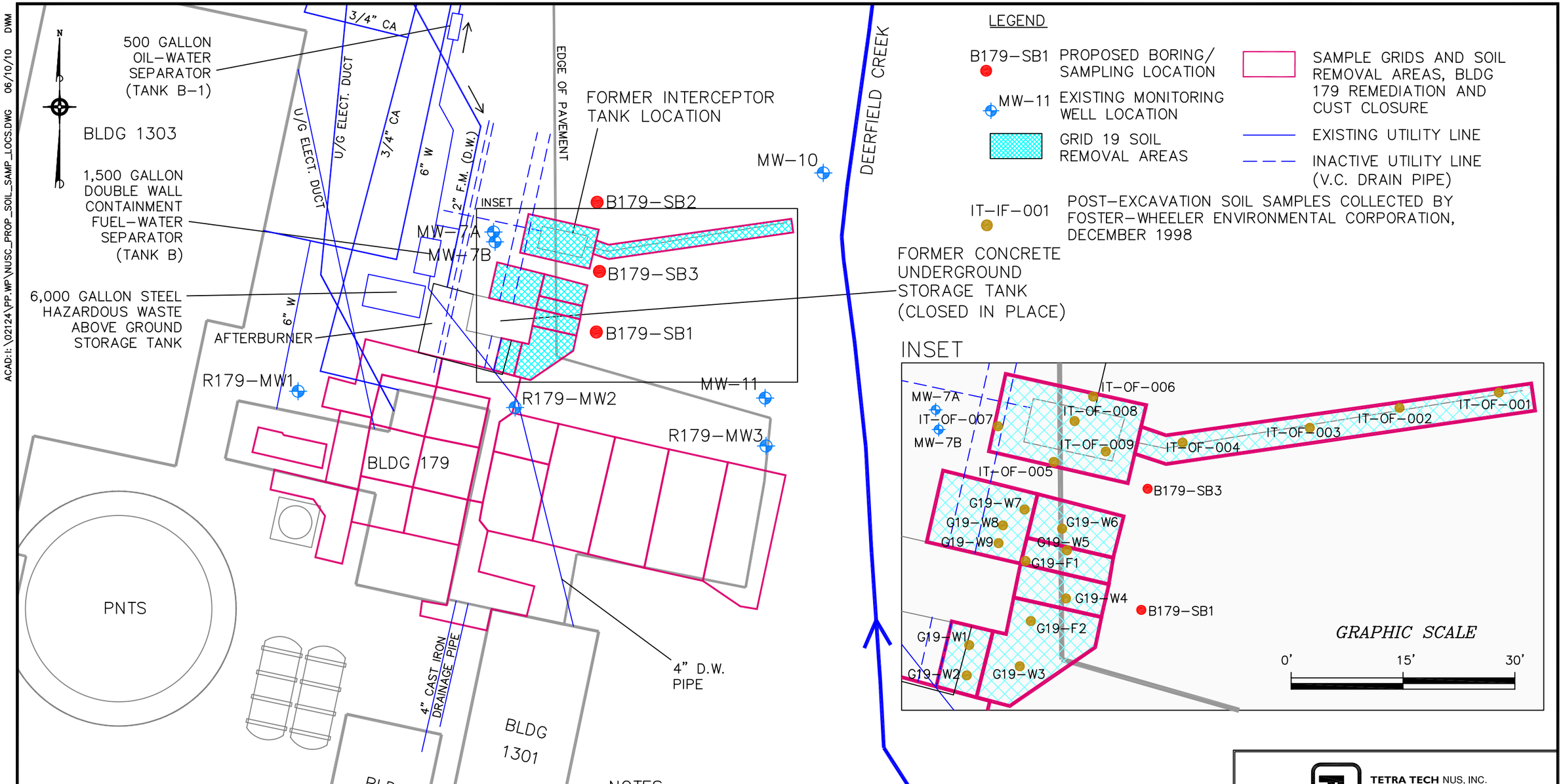


TETRA TECH NUS, INC.

PROPOSED SOIL BORING LOCATIONS:
BUILDING 185 COMPLEX AREA NOS. 1 AND 3
WORK PLAN ADDENDUM
SUPPLEMENTAL REMEDIAL INVESTIGATION
SITE 08, NUSC DISPOSAL AREA
NAVSTA NEWPORT, RHODE ISLAND

FILE	SCALE
\NUSC_BLDG_185_1&3.DWG	AS NOTED
FIGURE NUMBER 3-2	REV 0 / DATE 01/18/10

ACAD:I:\02124\PP.WP\NUSC_PROP_SOIL_SAMP_LOCS.DWG 06/10/10 DWM



LEGEND

- B179-SB1 — PROPOSED BORING/ SAMPLING LOCATION
- MW-11 — EXISTING MONITORING WELL LOCATION
- GRID 19 SOIL REMOVAL AREAS
- SAMPLE GRIDS AND SOIL REMOVAL AREAS, BLDG 179 REMEDIATION AND CUST CLOSURE
- EXISTING UTILITY LINE
- INACTIVE UTILITY LINE (V.C. DRAIN PIPE)
- IT-IF-001 — POST-EXCAVATION SOIL SAMPLES COLLECTED BY FOSTER-WHEELER ENVIRONMENTAL CORPORATION, DECEMBER 1998

INSET

NOTES

1. ALL LOCATIONS ARE TO BE CONSIDERED APPROXIMATE.
2. G19-W4 AND G19-W6 ARE THE LOCATIONS WHERE THE RIDEM INDUSTRIAL/COMMERCIAL STANDARD FOR TPH WAS EXCEEDED.

SOURCES:

FIGURES 2 AND 3, BUILDING 179 CONCRETE UST RI, TRC ENVIRONMENTAL CORPORATION, DECEMBER 1999, PREPARED FOR NUWC, NEWPORT AND APPENDIX I, FINAL PROJECT CLOSURE REPORT FOR BUILDING 179 TANK CLOSURES, FOSTER-WHEELER ENVIRONMENTAL CORPORATION, OCTOBER 1999, PREPARED FOR NUWC, NEWPORT

TETRA TECH NUS, INC.

PROPOSED SOIL BORING LOCATIONS AND POST-EXCAVATION SOIL SAMPLES:
BLDG 179 CUST AND INTERCEPTOR TANK
WORK PLAN ADDENDUM
SUPPLEMENTAL REMEDIAL INVESTIGATION
SITE 08, NUSC DISPOSAL AREA
NAVAL STATION NEWPORT, RHODE ISLAND

FILE	SCALE
\..\NUSC_PROP_SOIL_SAMP_LOCS.DWG	AS NOTED

FIGURE NUMBER	REV	DATE
FIGURE NO. 3-3	0	06/10/10

REFERENCES

REFERENCES

Foster Wheeler Environmental Corporation (FWEC), October 1999. Final Close-Out Report for Building 179 Tank Closures at the Naval Undersea Warfare Center (NUWC), Newport, Rhode Island.

FWEC, March 2000. Final Close-Out Report for Building 179 Remediation at the Naval Undersea Warfare Center (NUWC), Newport, Rhode Island.

The Environmental Compliance Group (TECG), August 1995. UST Closure Assessment, Building 179, Concrete Pits, Naval Undersea Warfare Center, Middletown, Rhode Island.

TRC, December 1999. Building 179 Concrete UST Remedial Investigation. Naval Undersea Warfare Center Division, Newport, Rhode Island. U.S. Department of the Navy.

Tetra Tech NUS, Inc. (TtNUS), September 2006. Background Soil Investigation Report for NUSC Disposal Area, SA-08, Naval Undersea Warfare Center, Middletown, Rhode Island. Tetra Tech NUS, Inc., King of Prussia, Pennsylvania.

TtNUS, January 2007. Work Plan for Remedial Investigation, Revision 2, for Site 08 – NUSC Disposal Area, Naval Station Newport, Middletown, Rhode Island. Tetra Tech NUS, Inc., King of Prussia, Pennsylvania.

TtNUS, July 2008. Basewide Background Study Report for Naval Station Newport, Newport, Rhode Island. Tetra Tech NUS, Inc., King of Prussia, Pennsylvania.

TtNUS, March 2009. Draft Remedial Investigation for Site 08, NUSC Disposal Area, Naval Station Newport, Middletown, Rhode Island. Tetra Tech NUS, Inc., King of Prussia, Pennsylvania.

U.S. Environmental Protection Agency (USEPA), May 2009. Draft Toxicological Review of 1,4-Dioxane, EPA/635/R-09/005, Washington, D.C.

USEPA, September 2009. Emerging Contaminant –1,4-Dioxane Fact Sheet. EPA 505-F-09-006. Developed by Federal Facilities Restoration and Reuse Office (FFRRO).

USEPA. Online Screening Level Calculator: http://www.epa.gov/region09/superfund/prg/rsl-table.html.

APPENDIX A

CALCULATION OF 1,4-DIOXANE SCREENING LEVEL USING EPA's PROPOSED TOXICITY CRITERIA AND EPA's ONLINE RSL CALCULATOR

SITE 08, NUSC DISPOSAL AREA

Site-specific

Resident Risk-Based Screening Levels for Tap Water

ca=Cancer, nc=Noncancer, ca* (Where nc SL < 100 x ca SL),

ca** (Where nc SL < 10 x ca SL), ++=Non-standard Method (see User's Guide),

max=SL exceeds ceiling limit (see User's Guide), sat=SL exceeds csat

Chemical	CAS Number	Ingestion SF (mg/kg-day)$^{-1}$	SFO Ref	Inhalation Unit Risk (ug/m^3)$^{-1}$	IUR Ref	Chronic RfD (mg/kg-day)	RfD Ref	Chronic RfC (mg/m^3)	RfC Ref	MCL ug/L	Ingestion SL TR=1.0E-6 (ug/L)	Inhalation SL TR=1.0E-6 (ug/L)	Carcinogenic SL TR=1.0E-6 (ug/L)	Ingestion SL HQ=1 (ug/L)	Inhalation SL HQ=1 (ug/L)	Noncarcinogenic SL HI=1 (ug/L)	Screening Level (ug/L)
Dioxane, 1,4-	123-91-1	1.9E-01	USER	-		3.0E-02	USER	-		-	3.54E-01	-	3.54E-01	1.10E+03	-	1.10E+03	3.54E-01 ca

Output generated 09NOV2009:14:15:19

Site-specific

Resident Equation Inputs for Tap Water

Variable	Value
Target cancer risk (TR) - unitless	0.000001
Target hazard quotient (THQ) - unitless	1
Averaging time (AT) - days	365
Exposure frequency (EF) - days	350
Exposure duration (ED) - years	30
Mutagenic Exposure duration (ED_{0-2}) - years	2
Mutagenic Exposure duration (ED_{2-6}) - years	4
Mutagenic Exposure duration (ED_{6-16}) - years	10
Mutagenic Exposure duration (ED_{16-30}) - years	14
Life Time (LT)	70
Exposure Time (ET) hours/day	24
Body Weight - adult (BW_a) - kg	70
Body Weight - children 1-6 yr (BW_c) - kg	15
Exposure duration - child (ED_c) - years	6
Water Ingestion - adult (IRW_a) - L/day	2
Water Ingestion - child (IRW_c) - L/day	1
Volatilization factor of Andelman (K) - L/m^3	0.5
Ingestion Factor - L-year/kg-day	1.085714286
Mutagenic Ingestion Factor - L-year/kg-day	3.390476191

Output generated 09NOV2009:14:15:19

ACRONYMS AND DEFINITIONS

SF	Slope Factor
SFO	Slope Factor Oral
SL	Screening Level
TR	Target Risk
RfD	Reference Dose
HQ	Hazard Quotient
HI	Hazard Index
USER	The RSL calculator has a toxicity database that can be used to calculate screening levels or the user can enter other toxicity criteria. "USER" under the reference column indicates the toxicity criteria were input by the user.
Toxicity Criteria Input **	Ingestion SF (mg/kg-day)-1 = 1.9E-01
	Chronic RfD (mg/kg-day) = 3.0E-02

** From "Draft Toxicological Review of 1,4-Dioxane, EPA/635/R-09/005". U.S. Environmental Protection Agency, Washington D.C., May 2009.

APPENDIX B

B1: METHOD DETECTION LIMIT (MDL) STUDY FOR PROPYLENE GLYCOL DINITRATE (PGDN)

B2: PROJECT-REQUIRED QUANTITATION LIMITS FOR PGDN ("ATTACHMENT A") AND DOD-ELAP ACCREDITATION FOR APPL, INC.

B1: METHOD DETECTION LIMIT (MDL) STUDY FOR PROPYLENE GLYCOL DINITRATE (PGDN)

INTERNAL

CORRESPONDENCE

C-NAVY-01-10-3468W

Date: January 5, 2010 c: File G02124-4.10 (w/enc.)

To: James Forrelli (w/enc.)

From: Lucy Guzman (w/enc)

Subject: MDL Study for PGDN
APPL, Inc (Laboratory)
CTO WE19, Otto Fuel Investigation, Naval Station Newport, Middletown, RI

Tetra Tech NUS, Inc. (TtNUS) reviewed the method detection Limit (MDL) study for the analysis of propylene glycol dinitrate (PGDN, CAS # 6423-43-4 by high performance liquid chromatography (HPLC) Method 8330B (SW-846). PGDN is the main component of Otto Fuel.

The MDL study was performed for aqueous and solid matrices as per requested in the statement of work. The MDL study was performed in accordance with Section 10.3 of the Method and Code of Federal Regulations, Pt. 136, Appendix B. Seven spikes and a method blank were analyzed using and Agilent 1100 HPLC with UV detector. The analysis was performed using a primary and a confirmation column.

In addition to the MDL study, APPL performed an initial demonstration of capabilities (IDC) study by analyzing four aqueous and solid matrices. The average recoveries of the four spikes in both analytical columns were 98.1/98.25 % for aqueous matrix and 84.3/82.6 % for the solid matrix. These recoveries are within the generic method control limits of 70-130%.

The HPLC was initially calibrated with nine concentrations of PGDN standards. Initial and continuing calibration criteria were met. No PDGN was reported in the laboratory method blanks and the surrogate standard has acceptable recoveries.

In summary, no analytical problems were found with the MDL or the ICD study for PGDN by EPA Method 8330B.

The APPL MDL for soil matrices is 0.083 mg/kg for and 0.083 ug/L for aqueous.

APPL is proceeding to obtain DoD certification for the analysis of PDGN by Method 8330B. Presently, APPL is establishing level of detection (LOD) and level of quantitation as required in the latest DOD Quality System Manual.

INTERNAL

CORRESPONDENCE

C-NAVY-01-10-3468W

Date: January 5, 2010 c: File G02124-4.10 (w/enc.)

To: James Forrelli (w/enc.)

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Subject: MDL Study for PGDN
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The HPLC was initially calibrated with nine concentrations of PGDN standards. Initial and continuing calibration criteria were met. No PDGN was reported in the laboratory method blanks and the surrogate standard has acceptable recoveries.

In summary, no analytical problems were found with the MDL or the ICD study for PGDN by EPA Method 8330B.

The APPL MDL for soil matrices is 0.083 mg/kg for and 0.083 ug/L for aqueous.

APPL is proceeding to obtain DoD certification for the analysis of PDGN by Method 8330B. Presently, APPL is establishing level of detection (LOD) and level of quantitation as required in the latest DOD Quality System Manual.

Initial Demonstration of Capability
APPL, Inc.

EPA 8330B PGDN Soil

PGDN1217.M

Instrument: Frank
Matrix: soil
Units: ug / kg

Data Path: H:\FRANK\HPCHEM\1\QUANT\091217\
Column ID (1): Phenomenex Luna PFP(2) 250x4.6 mm 5 micron
Extraction Ratio: 0.010kg / 20mL x DF-2

Date: 12/18/09
Analyzed By: Robert Bisnett
Extracted By: Kia Yang
Extraction Method: EPA 8330B

File ID:	1217_026.D	1217_027.D	1217_028.D	1217_029.D			
Extracted:	17-Dec-09, 10:00	17-Dec-09, 10:00	17-Dec-09, 10:00	17-Dec-09, 10:00			
Injected:	17-Dec-09, 20:24	17-Dec-09, 20:40	17-Dec-09, 20:56	17-Dec-09, 21:12			
Analyte	**1**	**2**	**3**	**4**	**Average**	**STDEV**	**C.L.**
1,2-DNB (Surrog)	87.6%	88.5%	88.5%	87.9%	88.1%	0.452%	70% - 130%
PGDN	85.8%	85.7%	83.9%	81.7%	84.3%	1.914%	70% - 130%

Initial Demonstration of Capability
APPL, Inc.

EPA 8330B PGDN Soil

PGDN1218.M

Instrument: Frank
Matrix: Soil
Units: ug/kg

Data Path: H:\FRANK\HPCHEM\1\QUANT\091218\
Column ID (1): Restek Ultra II Aromax 25 cm x 4.6 mm
Extraction Ratio: 0.010 kg / 20 mL x DF-2

Date: 12/18/09
Analyzed By: Robert Bisnett
Extracted By: Kia Yang
Extraction Method: EPA 8330B

File ID:	1218_032.D	1218_033.D	1218_034.D	1218_035.D			
Extracted:	14-Dec-09, 15:00	14-Dec-09, 15:00	14-Dec-09, 15:00	14-Dec-09, 15:00			
Injected:	18-Dec-09, 18:04	18-Dec-09, 18:20	18-Dec-09, 18:35	18-Dec-09, 18:51			
Analyte	**1**	**2**	**3**	**4**	**Average**	**STDEV**	**C.L.**
1,2-DNB (Surrog)	86.6%	86.4%	87.0%	86.6%	86.7%	0.241%	70% - 130%
PGDN	87.4%	86.4%	84.7%	82.6%	85.3%	2.09%	70% - 130%

Method Detection Limit Report
APPL, Inc.

EPA 8330B PGDN Soil

PGDN1217.M

Instrument: Frank
Matrix: Soil
Units: ug/kg

Data Path: H:\FRANK\HPCHEM\1\QUANT\091217\
Column ID (1): Phenomenex Luna PFP(2) 250x4.6mm 5 micron
Extraction Ratio: 0.010 kg / 20 mL x DF-2

Date: 12/17/09
Analyzed By: Robert Bisnett
Extracted By Kia Yang
Extraction Method EPA 8330B

	File ID:	1217_019.D	1217_020.D	1217_021.D	1217_022.D	1217_023.D	1217_024.D	1217_025.D				
	Extracted:	14-Dec-09, 15:00	14-Dec-09, 15:00	14-Dec-09, 15:00	14-Dec-09, 15:00	14-Dec-09, 15:00	14-Dec-09, 15:00	14-Dec-09, 15:00				
	Injected:	17-Dec-09, 18:33	17-Dec-09, 18:49	17-Dec-09, 19:05	17-Dec-09, 19:21	17-Dec-09, 19:37	17-Dec-09, 19:53	17-Dec-09, 20:08				
Analyte		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**StdDev**	**SpkAmt**	**RL**	**MDL**
1,2-DNB (Surrog)		222	224	222	222	222	220	222	1.20	250	NA	3.76
PGDN		428	434	428	402	422	410	405	12.6	500	250	39.7

* For sample screening purposes, the MDL will be set at 83ug/kg with an RL of 250ug/kg.

Method Detection Limit Report
APPL, Inc.

EPA 8330B PGDN Soil

PGDN1218.M

Instrument: Frank
Matrix: Soil
Units: ug/kg

Data Path: H:\FRANK\HPCHEM\1\QUANT\091218\
Column ID (1): Restek Ultra II Aromax 25 cm x 4.6 mm
Extraction Ratio: 0.010 kg / 20 mL x DF-2

Date: 12/18/09
Analyzed By: Robert Bisnett
Extracted By: Kia Yang
Extraction Method: EPA 8330B

	File ID:	1218_025.D	1218_026.D	1218_027.D	1218_028.D	1218_029.D	1218_030.D	1218_031.D				
	Extracted:	14-Dec-09, 15:00	14-Dec-09, 15:00	14-Dec-09, 15:00	14-Dec-09, 15:00	14-Dec-09, 15:00	14-Dec-09, 15:00	14-Dec-09, 15:00				
	Injected:	18-Dec-09, 16:13	18-Dec-09, 16:29	18-Dec-09, 16:45	18-Dec-09, 17:00	18-Dec-09, 17:16	18-Dec-09, 17:32	18-Dec-09, 18:04				
Analyte		1	2	3	4	5	6	7	StdDev	SpkAmt	RL	MDL
1,2-DNB(Surrog)		222	221	218	220	217	214	217	2.61	250	NA	8.20
PGDN		431	439	434	413	425	413	413	11.2	500	250	35.2

* For sample screening purposes, the MDL will be set at 83ug/kg with an RL of 250ug/kg.

Initial Demonstration of Capability
APPL, Inc.

EPA 8330B PGDN Water

PGDN1217.M

Instrument: Frank
Matrix: Water
Units: ug/L
Extraction Method: EPA 3535A

Data Path: H:\FRANK\HPCHEM\1\QUANT\091217\
Column ID (1): Phenomenex Luna PFP(2) 250x4.6mm 5 micron
Extraction Ratio: 1 L / 5 mL x DF-2

Date: 12/17/09
Analyzed By: Robert Bisnett
Extracted By: Kia Yang

	File ID:	1217_039.D	1217_040.D	1217_041.D	1217_042.D					
	Extracted:	17-Dec-09, 10:00	17-Dec-09, 10:00	17-Dec-09, 10:00	17-Dec-09, 10:00					
	Injected:	17-Dec-09, 23:50	18-Dec-09, 00:06	18-Dec-09, 00:22	18-Dec-09, 00:38					
Analyte		1	2	3	4	Average	StdDev	LCL		UCL
1,2-DNB (surrog)		105.8%	104.0%	107.5%	108.8%	104.9%	1.24%	70%	—	130%
PGDN		98.1%	98.0%	99.0%	97.8%	98.1%	0.088%	70%	—	130%

Initial Demonstration of Capability
APPL, Inc.

EPA 8330B - PGDN Water

PGDN1218.M

Instrument: Frank
Matrix: Water
Units: ug/L
Extraction Method: EPA 3535A

Data Path: H:\FRANK\HPCHEM\1\QUANT\091218\
Column ID (1): Restek Ultra II Aromax 250x4.6 mm 5 micron
Extraction Ratio: 1 L / 5 mL x DF-2

Date: 12/18/09
Analyzed By: Robert Bisnett
Extracted By: Kia Yang

	File ID:	1218_045.D	1218_046.D	1218_047.D	1218_048.D			
	Extracted:	17-Dec-09, 10:00	17-Dec-09, 10:00	17-Dec-09, 10:00	17-Dec-09, 10:00			
	Injected:	19-Dec-09, 01:45	19-Dec-09, 02:33	19-Dec-09, 03:21	19-Dec-09, 04:08			
Analyte		**1**	**2**	**3**	**4**	**Average**	**STDEV**	**C.L.**
1,2-DNB (surrog)		94.7%	95.2%	95.3%	96.2%	95.3%	0.638%	70% - 130%
PGDN		98.2%	98.9%	98.6%	98.2%	98.5%	0.331%	70% - 130%

Method Detection Limit Report
APPL, Inc.

EPA 8330B PGDN Water

PGDN1217.M

Instrument: Frank
Matrix: Water
Units: ug/L

Data Path: H:\FRANK\HPCHEM\1\QUANT\091217\
Column ID (1): Phenomenex Luna PFP(2) 250x4.6mm 5 micron
Extraction Ratio: 1 L / 5 mL x DF-2

Date: 12/17/09
Analyzed By: Robert Bisnett
Extracted By: Kia Yang
Extraction Method: EPA 3535A

	File ID:	1217_032.D	1217_033.D	1217_034.D	1217_035.D	1217_036.D	1217_037.D	1217_038.D				
	Extracted:	17-Dec-09, 10:00	17-Dec-09, 10:00	17-Dec-09, 10:00	17-Dec-09, 10:00	17-Dec-09, 10:00	17-Dec-09, 10:00	17-Dec-09, 10:00				
	Injected:	17-Dec-09, 21:59	17-Dec-09, 22:15	17-Dec-09, 22:31	17-Dec-09, 22:47	17-Dec-09, 23:03	17-Dec-09, 23:19	17-Dec-09, 23:34				
Analyte		1	2	3	4	5	6	7	StdDev	SpkAmt	RL	MDL
1,2-DNB(Surrog)		0.215	0.229	0.227	0.220	0.223	0.203	0.217	0.00869	0.200	NA	0.0273
PGDN		0.396	0.391	0.403	0.411	0.406	0.392	0.399	0.00741	0.400	0.25	0.0233

* For sample screening purposes, the MDL will be set at 0.083 ug/L with an RL of 0.25u/L.

Method Detection Limit Report
APPL, Inc.

EPA 8330B PGDN Water

PGDN1218.M

Instrument: Frank
Matrix: Water
Units: ug/L

Data Path: H:\FRANK\HPCHEM\1\QUANT\091218\
Column ID (1): Restek Ultra II Aromax 250x4.6 mm 5 micron
Extraction Ratio: 1 L / 5 mL x DF-2

Date: 12/18/09
Analyzed By: Robert Bisnett
Extracted By: Kia Yang
Extraction Method: EPA 3535A

	File ID:	1218_038.D	1218_039.D	1218_040.D	1218_041.D	1218_042.D	1218_043.D	1218_044.D				
	Extracted:	17-Dec-09, 10:00	17-Dec-09, 10:00	17-Dec-09, 10:00	17-Dec-09, 10:00	17-Dec-09, 10:00	17-Dec-09, 10:00	17-Dec-09, 10:00				
	Injected:	18-Dec-09, 20:11	18-Dec-09, 20:59	18-Dec-09, 21:46	18-Dec-09, 22:34	18-Dec-09, 23:22	18-Dec-10, 00:10	18-Dec-10, 00:57				
Analyte		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**StdDev**	**SpkAmt**	**RL**	**MDL**
1,2-DNB(Surrog)		0.189	0.185	0.185	0.191	0.186	0.190	0.185	0.00267	0.200	NA	0.0084
PGDN		0.401	0.391	0.394	0.407	0.390	0.405	0.392	0.00693	0.400	0.25	0.0218

* For sample screening purposes, the MDL will be set at 0.083ug/L with an RL of 0.25ug/L

B2: PROJECT-REQUIRED QUANTITATION LIMITS FOR PGDN ("ATTACHMENT A") AND DOD-ELAP ACCREDITATION FOR APPL, INC.

ATTACHMENT A
REQUIRED TARGET COMPOUND LIST AND PROJECT REQUIRED QUANTITATION LIMITS
SITE 08, NAVAL UNDERSEA SYSTEM CENTER (NUSC) DISPOSAL AREA
NAVAL STATION NEWPORT, MIDDLETOWN, RHODE ISLAND
SUPPLEMENTAL REMEDIAL INVESTIGATION, ANALYSIS OF PROPYLENE GLYCOL DINITRATE

Matrix: Groundwater

Analyte	CAS Number	Project Action Limit (µg/L)	Project Quantitation Limit Goal (µg/L)	Laboratory-Specific		
				LOQ (µg/L)	LOD (µg/L)	DL (µg/L)
Propylene glycol dinitrate by SW846, Method 8330B						
Propylene glycol dinitrate	6423-43-4	0.57	0.25	0.2	0.10	0.05

LOD – Limit of Detection
LOQ – Limit of Quantitation
DL – Detection Limit

Matrix: Soil

Analyte	CAS Number	Project Action Limit (µg/kg)	Project Quantitation Limit Goal (µg/kg)	Laboratory-Specific		
				LOQ (µg/kg)	LOD (µg/kg)	DL (µg/kg)
Propylene glycol dinitrate by SW846, Method 8330B						
Propylene glycol dinitrate	6423-43-4	60,000	250	750	500	250

LOD – Limit of Detection
LOQ – Limit of Quantitation
DL – Detection Limit

ANSI-ASQ National Accreditation Board

SCOPE OF DoD-ELAP ACCREDITATION

APPL, Inc.
908 N. Temperance Avenue, Clovis, CA 93611
Diane Anderson Phone: 559-275-2175

TESTING

Valid to:October 23, 2011 Certificate Number: ADE-1410

I. Environmental

MATRIX	SPECIFIC TEST or GROUP of ANALYTES	SPECIFICATION OR STANDARD METHOD (all SW846 unless specified)	* KEY EQUIPMENT OR TECHNOLOGY USED
Water / Wastewater	Acid Digestion for Metals Analysis	3010A	
Solid / Solid Waste	Acid digestion for Metals Analysis	3050B	
Water / Wastewater	Mercury Digestion and Analysis	245.1 / 7470A	AAS
Solid / Solid Waste	Mercury Digestion and Analysis	7471B	AAS
Water / Wastewater	Microwave assisted Acid Digestion for Metals Analysis	3015	Microwave
Solid / Solid Waste	Microwave assisted Acid Digestion for Metals Analysis	3051A	Microwave
Water / Wastewater	Purge and Trap for Aqueous Samples	5030B / 5030C	
Solid / Solid Waste	Closed-system purge and trap extraction for VOA analysis	5035 / 5035A	
Water / Wastewater	Separatory Funnel Extraction	3510C	
Solid / Solid Waste	Ultrasonic Extraction	3550B	Ultrasonic waterbath
Solid / Solid Waste	Soxhlet Extraction	3540C	Soxhlet Extractors

MATRIX	SPECIFIC TEST or GROUP of ANALYTES	SPECIFICATION OR STANDARD METHOD (all SW846 unless specified)	* KEY EQUIPMENT OR TECHNOLOGY USED
Water / Wastewater	Liquid-Liquid Extraction	3520C	Liquid-Liquid Extractor
Water / Wastewater / Solid / Solid Waste	Silica gel cleanup	3630C	
Solid / Solid Waste	Incremental sampling	8330B, Appendix A	Puck mill grinder
Water / Wastewater / Solid / Solid Waste	Sulfur cleanup	3660B	
Water / Wastewater / Solid / Solid Waste	Sulfuric acid – permanganate cleanup	3665A	
Water / Wastewater / Solid / Solid Waste	Gel permeation cleanup	3640A	
Solid / Solid Waste	TCLP extraction	1311	Rotary Tumbler
Solid / Solid Waste	SPLP extraction	1312	Rotary Tumbler
Solid / Solid Waste	Waste Extraction Test (WET)	CCR Chapter 11, Article 5, Appendix II	Rotary Tumbler
Water / Wastewater	Total Dissolved Solids	160.1 / 2540C	Gravimetric
Water / Wastewater	Total Suspended Solids	160.2 / 2540D	Gravimetric
Water / Wastewater	Anion analysis	300.0 / 9056 / 9056A	Dionex Ion Chromatography
Solid / Solid Waste	Anion analysis	9056 / 9056A	Dionex Ion Chromatography
Water / Wastewater / Solid / Solid Waste	Perchlorate analysis	314.0	Dionex Ion Chromatography
Water / Wastewater / Solid / Solid Waste	Ammonia	350.1	Lachat Flow Injection Analysis
Water / Wastewater / Solid / Solid Waste	TKN	351.2	Lachat Flow Injection Analysis
Water / Wastewater / Solid / Solid Waste	Nitrate / Nitrite	353.2	Lachat Flow Injection Analysis
Water / Wastewater / Solid / Solid Waste	Sulfide	376.1	Titrimetric
Water	Fluoride	9214	Ion Selective Electrode

MATRIX	SPECIFIC TEST or GROUP of ANALYTES	SPECIFICATION OR STANDARD METHOD (all SW846 unless specified)	* KEY EQUIPMENT OR TECHNOLOGY USED
Drinking Water / Water / Wastewater / Solid / Solid Waste	PCB Congeners	1668	High Resolution GC/MS
Water / Wastewater / Solid / Solid Waste	Perchlorate	6850	HPLC/Electrospray Ionization/MS
Water / Wastewater	Oil & Grease	1664A	Gravimetric
Water / Wastewater	Oil & Grease	5520B	Gravimetric
Water / Wastewater	TRPH	5520BF	Gravimetric
Water / Wastewater / Solid / Solid Waste	Total Metals	6010B / 6010C	ICP
Water / Wastewater / Solid / Solid Waste	Total Metals	6020 / 6020A	ICP/MS
Water / Wastewater / Solid / Solid Waste	Hexavalent Chromium	7196A	UV/Vis
Solid / Solid Waste	Alkaline digestion of Hexavalent Chromium	3060A	
Water / Wastewater	Hexavalent Chromium	218.6 / 7199	Dionex Ion Chromatography
Water / Wastewater / Solid / Solid Waste	Total Cyanide Distillation	9010B / 9010C	Midi-Distillation unit
Water / Wastewater / Solid / Solid Waste	Total Cyanide Analysis	9014	UV/Vis
Water / Wastewater	Corrosivity - pH	9040B	Ion Selective Electrode
Solid / Solid Waste	Corrosivity - pH	9045C / 9045D	Ion Selective Electrode
Water / Wastewater / Solid / Solid Waste	Chlorinated & Brominated Hydrocarbons	8011	GC/ECD
Water / Wastewater / Solid / Solid Waste	DRO/GRO	8015B/C/D	GC/FID
Water / Wastewater / Solid / Solid Waste	BTEX	8021B	GC/PID
Water / Solid	OP Pesticides	614 / 8141A / 8141B	GC/ECD
Water / Waste Water	OP Pesticides	614	GC/ECD

MATRIX	SPECIFIC TEST or GROUP of ANALYTES	SPECIFICATION OR STANDARD METHOD (all SW846 unless specified)	* KEY EQUIPMENT OR TECHNOLOGY USED
Water / Waste Water	OCL Pesticides	608	GC/ECD
Water / Wastewater / Solid / Solid Waste	OCL Pesticides	8081A / 8081B	GC/ECD
Water / Waste Water	PCB	608	GC/ECD
Water / Wastewater / Solid / Solid Waste	PCB	8082 / 8082A	GC/ECD
Water / Waste Water	Herbicides	615	GC/ECD
Water / Wastewater / Solid / Solid Waste	Herbicides	8151A	GC/ECD
Water / Wastewater / Solid / Solid Waste	VOA	8260B / 8260C	GC/MS
Water / Wastewater / Solid / Solid Waste	PAH	8270 SIM	GC/MS
Water / Waste Water	Semi-VOA	625	GC/MS
Water / Wastewater / Solid / Solid Waste	Semi-VOA	8270C / 8270D	GC/MS
Water / Wastewater / Solid / Solid Waste	Dioxins	8290	HRGC/HRMS
Water / Wastewater / Solid / Solid Waste	Nitroaromatics & Nitramines & Nitroguanadine	8330A / 8330B / 8321A&B	HPLC
Water / Wastewater / Solid / Solid Waste	Carbamates	8321A / 8321B	HPLC
Solid / Solid Waste	Ignitability	1030	

Notes:

1. ** = As Applicable*
2. *This scope is part of and must be included with the Certificate of Accreditation No. ADE- 1410*

Vice President

ANSI-ASQ National Accreditation Board/ACLASS

January 20, 2010

Diane Anderson / Frances Lediaev
APPL Labs
908 N. Temperance Avenue
Clovis, CA 93611

Dear Diane and Frances,

We have reviewed the materials submitted by your laboratory and can confirm that they have provided sufficient documentation indicating all requirements of the DoD QSM have been met for the new analyte as you have requested. We can therefore recommend that any formal analyte list for method 8330A/8330B pertinent to APPL Labs could be expanded by the addition of propylene glycol dinitrate [PGDN] at this time.

We understand that there is no current commercial PT testing for this analyte, so it will not be in the "DoD-approved PT" listing that we publish, but that does not deny our verification of the competence review that has been favorable for this analyte.

The addition of this analyte to the existing, accredited method falls within the allowable additions to the method and does not require a new method listing in the current scope of accreditation.

Please let us know if we can assist you any further in this matter.

Best wishes.

Bill Hirt, Ph.D.

Bill Hirt, Ph.D.
ANSI/ASQ National Accreditation Board / ACLASS
Director of Accreditation

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