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NAVSTA NEWPORT RI
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DRAFT

30% REMOVAL ACTION WORK PLAN FOR SOIL REMOVAL AND REVETMENT CONSTRUCTION AT OLD FIRE FIGHTING TRAINING AREA NAVAL STATION NEWPORT NEWPORT, RHODE ISLAND

Prepared for:

DEPARTMENT OF THE NAVY
ENGINEERING FIELD ACTIVITY, NORTHEAST
Naval Facilities Engineering Command
10 Industrial Highway, Mail Stop #82
Lester, Pennsylvania 19113

REMEDIAL ACTION CONTRACT NO. N62472-99-D-0032
Contract Task Order No. 102

March 11, 2005

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CONTROL NO. 06

CONTRACT NO.	CONTRACT TASK ORDER NO.	ACTIVITY LOCATION
N62472-99-D-0032	**0102**	**Naval Station Newport – Newport, RI**

PROJECT TITLE:
OFFTA – Soil and Debris Removal

FROM:	DATE
Tetra Tech EC, Inc.: Program QC Manager Thomas Kelly	March 11, 2005
TO:	DATE
C. Frye (2 CD-Copies and 1 Hard Copy)	March 11, 2005

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ITEM NO.	SUBMITTAL DESCRIPTION	PREPARED/ SUBMITTED BY	APPROVED	DISAPPROVED	REMARKS
1	SD-08, Statements; Draft 30% Removal Action Work Plan for Soil Removal and Revetment Construction at Old Fire Fighting Training Area	Helene Ropars			

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ACROYNMS AND ABBREVIATIONS

AASHTO	American Association of State Highway and Transportation Officials
ARAR	Applicable or Relevant and Appropriate Requirements
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
COTR	Contracting Officer's Technical Representative
CQC	Construction Quality Control
CRF	Change Request Form
CRMC	Coastal Resource Management Control
CTO	Contract Task Order
Cy	Cubic Yards
EFANE	Engineering Field Activity, Northeast
EMAC	Environmental Multiple Award Contractor
FFA	Federal Facilities Agreement
FS	Feasibility Study
IRP	Installation Restoration Program
lb	Pound
LDR	Land Disposal Restrictions
MLW	Mean Low Water
NAVSTA	Naval Station
NCR	Non-Conformance Report
NESHAP	National Emissions Standards for Hazardous Air Pollutants
NETC	Naval Education and Training Center
NOS	Not Otherwise Specified
NPL	National Priorities List
NTR	Navy Technical Representative
OFFTA	Old Fire Fighting Training Area
PAH	Polynuclear Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
PDI	Pre-Design Investigation
PESM	Project Environmental and Safety Manager
PPE	Personal Protective Equipment
ppm	Parts Per Million
PQCM	Program Quality Control Manager
PRG	Preliminary Remedial Goals
QC	Quality Control
RAC	Remedial Action Contract
RCRA	Resource Conservation and Recovery Act
RFI	Request for Information
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
RIDEM	Rhode Island Department of Environmental Management
RIPDES	Rhode Island Pollutant Discharge Elimination System
ROICC	Resident Officer in Charge of Construction
SARA	Superfund Amendments and Reauthorization Act
SER	Shore Realignment Establishment
SHSO	Site Health and Safety Officer
SHSP	Site Specific Health and Safety Plan
SQCM	Site Quality Control Manager
SVOC	Semi-Volatile Organic Compounds

ACROYNMS AND ABBREVIATIONS (Cont'd)

TCLP	Toxic Characteristic Leaching Procedure
TPH	Total Petroleum Hydrocarbons
TRC	TRC Environmental Corporation
TSDF	Treatment, Storage and Disposal Facility
TtEC	Tetra Tech EC, Inc.
TtNUS	Tetra Tech NUS, Inc.
USACE	Unites States Army Corps of Engineers
USDOT	United States Department of Transportation
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compounds

1.0 INTRODUCTION

Tetra Tech EC, Inc. (TtEC) has been contracted by the Department of the Navy, Engineering Field Activity, Northeast (EFANE) to perform excavation of contaminated soil, backfill, and construction of a stone revetment at the Old Fire Fighting Training Area (OFFTA), located at Naval Station (NAVSTA) Newport, in Newport, Rhode Island. This Removal Action Work Plan has been prepared to satisfy the requirements of the Remedial Action Contract (RAC) No. N62472-99-D-0032, Contract Task Order (CTO) No. 102.

1.1 Project Background

Tetra Tech NUS, Inc. (TtNUS) performed a pre-design investigation (PDI) (TtNUS, 2004b) for soils at the OFFTA Site. The objective of the PDI was to acquire data to assess the horizontal and vertical extent of construction debris and the extent of soil contamination to determine the volume of debris and soil that will be removed in each of two planned actions. The first action was removal of debris and soil contained in three mounds above the base grade elevation of the Site, performed by another Navy contractor. The second action will remove soil and fill exceeding removal action goals located below the base grade elevation of the Site (subsurface material). These subsurface materials are the subject of an Action Memorandum (pending) This Removal Action Work Plan discusses implementation of the below grade removal action.. The removal action involves removal and off-site disposal of all soils exceeding the Preliminary Remediation goals (PRG) above the historical low water line. The removal action also includes removal of Total Petroleum Hydrocarbons (TPH) contaminated soil exceeding Rhode Island state standards or containing free product to the maximum depth practical. Follow on activities associated with any remaining contamination is not addressed in this work plan.

1.2 Site Location and Description

NAVSTA Newport is located approximately 60 miles southwest of Boston, Massachusetts and 25 miles south of Providence, Rhode Island. It occupies approximately 1,063 acres, with portions of the facility located in the City of Newport and Towns of Middletown and Portsmouth, Rhode Island. The facility layout is long and narrow, following the western shoreline of Aquidneck Island for approximately 6 miles facing the east passage of Narragansett Bay.

1.2.1 Site Conditions

The OFFTA Site is located at the northern end of Coasters Harbor Island (see Figure 1). The Site occupies approximately 5.5 acres and is bordered by Taylor Drive to the south and is surrounded by Coasters Harbor (part of Narragansett Bay) to the east, north, and west. The OFFTA Site is generally flat, with base grade surface elevations ranging from 8 to 12 feet above mean low water (MLW).

The shoreline has been partially eroded by wave action, particularly on the western side of the Site. Tide change over a six-month period ranges between 2.6 and 4.5 vertical feet (Newport).

The Site is entirely vegetated with grass except for a gravel-surfaced temporary parking lot located in the center portion of the Site. The temporary parking lot was occupied by a baseball field until 2002. A one-story concrete block building (Building 144), used for recruiting offices, is located along the southern side of the Site. Recreational equipment north of the building has been fenced off to restrict access. Access to the Site is restricted by a chain link fence along its eastern, southern, and western sides, except for the temporary parking lot, which has been cordoned off from the rest of the Site.

1.3 Site History

The NAVSTA Newport facility has been in use by the Navy since the era of the Civil War. During World Wars I and II military activities at the facility increased significantly and the base provided housing for many servicemen. In subsequent peacetime years, use of on-site facilities was slowly phased out until Newport became the headquarters of the Commander Cruiser-Destroyer Force Atlantic in 1962. In April 1973, the Shore Establishment Realignment (SER) Program resulted in the reorganization of naval forces and activity at the base again declined. This reorganization resulted in the Navy excessing some 1,629 acres of its 2,420 acres. Portions of the facility are currently leased by the Navy to the State of Rhode Island Port Authority and Economic Development Corporation. Some of these areas are, in turn, subleased to private enterprises.

The entire NAVSTA Newport was listed on the United States Environmental Protection Agency (USEPA) National Priorities List (NPL) of abandoned or uncontrolled hazardous waste sites in November 1989. The NPL identifies those sites that pose a significant threat to the public health and environment. The OFFTA Site was listed as one of the sites requiring Remedial Investigation/Feasibility Study (RI/FS) activities. It is currently being studied by the Navy under the Department of Defense Installation Restoration Program (IRP). This program is similar to the USEPA's Superfund Program authorized under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) in 1980 and as amended by the Superfund Amendments and Reauthorization Act (SARA) in 1986.

A Federal Facilities Agreement (FFA) for NAVSTA Newport (then Naval Education and Training Center (NETC)) was signed by the Navy, the State of Rhode Island, and the USEPA on March 23, 1992. The FFA outlines response action requirements under the Department of Defense IRP at NAVSTA Newport. The FFA was developed, in part, to provide a framework to address environmental impacts associated with past and present activities at NAVSTA Newport. As part of the FFA, regulatory agencies must review all documents pertaining to cleanup of the OFFTA Site.

The OFFTA Site was home to a Navy fire fighting training facility from World War II until 1972. During the training operations, fuel oils were ignited in various structures at the Site including burn pits, so-called Christmas Tree above-ground nozzle array, and small buildings that simulated shipboard compartments. Ignited fires were then extinguished by sailors. It was reported that the two "Carrier Compartment" buildings were injected with a water/oil mixture that was subsequently set on fire for fire fighting practice. Underground piping reportedly carried the water/oil mixture to the buildings and from the buildings to an oil/water separator. Drainage piping from historic photos and maps provided in the Feasibility Study (FS) report (TtNUS, 2002a) shows pipes from the separator discharged to Coasters Harbor to the north.

The fire fighting training facility was closed in 1972. Upon closure, the training structures were reportedly demolished and buried and compacted into mounds on the Site and then the entire area was covered with topsoil. The Site was then converted to a recreational area (Katy Field) with a playground, a baseball field, and a picnic area with an open pavilion and barbecue grills. The field was dedicated on July 4, 1976 and used as a recreational area until its closure in October 1998.

In its 22 years as a recreational area, the Site was used for organized activities including youth day camps, picnic functions, and little league baseball (1 year only), as well as for general recreation. A child day care center operated out of Building 144 on the Site from approximately 1983 through January 1994 when it was relocated off-site to a larger facility on base.

Aerial photos and facility maps for the period from 1939 through 1988 were reviewed to better evaluate the Site history. Activity on the Site appears to date back to approximately 1943. A 1953 facility design map indicates the locations of structures and Site features associated with fire fighting training exercises. An aerial photo taken in May 1944 depicts the Site with structures in a similar layout to that shown on the 1953 facility design map. Based on the design map and subsequent facility condition maps, on-site structures included an administration building, hose house, two carrier compartments, smothering pit, separator pit, foam pit, simulated ship structures, suction pumps, and oil tanks.

The indexes that accompanied some of the facility conditions maps indicate that the on-site structure that was used in recent years as a day care center was once used as "wash and dressing rooms." No significant visible Site changes are noted from 1944 until a 1975 aerial photo of the Site, when the structures and facilities associated with the fire fighting training area are no longer evident, with the exception of the "hose house" and Building 144. As of 1987, the Site appears similar to its current condition, with soil mounds visible in the central and western portions of the Site and a pavilion in the east-central portion of the Site.

1.4 Results of Previous Studies

The PDI (TtNUS, 2004b) was preceded by a Remedial Investigation (RI) and a FS completed in 2001 and 2002, respectively. Data from all prior investigations conducted by TtNUS and TRC Environmental Corporation (TRC) (TRC, 1994) were assimilated into these reports, including three phases of the RI, a source removal investigation, and risk assessment reports. The overall findings reported in these studies are summarized below:

- Semi-volatile organic compounds (SVOC) were detected in all media across the Site. The most prevalent SVOC detected were polynuclear aromatic hydrocarbons (PAH) with the highest concentrations detected in surface and subsurface soil and groundwater sampling locations near Coasters Harbor. PAH concentrations in surface soils, subsurface soils, groundwater, and stormwater exceed Rhode Island Department of Environmental Management (RIDEM) Residential Direct Exposure Criteria for soils.
- Metals were detected throughout the Site. Metals concentrations were generally higher in site soil and groundwater relative to the same metals in background soil and upgradient groundwater locations. Metals concentrations in both surface soils and subsurface soils exceeding RIDEM Residential Direct Exposure Criteria for soils were arsenic, beryllium, lead, and manganese.
- TPH were detected in the subsurface throughout the Site exceeding RIDEM Residential Direct Exposure Criteria at depths ranging from 3 to 11 feet below ground surface (bgs). Petroleum contamination was observed visually in the central portion of the Site in soils sampled immediately above the water table.

1.5 Pre-Design Investigation Activities and Results

The PDI (TtNUS, 2004b) included field investigation activities, sample analysis and data review, and data evaluation and reduction. The objective of the PDI was to provide data to assess the horizontal and vertical extent of construction debris and the extent of soil that exceeds selected PRG across the Site.

The resulting data was evaluated to determine the volume of material in the subsurface below the base grade that will be considered for removal. The resulting data was used in support of this Removal Action Work Plan.

1.6 Project Objectives

At the Navy's direction, the objectives of the removal action are as the follows:

- Construct a stone revetment along the shoreline to absorb wave action, protect sensitive environments, and prevent sediment scouring at the foot of the slope.
- Excavate and dispose of approximately 52,511 cubic yards (cy) of soil and fill from the OFFTA Site to the limits and depths of historic low groundwater. The type of materials to be excavated are shown on Figures 3 through 7.
- The historical elevations of the groundwater as provided by TtNUS are shown in Figure 8. Based on TtNUS report, it is estimated that 46,802 cy will be excavated from the ground surface to the groundwater and 5,709 cy of petroleum contaminated soil will be excavated in the water to an approximate depth of 3 feet below the groundwater elevation. Preliminary estimate , final quantity to be confirmed prior to next submittal.
- Where petroleum contaminated soil exists below the historical low groundwater elevation in exceedence of the RIDEM Residential Direct Exposure Criteria (500 parts per million (ppm) TPH) or free petroleum product is present, removal of this soil will be attempted. The excavation will be performed to approximately 3 feet below groundwater to remove petroleum compounds in exceedance of 500 ppm. The 3 feet depth was selected as this is estimated to be the deepest that excavation with conventional equipment can practically be performed without the use of sheet piling and dewatering equipment. Deeper excavations can be performed, but become increasingly impractical due to lack of visibility, potential of side slope failure and cross contamination. Where soil conditions permit, the removal will be accomplished to the maximum extent practical by sequencing the removal to occur at low tide. Where side slope failure and sloughing occurs and in the judgement of the superintendent is no longer feasible, excavation will be discontinued.
- The excavation procedure is shown in Figure 9.

2.0 PROJECT MANAGEMENT

The Project Management Team will be responsible for all technical and administrative aspects of the project. Technical responsibilities include completion of the required remediation and construction activities in accordance with the Removal Action Work Plan and the *Rhode Island Rules and Regulations for the Investigation and Remediation of Hazardous Material Releases* (Remediation Regulations) (RIDEM, February 2004). Included among the team's administrative responsibilities are project communications, project controls and scheduling, document control, and project meetings.

2.1 Project Team Organization

The following TtEC personnel are considered to be key team members for the performance of this project:

<u>Project Manager, Carl Tippmann</u>: The responsibility of the Project Manager is general oversight of all facets of the project. The Project Manager will be responsible for the oversight, resource allocation, scheduling, and quality control of the project. The Project Manager is also the Program Manager and is

the first point of contact for the Contracting Officer's Technical Representative (COTR) and the Design Navy Technical Representative (NTR).

Project Superintendent, Dan Sullivan: The Project Superintendent will be responsible for all on-site construction activities including supervision of craft labor and subcontractors and control of materials and equipment. The Project Superintendent reports directly to the Project Manager and Design NTR and interfaces with the Project Engineer and Site Quality Control Manager (SQCM) on a daily basis to ensure that quality control standards are being met.

Craft Supervisor, TBD: The Craft Supervisor will be responsible for construction activities in the absence of the project superintendent and will supervise craft labor and subcontractors. The Craft Supervisor reports directly to the Project Superintendent and interfaces with the Project Engineer and SQCM.

Project Engineer, TBD: The responsibility of the Project Engineer is to provide guidance to the field construction staff relating to compliance with the Removal Action Design Work Plan and to prepare technical plans and submittals. The Project Engineer reports directly to the Project Superintendent.

Project Procurement Engineer, Dean Peterson: The Project Procurement Engineer is responsible for procurement of materials and equipment and reports directly to the Project Superintendent.

Project Controls Engineer, George Sze: The Project Controls Engineer is responsible for project controls, including scheduling, invoicing, and financial reporting and reports directly to the Project Superintendent.

Project Environmental and Safety Manager (PESM), Grey Coppi: The PESM is responsible for general oversight of the health and safety procedures used on this project. He will consult with and give direction to the Site Health and Safety Officer (SHSO).

SHSO, TBD: The SHSO will be responsible for the overall health and safety of all employees on site. The SHSO will be responsible for daily health and safety monitoring, implementation of all health and safety procedures and requirements, and maintenance of health and safety records. The SHSO will have the authority to shut down any operation that is deemed to be unsafe. The SHSO will report to the PESM and will interface closely with the Project Superintendent.

Program Quality Control Manager (PQCM), Tom Kelly: The PQCM is responsible for approval and oversight of quality control activities and procedures used on the project. He will provide direction to the SQCM.

Site Quality Control Manager, TBD: The SQCM will be responsible for performing inspection and surveillance activities and for documenting results of these activities as required to achieve the quality of construction required by the Removal Action Work Plan. The SQCM will report to the PQCM and will interface with the Project Engineer and Project Superintendent.

2.2 Project Communication

Communication between TtEC and NAVSTA Newport Security, Public Works, Environmental Office, and other departments will be through the Construction NTR in the office of the Resident Officer in Charge of Construction (ROICC).

2.3 Project Schedule

The project schedule is included in Appendix A. The construction of the project is anticipated to start in August 2005. The completion date is anticipated in mid-February 2006.

2.4 Document Control

Quality control records, test reports, submittals and approvals, as-built drawings, changes to the contract, updated construction schedules, invoices, daily reports, and all other project record documents, as required, will be maintained in the project files. The files will be located in the site office and will be available for review by the Navy.

A Submittal Register, which summarizes the submittal requirements of the project, are included in the Construction Quality Control (CQC) Plan in Appendix B. Submittals will be prepared by the SQCM for review and approval by the PQCM. Copies of the approved submittals will be forwarded to the Construction NTR for information only.

Technical changes to the work identified by TtEC and reporting of non-conforming items will be documented by the submittal of Change Request Form (CRF), Request for Information (RFI), and Non-Conformance Report (NCR) to the Navy for disposition. Formats that will be used for these reports are included in the CQC Plan in Appendix B. Submittal of the above reports will be noted in the weekly progress meeting minutes. Each of the above items is discussed below:

- CRF will be submitted by TtEC in the event that a change in site conditions arises that requires modification to the Removal Action Work Plan. TtEC will draft a CRF to identify the problem and will propose a course of action to remedy the problem. TtEC will submit CRF to the Navy ROICC, Design NTR and COTR for review. The Navy will forward each CRF to the regulatory agencies to request input prior to providing TtEC with direction regarding resolution of the CRF.
- If a field situation arises that requires clarification and does not result in a change to the Removal Action Work Plan, TtEC will submit an RFI to obtain such clarification. RFI will be submitted to the Navy ROICC and Design NTR for disposition.
- NCR will be prepared by TtEC's SQCM in the event that an aspect of the construction activities does not conform to the Removal Action Work Plan and cannot be repaired. NCR will be submitted to the Navy ROICC and Design NTR for disposition.

2.5 Project Meetings

2.5.1 Pre-Construction Meeting

Before any physical work begins on the Site, the TtEC project staff and the Navy and their representatives will meet to discuss coordination of the project. Items to be discussed in this meeting will include access to the Site, working hours, specific health and safety issues, and general scheduling of the work.

2.5.2 Weekly Quality Control (QC)/Progress Meeting

QC/Progress Meetings will be conducted once per week. The meetings will be held at the TtEC field office unless otherwise requested by the Navy. Any interested project team member, or their designee, may attend the progress meeting in person. Any interested project team member wishing to participate in the progress meeting via telephone conference call must contact the TtEC site trailer a minimum of one business day prior to the meeting. Meeting minutes will be distributed by e-mail or fax within two

business days of the meeting. Prior to the start of the project, an e-mail will be sent to the project distribution list to identify persons who wish to be included on the meeting minute e-mail distribution list.

2.5.3 Daily Safety Meeting

TtEC supervisory personnel will hold daily tailgate safety meetings to advise the workers of proper methods of performing the work planned for the day. The topics of discussion will be listed on a sign-in sheet and the sheet will be kept as a record of the meeting.

2.6 Status Reports

TtEC will prepare monthly status reports for the project. The status reports will include a Technical Progress Report, Non-Compliance Report, Cost Performance Report, Project Schedule, updated Submittal Register, Government Materials Tracking Report, Variance Analysis Report, and a Waste Materials Report.

2.7 Daily Production Report/CQC Report

For every day that work is performed, TtEC will prepare and submit the Daily Production Report/CQC Report to the Navy. The report will be submitted to the Navy the following business day.

2.8 Submittal Register

The CQC representative will prepare and continually update a Submittal Register to document QC for materials, inspection, and testing. The Submittal Register will be maintained on-site and available for review.

2.9 Regulatory Agency Personnel Site Visits

Regulatory agency personnel who visit the Site and have questions or comments concerning the work will give those questions or comments, in writing, directly to the on-scene representative from NAVSTA Environmental Office, who will forward them to the ROICC and Design NTR and the COTR for disposition. The COTR will provide a written response to questions or comments within 5 business days from receipt of such questions or comments. In the event that a regulatory agency concern is submitted that requires immediate action and the COTR cannot be reached, the on-scene representative from the NAVSTA Environmental Office will coordinate with the ROICC and TtEC to address the immediate concern. Except in the event of an immediate threat to safety or the environment, any requests for additional work to be performed must be submitted in writing by the regulatory agency to the NAVSTA Environmental Office. This request will be forwarded to the COTR, who will provide appropriate technical direction to TtEC. All regulatory agency personnel must have training in accordance with 29 Code of Federal Regulations (CFR) 1910.120 and sign in at the TtEC office trailer immediately upon arrival at the Site.

3.0 DESCRIPTION OF ACTIVITIES

3.1 Anticipated Tasks

The following tasks are anticipated to be performed:

- Mobilize and install temporary facilities.
- Install security fence.
- Install and maintain soilerosion and sediment control measures.
- Construct temporary decontamination facilities.
- Construct soil staging area.
- Construct stone revetment.
- Investigate buried structure evidenced by manhole cover (was under Central Mound), may be a former oil/water separator.
- Excavate contaminated soil.
- Backfill the excavated areas.
- Installation of pipes and risers if all of the TPH cannot be removed.
- Load soil for off-site transportation and disposal following waste characterization by others.
- Upgrade of existing two storm lines that cross the site.
- Construct gravel road along shoreline at top of revetment (double as walking trail).
- Restore gravel parking lot to the site the way it was before mound removal started.
- Seeding.
- Perform site restoration.
- Demobilize resources.

3.2 Labor Requirements

TtEC anticipates that the following union craft labor will be required for the proposed activities:

- Operating Engineers 4.
- Laborers 7.
- Teamsters 2.

3.3 Equipment Requirements

Major construction equipment that will be used on this project, (Note: the Project Superintendent may substitute or add equipment as required), will include the following:

- D-6 bulldozer.
- Cat 350 excavator.
- (2) 30-ton off-road dump trucks.
- (2) 5 cy Loaders.
- 15-ton vibratory roller.

3.4 Construction QC

A CQC Plan has been prepared for this project (Appendix B). CQC will be performed on-site by the SQCM. The SQCM will be responsible for ensuring that construction conforms to the requirements of the Removal Action Work Plan and the State of Rhode Island Remediation Regulations. This includes

material testing, documentation of results, reporting results to the Project Superintendent, reporting deficiencies, and certifying that all submittals are in compliance with contract requirements.

QC inspection and testing will be performed in accordance with the Removal Action Work Plan, the State of Rhode Island Remediation Regulations, and the CQC Plan. Testing includes geotechnical testing of soil materials, analytical testing of excavated material, and general testing and inspection of materials and workmanship to ensure compliance with the Removal Action Work Plan. Testing will be conducted both on-site and off-site. Subcontracted testing laboratories will be utilized for geotechnical and analytical testing.

3.5 Health And Safety Requirements

The Site-Specific Health and Safety Plan (SHSP) provides requirements and guidelines that will be utilized in the field to protect the health and safety of workers. The SHSO will provide oversight of activities to ensure conformance with the SHSP. The SHSO will supervise operations and be responsible for conducting site health and safety trainings/briefings, air monitoring, personnel monitoring, enforcing/modifying levels of Personal Protective Equipment (PPE), ensuring compliance with decontamination procedures, maintaining monitoring equipment, and documenting and reporting all health and safety related accidents or injuries. The SHSP is included as Appendix C.

The SHSO will conduct regular site safety inspections. Weekly and monthly reports will be prepared and submitted to the PESM. Daily health and safety reports will also be prepared and submitted with the Daily Production Report/CQC Report.

4.0 REMEDIAL CONSTRUCTION

This section provides a description of the major tasks that will be performed to accomplish the objectives of the remedial action.

The excavation activities and associated work will generally be performed in all types of weather conditions, but will be shut down if the weather is affecting the performance of the turbidity curtain, or if the project management team determines that the weather is causing safety concerns at the Site.

If items suspected of having historical or archaeological significance or human skeletal remains are discovered during the work effort, work will immediately be stopped in the immediate vicinity of the discovery until resumption of work is directed by the Contracting Officer. The discovery will be reported immediately to the Contracting Officer.

4.1 Mobilization

Temporary construction offices and facilities, lay down, staging, and material storage areas will be established at the OFFTA Site. Temporary facilities will include an office trailer, a craft trailer, one or more storage containers, and portable toilets. Utility connections will be made to power, water, and communications. All of the utility work will be coordinated with the Navy. Arrangements will be made for mail delivery and solid waste and sewage disposal services. Administrative staff, craft labor, and equipment will be mobilized to the Site.

4.2 Site Preparation

4.2.1 Security Fence

The existing chain-link fence is to remain as a security fence. Any damaged portion of the existing chain-link fence will be enhanced. New security fence will be installed only in areas where there currently is no fence and fence is required. The land side of the site will be protected with a chain link fence.

4.2.2 Soil Erosion and Sediment Controls

The existing Jersey barriers will be left in place on the west side of the site. These Jersey barriers will be removed and disposed off-site as the revetment construction proceeds. Silt fence and hay bales will be required across the site along the shoreline. Prior to site disturbance, soil erosion and sediment control devices will be installed around the limits of disturbance, in accordance with the Rhode Island *Soil Erosion and Sediment Control Handbook* and the Soil Erosion and Sediment Control Plan (Appendix D). Silt fence will be installed in areas where deemed necessary. Soil erosion controls will also be installed around the perimeter of any active soil stockpile areas.

Soil erosion and sediment control features will be inspected and maintained on a daily basis throughout the project. Written soil erosion and sediment control inspections will be performed on a weekly basis and after any precipitation event greater than 0.25 inches in a 12-hour period. Accumulated sediment will be removed from the silt fence as needed and characterized and disposed with the excavated soil.

A floating turbidity curtain will be installed along the shoreline boundary of the excavation areas to minimize the migration of sediments into the Narragansett Bay and between the excavation area and the area being backfilled.. The curtain will prevent sediments from passing through the material, while allowing water to pass through.

Each section of turbidity curtain in use on the project will be inspected and maintained on a daily basis by a crew that is dedicated to installation and maintenance of the turbidity curtain. TtEC field personnel will inspect the turbidity curtain for holes, breaches in the seams, connections to the anchors, and any other visible damage. Any damage to the turbidity curtain that is noted during the inspections will be repaired immediately or replaced with a new section of turbidity curtain if a repair cannot be made. TtEC will maintain additional sections of turbidity curtain on-site at all times for this purpose. If a section of turbidity curtain is being repaired or replaced in an area of active excavation, then the excavation activities will be stopped until the turbidity curtain repair has been completed.

4.2.3 Stormwater Drainage

Stormwater drainage from the Site will be allowed to flow in sheet flow into the Narragansett Bay during construction activities as controlled per Section 4.2.2. The two existing stormwater lines that cross the site will be upgraded to current standards.

4.2.4 Decontamination Facilities

Personnel and equipment decontamination facilities will be established. The equipment decontamination facility will be located within the excavated cell. Decontamination liquids will be allowed to flow on to the surface of the planned excavation area until the area has been remediated.

4.3 Staging Area Preparation

The excavated soil and fill will be stockpiled at a temporary staging area. The staging area will be located within the area of contamination on a planned excavation grid cell. A soil berm or silt fence will be constructed around the staging area. Water that collects within the staging area will be allowed to infiltrate the ground surface. Surface water sheet flow directed toward the staging area will be diverted away from the staging area into the Narragansett Bay by a temporary earthen swale.

Access to the staging area by off-site disposal trucks will be gained from a dedicated clean roadway so that decontamination of the trucks will not be required.

When excavation has been completed at all grid cells except for the cell containing the staging area, the staging area will be relocated to a non-excavation area. At the new location, a polyethylene liner will be placed under the stockpiles to prevent the contaminated soil from contacting the underlying soil.

Once all of the stockpiles have been removed from the staging area, the polyethylene liner will be removed and disposed of off-site with the contaminated soil. Confirmation sampling under the liner will be performed.

4.4 Revetment Construction

Prior to any on land excavation, a revetment will be constructed within that area. The revetment will consist of placing an 8-oz non-woven geotextile fabric, a minimum of 1-foot thick of gravel filter, and a minimum of 3.6 feet thick of layer armor. The cross section location map is shown on Figure 10 and typical cross sections are shown on Figures 10 through 13.

Contaminated soil will be first excavated from the area where the revetment will be constructed. Then the revetment construction will proceed.

The revetment will be constructed by sections. The first section will be constructed along a given grid. After the revetment is constructed within a selected grid, then on land excavation of contaminated soil will proceed along the alignment of the constructed revetment.

The revetment construction will conform to the Technical Specifications, which are included in Appendix E. The preliminary revetment design is included in Appendix F.

4.5 Soil Excavation

Using an excavator, soil and fill will be removed from Areas 1 through 6 to the approximate limits depths indicated in Figure 8. Areas 1 through 6 have been divided into 100-foot by 100-foot grid cells. The grid areas will be staked out prior to excavation. Note that TtEC will remove (1) any and all concrete structures/foundations that are encountered, (2) TtEC will investigate buried structures evidenced by manhole cover (was under Central Mound), may be a former oil/water separator), if buried structures by manhole covers are encountered then a spill control plan will be implemented, (3) TtEC will remove any encountered asbestos material in accordance with Federal, State, and Local regulations.

The excavation will begin at the shoreline to permit construction of the revetment. Excavation will generally proceed from west to east across the site. Prior to site disturbance, a floating turbidity curtain will be installed along the shoreline boundary of the areas to be disturbed in order to minimize the migration of sediments into the Narragansett Bay. The curtain will prevent sediments from passing

through the material, while allowing water to pass through due to tidal fluctuations. After installation of the floating turbidity curtain, the construction will be executed by excavating one grid or two at a time starting from Grid C1 followed by B2, C2, B3, C3, B4, C4, A5, B5, C5, A6, A7, A8, A9, A10, B10, B11, B12, C12, C11, C10, B9, C9, B8, C8, B7, B6, C6, and finally C7. The removal and backfill will be conducted in the following manner:

- Excavate contaminated material along the shoreline in order to construct the revetment.
- Once an area has been excavated and post excavation samples taken, begin constructing the revetment beginning at the southern edge of Grid C-1. The conceptual revetment design will consist of placing an 8-oz non-woven geotextile fabric, a minimum of 1-foot thick of gravel filter, and a minimum of 3.6 feet thick of layer armor. As the revetment is constructed on land excavation of contaminated soil will proceed behind the constructed revetment.
- If groundwater or tidal water is encountered during excavation of a grid, then a turbidity curtain will be installed between the excavation and the backfill to prevent cross contamination of backfill material. Excavated soil will be directly loaded into off-road dump trucks for transportation to the staging area within the area of contamination in Grids C-6 and C-7 where the material will be staged in 500cy stockpiles to be dewatered and characterized for off-site disposal. This area will be surrounded by erosion control measures. The excavated soil will remain in the stockpiles until waste characterization of the material has been performed.
- It is assumed that approximately 15 percent of the total soil volume will be classified as Resource Conservation and Recovery Act (RCRA) hazardous waste due to the lead content. The non-hazardous soil will be beneficially reused at a RCRA Subtitle D landfill as daily cover and the hazardous soil will require disposal at a RCRA Subtitle C hazardous waste disposal facility.
- When a grid cell has been excavated to the specified depth, post-excavation samples will be collected from the base of the excavation. Since the excavation bottom will be under water, samples will be collected using the excavator bucket. The samples will be analyzed for PAH, TPH, and metals.
- The confirmation sampling will be 50’x50’ grids excavated to the prescribed depth to remove petroleum compounds in exceedance of 500 ppm or no visible evidence of petroleum contamination or till no longer practical. If a specific location within any grid is emitting evidence of petroleum contamination, then only that location will be continuously excavated. At that point of the deepest point within each 50’x50’ grid will be sampled for petroleum by means of petroflag field screening and no laboratory analysis, also within the parent 100’x100’ grid a sample will be taken from the deepest of all locations and sent off for standard turn laboratory analysis for all of the PRG’s with exception of petroleum compounds. The data from these samples are to be utilized for information only at a later date by the Navy to conduct a risk assessment on the site based on contamination left behind below the water table. The PRG’s for the site are TPH, PAH, Manganese, Lead, Arsenic, Barilum.
- Once post-excavation samples in a given area have been collected, the area will be backfilled to the final grade. Where required due to the presence of groundwater, a granular material will be first installed followed by a layer of common fill, and a six-inch layer of topsoil. Backfill material will be hauled directly to the grid cells in off-site trailer or tri-axle dump trucks.
- The final grades will be documented by performing a post-construction survey at the completion of the construction activities.
- Restore the site by hydroseeding the topsoil and any other disturbed area.
- Following completion of construction activities, temporary facilities and utilities, personnel, equipment, and materials will be removed from the Site. The support zone areas will be restored. Construction equipment will be cleaned before leaving the Site.

4.6 Soil Staging

Excavated soil and fill will be staged in 500-cy stockpiles at the staging area. The stockpiles will be maintained by a front-end loader that will remain in the staging area. The excavated soil will remain in the stockpiles until waste characterization of the material has been performed by others.

4.7 Backfill

Upon completion of the excavation activities in a given grid cell, each cell will be backfilled to the final grade. Where required due to the presence of groundwater, a granular material will be installed as the bottom layer of backfill, followed by a layer of common fill, and a six-inch layer of topsoil. The actual thickness of the common fill layer will vary depending on the final grade in a given grid cell. Backfill material will be installed such that it will not come in contact with material that remains to be excavated. Installation of the backfill material will generally be in one to two foot lifts, followed by compaction. Backfill material will not contain any contaminants above RIDEM Residential Direct Exposure Criteria for Soils Standards or natural site background levels. Backfill suppliers will provide analytical documentation or written certification that fill does not exceed RIDEM Residential Direct Exposure Criteria for Soils Standards or natural site background levels.

Backfill material will be hauled directly to the grid cells in off-site trailer or tri-axle dump trucks. If it is necessary for the trucks to travel over contaminated areas to reach the grid cells, truck tires will be decontaminated by brushing off soils and sediments.

The final grades will be documented by performing a post-construction survey at the completion of the construction activities.

The backfill material will conform to the requirements of the technical specifications which are included in Appendix E.

4.8 Off-Ste Transportation And Disposal

Waste characterization sampling of the excavated material will be performed by others. One composite soil sample will be collected from each 500-cy stockpile and analyzed for waste characterization parameters, as required by the disposal facility, which may include volatile organic compounds VOC, Toxic Characteristic Leaching Procedure (TCLP), VOC, SVOC, RCRA 8 Metals, and TCLP RCRA 8 Metals, in addition to PCB, TPH, pH, ignitability, reactivity (cyanide/sulfide). Results of this sampling will be used to determine the appropriate off-site disposal facility.

It is estimated that 52,511 CY of soil and fill will require off-site disposal. It is assumed that approximately 15 percent of the total soil volume will be classified as RCRA hazardous waste due to the lead content. The non-hazardous soil will be disposed of at a RCRA Subtitle D landfill and the hazardous soil will require disposal at a RCRA Subtitle C hazardous waste disposal facility.

Off-site transportation and disposal of excavated soil will be performed by a subcontractor to the Navy. TtEC will load material from the staging area into EMAC's off-site disposal vehicles. The disposal vehicles will access the staging area on a clean haul road and be loaded by the front-end loader that remains in the staging area. The vehicles will be inspected by TtEC after loading for the presence of material that may have spilled onto the vehicles during the loading process. Any such material will be removed from the vehicle prior to exiting the loading area. If an off-site disposal truck is required to

travel through a contaminated section of the Site, it will have its tires and wheel wells brushed off of soils and sediments prior to leaving the Site.

Each disposal vehicle will be equipped with liners, tarps, and other appurtenances as required by United States Department of Transportation (USDOT) and RIDEM Hazardous Waste regulations. Hazardous waste manifests or non-hazardous waste Bills of Lading will be provided for each load of material removed from the Site. EMAC will prepare hazardous waste manifests and/or non-hazardous Bills of Lading. A dedicated representative from NAVSTA Newport will inspect any hazardous waste vehicles and sign each manifest or non-hazardous Bill of Lading prior to the disposal vehicle leaving the Site. Off-site disposal vehicles will only be loaded between the hours of 8:00 AM and 5:30 PM to minimize disturbance to local residents.

4.9 Site Restoration

The Site will be restored by installing a layer of topsoil over the backfill material and hydroseeding. Erosion controls will remain in place until vegetation has been established. Silt fence will be removed and disposed of as solid waste. Turbidity curtain will be removed from Narragansett Bay and will be washed if necessary and will be staged for reuse or disposed of as solid waste.

The staging area will be restored by removing the polyethylene liner material and silt fence and disposing of them as solid waste.

A perimeter road base will be installed to allow equipment access to the shoreline if necessary in the future. The security fence will remain as a site fence.

4.10 Demobilization

Following completion of construction activities, temporary facilities and utilities, personnel, equipment, and materials will be removed from the Site and the support zone areas will be restored. Construction equipment will be cleaned before leaving the Site. Equipment cleaning methods will include brushing to remove gross contamination and steam cleaning/pressure washing to meet the USEPA clean metal surface decontamination standards.

4.11 Subcontracted Work

The following tasks are anticipated to be performed by TtEC subcontractors:

- Analytical and geotechnical testing
- Hydroseeding
- Surveying

The Navy will directly subcontract transportation and disposal services. It is anticipated that TtEC will self-perform all of the other work.

5.0 SAMPLING AND ANALYSIS

5.1 Confirmation Sampling

The confirmation sampling will be 50'x50' grids excavated to the prescribed depth to remove petroleum compounds in exceedance of 500 ppm or no visible evidence of petroleum contamination or till no longer practical. If a specific location within any grid is emitting evidence of petroleum contamination, then only that location will be continuously excavated. At that point of the deepest point within each 50'x50' grid will be sampled for petroleum by means of petroflag field screening and no laboratory analysis, also within the parent 100'x100' grid a sample will be taken from the deepest of all locations and sent off for standard turn laboratory analysis for all of the PRG's with exception of petroleum compounds. The data from these samples are to be utilized for information only at a later date by the Navy to conduct a risk assessment on the site based on contamination left behind below the water table. The PRG's for the site are TPH, PAH, Manganese, Lead, Arsenic, Barilum.

5.2 Waste Characterization Sampling

The excavated soil and fill will be stockpiled in the staging area in 500-cy stockpiles. EMAC will collect waste characterization samples from each of the stockpiles prior to off-site disposal of the soil. Waste characterization samples will be composite samples taken from five locations within each of the stockpiles. The samples will be analyzed for VOC, TCLP VOC, SVOC, RCRA 8 Metals, and TCLP RCRA 8 Metals, in addition to PCB, TPH, pH, ignitability, reactivity (cyanide/sulfide), and any other parameters required by the disposal facility.

The disposal facility for the excavated soils will be selected based on the laboratory analytical results. The waste materials generated during the remedial action will be labeled, stored, and manifested in accordance with all applicable local, state, and federal regulations.

Dewatering liquids disposal is not anticipated due to the fact that the staging area is to be maintained such that liquids/water will percolate into an unexcavated grid cell.

6.0 REGULATORY COMPLIANCE

6.1 Stormwater Discharge From Construction Activities

The construction activities at the OFFTA Site will disturb approximately 4.85 acres of ground area and are subject to the Rhode Island Pollutant Discharge Elimination System (RIPDES) regulations for stormwater discharges from construction activities. Since this activity is at a CERCLA site a permit is not required; however, the site activities must comply with the substantive requirements of the Regulations for the RIPDES. Since the remedial construction action at this site does not meet the definition of a Class I or II Industrial Activity, no storm water discharge monitoring is required. However, a Stormwater Pollution Prevention Plan must be prepared and implemented. TtEC will implement soil erosion and sedimentation controls and use best management practices to prevent the discharge of any hazardous substances to surface water during construction activities. A Soil Erosion and Sediment Control Plan, which also serves as a Stormwater Pollution Prevention Plan, is included in Appendix D. The Soil Erosion and Sediment Control Plan will specify soil erosion and sediment controls and Best Management Practices that will be used on-site to prevent discharges of sediment and/or hazardous substances. Soil Erosion and sediment controls and stormwater controls will be installed prior to the start of intrusive earth disturbing activities as specified in Section 4.2.2. Erosion and sediment controls will be inspected weekly

and after each significant precipitation event (greater than 0.25 inches over a 12-hour period) that has the potential to damage the soil erosion and sediment controls. Inspections and corrective actions will be documented in writing and placed in the project file.

6.2 Earth Moving Operations

All excavation, grading, and earth-moving operations will be conducted in accordance with the Soil Erosion and Sediment Control Plan (Appendix D).

6.3 WaterWay Excavation And Filling Activities

Excavation activities to be conducted below the high tide limit along the shoreline of Narragansett Bay are regulated by the New England District United States Army Corps of Engineers (USACE) and the Rhode Island Coastal Resource Management Council (CRMC) and will require compliance with substantive permit requirements. All excavation activities will use Best Management Practices to ensure that sedimentation will not occur in Narragansett Bay. All excavated material will be disposed off-site in accordance with RIDEM solid and hazardous wastes regulations.

6.4 Coastal Zone Consistency Determination

A concurrence with the Federal Coastal Zone Consistency Determination is required from the CRMC for the shoreline excavation and filling activities and associated work within the 200-foot shoreline buffer zone. All activities are required to be consistent to the maximum extent practicable with the requirements of the Rhode Island Coastal Resources Management Program. The Navy is responsible for submitting a coastal zone consistency determination to the CRMC for review at least 60 days prior to the desired start date of site activities.

6.5 Air Pollution Control

Federal Clean Air Act Applicable or Relevant and Appropriate Requirements (ARAR) for the site restrict emissions of fugitive dust and odors and hazardous air pollutants regulated under the National Emissions Standards for Hazardous Air Pollutants (NESHAP).

6.5.1 Fugitive Dust Emissions

Fugitive dust emissions may result from project operations. Consequently, engineering controls and best management practices will be used to control dust emissions. This will include keeping surfaces adequately wet during intrusive activities, applying water to haul roads to minimize fugitive dust generation, maintaining soil stockpiles, and covering materials being transported to prevent fugitive dust emissions. Air monitoring will be performed in accordance with the SHSP to monitor dust levels at the Site.

6.5.2 Hazardous Air Pollutants

Hazardous air pollutants regulated under NESHAP include naphthalene, arsenic, cadmium, chromium, lead, mercury, nickel, PCB, DDE, and hexachlorobenzene. Contaminants present in site soils include lead. Engineering controls and best management practices described in Section 6.5.1 will be implemented to prevent emissions of hazardous air pollutants. Air monitoring will be performed as specified in the SHSP.

6.6 Waste Management

Based on previous site sampling, the majority of the waste materials generated will be classified as non-hazardous solid waste. Some hazardous wastes may be generated.

The following waste materials will be generated during remedial activities:

- Excavated soil and fill that may contain elevated concentrations of PAH, TPH, and lead.
- Used silt fence and turbidity curtain.
- Polyethylene liner from the staging area.
- Dewatering liquid.
- PPE consisting of Tyvek, booties, gloves, etc. from intrusive activities in potentially contaminated areas.
- Decontamination solids and liquids from equipment and personnel decontamination activities.
- Stone from the equipment decontamination facility.

All disposal facilities and transporters used for off-site disposal of the above waste materials will be subcontracted directly by the Navy.

6.6.1 Excavated Soil and Fill

Off-site transportation and disposal of excavated soil will be performed by a subcontractor to the Navy. Waste characterization sampling of the excavated material will be performed by Environmental Multiple Award Contractor (EMAC). TtEC will load material into the subcontractor's off-site disposal vehicles.

Results of the waste characterization sampling will be used to determine the appropriate off-site disposal facility. It is estimated that 52,511 CY)of soil and fill will require off-site disposal. It is assumed that approximately 15 percent of the total soil volume will be classified as RCRA hazardous waste due to the lead content. The non-hazardous soil will be disposed of at a RCRA Subtitle D landfill and the hazardous soil will require disposal at a RCRA Subtitle C hazardous waste disposal facility.

6.6.2 Soil Erosion and Sediment Controls

Used silt fence and turbidity curtain materials will be disposed of off-site along with excavated soil. Disposal classification will be based upon the waste classification of the excavated soil.

6.6.3 Polyethylene Liner

The polyethylene liner used at the staging area will be disposed of off-site along with excavated soil. Disposal classification will be based upon the waste classification of the excavated soil.

6.6.4 Dewatering Liquid

During the time that the staging area is located on a planned excavation grid cell, water that collects within the staging area will be allowed to infiltrate the ground surface.

6.6.5 PPE

PPE (Tyvek, gloves, booties) generated during intrusive work that is potentially contaminated will be disposed of off-site along with excavated soil. Disposal classification will be based upon the waste classification of the excavated soil. Any PPE generated during clean work activities will be disposed of as non-hazardous solid waste at a permitted RCRA Subtitle D landfill. As PPE is removed, it will be placed in segregated labeled containers to separate PPE from contaminated areas from PPE from clean work areas.

6.6.6 Decontamination Solids

All of the equipment in contact with contaminated materials will be decontaminated before removal from the Site or before use for construction in clean areas. Solid residues generated from decontamination of equipment will be disposed of off-site along with the excavated soil.

Any solids that are generated from decontaminated equipment that was used in a clean area will be considered clean and used on-site as common fill.

6.6.7 Decontamination Liquids

Liquid waste generated on-site will include equipment and personnel decontamination water. Decontamination liquids will be allowed to flow on to the surface of the planned excavation area until the area has been remediated. When all of the contaminated areas of the site have been remediated, decontamination liquids will be collected, placed in USDOT-approved 55-gallon drums and sampled. Decontamination water that meets surface water discharge standards will be discharged directly to Narragansett Bay. Although an RIPDES permit will not be required for discharge, the site activities will comply with the substantive RIPDES permit requirements including discharge standards and discharge sampling and monitoring requirements.

6.7 Hazardous Waste Management

A RCRA determination will be made to determine if the material is a RCRA hazardous waste (40 CFR 261.11). RCRA regulations define hazardous waste as (1) a listed waste under 40 CFR 261.31-261.33, or (2) characteristic for ignitability, corrosivity, reactivity, or toxicity as defined in 40 CFR 261.21- 261.24.

6.7.1 Listed Hazardous Waste

Based upon site history and past operations, there is no listed hazardous waste at the OFFTA Site. Excavated soil will be regulated as RCRA waste only if the soil exhibits RCRA characteristics.

6.7.2 Characteristic Hazardous Waste

A solid waste is a characteristic hazardous waste if it exhibits any of the following characteristics: (the full definition of these characteristics is provided in 40 CFR Part 261.21-.24)

- Ignitability (D001).
- Corrosivity (D002).
- Reactivity (D003).
- Toxicity (D004-D043).

The excavated soil will be placed in 500 cy stockpiles and sampled for waste characterization. All samples will be analyzed for RCRA Ignitability, Corrosivity, Reactivity, and Toxicity. All RCRA characteristic soils will be disposed off-site at a permitted RCRA Subtitle C hazardous waste disposal facility. Site soils contain arsenic, lead, TPH, and PAH and may be RCRA characteristically hazardous.

6.7.3 Land Disposal Restrictions

Land Disposal Restrictions (LDR) prohibit placement of hazardous waste on or in the land, except treatment standards for RCRA hazardous waste. Any RCRA characteristic waste will be subject to the treatment standards for any Underlying Hazardous Characteristic identified in the waste in addition to the primary hazardous characteristic of the waste. The Regulatory Specialist will identify LDR for any site-generated RCRA waste prior to off-site disposal. The Regulatory Specialist from EMAC will prepare Generator LDR Waste Notification and Certification forms required for all off-site hazardous waste shipments. The Notification and Certification forms will be provided to the Navy for review and signature prior to off-site waste shipments.

6.7.4 Waste Management Permit/Approval Requirements

There are no permitting requirements for the off-site disposal of hazardous and non-hazardous waste generated during this project. The Navy and its transportation and disposal subcontractor are responsible for obtaining disposal approvals from the off-site disposal facilities. The Navy is responsible for supplying a RCRA Hazardous Waste Generator Identification Number for disposal of any hazardous waste. If the Navy does not have a RCRA Generator Identification Number for the site, TtEC will assist the Navy in completing and submitting the RCRA Notification of Hazardous Waste Activity Forms to RIDEM or USEPA to obtain one.

6.7.5 Accumulation/Storage

Any hazardous waste excavated or generated will be stored on-site for less than 90 days from the point of generation unless a generator storage limit extension is obtained from RIDEM. The Regulatory Specialist will complete any requests for extension and submit them to the Navy for review and signature before submittal to RIDEM for approval.

The hazardous waste storage area will meet RIDEM storage requirements and will be equipped with the following:

- “Hazardous Waste” signs.
- “Authorized Personnel Only” signs.
- Secondary containment for all liquid waste containers, totaling 110% of the volume of the largest container held within. Containment area will be constructed of or lined with impermeable materials.
- Spill kit.
- Physically segregated storage area for incompatible waste types equipped with an impermeable berm or other device to prevent mixing of incompatible wastes if spilled.
- Reactive or ignitable waste will be stored more than 50 feet from the property line.
- Fire extinguisher or other fire fighting device if ignitable waste is stored.
- Emergency communications devices (i.e. radio or phone).
- Contingency Plan that specifies the emergency coordinator and contains an emergency response plan for the waste storage area.

Weekly hazardous waste container inspections will be conducted. Inspections will be documented in writing and placed in the project file. A written container storage inventory will be maintained recording the waste description, waste codes, waste generation and shipment dates, and manifest numbers for all waste shipped off-site.

The Project Superintendent is responsible for identifying the emergency coordinator for the waste accumulation/storage area(s). The emergency coordinator is responsible for coordinating any emergency response activities related to waste storage area spills/releases. The following information will be posted at the accumulation area(s) at all times:

- Name/phone number of emergency coordinator.
- Location of fire extinguisher and spill control materials.
- Telephone number of the base fire department.
- "Authorized Personnel Only" signs.

6.7.6 Recordkeeping Requirements

Records must be kept for all hazardous waste activities. Records to be retained include all hazardous waste manifests, LDR Waste Notification forms, Generator Biennial Reports, manifest exception reports, Bills of Lading for non-hazardous waste shipments, and records of any test results, waste analyses, and waste profile sheets, for at least three years after the waste is disposed. TtEC will retain photocopies of all test results and waste analyses in the project file and will forward original copies to the Navy. This information will be included in the Final Report. Copies of Hazardous Waste Manifests, LDR Notifications and Bills of Lading will be provided and maintained by the Navy's disposal subcontractor.

6.7.7 Discrepancy Reports

Any discrepancies due to differences between the quantities or types of waste designated on the manifest or shipping papers and the quantity or type of waste a facility actually receives must be reported. These discrepancies will be resolved by the Navy's disposal subcontractor.

6.7.8 Exception Reports

If by the 35th day after the transporter signs the manifest, the Navy has not received a signed copy of the signed manifest from the Treatment, Storage and Disposal Facility (TSDF). The TSDF must be contacted by phone to obtain a signed copy. If the Navy has not received a signed copy of the manifest by the 38th day, an exception report must be prepared. The signed exception report will be submitted to the USEPA Regional Administrator prior to the 45th day.

6.8 Hazardous Material Transportation

The majority of waste materials destined for off-site disposal are expected to be non-hazardous and will not meet the definition of a USDOT hazardous material; however, in the event hazardous materials are encountered, EMAC will follow the requirements for waste and sample shipments. Hazardous materials will be properly classed, described, packaged, marked, labeled, and in condition for shipment as required by 49 CFR 171.

Waste that does not exhibit one of the nine USDOT hazard class characteristics (i.e., explosive, flammable, poison, combustible, etc.) is not regulated under USDOT rules for the transportation of hazardous material. If waste is suspected to be hazardous, then it will be shipped under the suspected

hazard class. If a particular hazard class is unable to be determined, then the soil or water may be shipped under either of the following:

Shipping Name	Hazard Class	ID Number	Packing Group	Label
Environmentally hazardous substances, liquid, n.o.s.	9	UN3082	III	Class 9
Environmentally hazardous substances, solid, n.o.s.	9	UN3077	III	Class 9

When using either one of these Not otherwise specified (NOS) shipping names, at least two technical names must follow (i.e., "Environmentally hazardous substances, liquid, n.o.s. [Benzene and Acetone]").

The shipping name, identification number, packing group, instructions, cautions, weights, USEPA waste code numbers, and consignee/consignor designations will be marked on packages for shipment. Labeling provides information regarding the USDOT hazard class.

The label to be placed on material will depend upon the results of sampling. Once the waste is characterized, reference should be made to the Hazardous Materials Table in 49 CFR 172.101 to determine the appropriate label. The package (or drum) will be marked and labeled as specified in 49 CFR 172.301.

The person offering hazardous material for shipment will offer placards (49 CFR 172.506). Any quantity of material listed in Table 1 of the regulations will be placarded. However, if there is less than 1,000 pounds (lb) of a Table 2 material, no placard is required. No Class 9 placard is required for domestic shipments. If a placard is required, the label referenced above will be affixed on each side and each end of the vehicle(s).

Hazardous material shipping papers will have the following description of the hazardous material, in the following order:

- Proper shipping name.
- Hazard class or division.
- Identification number.
- Packaging group.
- Total quantity (must appear either before or after the above information).
- Technical and chemical group names may be entered in parentheses between the proper shipping name and hazard class or following the basic description (e.g., "Flammable liquids, n.o.s. [contains xylene and benzene], 3 UN1993, PG II").

Other required information includes:

- USEPA identification (manifests).
- Emergency Response Guidebook numbers.
- Twenty-four-hour emergency response number, supplied by the generator and answered by a knowledgeable person.
- Signatures.
- Shipper's certification.

All TtEC and subcontractor personnel involved in USDOT Hazardous Material Shipment activities will be trained in accordance with personnel training requirement outlined in 49 CFR 172.

6.8.1 Transportation Procedures

RIDEM does not require transporter permits for non-hazardous waste transporters for in-state disposal; however, for out-of-state disposal, it is necessary to comply with the receiving state requirements for waste transporter permitting. All hazardous waste transportation units (tractors and trailers) must have current RIDEM Hazardous Waste Vehicle Permit Stickers. Prior to loading, TtEC will inspect all transportation units to ensure that they have valid RIDEM Hazardous Waste Permit stickers.

6.8.2 Release/Spill Reporting

NAVSTA Newport has established specific spill reporting requirements for spills of petroleum oil into surface waters, groundwater, or soils from facilities or operations engaged in oil transfer in order to meet RIDEM and USEPA spill reporting requirements. If an oil spill or release occurs and any quantity of oil enters surface water, groundwater, or subsurface soils, immediate telephone notification must be made to NAVSTA Fire Department and RIDEM.

An Emergency Response Plan is included in the SHSP. The information contained in the Emergency Response Plan details how TtEC will address spill control and prevention activities on-site.

In the event of a release, the TtEC Project Manager or Project Superintendent must notify the project Regulatory Specialist as soon as possible to determine federal and state release reporting requirements.

7.0 FINAL REPORT

A Final Report will be written and submitted within 90 days of project completion to the Navy. The 90 days will commence on the first day after the final inspection has been completed and the Navy has accepted the work. The Final Report will follow the format of a Remedial Action Completion Report as outlined in the USEPA Guidance Document, "Close Out Procedures for National Priorities List Sites" (USEPA 540-R-98-016, January 2000), and will contain, at a minimum, the following items:

- Summary of Record Documents – This section will include brief descriptions of the FS, Pre-Design Investigation, Removal Action Work Plan, and SHSP and their relation to the project.
- Discussion of remediation activities performed.
- Contractor submittals to document that the project was performed in accordance with the Removal Action Work Plan.
- Waste characterization and confirmation sampling data.
- Photographic documentation.

8.0 REFERENCES

TRC Environmental Corporation (TRC), 1994. *Old Fire Fighting Training Area Remedial Investigation Report, Naval Education and Training Center, Newport, Rhode Island, Draft Final Report with Appendices*. U.S. Department of the Navy, Installation Restoration Program Contract No. N62472-86-C-1282. August.

TtNUS, 2000. *Background Soil Investigation for Old Fire Fighting Training Area, Naval Station Newport, Newport, RI*.

TtNUS, 2001. *Remedial Investigation for Old Fire Fighting Training Area, Naval Station Newport, Newport, RI*. July.

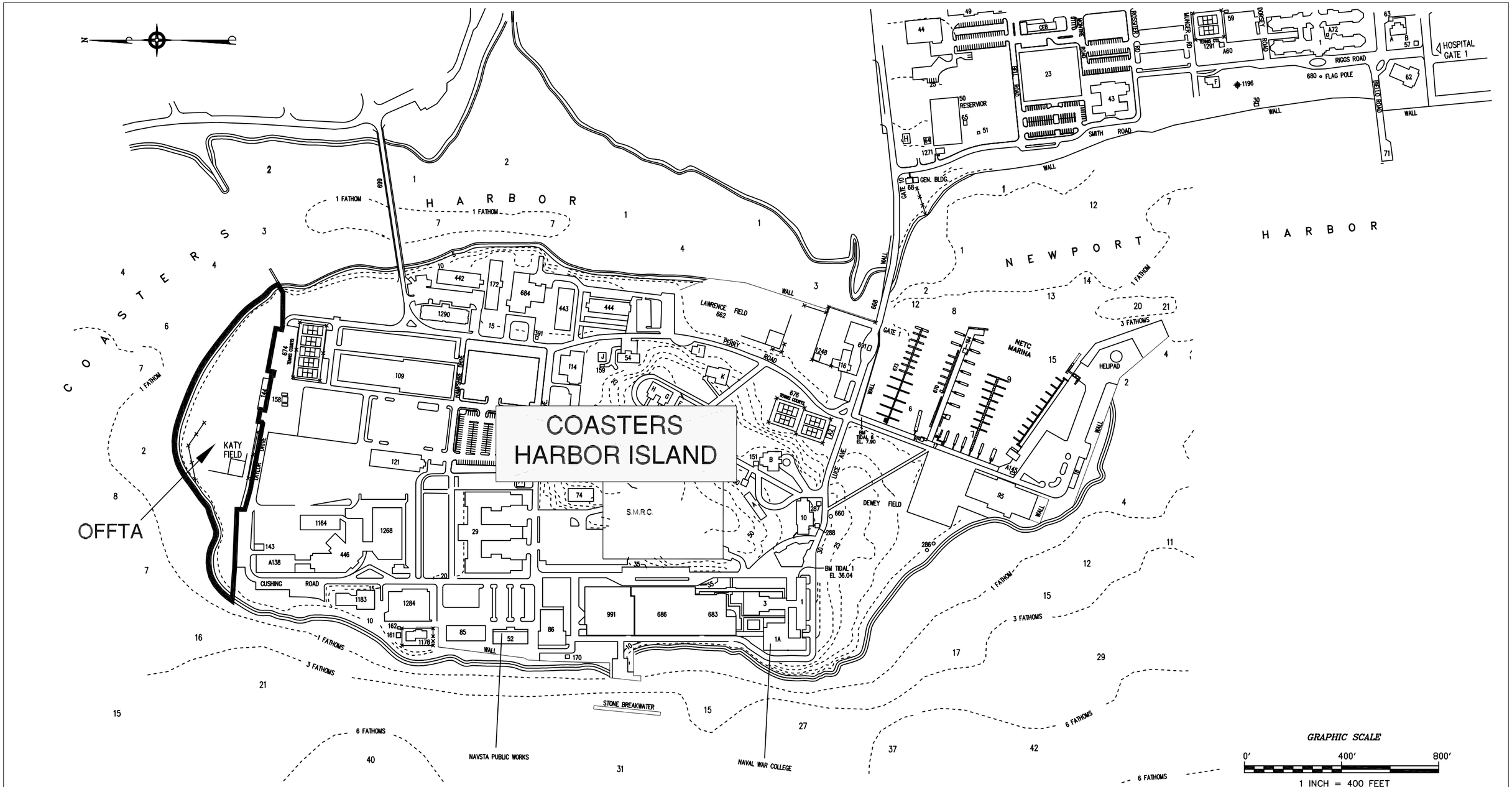
TtNUS, 2002a. *Feasibility Study for Old Fire Fighting Training Area, Naval Station Newport, Newport, RI*. September.

TtNUS, 2002b. *Phase II Predesign Investigation for Old Fire Fighting Training Area, Naval Station Newport, Newport, RI*. September.

TtNUS, 2004a. *Action Memorandum, Old Fire Fighting Training Area Soil Removal Action*. Internal Draft R1. March.

TtNUS, 2004b. *Soil Pre-Design Investigation Report for Old Fire Fighting Training Area, Naval Station Newport, Newport, RI*. July.

FIGURES



NOTES:

BASE MAP FROM PLAN BY DEPT. OF NAVY, "COASTERS HARBOR ISLAND AND NAVAL HOSPITAL EXISTING CONDITIONS MAP", DATED: 9/98, NETC DWG NO.: 31058-307, CODE ID NO.: 80091, SCALE: 1"=200'.

OFFTA LOCATION MAP			FIGURE 1
OLD FIRE FIGHTING TRAINING AREA			TETRA TECH NUS, INC.
NAVSTA NEWPORT – NEWPORT, RHODE ISLAND			55 Jonspin Road Wilmington, MA 01887 (978)658-7899
DRAWN BY:	D.W. MACDOUGALL	REV.:	0
CHECKED BY:	S. PARKER	DATE:	MARCH 25, 2004
SCALE:	1" = 400'	FILE NO.:	DWG\4152\3551\FIG_2-1.DWG

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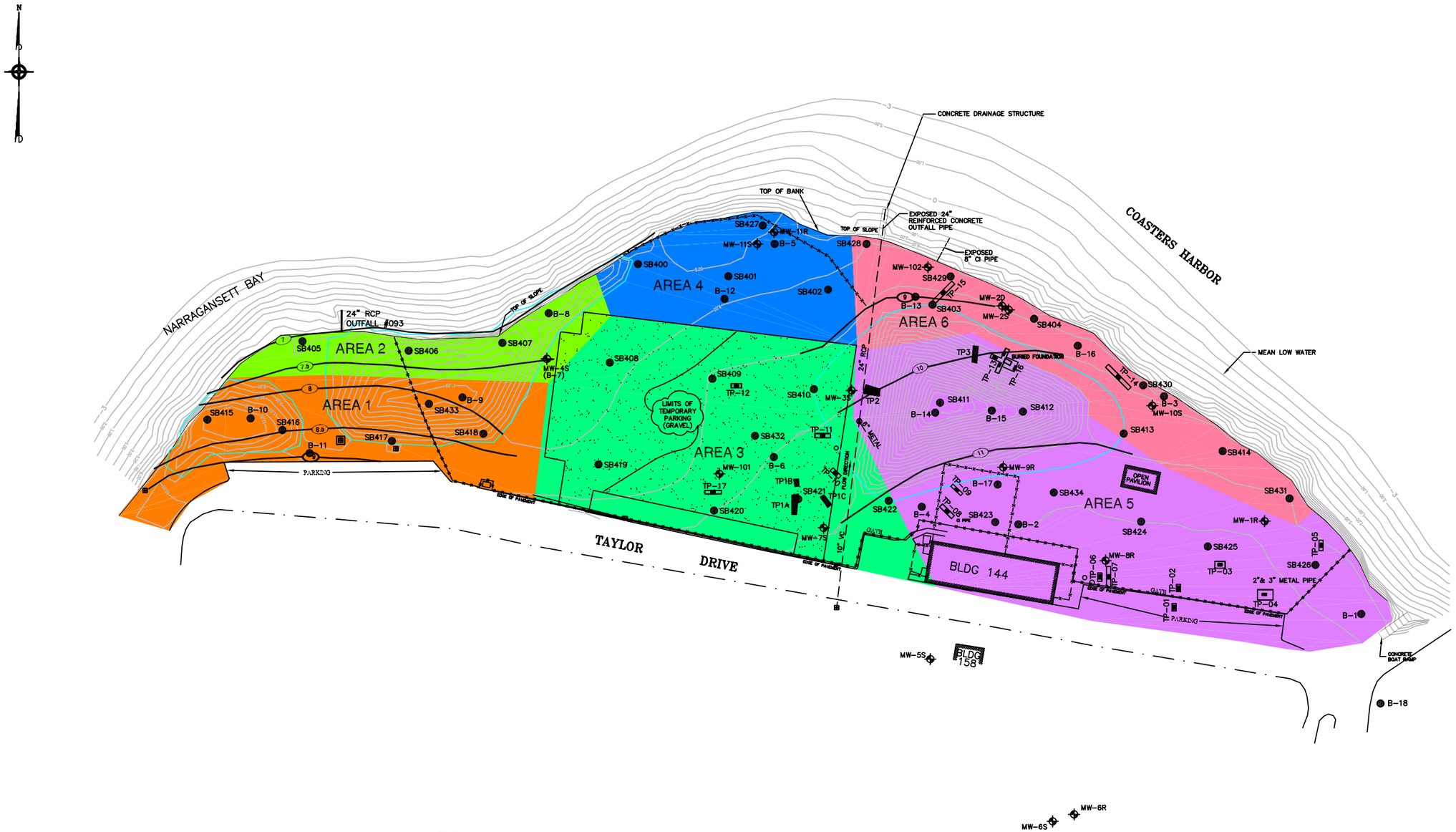

LEGEND

- CATCH BASIN
- FENCE
- EXISTING CONTOUR
- B-16 SOIL BORING LOCATION
- MW-6S MONITORING WELL LOCATION
- STORM SEWER
- TP-10 TEST PIT LOCATION (B&RE, 6/97)
- TP1C TEST PIT LOCATION (TRC, 1/94)
- ROAD CHANGED FROM LAST SURVEY DUE TO CONSTRUCTION ON TAYLOR DRIVE
- 8 EXPECTED TOPOGRAPHY AFTER MOUND REMOVAL (2004)
- AREAS WITHIN WILL BE REGRADED 2004

- AREA 1
- AREA 2
- AREA 3
- AREA 4
- AREA 5
- AREA 6

NOTES AND REFERENCES:

1. DRAWING COMPILED FROM A DRAWING ENTITLED "BASE MAP OLD FIRE FIGHTING TRAINING AREA NETC, NEWPORT, RHODE ISLAND, JULY 1997, PROJ. NO. 7578 CTO: 288, BY BROWN & ROOT ENVIRONMENTAL, SOURCE: BASE PLAN BY GUERRIERE & HALNON, INC., DATED NOVEMBER 10, 1997, AND THE ADDITION OF FIELD MEASURED FEATURES, BY LOUIS FEDERICI AND ASSOCIATES 3/16/99, PRESENTED ON A DRAWING ENTITLED "KADY FIELD, TOPOGRAPHIC, SOIL SAMPLE LOCATION, AND SITE SURVEY AT THE OLD FIRE FIGHTING TRAINING AREA, NAVAL STATION NEWPORT IN NEWPORT, RHODE ISLAND FOR TETRA TECH NUS, INC., LOUIS FEDERICI & ASSOCIATES, 3/16/99, DWG NO. 990205-01.

2. HORIZONTAL DATUM BASE ON THE RI STATE PLANE COORDINATE SYSTEM NAD 1927. VERTICAL DATUM BASED ON NAVAL BASE MEAN LOW WATER.

3. ALL LOCATIONS ARE TO BE CONSIDERED APPROXIMATE.

4. PLAN NOT TO BE USED FOR DESIGN.

GRAPHIC SCALE

50' 0' 50' 100'

1 INCH = 50 FEET

DRAWN BY: D.W. MACDOUGALL	TITLE: SOIL BORING LOCATIONS SUBSURFACE PRE-DESIGN INVESTIGATION OLD FIRE FIGHTING TRAINING AREA NAVAL STATION NEWPORT, RHODE ISLAND
PREPARED BY: J. LAMBERT	
CHECKED BY: S. PARKER	
	SOURCE: BASE PLAN BY SEE NOTES.
	SCALE: 1" = 50' / DATE: MARCH 25, 2004 / PROJ. NO: 4152
PROJECT MANAGER: S. PARKER	DRAWING NO: FIGURE 4-1 / ACFILE NAME: DWG\4152\3551\FIG_4-1.DWG / REV: 0
PROGRAM MANAGER: J. TREPANOWSKI	

FIGURE 2

TETRA TECH NUS, INC.

55 JONSPIN ROAD
WILMINGTON, MASSACHUSETTS 01887
(978)658-7899

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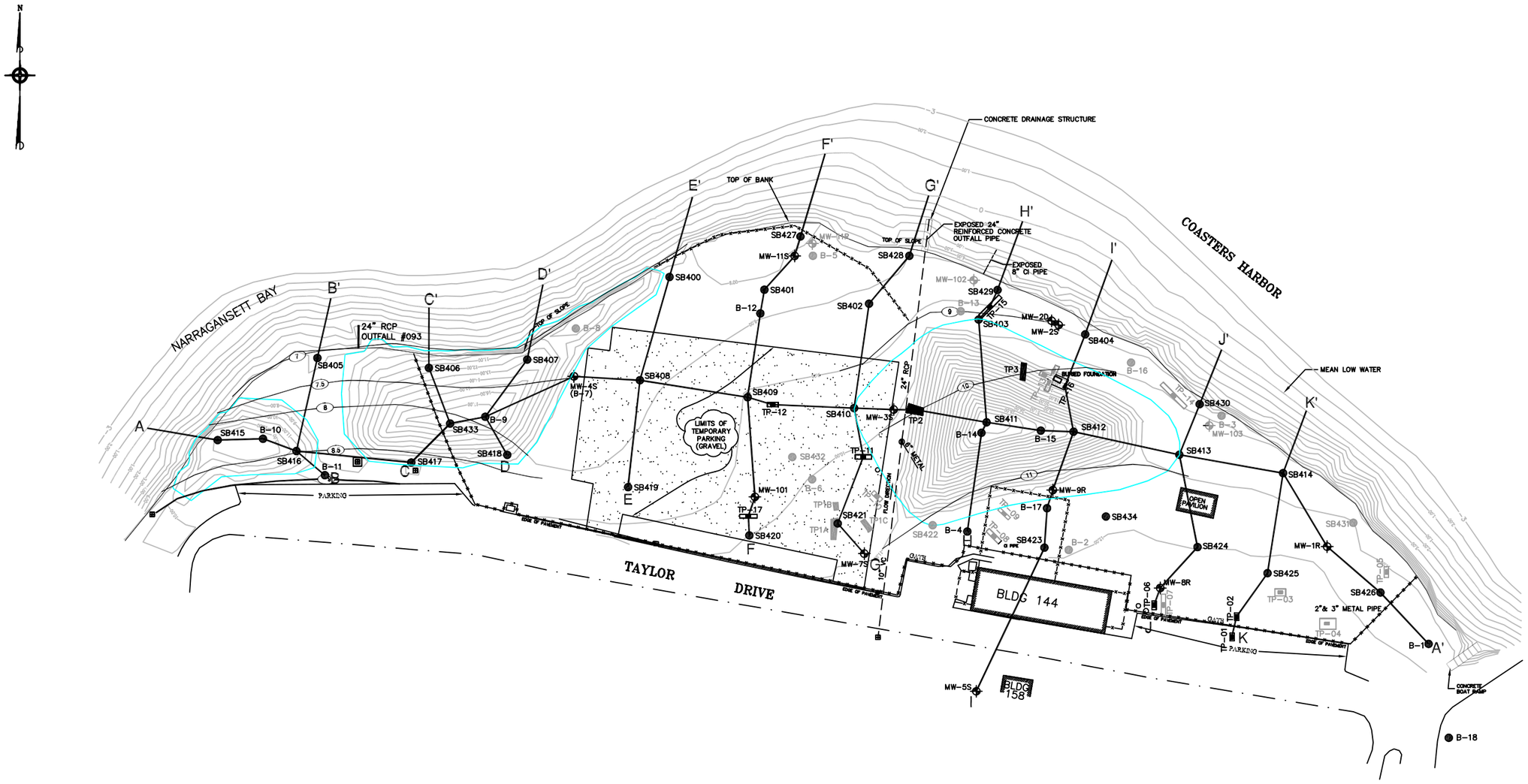

LEGEND

- CATCH BASIN
- FENCE
- EXISTING CONTOUR
- B-16 SOIL BORING LOCATION
- MW-6S MONITORING WELL LOCATION
- STORM SEWER
- TP-10 TEST PIT LOCATION (B&RE, 6/97)
- TP1C TEST PIT LOCATION (TRC, 1/94)
- ROAD CHANGED FROM LAST SURVEY DUE TO CONSTRUCTION ON TAYLOR DRIVE
- (8) EXPECTED TOPOGRAPHY AFTER MOUND REMOVAL (2004)
- AREAS WITHIN WILL BE REGRADED 2004

NOTES AND REFERENCES:

1. DRAWING COMPILED FROM A DRAWING ENTITLED "BASE MAP OLD FIRE FIGHTING TRAINING AREA NETC, NEWPORT, RHODE ISLAND, JULY 1997, PROJ. NO. 7578 CTO: 288, BY BROWN & ROOT ENVIRONMENTAL, SOURCE: BASE PLAN BY GUERRIERE & HALNON, INC., DATED NOVEMBER 10, 1997, AND THE ADDITION OF FIELD MEASURED FEATURES, BY LOUIS FEDERICI AND ASSOCIATES 3/16/99, PRESENTED ON A DRAWING ENTITLED "KADY FIELD, TOPOGRAPHIC, SOIL SAMPLE LOCATION, AND SITE SURVEY AT THE OLD FIRE FIGHTING TRAINING AREA, NAVAL STATION NEWPORT IN NEWPORT, RHODE ISLAND FOR TETRA TECH NUS, INC., LOUIS FEDERICI & ASSOCIATES, 3/16/99, DWG NO. 990205-01.

2. HORIZONTAL DATUM BASE ON THE RI STATE PLANE COORDINATE SYSTEM NAD 1927. VERTICAL DATUM BASED ON NAVAL BASE MEAN LOW WATER.

3. ALL LOCATIONS ARE TO BE CONSIDERED APPROXIMATE.

4. PLAN NOT TO BE USED FOR DESIGN.

GRAPHIC SCALE

50' 0' 50' 100'

1 INCH = 50 FEET

DRAWN BY: D.W. MACDOUGALL	TITLE: CROSS-SECTION LOCATIONS SUBSURFACE PRE-DESIGN INVESTIGATION OLD FIRE FIGHTING TRAINING AREA NAVAL STATION NEWPORT, RHODE ISLAND
PREPARED BY: J. LAMBERT	
CHECKED BY: S. PARKER	
	SOURCE: BASE PLAN BY SEE NOTES.
	SCALE: 1" = 50' / DATE: FEBRUARY 24, 2004 / PROJ. NO: 4152
PROJECT MANAGER: S. PARKER	DRAWING NO: FIGURE 4-2 / ACFILE NAME: DWG\4152\3581\FIG_4-2.DWG / REV: 0
PROGRAM MANAGER: J. TREPANOWSKI	

FIGURE 3

TETRA TECH NUS, INC.

55 JONSPIN ROAD
WILMINGTON, MASSACHUSETTS 01887
(978)658-7899

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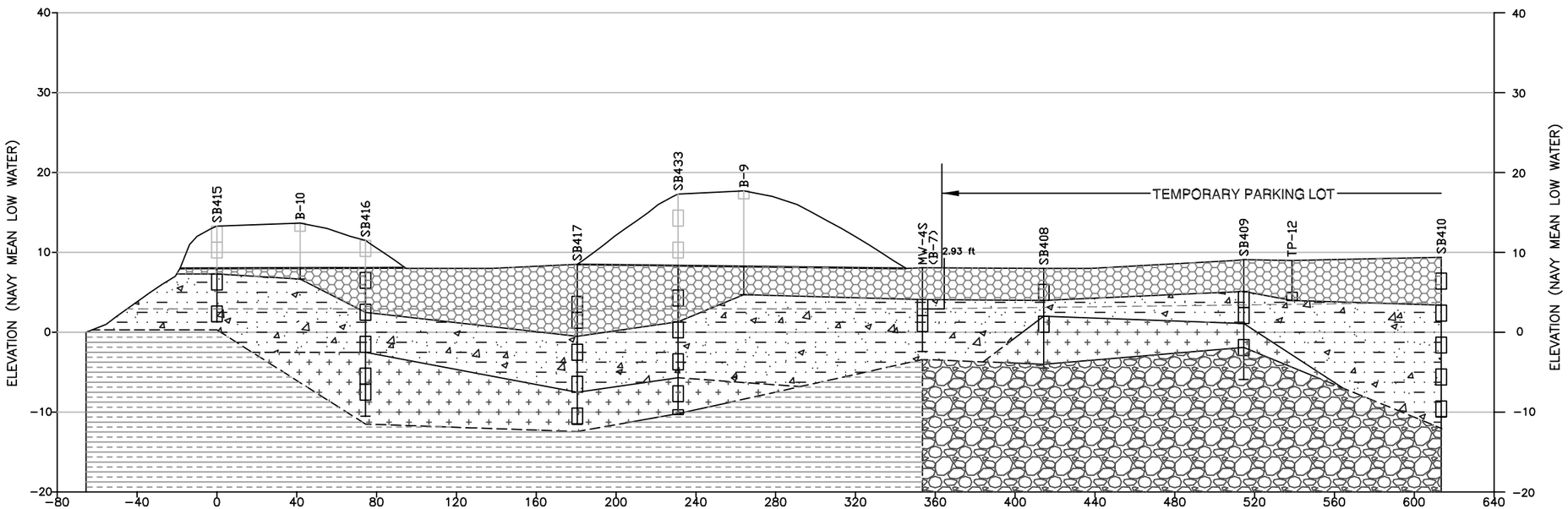
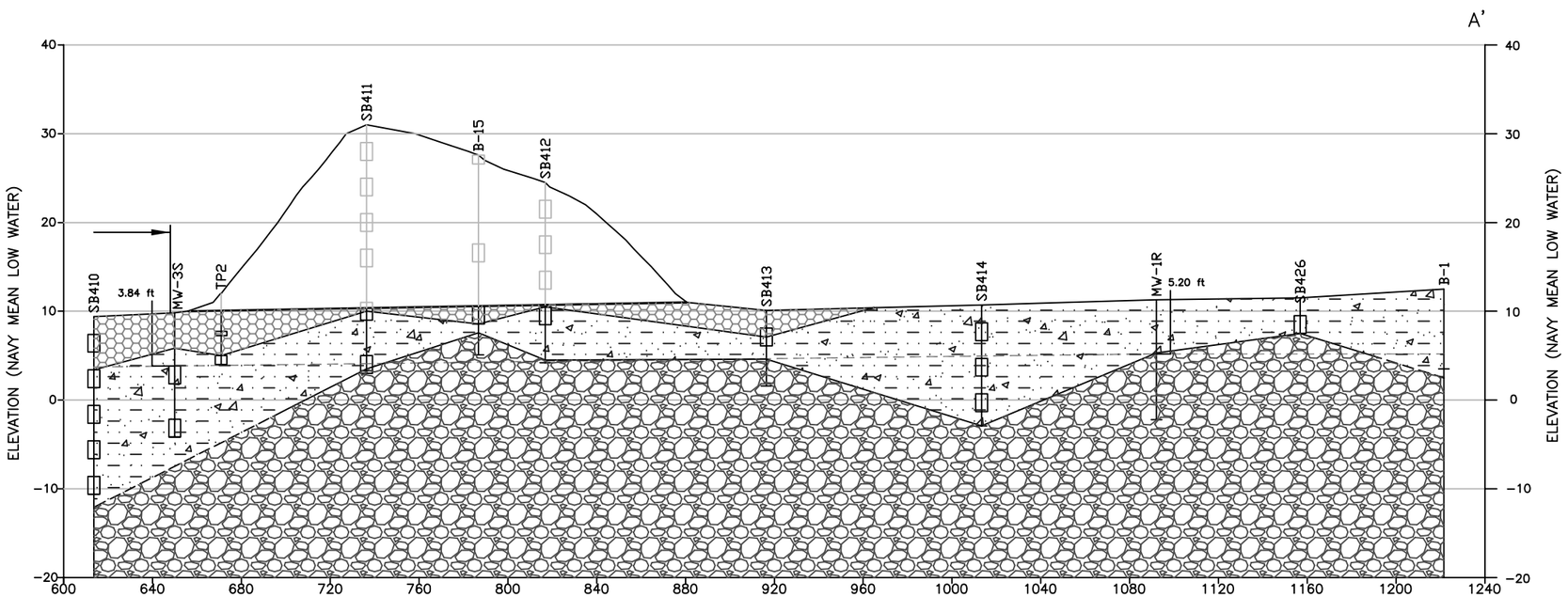
SECTION A - A'





NOTES:

1. THE DEPTHS AND THICKNESSES DETERMINED FOR THE SUBSURFACE STRATA WERE GENERALIZED FROM AND INTERPOLATED BETWEEN TEST BORINGS. THE STRATIFICATION LINES REPRESENT AN APPROXIMATE BOUNDARY BETWEEN SOIL TYPES; THE TRANSITION MAY BE GRADUAL. INFORMATION ON SUBSURFACE CONDITIONS EXIST ONLY AT THE LOCATION OF THE TEST BORINGS; THEREFORE, IT IS POSSIBLE THAT THE SUBSURFACE CONDITIONS MAY VARY FROM THOSE INDICATED.

2. HORIZONTAL DATUM IS BASED ON THE RI STATE PLANE COORDINATE SYSTEM NAD 1927. VERTICAL DATUM IS BASED ON NAVAL BASE MEAN LOW WATER (NGVD 1929).

3. BASE PLAN BY GUERRIERE AND HALNON, INC., JULY 1997, DATED NOVEMBER 10, 1997, PROJ. NO. 7578 CTO 288, BY BROWN AND ROOT ENVIRONMENTAL.

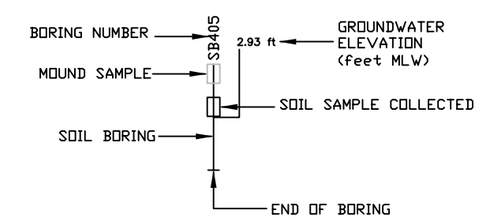
4. ELEVATIONS ON SUBSURFACE CONTACTS WERE GENERALIZED FROM BORING LOGS BY TRC AND TtNUS.

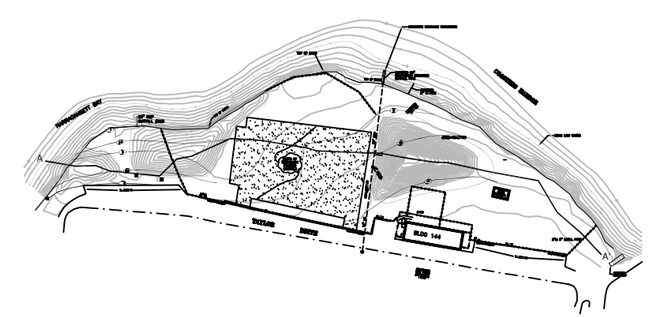
5. BEDROCK ELEVATIONS ARE BASED ON THE DEPTH TO BEDROCK OBSERVED IN TEST PITS AND BORING. IF A REFUSAL WAS NOTED IN A BORING, THE TOP OF BEDROCK WAS GENERALLY ASSUMED TO BE WITHIN ONE FOOT OF THE REFUSAL DEPTH. THE BEDROCK CONTOURS ARE INTERPRETATIONS OF THESE DATA AND THE ACTUAL BEDROCK ELEVATION MAY BE DIFFERENT FROM THE ELEVATION INDICATED.

6. DASHED LINES INDICATE UNCERTAINTY.

7. ALL LOCATIONS TO BE CONSIDERED APPROXIMATE.

8. PLAN NOT TO BE USED FOR DESIGN.





MOUND MATERIAL – CONSISTS OF FILL AND WILL BE REMOVED PRIOR TO SUBSURFACE EXCAVATION

FILL – FINE TO MEDIUM SAND, SILT, GRAVEL, AND ROCK FRAGMENTS MIXED WITH VARYING AMOUNTS OF CONSTRUCTION–TYPE DEBRIS INCLUDING: ASPHALT, CONCRETE, METAL, BRICK, WOOD AND GLASS

SILTY SAND AND GRAVEL – FINE TO MEDIUM SAND, SILT AND GRAVEL, WITH VARYING AMOUNTS OF COBBLES, ROCK FRAGMENTS AND SEASHELL FRAGMENTS

TILL – DENSE SILT WITH FINE TO MEDIUM SAND, GRAVEL AND ROCK FRAGMENTS

BEDROCK – CONGLOMERATE WITH QUARTZITE COBBLES

BEDROCK – PHYLLITE

GROUNDWATER ELEVATION MEASURED ON 8/8/2002

BASE GRADE ELEVATION

DRAWN BY: D.W. MACDOUGALL	TITLE: CROSS–SECTION A–A' SUBSURFACE PRE–DESIGN INVESTIGATION OLD FIRE FIGHTING TRAINING AREA NAVAL STATION NEWPORT, RHODE ISLAND	FIGURE 4
PREPARED BY: J. LAMBERT		TETRA TECH NUS, INC.
CHECKED BY: S. PARKER		55 JONSPIN ROAD WILMINGTON, MASSACHUSETTS 01887 (978)658–7899
	SOURCE: REFER TO FIGURE 4–1 FOR TOPOGRAPHIC SOURCE	
	SCALE: AS NOTED / DATE: MARCH 18, 2004 / PROJ. NO: 4152	
PROJECT MANAGER: S. PARKER	DRAWING NO: 4–3 / ACFILE NAME: DWG\4152\3551\FIG_4–3.DWG	REV: 0
PROGRAM MANAGER: J. TREPANOWSKI		

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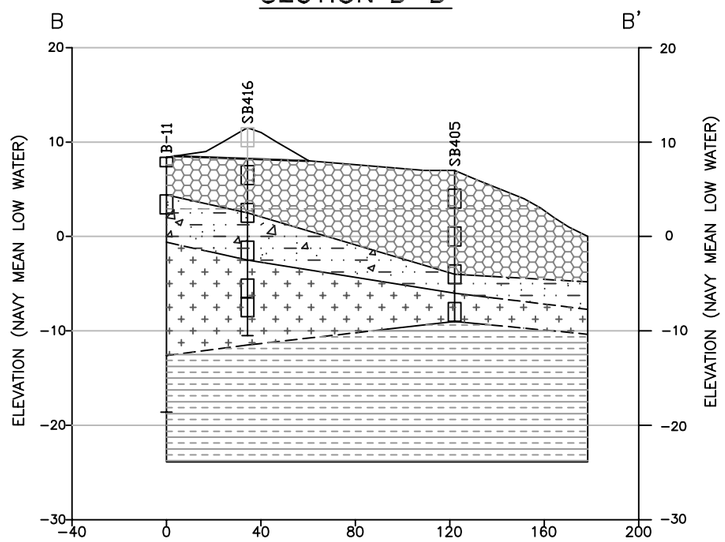
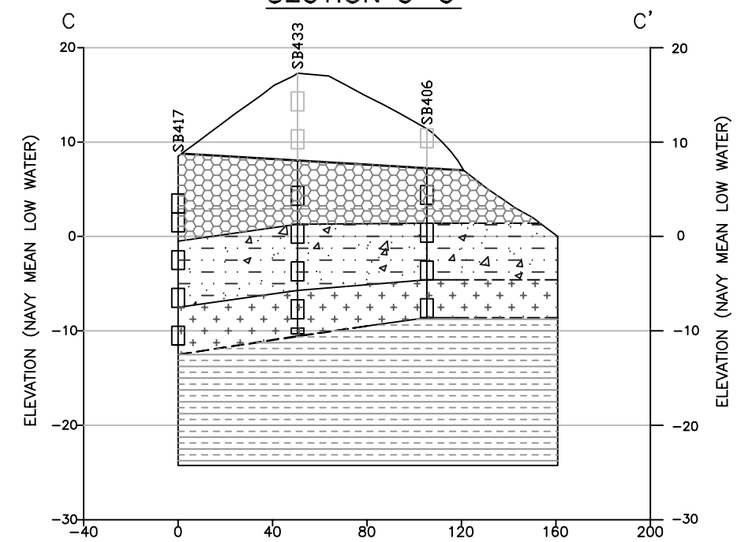
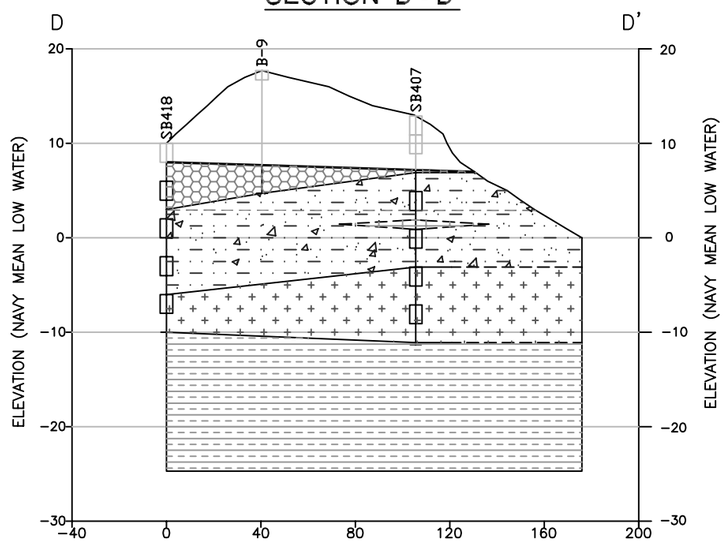
SECTION B - B'

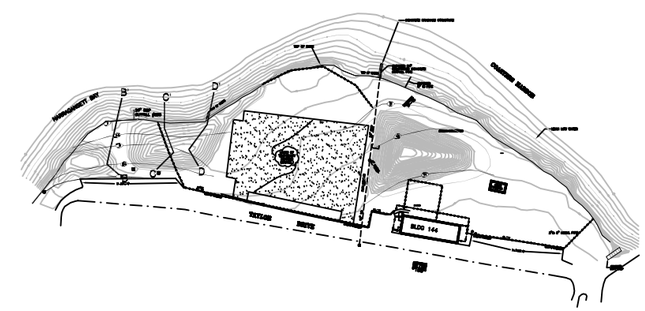


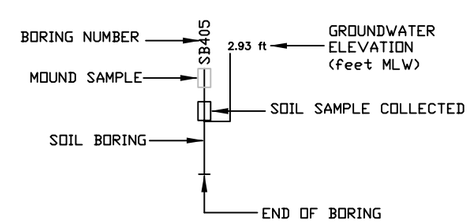
SECTION C - C'



SECTION D - D'







NOTES:

1. THE DEPTHS AND THICKNESSES DETERMINED FOR THE SUBSURFACE STRATA WERE GENERALIZED FROM AND INTERPOLATED BETWEEN TEST BORINGS. THE STRATIFICATION LINES REPRESENT AN APPROXIMATE BOUNDARY BETWEEN SOIL TYPES; THE TRANSITION MAY BE GRADUAL. INFORMATION ON SUBSURFACE CONDITIONS EXIST ONLY AT THE LOCATION OF THE TEST BORINGS; THEREFORE, IT IS POSSIBLE THAT THE SUBSURFACE CONDITIONS MAY VARY FROM THOSE INDICATED.
2. HORIZONTAL DATUM IS BASED ON THE RI STATE PLANE COORDINATE SYSTEM NAD 1927. VERTICAL DATUM IS BASED ON NAVAL BASE MEAN LOW WATER (NGVD 1929).
3. BASE PLAN BY GUERRIERE AND HALNON, INC., JULY 1997, DATED NOVEMBER 10, 1997, PROJ. NO. 7578 CTO 288, BY BROWN AND ROOT ENVIRONMENTAL.
4. ELEVATIONS ON SUBSURFACE CONTACTS WERE GENERALIZED FROM BORING LOGS BY TRC AND TtNUS.
5. BEDROCK ELEVATIONS ARE BASED ON THE DEPTH TO BEDROCK OBSERVED IN TEST PITS AND BORING. IF A REFUSAL WAS NOTED IN A BORING, THE TOP OF BEDROCK WAS GENERALLY ASSUMED TO BE WITHIN ONE FOOT OF THE REFUSAL DEPTH. THE BEDROCK CONTOURS ARE INTERPRETATIONS OF THESE DATA AND THE ACTUAL BEDROCK ELEVATION MAY BE DIFFERENT FROM THE ELEVATION INDICATED.
6. DASHED LINES INDICATE UNCERTAINTY.
7. ALL LOCATIONS TO BE CONSIDERED APPROXIMATE.
8. PLAN NOT TO BE USED FOR DESIGN.

MOUND MATERIAL – CONSISTS OF FILL AND WILL BE REMOVED PRIOR TO SUBSURFACE EXCAVATION

FILL – FINE TO MEDIUM SAND, SILT, GRAVEL, AND ROCK FRAGMENTS MIXED WITH VARYING AMOUNTS OF CONSTRUCTION–TYPE DEBRIS INCLUDING: ASPHALT, CONCRETE, METAL, BRICK, WOOD AND GLASS

SILTY SAND AND GRAVEL – FINE TO MEDIUM SAND, SILT AND GRAVEL, WITH VARYING AMOUNTS OF COBBLES, ROCK FRAGMENTS AND SEASHELL FRAGMENTS

PEAT – PEAT AND ORGANIC MUCK WITH VARYING AMOUNTS OF SAND AND SILT

TILL – DENSE SILT WITH FINE TO MEDIUM SAND, GRAVEL AND ROCK FRAGMENTS

BEDROCK – PHYLLITE

GROUNDWATER ELEVATION BASED ON MW–4S (2.93 MLW ON 8/8/2002)

BASE GRADE ELEVATION

DRAWN BY: D.W. MACDOUGALL	TITLE: CROSS–SECTIONS B–B', C–C', AND D–D' SUBSURFACE PRE–DESIGN INVESTIGATION OLD FIRE FIGHTING TRAINING AREA NAVAL STATION NEWPORT, RHODE ISLAND		FIGURE 5
PREPARED BY: J. LAMBERT			TETRA TECH NUS, INC.
CHECKED BY: S. PARKER	SOURCE: REFER TO FIGURE 4–1 FOR TOPOGRAPHIC SOURCE		55 JONSPIN ROAD WILMINGTON, MASSACHUSETTS 01887 (978)658–7899
	SCALE: AS NOTED	DATE: MARCH 19, 2004	PROJ. NO: 4152
PROJECT MANAGER: S. PARKER	DRAWING NO: 4–4	ACFILE NAME: DWG\4152\3551\FIG_4–4.DWG	REV: 0
PROGRAM MANAGER: J. TREPANOWSKI			

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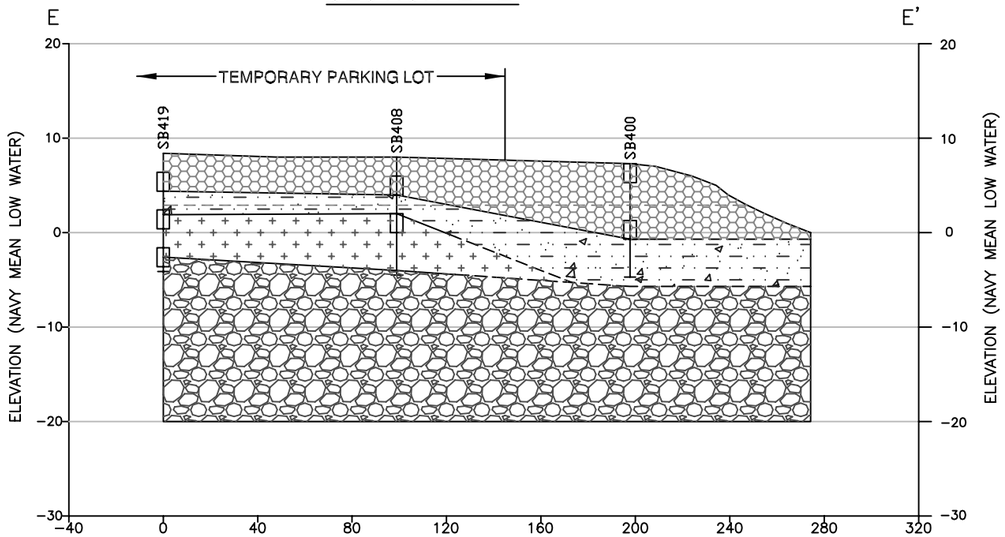
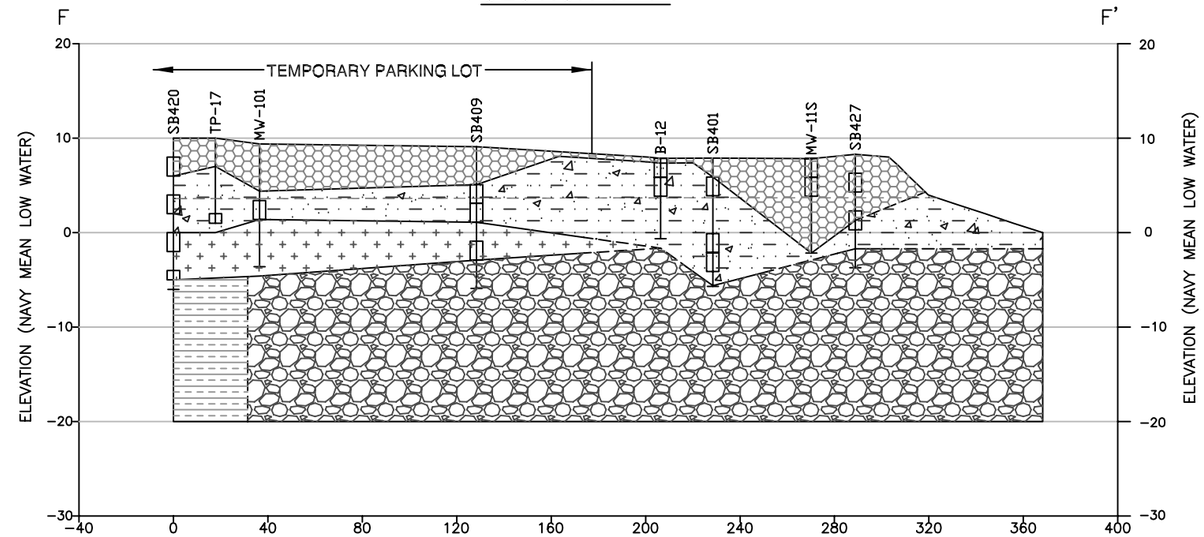
SECTION E - E'



SECTION F - F'



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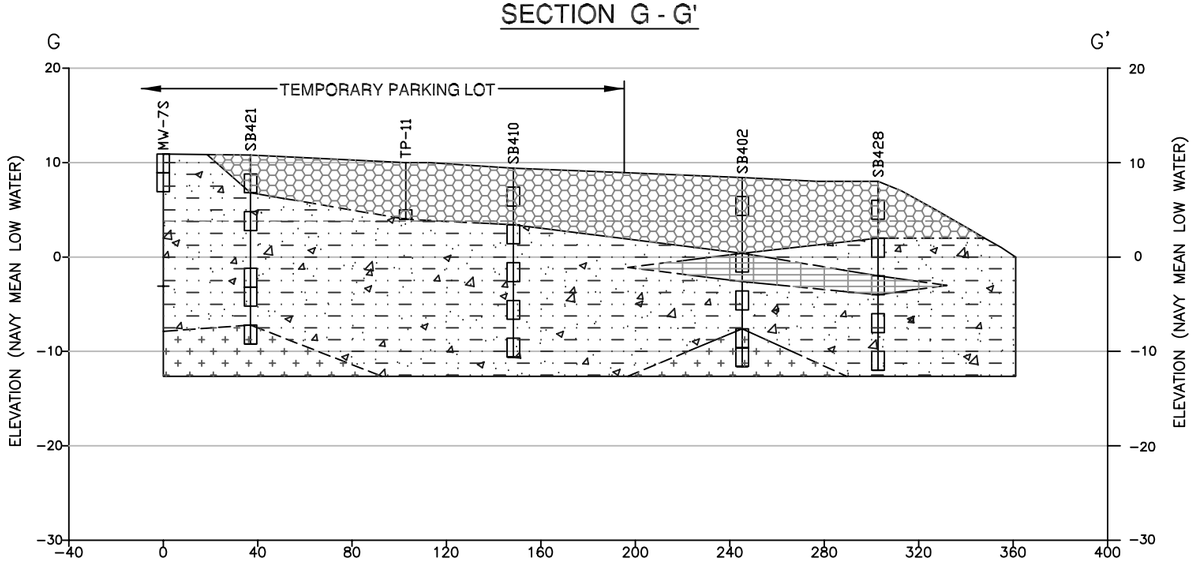
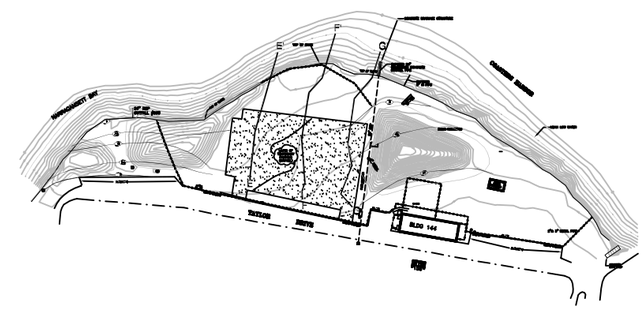




MOUND MATERIAL – CONSISTS OF FILL AND WILL BE REMOVED PRIOR TO SUBSURFACE EXCAVATION

FILL – FINE TO MEDIUM SAND, SILT, GRAVEL, AND ROCK FRAGMENTS MIXED WITH VARYING AMOUNTS OF CONSTRUCTION-TYPE DEBRIS INCLUDING: ASPHALT, CONCRETE, METAL, BRICK, WOOD AND GLASS

SILTY SAND AND GRAVEL – FINE TO MEDIUM SAND, SILT AND GRAVEL, WITH VARYING AMOUNTS OF COBBLES, ROCK FRAGMENTS AND SEASHELL FRAGMENTS

PEAT – PEAT AND ORGANIC MUCK WITH VARYING AMOUNTS OF SAND AND SILT

TILL – DENSE SILT WITH FINE TO MEDIUM SAND, GRAVEL AND ROCK FRAGMENTS

BEDROCK – CONGLOMERATE WITH QUARTZITE COBBLES

BEDROCK – PHYLLITE

GROUNDWATER ELEVATIONS MEASURED ON 8/8/2002; MW-4S GROUNDWATER ELEVATION USED FOR E-E'; MW-3S USED FOR G-G'

BASE GRADE ELEVATION

NOTES:

1. THE DEPTHS AND THICKNESSES DETERMINED FOR THE SUBSURFACE STRATA WERE GENERALIZED FROM AND INTERPOLATED BETWEEN TEST BORINGS. THE STRATIFICATION LINES REPRESENT AN APPROXIMATE BOUNDARY BETWEEN SOIL TYPES; THE TRANSITION MAY BE GRADUAL. INFORMATION ON SUBSURFACE CONDITIONS EXIST ONLY AT THE LOCATION OF THE TEST BORINGS; THEREFORE, IT IS POSSIBLE THAT THE SUBSURFACE CONDITIONS MAY VARY FROM THOSE INDICATED.

2. HORIZONTAL DATUM IS BASED ON THE RI STATE PLANE COORDINATE SYSTEM NAD 1927. VERTICAL DATUM IS BASED ON NAVAL BASE MEAN LOW WATER (NGVD 1929).

3. BASE PLAN BY GUERRIERE AND HALNON, INC., JULY 1997, DATED NOVEMBER 10, 1997, PROJ. NO. 7578 CTO 288, BY BROWN AND ROOT ENVIRONMENTAL.

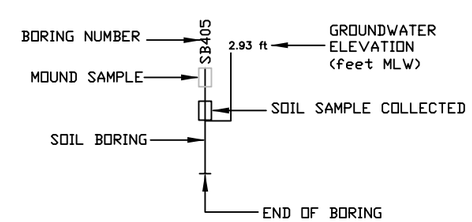
4. ELEVATIONS ON SUBSURFACE CONTACTS WERE GENERALIZED FROM BORING LOGS BY TRC AND TtNUS.

5. BEDROCK ELEVATIONS ARE BASED ON THE DEPTH TO BEDROCK OBSERVED IN TEST PITS AND BORING. IF A REFUSAL WAS NOTED IN A BORING, THE TOP OF BEDROCK WAS GENERALLY ASSUMED TO BE WITHIN ONE FOOT OF THE REFUSAL DEPTH. THE BEDROCK CONTOURS ARE INTERPRETATIONS OF THESE DATA AND THE ACTUAL BEDROCK ELEVATION MAY BE DIFFERENT FROM THE ELEVATION INDICATED.

6. DASHED LINES INDICATE UNCERTAINTY.

7. ALL LOCATIONS TO BE CONSIDERED APPROXIMATE.

8. PLAN NOT TO BE USED FOR DESIGN.



DRAWN BY: D.W. MACDOUGALL	TITLE: CROSS-SECTIONS E-E', F-F', AND G-G' SUBSURFACE PRE-DESIGN INVESTIGATION OLD FIRE FIGHTING TRAINING AREA NAVAL STATION NEWPORT, RHODE ISLAND		FIGURE 6
PREPARED BY: J. LAMBERT			TETRA TECH NUS, INC.
CHECKED BY: S. PARKER			55 JONSPIN ROAD WILMINGTON, MASSACHUSETTS 01887 (978)658-7899
	SOURCE: REFER TO FIGURE 4-1 FOR TOPOGRAPHIC SOURCE		
	SCALE: AS NOTED	DATE: MARCH 18, 2004	PROJ. NO: 4152
PROJECT MANAGER: S. PARKER	DRAWING NO: 4-5	ACFILE NAME: DWG\4152\3551\FIG_4-5.DWG	REV: 0
PROGRAM MANAGER: J. TREPANOWSKI			

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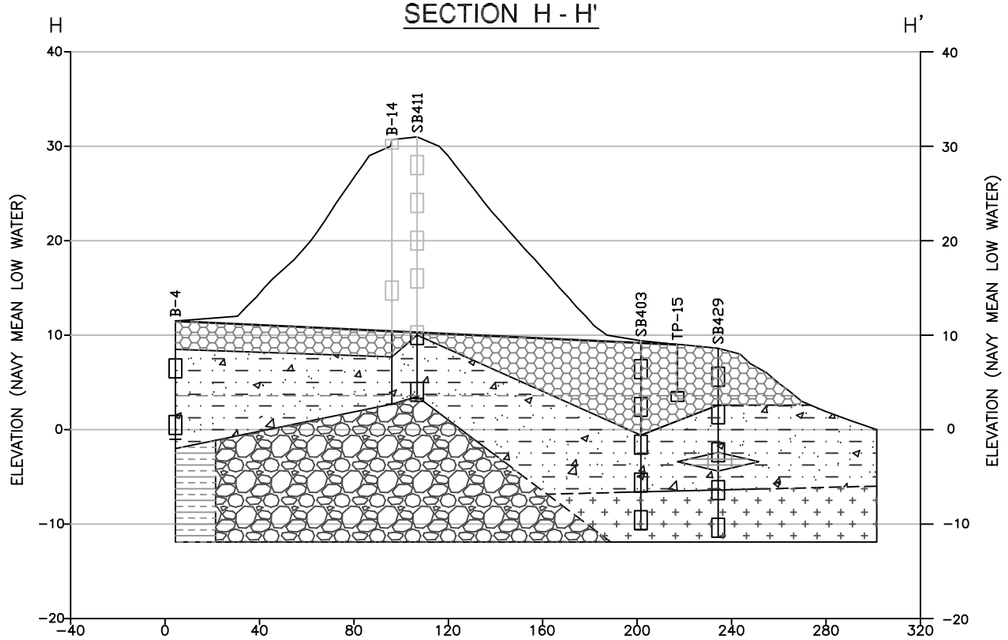
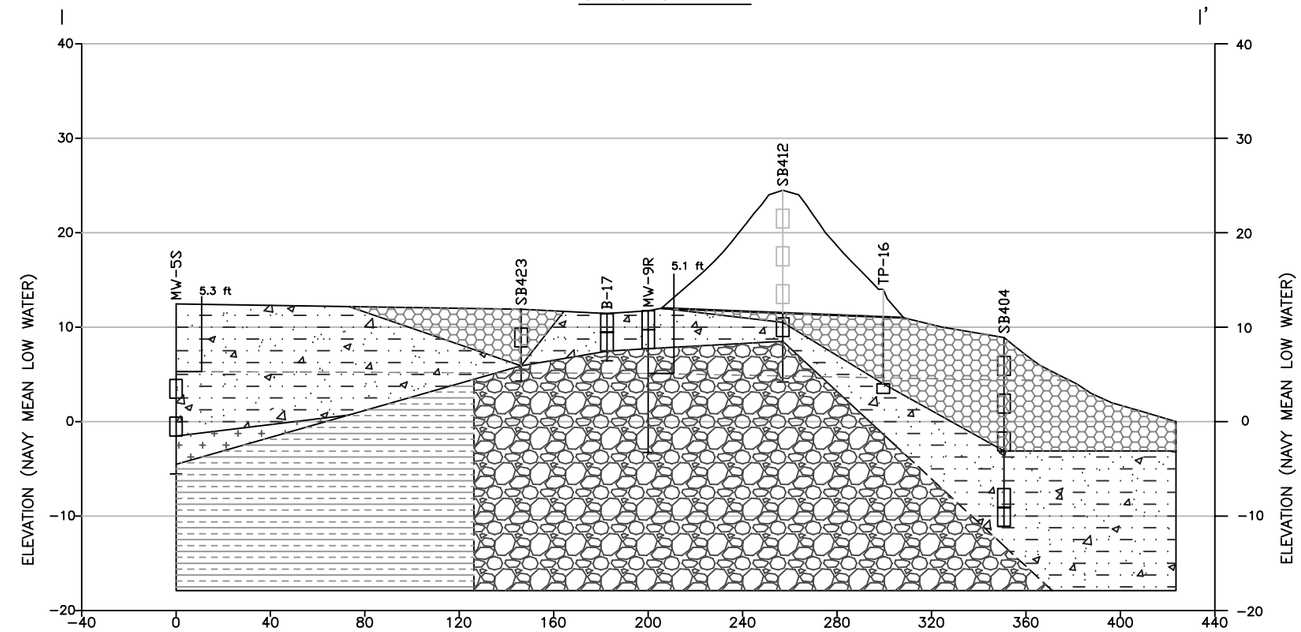
SECTION H - H'



SECTION I - I'



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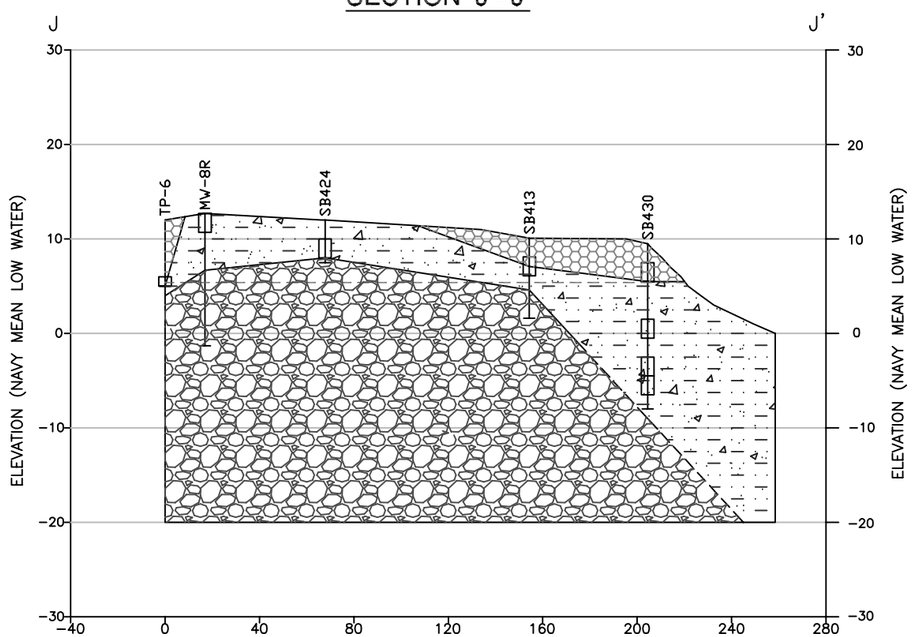
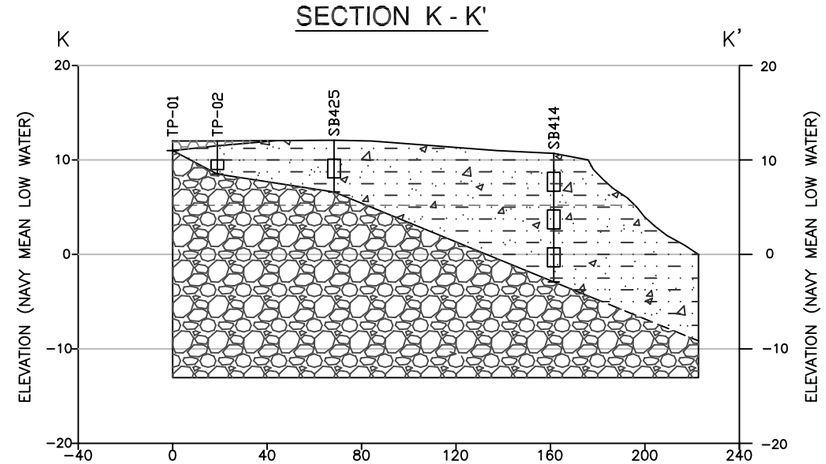
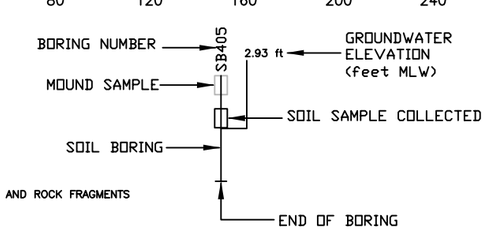


SECTION K - K'





NOTES:

1. THE DEPTHS AND THICKNESSES DETERMINED FOR THE SUBSURFACE STRATA WERE GENERALIZED FROM AND INTERPOLATED BETWEEN TEST BORINGS. THE STRATIFICATION LINES REPRESENT AN APPROXIMATE BOUNDARY BETWEEN SOIL TYPES; THE TRANSITION MAY BE GRADUAL. INFORMATION ON SUBSURFACE CONDITIONS EXIST ONLY AT THE LOCATION OF THE TEST BORINGS; THEREFORE, IT IS POSSIBLE THAT THE SUBSURFACE CONDITIONS MAY VARY FROM THOSE INDICATED.

2. HORIZONTAL DATUM IS BASED ON THE RI STATE PLANE COORDINATE SYSTEM NAD 1927. VERTICAL DATUM IS BASED ON NAVAL BASE MEAN LOW WATER (NGVD 1929).

3. BASE PLAN BY GUERRIERE AND HALNON, INC., JULY 1997, DATED NOVEMBER 10, 1997, PROJ. NO. 7578 CTO 288, BY BROWN AND ROOT ENVIRONMENTAL.

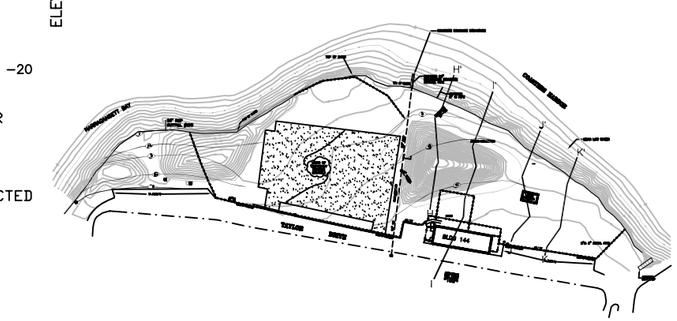
4. ELEVATIONS ON SUBSURFACE CONTACTS WERE GENERALIZED FROM BORING LOGS BY TRC AND TtNUS.

5. BEDROCK ELEVATIONS ARE BASED ON THE DEPTH TO BEDROCK OBSERVED IN TEST PITS AND BORING. IF A REFUSAL WAS NOTED IN A BORING, THE TOP OF BEDROCK WAS GENERALLY ASSUMED TO BE WITHIN ONE FOOT OF THE REFUSAL DEPTH. THE BEDROCK CONTOURS ARE INTERPRETATIONS OF THESE DATA AND THE ACTUAL BEDROCK ELEVATION MAY BE DIFFERENT FROM THE ELEVATION INDICATED.

6. DASHED LINES INDICATE UNCERTAINTY.

7. ALL LOCATIONS TO BE CONSIDERED APPROXIMATE.

8. PLAN NOT TO BE USED FOR DESIGN.



MOUND MATERIAL – CONSISTS OF FILL AND WILL BE REMOVED PRIOR TO SUBSURFACE EXCAVATION

FILL – FINE TO MEDIUM SAND, SILT, GRAVEL, AND ROCK FRAGMENTS MIXED WITH VARYING AMOUNTS OF CONSTRUCTION-TYPE DEBRIS INCLUDING: ASPHALT, CONCRETE, METAL, BRICK, WOOD AND GLASS

SILTY SAND AND GRAVEL – FINE TO MEDIUM SAND, SILT AND GRAVEL, WITH VARYING AMOUNTS OF COBBLES, ROCK FRAGMENTS AND SEASHELL FRAGMENTS

PEAT – PEAT AND ORGANIC MUCK WITH VARYING AMOUNTS OF SAND AND SILT

TILL – DENSE SILT WITH FINE TO MEDIUM SAND, GRAVEL AND ROCK FRAGMENTS

BEDROCK – CONGLOMERATE WITH QUARTZITE COBBLES

BEDROCK – PHYLLITE

GROUNDWATER ELEVATIONS MEASURED ON 8/8/2002; MW-102 GROUNDWATER ELEVATIONS USED FOR H-H'; MW-1R GROUNDWATER ELEVATIONS USED FOR K-K'

BASE GRADE ELEVATION

DRAWN BY: D.W. MACDOUGALL	TITLE: CROSS-SECTIONS H-H', I-I', J-J', AND K-K' SUBSURFACE PRE-DESIGN INVESTIGATION OLD FIRE FIGHTING TRAINING AREA NAVAL STATION NEWPORT, RHODE ISLAND
PREPARED BY: J. LAMBERT	
CHECKED BY: S. PARKER	
	SOURCE: REFER TO FIGURE 4-1 FOR TOPOGRAPHIC SOURCE
	SCALE: AS NOTED / DATE: MARCH 19, 2004 / PROJ. NO: 4152
PROJECT MANAGER: S. PARKER	DRAWING NO: 4-6 / ACFILE NAME: DWG\4152\3551\FIG_4-6.DWG / REV: 0
PROGRAM MANAGER: J. TREPANOWSKI	

FIGURE 7

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

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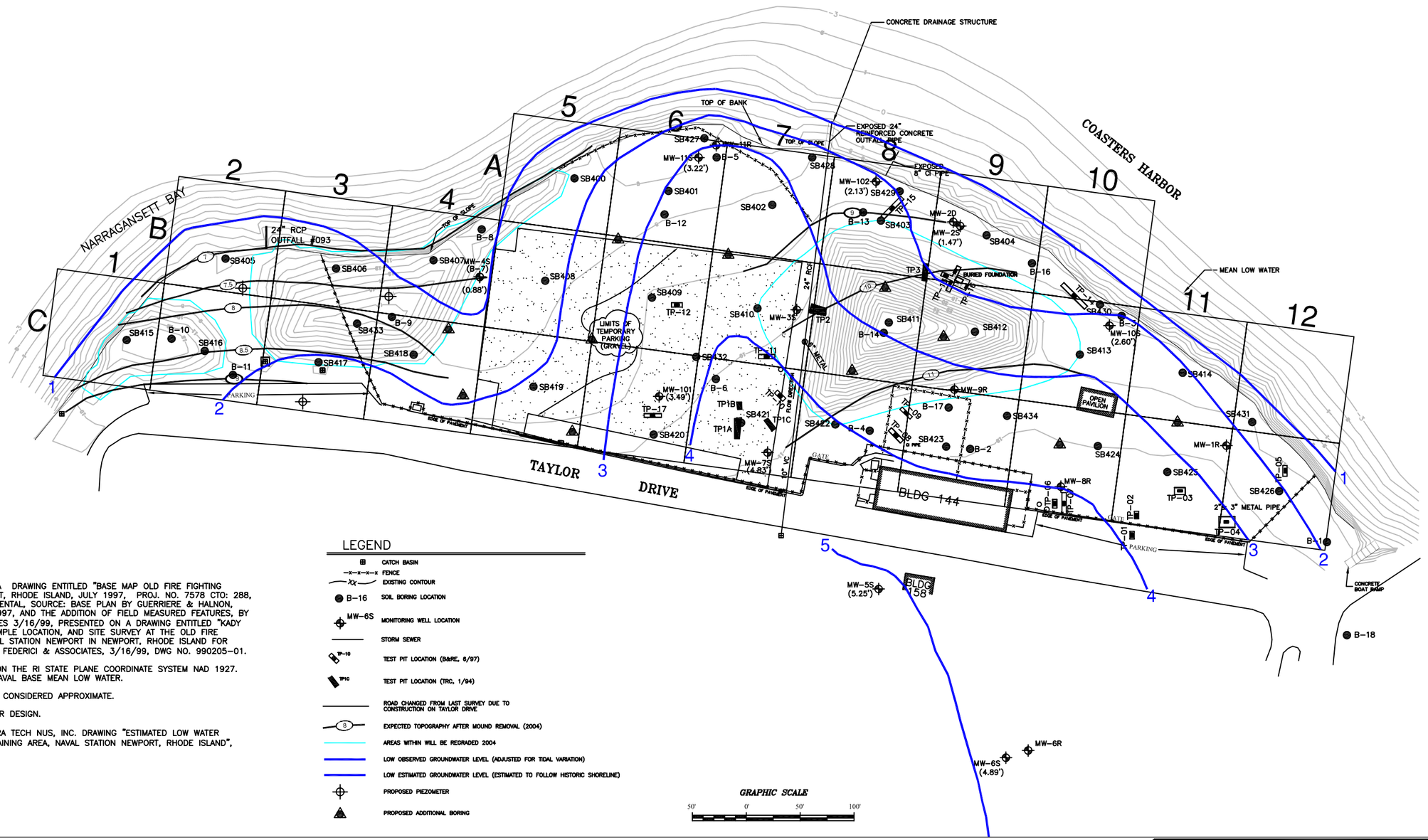


NOTES AND REFERENCES:

1. DRAWING COMPILED FROM A DRAWING ENTITLED "BASE MAP OLD FIRE FIGHTING TRAINING AREA NETC, NEWPORT, RHODE ISLAND, JULY 1997, PROJ. NO. 7578 CTO: 288, BY BROWN & ROOT ENVIRONMENTAL, SOURCE: BASE PLAN BY GUERRIERE & HALNON, INC., DATED NOVEMBER 10, 1997, AND THE ADDITION OF FIELD MEASURED FEATURES, BY LOUIS FEDERICI AND ASSOCIATES 3/16/99, PRESENTED ON A DRAWING ENTITLED "KADY FIELD, TOPOGRAPHIC, SOIL SAMPLE LOCATION, AND SITE SURVEY AT THE OLD FIRE FIGHTING TRAINING AREA, NAVAL STATION NEWPORT IN NEWPORT, RHODE ISLAND FOR TETRA TECH NUS, INC., LOUIS FEDERICI & ASSOCIATES, 3/16/99, DWG NO. 990205-01.

2. HORIZONTAL DATUM BASE ON THE RI STATE PLANE COORDINATE SYSTEM NAD 1927. VERTICAL DATUM BASED ON NAVAL BASE MEAN LOW WATER.

3. ALL LOCATIONS ARE TO BE CONSIDERED APPROXIMATE.

4. PLAN NOT TO BE USED FOR DESIGN.

5. DRAWING TAKEN FROM TETRA TECH NUS, INC. DRAWING "ESTIMATED LOW WATER TABLE, OLD FIRE FIGHTING TRAINING AREA, NAVAL STATION NEWPORT, RHODE ISLAND", MARCH, 2005.

LEGEND

- CATCH BASIN
- FENCE
- EXISTING CONTOUR
- B-16 SOIL BORING LOCATION
- MW-6S MONITORING WELL LOCATION
- STORM SEWER
- TP-10 TEST PIT LOCATION (B&RE, 6/97)
- TP1C TEST PIT LOCATION (TRC, 1/94)
- ROAD CHANGED FROM LAST SURVEY DUE TO CONSTRUCTION ON TAYLOR DRIVE
- 8 EXPECTED TOPOGRAPHY AFTER MOUND REMOVAL (2004)
- AREAS WITHIN WILL BE REGRADED 2004
- LOW OBSERVED GROUNDWATER LEVEL (ADJUSTED FOR TIDAL VARIATION)
- LOW ESTIMATED GROUNDWATER LEVEL (ESTIMATED TO FOLLOW HISTORIC SHORELINE)
- PROPOSED PIEZOMETER
- PROPOSED ADDITIONAL BORING

GRAPHIC SCALE

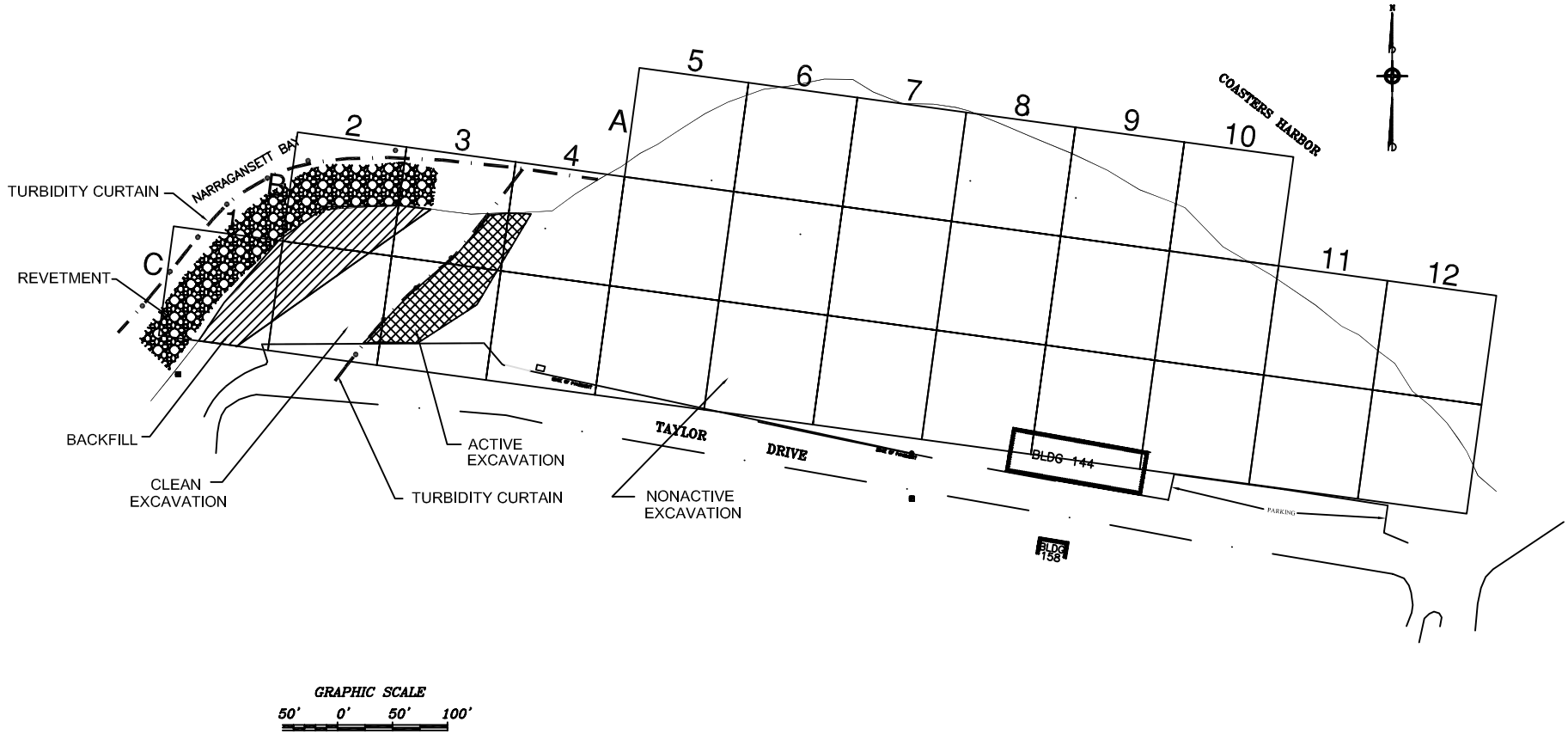
50' 0' 50' 100'

PRELIMINARY

U.S. Navy RAC
OFFTA Newport, Rhode Island

Figure 8
Estimated Low Water Table

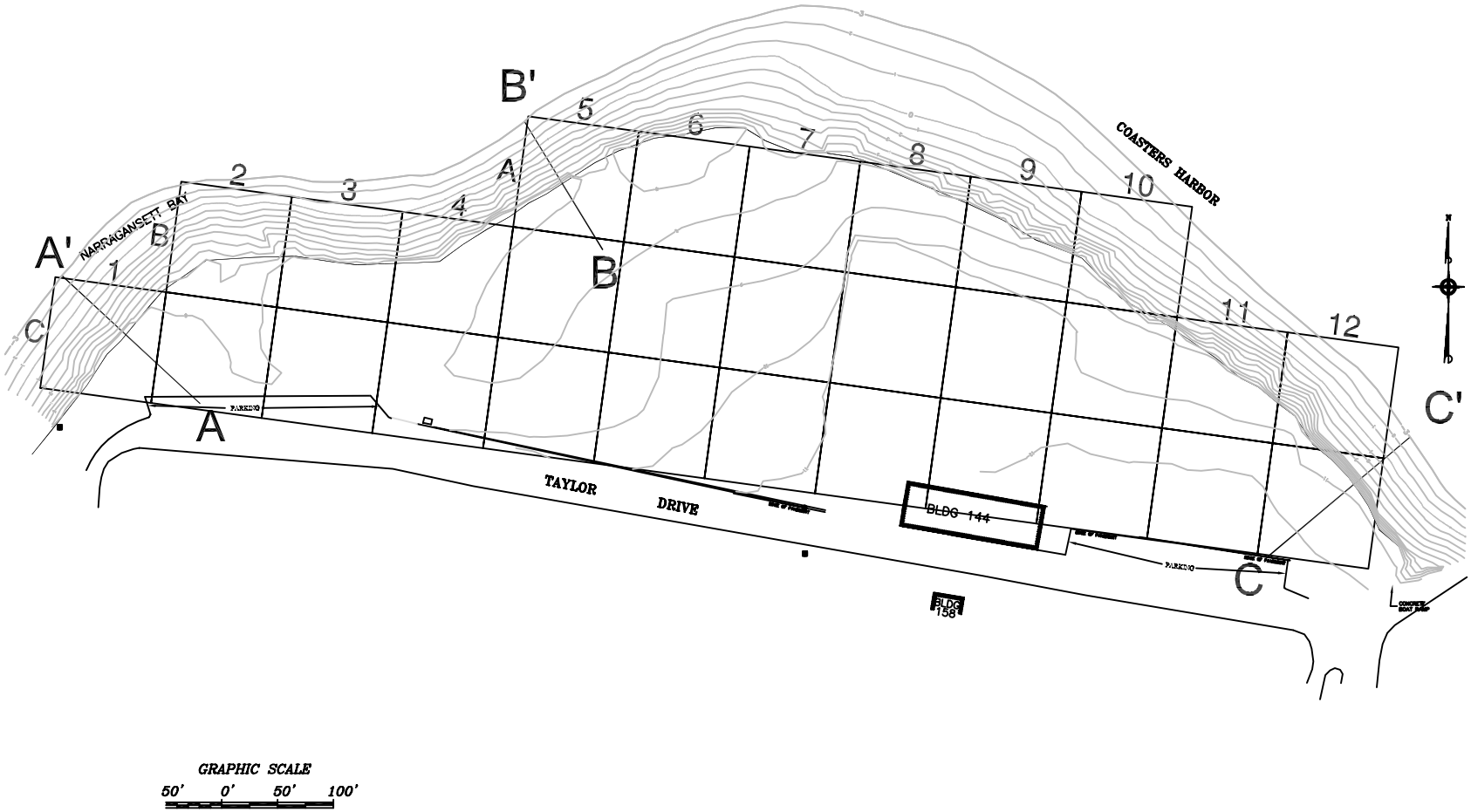
TETRA TECH EC, INC.



U.S. Navy RAC
OFFTA Newport, Rhode Island

Figure 9
Excavation Plan

TETRA TECH EC, INC.



U.S. Navy RAC
OFFTA Newport, Rhode Island

Figure 10
Cross Section Location Map, Rubble Revetment

TETRA TECH EC, INC.

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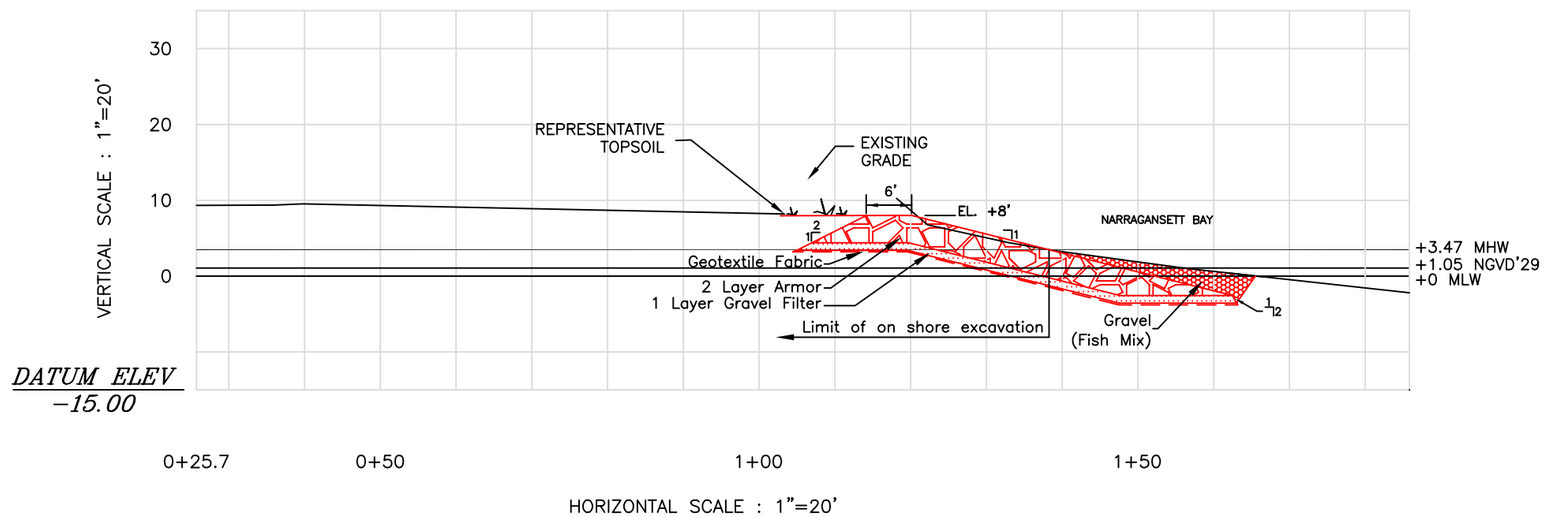
SECTION A–A'



NOTES:

1.) VERTICAL DATUM MLW AS DEFINED BY NOAA AT BENCHMARK # 8452660 (NEWPORT, RI)

2.) DATUM FOR EXISTING GRADE IS DEFINED AS THE NAVY MLW, WHICH ASSUMED TO BE SAME AS NOTE 1 ABOVE.

U.S. Navy RAC
OFFTA Newport, Rhode Island

Figure 11
Section A–A'
Revetment Cross Sections

TETRA TECH EC, INC.

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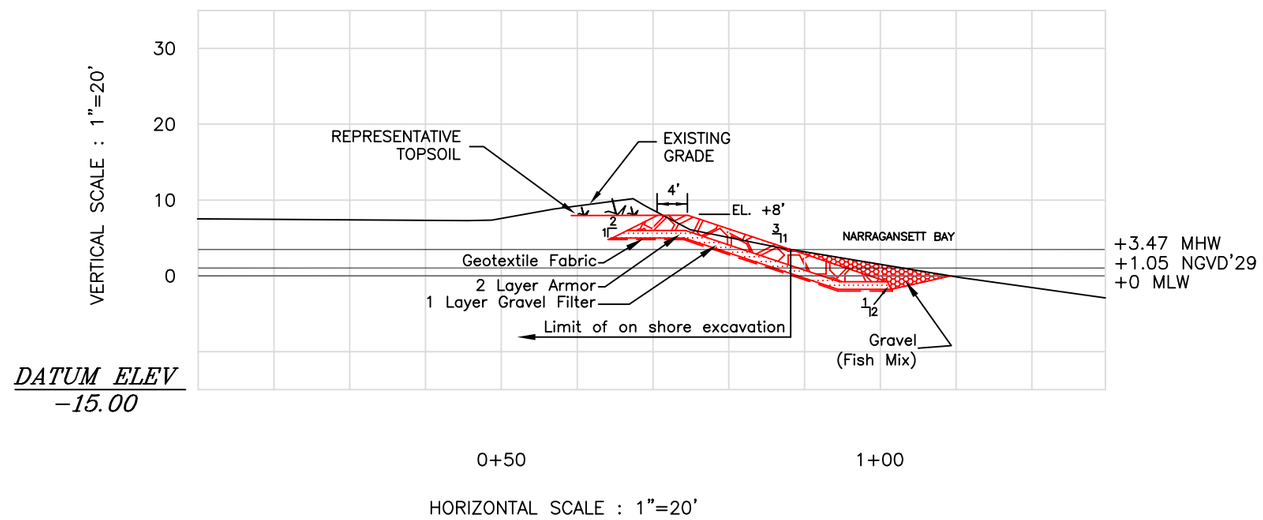
SECTION B–B'



NOTES:

1.) VERTICAL DATUM MLW AS DEFINED BY NOAA AT BENCHMARK # 8452660 (NEWPORT, RI)

2.) DATUM FOR EXISTING GRADE IS DEFINED AS THE NAVY MLW, WHICH ASSUMED TO BE SAME AS NOTE 1 ABOVE.

U.S. Navy RAC
OFFTA Newport, Rhode Island

Figure 12
Section B–B'
Revetment Cross Sections

TETRA TECH EC, INC.

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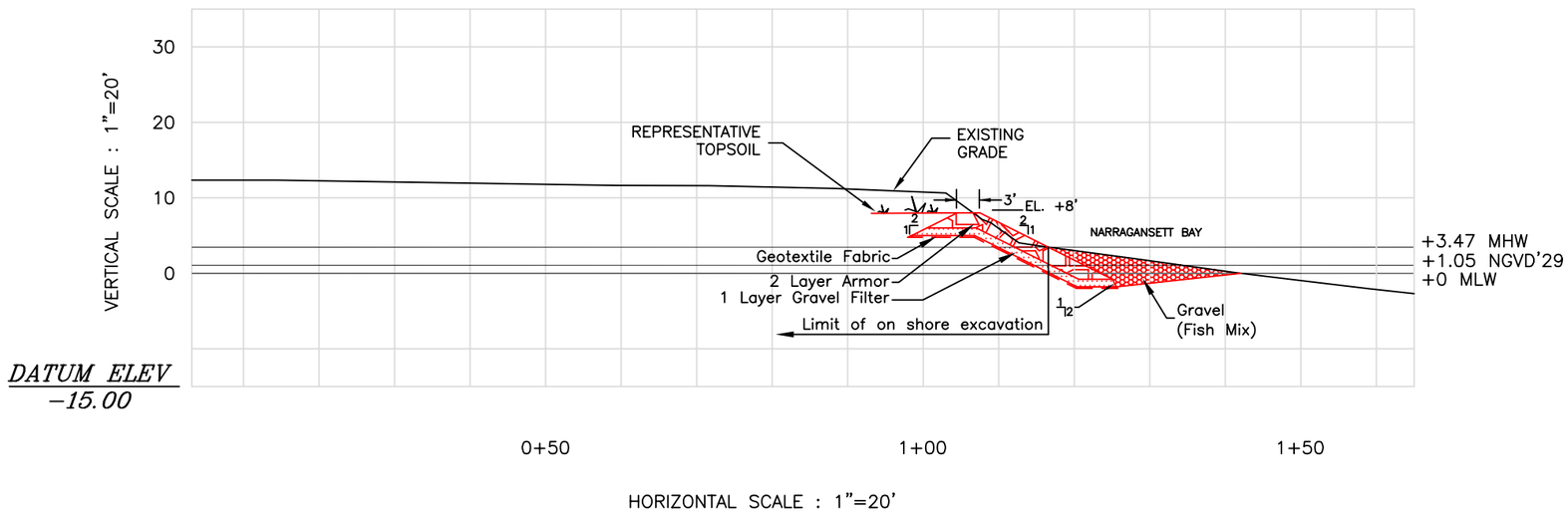
SECTION C–C'



NOTES:

1.) VERTICAL DATUM MLW AS DEFINED BY NOAA AT BENCHMARK # 8452660 (NEWPORT, RI)

2.) DATUM FOR EXISTING GRADE IS DEFINED AS THE NAVY MLW, WHICH ASSUMED TO BE SAME AS NOTE 1 ABOVE.

U.S. Navy RAC
OFFTA Newport, Rhode Island

Figure 13
Section C–C'
Revetment Cross Sections

TETRA TECH EC, INC.

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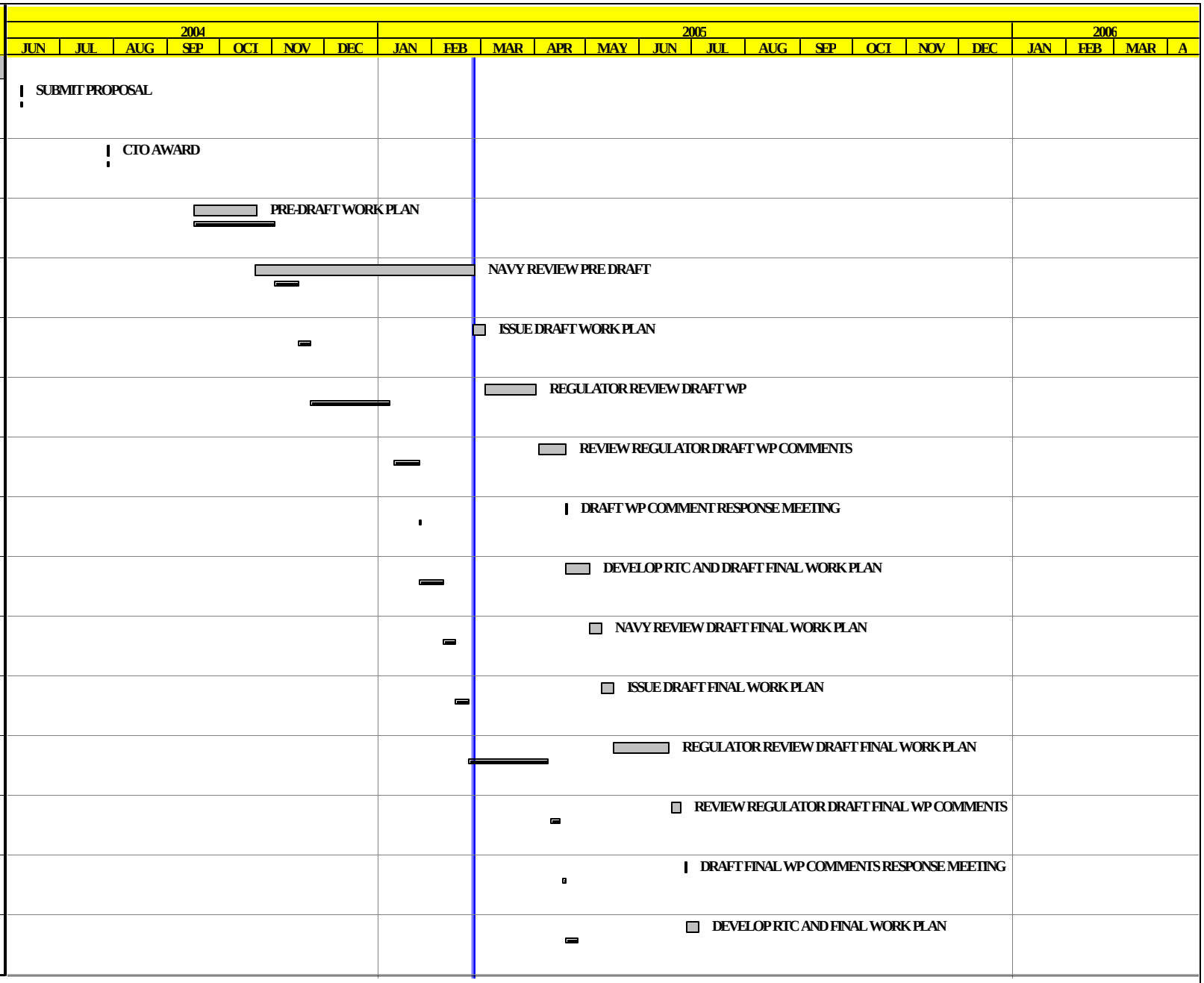
APPENDIX A

Project Schedule

Early Start	Early Finish	% Comp	Work Plan
09JUN04A	09JUN04A	100	SUBMIT PROPOSAL
29JUL04A	29JUL04A	100	CTO AWARD
17SEP04A	22OCT04A	100	PRE-DRAFT WORK PLAN
22OCT04A	25FEB05A	100	NAVY REVIEW PRE DRAFT
25FEB05A	03MAR05	0	ISSUE DRAFT WORK PLAN
04MAR05	01APR05	0	REGULATOR REVIEW DRAFT WP
04APR05	18APR05	0	REVIEW REGULATOR DRAFT WP COMMENTS
19APR05	19APR05	0	DRAFT WP COMMENT RESPONSE MEETING
19APR05	02MAY05	0	DEVELOP RTC AND DRAFT FINAL WORK PLAN
03MAY05	09MAY05	0	NAVY REVIEW DRAFT FINAL WORK PLAN
10MAY05	16MAY05	0	ISSUE DRAFT FINAL WORK PLAN
17MAY05	17JUN05	0	REGULATOR REVIEW DRAFT FINAL WORK PLAN
20JUN05	24JUN05	0	REVIEW REGULATOR DRAFT FINAL WP COMMENTS
27JUN05	27JUN05	0	DRAFT FINAL WP COMMENTS RESPONSE MEETING
28JUN05	04JUL05	0	DEVELOP RTC AND FINAL WORK PLAN



Start Date	01JUN04
Finish Date	10FEB06
Data Date	25FEB05
Run Date	22FEB05 10:48

Early Bar
Target Bar
Progress Bar

C102 Sheet 1 of 2

CONTRACT TASK ORDER NO. 102

NEWPORT, RI

OLD FIRE FIGHTING TRAINING AREA

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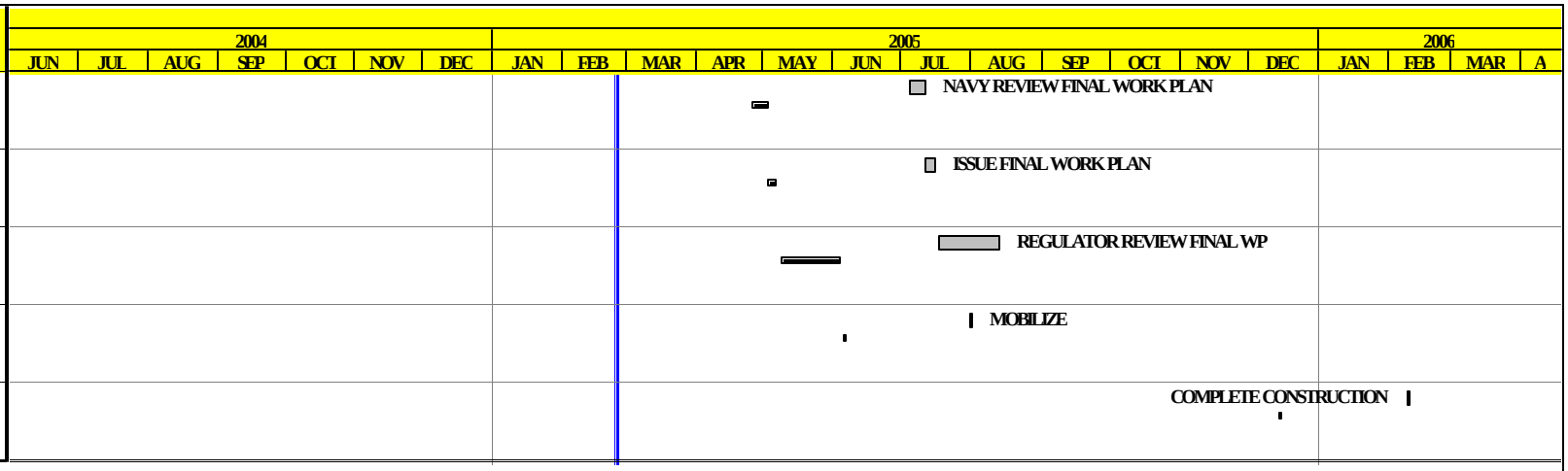
Early Start	Early Finish	% Comp	Activity
05JUL05	11JUL05	0	NAVY REVIEW FINAL WORK PLAN
12JUL05	15JUL05	0	ISSUE FINAL WORK PLAN
18JUL05	12AUG05	0	REGULATOR REVIEW FINAL WP
01AUG05	01AUG05	0	MOBILIZE
10FEB06	10FEB06	0	COMPLETE CONSTRUCTION



Start Date	01JUN04
Finish Date	10FEB06
Data Date	25FEB05
Run Date	22FEB05 10:48

Early Bar
Target Bar
Progress Bar

C102 Sheet 2 of 2

CONTRACT TASK ORDER NO. 102

NEWPORT, RI

OLD FIRE FIGHTING TRAINING AREA

© Primavera Systems, Inc.

APPENDIX B

Construction Quality Control Plan

DRAFT

30% CONSTRUCTION QUALITY CONTROL (CQC) PLAN FOR SOIL REMOVAL AND REVETMENT CONSTRUCTION AT OLD FIRE FIGHTING TRAINING AREA NAVAL STATION NEWPORT NEWPORT, RHODE ISLAND

Prepared for:

DEPARTMENT OF THE NAVY
ENGINEERING FIELD ACTIVITY, NORTHEAST
Naval Facilities Engineering Command
10 Industrial Highway, Mail Stop #82
Lester, Pennsylvania 19113

REMEDIAL ACTION CONTRACT NO. N62472-99-D-0032
Contract Task Order No. 102

March 11, 2005

Prepared by:

TETRA TECH EC, INC.

2300 Lincoln Highway East
One Oxford Valley, Suite 200
Langhorne, PA 19047

Revision	Date	Prepared by:	Approved by:	Pages Affected:
0	10/22/04	J. Khouri	F. Ahtchi-Ali	All
1	3/11/05	J. Khouri	F. Ahtchi-Ali	All

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FIGURE

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Appendix B Résumé – SQCM
Appendix C Outside Organizations
Appendix D Appointment Letter
Appendix E Initial Submittal Register
Appendix F Pre-Construction Testing Plan and Log
Appendix G Sample “Rework Items List” Form
Appendix H Sample “Contractor Production Report” Form
Appendix I Sample “Contractor Quality Control Report” Form
Appendix J Sample “Record of Quality Control Meeting/Minutes” Form
Appendix K Sample “Preparatory Phase Checklist” Form
Appendix L Sample “Initial Phase Checklist” Form

ACRONYMS AND ABBREVIATIONS

AALA	American Association for Laboratory Accreditation
AASHTO	American Association of State Highway and Transportation Officials
AHA	Activity Hazard Analysis
BRAC	Base Realignment and Closure
CO	Contracting Officer
CQC	Construction Quality Control
EFANE	Engineering Field Activity, Northeast
ER, N	Environmental Restoration, Navy
IRP	Installation Restoration Program
MSDS	Material Safety Data Sheets
NAVSTA	Naval Station
NIST	National Institute of Standards and Technology
NLEP	Navy Laboratory Evaluation Program
NVLAP	National Voluntary Laboratory Accreditation Program
OFFTA	Old Fire Fighting Training Area
OSHA	Occupational Safety and Health Administration
PAH	Polynuclear Aromatic Hydrocarbons
PQCM	Program Quality Control Manager
QC	Quality Control
RAC	Remedial Action Contract
SQCM	Site Quality Control Manager
SSHSP	Site-Specific Health and Safety Plan
TPH	Total Petroleum Hydrocarbons

1.0 INTRODUCTION

This document presents the Construction Quality Control (CQC) Plan for removal of contaminated soil and construction of a stone revetment at the Old Fire Fighting Training Area (OFFTA), located at Naval Station (NAVSTA) Newport, in Newport, Rhode Island. This CQC Plan will be considered one of the contract documents for this project. The purpose of this CQC Plan is to specify the methods, procedures, and frequency of inspection and testing activities to verify the quality of the work performed in accordance with the approved Contract Drawings and Technical Specifications.

This Quality Control (QC) program applies to all work performed by Tetra Tech EC, Inc. (TtEC) on this project as well as all subcontractors to TtEC.

This CQC Plan was prepared in accordance with the Remedial Action Contract (RAC) No. N62472-99-D-0032, Section C Part 6 (Quality Control), Part 7 (Submittals – General Standards)

2.0 QUALITY CONTROL ORGANIZATION

2.1 General

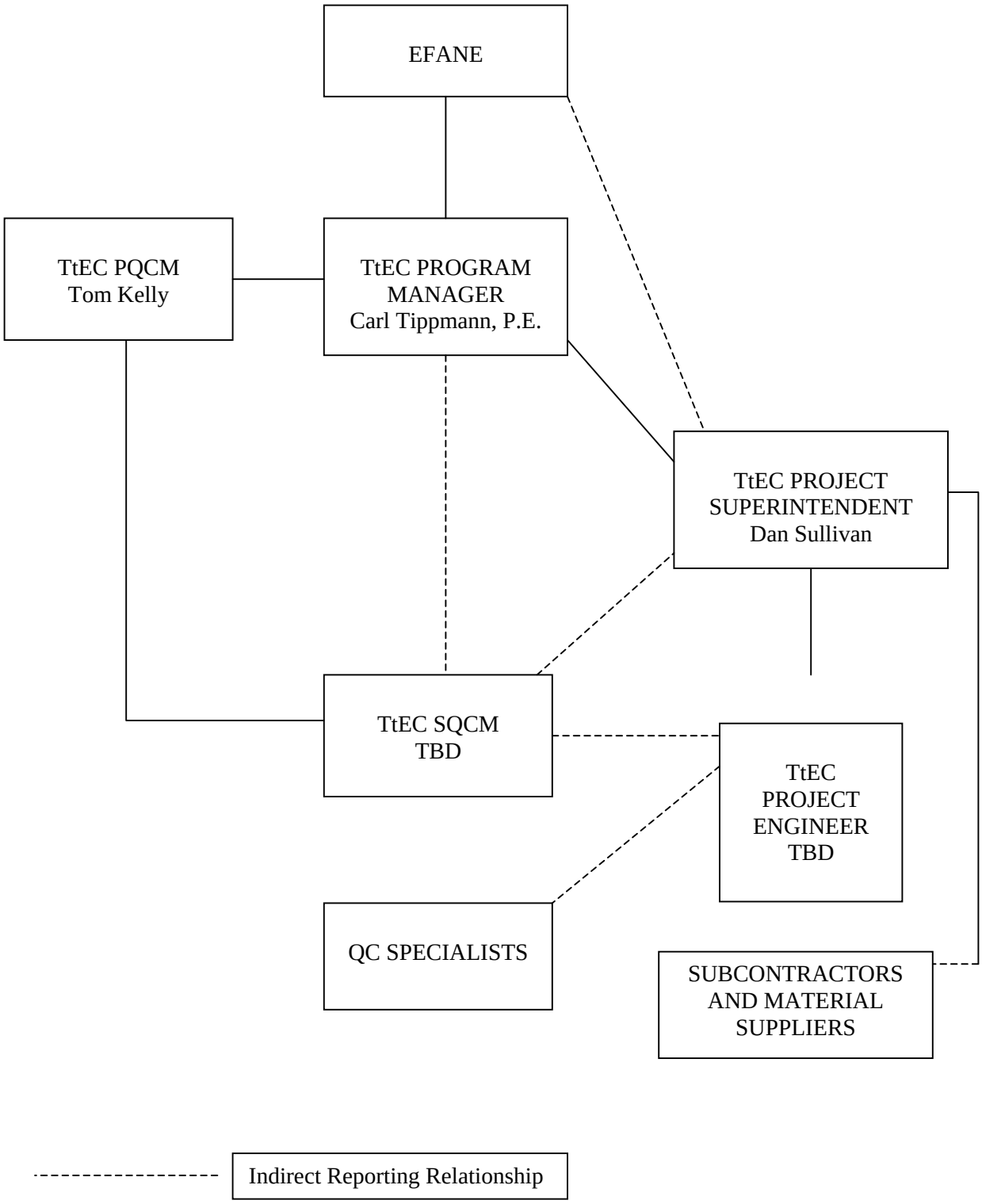
The organizations involved in the project include the United States Navy Engineering Field Activity, Northeast (EFANE) and the Remedial Action Contractor. CQC representatives will be the Program Quality Control Manager (PQCM), the Site Quality Control Manager (SQCM), and QC Specialists, as required.

The roles of CQC personnel are described within this CQC Plan.

2.2 Organization

Figure 1, presented below, shows the project CQC organization with all lines of authority.

Figure 1
CQC Organization Chart



3.0 NAMES AND QUALIFICATIONS

3.1 PQCM – Résumé

See Appendix A for Résumé – PQCM.

3.2 SQCM – Résumé

See Appendix B for Résumé – SQCM.

4.0 DUTIES, RESPONSIBILITIES AND AUTHORITIES

4.1 General

TtEC is the Remedial Action Contractor for the OFFTA project. TtEC is responsible for implementation of construction activities in strict accordance with design criteria, Contract Drawings, and Technical Specifications using the necessary construction procedures and techniques. TtEC is also responsible for formulating and implementing a CQC Plan which addresses the roles and responsibilities of TtEC project and CQC personnel, and outlines inspection and testing procedures to be conducted by CQC personnel and/or subcontractors.

4.2 PQCM

The PQCM, Thomas Kelly, reports to the TtEC Program Manager on all quality-related matters. The PQCM interfaces with the SQCM and the Project Manager on all matters affecting quality. Specific tasks to be performed by the PQCM include the following:

- Review and approve the CQC Plan and any revisions.
- Assure all relevant portions of the CQC Plan are implemented on the project.
- Issue reports to the Project Manager on any deviation of the approved plans.
- Authorize the SQCM to act on his behalf for all site-related QC activities.
- Assist the SQCM with resolving quality-related issues that are raised beyond resolution at the site level.

4.3 SQCM

The SQCM, TBD, reports to the PQCM on all matters affecting quality and interfaces on a daily basis with the Project Superintendent and Project Engineer. The SQCM is responsible for coordinating inspection and surveillance activities. The SQCM or designated representative will monitor site activities on a full-time basis. The results of inspections and surveillance will be documented in the Contractor QC Report. The SQCM will also be responsible for:

- Implementation of the Project CQC Plan, including performance and documentation of the Three Phases of Control for all construction activities.
- Performance of CQC inspection/testing and preparation of inspection and testing reports.
- Assuring proper collection of samples for laboratory testing and review of test results.
- Preparation and maintenance of the Rework Items List and ensuring closure/compliance of all listed items.

- Maintenance of the latest applicable Contract Drawings and Technical Specifications with amendments and/or approved modifications at the job site and assuring that they are used for shop drawings, fabrication, construction, inspections, and testing.
- Assuring maintenance and availability of Record Drawings.
- Maintenance of a TtEC-generated Submittal Register, ENG Form 4288, for the duration of the contract, reviewing the Submittal Register at least monthly and taking appropriate actions should slippages or other changes so necessitate.
- Reviewing all submittals for compliance with the construction drawings and technical specifications prior to approval or submission to the Contracting Officer (CO) or designated representative.
- Scheduling, conducting and documenting periodic QC Meetings.
- Stop Work Authority in concert with the Project Manager.

4.4 QC Specialist

The QC Specialist reports directly to the SQCM on all matters affecting QC and will be responsible for performing the three phases of control as designated. The QC Specialist will be physically at the project site whenever quality related activities are in progress or definable features of work are being completed.

Responsibilities of the QC Specialist include, but are not limited to, the following:

- Monitoring assigned QC activities to ensure conformance with authorized policies, approved procedures, standards, and sound construction practices.
- Identifying, informing, and resolving discrepancies in accordance with the requirements of the CQC procedures.
- Recommending Stop-Work or re-performance, with concurrence of the SQCM, of any discrepancies resulting from improper application of prescribed procedures or use of nonconforming materials.
- Monitoring corrective action documentation for conditions adverse to quality, verifying implementation of corrective actions, tracking and eventual closing out of all rework items.

5.0 OUTSIDE ORGANIZATIONS

A listing of TtEC subcontractors and other outside organizations performing work on this project, along with a description of their services, is included as Appendix C.

6.0 APPOINTMENT LETTER

A letter appointing the SQCM and stating the assigned responsibilities and authorities is included as Appendix D.

7.0 SUBMITTAL PROCEDURES AND INITIAL SUBMITTAL REGISTER

7.1 Types of Submittals

Types of submittals include, but are not limited to, shop drawings, samples, catalog cuts, certifications, manuals, parts lists, laboratory results, inspections, and test reports.

7.2 Review and Approval Authority

The SQCM or designee is responsible for reviewing and certifying that the submittals are in compliance with contract requirements. The approving authority is the SQCM unless submission to the CO or designated representative is required for the specific submittal.

7.3 Review Period

Except as noted otherwise, a review period, beginning with receipt by the approving authority, is not to exceed 15 working days for submittals requiring SQCM approval, and 20 working days for submittals requiring CO or designated representative approval. The period of review for submittals with CO or designated representative approval begins when the Government receives the submittal from TtEC QC organization. The period of review for each resubmittal is the same as for the initial submittal.

7.4 Submittal Scheduling

Preparation and processing of submittals will be coordinated with the performance of the work so that work will not be delayed by the submittal process. Allowances will be incorporated for potential requirements for resubmissions.

7.5 QC Organization Submittal Responsibilities

Responsibilities of the QC Organization include, but are not limited to the following:

- Note the date on which submittal material is received from subcontractors, vendors, suppliers and internal TtEC departments.
- For each submittal, review and verify field measurements, materials, and incorporated field construction criteria.
- Review submittals for conformance with project design concepts and compliance with construction drawings and technical specifications.
- Act on submittals, determining the appropriate action based on the QC organization's review of the submittal:
    - Approved: Submittals are marked ‘Approved’, authorizing the covered work. Use of material, process, or installation is to proceed.
    - Approved as Noted: Submittals are marked ‘Approved as Noted’, and the work is authorized to proceed provided TtEC takes no exceptions to the notations.
    - Revise and Resubmit: Submittals marked ‘Revise and Resubmit’ indicate that the submittal is incomplete or does not comply with the design concept, Contract Drawings, or Technical Specifications, and will be resubmitted with appropriate changes.
    - Not Approved: This indicates that the submittal is not required as a submittal, or does not have evidence of being reviewed and approved by TtEC, or is incomplete.
- Ensure that the material is clearly legible.
- Sign the certifying statement on the submittal cover sheet. The person signing the certifying statements is the SQCM.
- Update the submittal register as submittal actions occur and maintain the submittal register at the project site until final acceptance of the work by the CO or designated representative.

- Retain a copy of the approved submittals at the project site.
- When the approving authority is the SQCM, two copies of each submittal will be forwarded to the CO or designated representative unless directed otherwise by the CO or designated representative.
- When the approving authority is the CO or designated representative, three copies of each submittal will be forwarded to the CO or designated representative for review and action. The returned signed submittal will be the project file copy pending further action, if required.

7.6 Initial Submittal Register

See Appendix E for Initial Submittal Register.

8.0 TESTING LABORATORY INFORMATION

8.1 General

An independent qualified laboratory or laboratories will be provided to perform testing required by this project. All laboratories performing testing and analysis services will be accredited/certified in the methods specified by project requirements.

8.2 Accreditation/Certification - General

The CO or designated representative will be provided with a copy of the certificate of accreditation, scope of accreditation, and the latest directory of the accrediting organization for accredited laboratories. The scope of the laboratory's accreditation will include the test methods required for the project.

Acceptable accreditation programs are:

- National Institute of Standards and Technology (NIST).
- National Voluntary Laboratory Accreditation Program (NVLAP).
- American Association of State Highway and Transportation Officials (AASHTO).
- American Association for Laboratory Accreditation (AALA).

Any deviation from the above must be approved in writing by the CO or designated representative.

8.3 Accreditation/Certification – IRP or BRAC Funded Work

Laboratories performing Installation Restoration Program (IRP) work funded by the Environmental Restoration, Navy (ER, N) or Base Realignment and Closure (BRAC) (ER,N eligible in the absence of BRAC funding) must successfully have completed the Navy Laboratory Evaluation Program (NLEP). Any deviation must be approved in writing by the CO or designated representative.

8.4 Capability Check

The CO or designated representative retains the right to check laboratory equipment in the proposed laboratory and review the laboratory's testing procedures, techniques, and other items pertaining to testing, for compliance with project requirements.

8.5 Test Results

The SQCM will maintain all project test results at the project site. The actual laboratory test results will be submitted to the CO or designated representative and placed on the updated submittal register. These results will be reviewed by the SQCM for conformance with the project requirements. The cover page for these results will be conspicuously stamped in red with 'CONFORMS' or 'DOES NOT CONFORM' to the project requirements, whichever is applicable.

A summary report of the results of all field testing will be attached to the last Contractor QC Report for each month.

9.0 TESTING PLAN AND LOG

9.1 Pre-Construction Testing Plan and Log

The Pre-Construction Testing Plan and Log was developed based on the list of definable features of work for this Project (Section 12.0).

The Pre-Construction Testing Plan and Log is included as Appendix F.

9.2 Construction Testing and Log

As tests are performed, the SQCM will record the following and attach to or include in the Construction Testing Log:

- The date the test was conducted.
- The date the test results were forwarded to the CO or designated representative.
- Remarks and acknowledgement that an accredited or CO-approved testing laboratory was used.

A copy of the updated Construction Testing Log will be attached to the last Contractor QC Report of each month.

10.0 PROCEDURES TO COMPLETE REWORK ITEMS

10.1 Rework Item

Rework Item is a part or aspect of a definable feature of work that does not comply with the contract. This item may be, but is not limited to, placed or delivered material; a delivered, installed, or fabricated piece of equipment; or deficient workmanship that may cause a material, equipment, or functionality of a system to perform in a way that does not meet the requirements for that item.

10.2 Control of Rework Items

During the conduct of field activities, if identification is made of an item or a feature of work that does not comply with project requirements, this will be noted by a full description in the Contractor QC Report.

If the item or feature of work is brought into compliance before the end of the workday, this will be noted in the Contractor QC Report and no further documentation is required.

If the item or feature of work is not brought into compliance by the end of the workday, it is logged onto the Rework Items List. A sample "Rework Items List" form is included as Appendix G. The following information is required for initial logging of an item:

- Unique identifying number.
- Date identified.
- Description.
- Requirement (i.e. technical specification section, construction drawing detail, etc.).
- Immediate action taken by the SQCM.

Once the resolution is determined and acted upon, the following is added to the rework item to close it out:

- Resolution to bring the item or feature of work into compliance.
- Date of completion.

10.3 Maintenance and Distribution

The Rework Items List is maintained by the SQCM at the project site. Items on this list also include those identified by the CO or designated representative. A copy of the Rework Items list will be included with the last Contractor QC Report of each month.

11.0 QC DOCUMENTATION

The SQCM will maintain a current and complete set of records that document the quality of the constructed project. A copy of these records will be maintained at the project site and will be readily available to the CO or designated representative for review or audit purposes. These records include, but are not limited to, those listed in the following sections.

11.1 Contractor Production Report

Contractor Production Reports are required for each day that work is performed and will be attached to the Contractor QC Report prepared for the same day. Each calendar day will be accounted for throughout the life of the project. The reporting of the work will be identified by terminology consistent with the construction schedule. Contractor Production Reports will be prepared, signed, and dated by the Project Superintendent and will contain the following information:

- Date of report, report number, name of Contractor (TtEC), contract number, project title, project location, and superintendent present.

- Weather conditions in the morning and afternoon, including maximum and minimum temperatures.
- A list of TtEC and subcontractor personnel on the work site, their trades, employer, work location, description of work performed, and hours worked.
- A list of job safety actions taken and safety inspections conducted. Indicate that safety requirements have been met, including the results of the following:
    - Was a job safety meeting held? (If YES, attach a copy of the meeting minutes)
    - Were there any lost time accidents? (If YES, attach a copy of the completed Occupational Safety and Health Administration (OSHA) report)
    - Was trenching, scaffold, high-voltage electrical, or high work done? (If YES, attach a statement or checklist showing inspection performed)
    - Was hazardous material or waste released into the environment? (If YES, attach description of incident and proposed action)
- A list of equipment and material received each day that is incorporated into the job.
- A list of construction and plant equipment on the work site, including the number of hours used, idle, and down for repair.
- A 'Remarks' section, which contains pertinent information including directions received, problems encountered during construction, work progress and delays, conflicts or errors in the drawings or specifications, field changes, safety hazards encountered, instructions given, corrective action taken, and a record of visitors to the work site.

See Appendix H for sample "Contractor Production Report" form.

11.2 Contractor QC Report

A Contractor QC Report is required for each day that work is performed and for every 7 consecutive days of no-work, on the last day of that no-work period. Each calendar day will be accounted for throughout the life of the project. The reporting of work will be identified by terminology consistent with the construction schedule. Contractor QC Reports will be prepared, signed, and dated by the SQCM and will contain the following:

- Identification of the control phase and the definable feature of work.
- Results of the preparatory phase meetings held, including the location of the definable feature of work, and indications that drawings and specifications have been reviewed, submittals have been approved, materials comply with approved submittals, materials are stored properly, preliminary work has been done correctly, and the testing plan has been reviewed and work methods have been discussed.
- Results of initial phase meetings held, including the location of the definable feature of work and a list of personnel present at the meeting. Verify in the report that for this definable feature of work, the preliminary work was done correctly, samples have been prepared and approved, the workmanship is satisfactory, test results are acceptable, work is in compliance with project requirements, and the required testing has been performed. Include a list of who performed the tests.
- Results of follow-up phase inspections held, including the location of the definable feature of work. Verify in the Contractor QC Report for this definable feature of work that the work complies with project requirements as approved in the initial phase, and required testing has been performed. Include a list of who performed the tests.
- Results of the three phases of control for off-site work, if applicable, including actions taken.

- A list of rework items that have been identified, only if not corrected by close of business.
- As rework items are corrected, a revised rework items list will be provided along with the corrective actions taken.
- A 'Remarks' section, which contains pertinent information including directions received, QC problem areas, deviations from the CQC Plan, construction deficiencies encountered, QC meetings held, acknowledgment that as-built drawings have been updated, corrective direction given by the SQCM, and corrective actions taken.

See Appendix I for sample "Contractor QC Report" form.

11.3 Testing Plan and Log

As tests are performed, the SQCM will update the Testing Plan and Log. A copy of the latest updated Testing Plan and Log will be attached to the last Contractor QC Report of each month. See Appendix F for Pre-Construction Testing Plan and Log.

11.4 Rework Items List

As new rework items are identified and old items are corrected, the SQCM will update the Rework Items List. A copy of the latest updated Rework Items List will be attached to the last Contractor QC Report of each month. See Appendix G for sample "Rework Items List" form.

11.5 As-Built Records

The SQCM will review the as-built records to ensure they are kept current on a daily basis and are clearly marked to show deviations that have been made from the Contract Drawings.

12.0 LIST OF DEFINABLE FEATURES OF WORK

Definable Feature	References	Components
Mobilize and install temporary facilities	Work Plan	Temporary construction offices and facilities, lay down, staging, and material storage areas
Install temporary security fence	Work Plan	Temporary security fence surrounding site
Install erosion and sediment control measures	Soil Erosion and Sediment Control Plan; Work Plan	Silt fence and turbidity curtain
Construct temporary decontamination facilities	Work Plan	Personnel and equipment decontamination facilities
Construct stone revetment	Technical Specification (R*evetment Construction*); Revetment Design; Work Plan	Stone revetment to be constructed along shoreline using geotextile and riprap; Riprap will meet requirements listed in the Technical Specifications and will be visually inspected for particle size.
Construct soil staging area	Work Plan	Staging area to be surrounded by soil berm; surface water will be diverted to Narragansett Bay via a temporary earthen swale.
Excavate contaminated soil	Technical Specification (*Excavation and Backfill*); Work Plan	To be performed to the elevations shown on the Contract Drawings.
Perform confirmatory sampling and analysis	Work Plan	Base samples to be analyzed for Polynuclear Aromatic Hydrocarbons (PAH), Total Petroleum Hydrocarbons (TPH), and metals
Backfill the excavated areas	Technical Specification (*Excavation and Backfill*); Work Plan	Granular material to be placed from the bottom of the excavation to approx. 1 foot above water table. Granular material will be visually inspected for particle size prior to placement. Common fill to be placed above the granular material to 6 inches below final grade. Common fill will be visually inspected for particle size. Common fill will be tracked and compacted using a bulldozer. 6 inches of topsoil to be placed and tracked with a bulldozer. Topsoil will meet gradation requirements as stated in the Technical Specifications.

Definable Feature	References	Components
Load soil for off-site transportation and disposal	Work Plan	TtEC will load material from the staging area into off-site disposal vehicles.
Perform site restoration	Technical Specification (*Excavation and Backfill*); Work Plan	Hydroseeding will meet requirements listed in the Technical Specifications.
Demobilize resources	Work Plan	Equipment will be cleaned; temporary facilities and utilities, personnel, equipment, and materials will be removed from the site; support zone areas will be restored.

13.0 MEETINGS

13.1 Coordination and Mutual Understanding Meeting

Prior to the commencement of site work, the SQCM will schedule a meeting with the CO or designated representative to discuss the QC program as it relates to this project. The purpose of this meeting is to develop a mutual understanding of the QC details, including forms to be used; administration of on-site and off-site work; and coordination of TtEC's management, production, and SQCM duties with the CO or designated representative. As a minimum, this meeting will be attended by TtEC's Project Manager, Project Superintendent, and SQCM. Minutes of the meeting will be prepared by the SQCM, signed by all attendees, and distributed to all attendees within 2 working days. This meeting can be held in conjunction with other meetings (i.e. preconstruction meeting).

13.2 QC Meetings

After commencement of site work, the SQCM will conduct scheduled and documented QC meetings. The frequency of these meetings (i.e. 1 per week, 1 per two weeks, 1 per month, etc.) will be discussed and agreed upon with the CO or designated representative at the project site. Attendees will include the SQCM, the Project Superintendent, and the foreman responsible for the upcoming work, and may be attended by the CO or designated representative or others, as the work requires.

As a minimum, the following will be accomplished at each meeting:

- Review the minutes of the previous meeting.
- Review the schedule, which will include a review of work and testing accomplished since the last meeting, and a discussion of any rework items identified and/or corrected since the last meeting.
- Review the status of submittals.
- Review the work to be accomplished before the next QC meeting and documentation required. Schedule the three phases of control and testing.
- Resolve any QC or production problems.
- Address items that may require revisions to the CQC Plan.

The SQCM will prepare the QC Meeting minutes/documentation and include it in the Contractor QC Report for that day. See Appendix J for sample “Record of QC Meeting/Minutes” form.

14.0 PROCEDURES FOR PERFORMING THE THREE PHASES OF CONTROL

14.1 General

The SQCM will certify the performance of the three phases of control for each definable feature of work, to ensure that the work complies with contract requirements. The CO or designated representative will be notified at least two working days in advance of all preparatory and initial phases for on-site work and at least 2 weeks in advance for off-site work so they may attend if they choose.

14.2 Preparatory Phase

The SQCM will conduct the Preparatory Phase with the Project Superintendent and the foreman responsible for the definable feature of work. The results of this Preparatory Phase will be documented in the Contractor QC Report. See Appendix K for sample "Preparatory Phase Checklist" form.. The following lists the tasks of the Preparatory Phase that will be performed prior to beginning work on each definable feature of work:

- Review each paragraph of the applicable specification sections.
- Review the contract drawings.
- Verify that appropriate shop drawings and submittals for materials and equipment have been submitted and approved.
- Verify receipt of approved factory test results, when required.
- Review the testing plan and ensure that provisions have been made to provide the required QC testing.
- Examine the work area to ensure that the required preliminary work has been completed.
- Examine the required materials and equipment, and sample work to ensure that materials and equipment are on hand and conform to the approved shop drawings and submitted data.
- Review the Site-Specific Health and Safety Plan (SHSP) and appropriate Activity Hazard Analysis (AHA) to ensure that applicable safety requirements are met, and that required Material Safety Data Sheets (MSDS) are submitted.
- Discuss construction methods.

14.3 Initial Phase

The SQCM will perform the Initial Phase for each definable feature of work. The SQCM or designee will observe the initial work to ensure that the work complies with contract requirements. The results of this Initial Phase will be documented in the Contractor QC Report. See Appendix L for sample "Initial Phase Checklist" form. The Initial Phase will be repeated if specified levels of quality are not met. The following tasks constitute the Initial Phase and will be performed prior to beginning work on each definable feature of work:

- Establish the quality of workmanship required.
- Resolve conflicts.
- Review the SHSP and the appropriate AHA to ensure that applicable safety requirements are met.
- Ensure that testing is performed.

14.4 Follow-Up Phase

The SQCM will perform the following Follow-Up Phase tasks for on-going work daily, or more frequently if necessary, until the completion of each definable feature of work. The results of this Follow-Up Phase will be documented in the Contractor QC Report. The following will be monitored on a daily basis:

- Ensure the work is in compliance with contract requirements.
- Maintain the required quality of workmanship.
- Ensure that required testing is performed.
- Ensure that rework items are being corrected.

APPENDIX A
Résumé – PQCM

To be included in the next submittal

APPENDIX B
Résumé – SQCM

To be included in the next submittal

APPENDIX C
Outside Organizations

To be included in the next submittal

Fence Subcontractor (to be determined)

Install security fence

Geotechnical Testing Laboratory (to be determined)

Sieve Analysis
Compaction Tests

Analytical Testing Laboratory (to be determined)

Imported clean fill analysis
Waste characterization analysis
Confirmatory sample analysis

Hydroseeding Subcontractor (to be determined)

Surveyor (to be determined)

As-Built Survey

APPENDIX D
Appointment Letter

To be included in the next submittal

APPENDIX E
Initial Submittal Register

To be included in the next submittal

APENDIX F

Pre-Construction Testing Plan and Log

To be included in the next submittal

APPENDIX G

Sample “Rework Items List” Form

To be included in the next submittal

APPENDIX H

Sample “Contractor Production Report” Form

To be included in the next submittal

APPENDIX I

Sample “Contractor QC Report” Form

To be included in the next submittal

APPENDIX J

Sample “Record of QC Meeting/Minutes” Form

To be included in the next submittal

APPENDIX K

Sample “Preparatory Phase Checklist” Form

To be included in the next submittal

APPENDIX L

Sample “Initial Phase Checklist” Form

To be included in the next submittal

APPENDIX C

Site-Specific Health and Safety Plan

0DEPARTMENT OF THE NAVY
ENGINEERING FIELD ACTIVITY, NORTHEAST
REMEDIAL ACTION CONTRACT (RAC)
CONTRACT NO. N62472-99-D-0032
CONTRACT TASK ORDER NO. 0102

DRAFT

30 % SITE-SPECIFIC HEALTH AND SAFETY PLAN FOR SOIL REMOVAL AND REVETMENT CONSTRUCTION AT OLD FIRE FIGHTING TRAINING AREA NAVAL STATION NEWPORT NEWPORT, RHODE ISLAND

March 11, 2005

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Revision	Date	Prepared by	Approved by	Pages Affected
0	10/22/04	M. Lavin	G. Coppi, F. Ahtchi-Ali	All
1	3/11/05	M. Lavin	G. Coppi, F. Ahtchi-Ali	All

APPROVALS

By their signature, the undersigned hereby certify that this Site-Specific Health and Safety Plan has been reviewed and approved for use during the soil removal and revetment construction at Old Fire Fighting Training Area, Naval Station Newport in Newport, RI.

PROJECT MANAGER	DATE
PROJECT SUPERINTENDENT	DATE
PROJECT ENVIRONMENTAL AND SAFETY MANAGER	DATE
SITE HEALTH AND SAFETY OFFICER	DATE

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ACRONYMS AND ABBREVIATIONS

ACGIH	American Conference of Governmental Industrial Hygienists
AHA	Activity Hazard Analysis
AIHA	American Industrial Hygiene Association
ANSI	American National Standards Institute
bgs	Below Ground Surface
BZ	Breathing Zone
CFR	Code of Federal Regulations
CGI/O_2	Combustible Gas Indicator/Oxygen
CIH	Certified Industrial Hygienist
CNS	Central Nervous System
CPR	Cardiopulmonary Resuscitation
CRF	Change Request Form
CRZ	Contamination Reduction Zone
CSP	Certified Safety Professional
CSQ	Client Service Quality
CTO	Contract Task Order
EC	Emergency Coordinator
EFANE	Engineering Field Activity, Northeast
EMAC	Environmental Multiple Award Contractor
ESQ	Environmental Safety Quality
EZ	Exclusion Zone
FS	Feasibility Study
GFCI	Ground Fault Circuit Interrupter
MLW	Mean Low Water
MSDS	Material Safety Data Sheet
NAVSTA	Naval Station
NEC	National Electric Code
NFPA	National Fire Protection Association
OFFTA	Old Fire Fighting Training Area
OSHA	Occupational Safety and Health Administration
PAH	Polynuclear Aromatic Hydrocarbons
PDI	Pre-Design Investigation
PESM	Project Environmental and Safety Manager
PID	Photoionization Detector
PM	Project Manager
PPE	Personal Protective Equipment
ppm	Parts Per Million
PS	Project Superintendent
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RIDEM	Rhode Island Department of Environmental Management
RIPDES	Rhode Island Pollutant Discharge Elimination System
RPM	Revolutions Per Minute
SER	Shore Establishment Realignment
SHSO	Site Health and Safety Officer
SHSP	Site-Specific Health and Safety Plan
SVOC	Semi-Volatile Organic Compounds

ACRONYMS AND ABBREVIATIONS (Cont'd)

SZ	Support Zone
T&D	Transportation and Disposal
TtEC	Tetra Tech EC, Inc.
TtNUS	Tetra Tech NUS, Inc.
TLV	Threshold Limit Value
TPH	Total Petroleum Hydrocarbons
TRC	TRC Environmental Corporation
UL	Underwriters Laboratories
USACE	United States Army Corps of Engineers
USDOT	United States Department of Transportation
WBGT	Wet Bulb Globe Temperature
ZIP	Zero Incident Performance

1.0 INTRODUCTION

Tetra Tech EC, Inc. (TtEC) has been contracted by the Department of the Navy, Engineering Field Activity, Northeast (EFANE) to perform removal of contaminated soil and construction of a stone revetment at the Old Fire Fighting Training Area (OFFTA), located at Naval Station (NAVSTA) Newport, in Newport, Rhode Island. This Site-Specific Health and Safety Plan (SHSP) addresses the health and safety practices that will be employed by all site workers participating in field operations. This SHSP takes into account the specific hazards inherent to the site work and presents procedures to be followed by TtEC, its subcontractors, and all other on-site personnel in order to avoid and, if necessary, protect against health and/or safety hazards. Activities performed on this Contract Task Order (CTO) will comply with this SHSP, Occupational Safety and Health Administration (OSHA) Regulations 29 Code of Federal Regulations (CFR) Parts 1910 and 1926, United States Army Corps of Engineers (USACE) EM 385-1-1, as well as the TtEC Health and Safety Program. A copy of this SHSP will be on-site during site activities. Modifications to this SHSP may be made with the approval of the Project Environmental and Safety Manager (PESM) and the Navy using the Change Request Form (CRF) in Appendix A.

1.1 Scope of Work

The work will include, but not be limited to the following:

- Mobilization and installation of temporary facilities.
- Installation of security fence.
- Installation and maintenance of soil erosion and sediment control measures.
- Construction of temporary decontamination facilities.
- Construction of soil staging area.
- Construction of stone revetment.
- Investigate buried structure evidenced by manhole cover (was under Central Mound), may be a former oil/water separator.
- Excavate contaminated soil.
- Backfill the excavated areas.
- Installation of pipes and risers if all of the total petroleum hydrocarbons (TPH) cannot be removed.
- Load soil for off-site transportation and disposal following waste characterization by others.
- Upgrade of existing two storm lines that cross the site.
- Construct gravel road along shoreline at top of revetment (double as walking trail).
- Restore gravel parking lot to the site the way it was before mound removal started.
- Seeding.
- Perform site restoration.
- Demobilize resources.

See the Work Plan for a detailed description of the Scope of Work.

1.2 Application

The SHSP applies to all personnel involved in the above tasks who wish to gain access to active work areas, including but not limited to:

- Client representatives – The Navy is responsible for ensuring that its personnel comply with OSHA and USACE EM 385-1-1 applicable requirements
- Federal, state, or local representatives.

TtEC employees and subcontractors will develop activity hazard analyses that will be reviewed by the PESM prior to start of work.

2.0 PROJECT ORGANIZATION

2.1 Project Manager (PM)

The PM is Carl Tippmann. His responsibilities include the following:

- Ensures implementation of this program through coordination with the responsible PESM.
- Conducts monthly inspections.
- Participates in all incident investigations.
- Ensures the SHSP has all of the required approvals before any site work is conducted.
- Ensures that the PESM or Site Health and Safety Officer (SHSO) is informed of project changes which require modifications of the SHSP.
- Has overall project responsibility for Project Health and Safety.
- Performs periodic site inspections.

2.2 PESM

The PESM is an individual certified by the American Board of Industrial Hygiene as a Certified Industrial Hygienist (CIH) or by the Board of Certified Safety Professionals as a Certified Safety Professional (CSP) with experience in hazardous waste site remediation activities. The PESM is Grey Coppi, CIH, CSP. His responsibilities include the following:

- Provides for the development and approval of the SHSP.
- Serves as the primary contact to review health and safety matters that may arise.
- Approves revised or new safety protocols for field operations.
- Approves individuals who are assigned SHSO responsibilities.
- Approves SHSO to fulfill other project roles.
- Coordinates revisions of this SHSP with field personnel.
- Coordinates upgrading or downgrading of Personal Protective Equipment (PPE) with the SHSO.
- Assists in the investigation of all incidents.
- Conducts quarterly inspections for compliance with the SHSP.

2.3 Project Superintendent (PS)

The PS is Dan Sullivan. His responsibilities include the following:

- Ensures that field work is scheduled with adequate personnel and equipment resources to complete the job safely.
- Ensures that adequate communication between field crews and emergency response personnel is maintained.

- Ensures that field site personnel are adequately trained and qualified to work at the site.
- Conducts periodic site inspections.
- Acts as Emergency Coordinator (EC).
- Reviews incident reports.
- Maintains a site safety committee, ensures that site participates in the EFANE safety incentive award program.
- Ensures that craft personnel participate in Activity Hazard Analysis (AHA) development, present safety briefings, participate as active members in site safety committee.

2.4 SHSO

The SHSO is To Be Determined. The SHSO responsibilities include the following:

- Ensures that all health and safety activities identified in the SHSP are conducted and/or implemented.
- Identifies operational changes which require modifications to health and safety procedures and the SHSP, and ensures that the procedure modifications are implemented and documented through changes to the SHSP.
- Determines upgrades or downgrades of PPE based on site conditions and/or real-time monitoring results.
- Enforces site health and safety rules.
- Directs and coordinates health and safety monitoring activities.
- Ensures that monitoring instruments are calibrated.
- Notifies PESM of all accidents/incidents, coordinates with PM in any accident/incident investigation, and maintains accident/incident report forms.
- Conducts daily safety briefings and weekly site inspections.
- Reports to PESM to provide summaries of field operations and progress.
- Maintains health and safety field log books.
- Displays and maintains postings such as:
    - OSHA Job Safety and Health Poster
    - OSHA Noise Regulation
    - Department of Labor Postings (Minimum wage, fair labor standards)
    - Hazard Warning Signs
    - Noise Hazard Warning Sign
    - Do It Right Poster
    - Client Service Quality (CSQ) Poster
    - TtEC Shared Vision
    - TtEC Mission Statement
    - TtEC Hot Line Poster
    - TtEC Work Rules
    - TtEC Environmental Safety Quality (ESQ) Policy Poster
    - Zero Incident Performance (ZIP) Bulletins
    - Flash reports
    - Emergency telephone numbers
    - Diagrams showing the location of fire extinguishers and emergency equipment
    - Emergency exit, evacuation routes and staging area

2.5 Site Personnel

Site Personnel responsibilities include the following:

- Report any unsafe or potentially hazardous conditions to the SHSO.
- Maintain knowledge of the information, instructions, and emergency response actions contained in the SHSP.
- Comply with rules, regulations, and procedures as set forth in this SHSP and any revisions.
- Prevent admittance to work sites by unauthorized personnel.
- Inspect all tools and equipment, including PPE, daily prior to use.

3.0 SITE LOCATION AND DESCRIPTION

3.1 Site Location

NAVSTA Newport is located approximately 60 miles southwest of Boston, Massachusetts and 25 miles south of Providence, Rhode Island. It occupies approximately 1,063 acres, with portions of the facility located in the City of Newport and Towns of Middletown and Portsmouth, Rhode Island. The facility layout is long and narrow, following the western shoreline of Aquidneck Island for approximately 6 miles facing the east passage of Narragansett Bay.

The OFFTA Site is located at the northern end of Coasters Harbor Island. The Site occupies approximately 5.5 acres and is bordered by Taylor Drive to the south and is surrounded by Coasters Harbor (part of Narragansett Bay) to the east, north, and west. The OFFTA Site is generally flat, with base grade surface elevations ranging from 8 to 12 feet above mean low water (MLW).

The shoreline has been partially eroded by wave action, particularly on the western side of the Site. Tide change over a six-month period ranges between 2.6 and 4.5 vertical feet (Newport).

The Site is entirely vegetated with grass except for a gravel-surfaced temporary parking lot located in the center portion of the Site. The temporary parking lot was occupied by a baseball field until 2002. A one-story concrete block building (Building 144), used for recruiting offices, is located along the southern side of the Site. Recreational equipment north of the building has been fenced off to restrict access. Access to the Site is restricted by a chain link fence along its eastern, southern, and western sides, except for the temporary parking lot, which has been cordoned off from the rest of the Site.

3.2 Site Background

The NAVSTA Newport facility has been in use by the Navy since the era of the Civil War. During World Wars I and II military activities at the facility increased significantly and the base provided housing for many servicemen. In subsequent peacetime years, use of on-site facilities was slowly phased out until Newport became the headquarters of the Commander Cruiser-Destroyer Force Atlantic in 1962. In April 1973, the Shore Establishment Realignment (SER) Program resulted in the reorganization of naval forces and activity at the base again declined. This reorganization resulted in the Navy excising some 1,629 acres of its 2,420 acres. Portions of the facility are currently leased by the Navy to the State of Rhode Island Port Authority and Economic Development Corporation. Some of these areas are, in turn, subleased to private enterprises.

The OFFTA Site was home to a Navy fire fighting training facility from World War II until 1972. During the training operations, fuel oils were ignited in various structures at the Site including burn pits, so-called Christmas Tree above-ground nozzle array, and small buildings that simulated shipboard compartments. Ignited fires were then extinguished by sailors. It was reported that the two "Carrier Compartment" buildings were injected with a water/oil mixture that was subsequently set on fire for fire fighting practice. Underground piping reportedly carried the water/oil mixture to the buildings and from the buildings to an oil/water separator. Drainage piping from historic photos and maps provided in the Feasibility Study (FS) report shows pipes from the separator discharged to Coasters Harbor to the north.

The fire fighting training facility was closed in 1972. Upon closure, the training structures were reportedly demolished and buried and compacted into mounds on the Site and then the entire area was covered with topsoil. The Site was then converted to a recreational area (Katy Field) with a playground, a baseball field, and a picnic area with an open pavilion and barbecue grills. The field was dedicated on July 4, 1976 and used as a recreational area until its closure in October 1998.

In its 22 years as a recreational area, the Site was used for organized activities including youth day camps, picnic functions, and little league baseball (1 year only), as well as for general recreation. A child day care center operated out of Building 144 on the Site from approximately 1983 through January 1994 when it was relocated off-site to a larger facility on base.

The Pre-Design Investigation (PDI) (TtNUS, 2004b) was preceded by a Remedial Investigation (RI) and an FS completed in 2001 and 2002, respectively. Data from all prior investigations conducted by Tetra Tech NUS, Inc. (TtNUS) and TRC Environmental Corporation (TRC) (TRC, 1994) were assimilated into these reports, including three phases of the RI, a source removal investigation, and risk assessment reports. The overall findings reported in these studies are summarized below:

- Semi-Volatile Organic Compounds (SVOC) were detected in all media across the Site. The most prevalent SVOC detected were polynuclear aromatic hydrocarbons (PAH) with the highest concentrations detected in surface and subsurface soil and groundwater sampling locations near Coasters Harbor. PAH concentrations in surface soils, subsurface soils, groundwater, and stormwater exceed Rhode Island Department of Environmental Management (RIDEM) Residential Direct Exposure Criteria for soils.
- Metals were detected throughout the Site. Metals concentrations were generally higher in site soil and groundwater relative to the same metals in background soil and upgradient groundwater locations. Metals concentrations in both surface soils and subsurface soils exceeding RIDEM Residential Direct Exposure Criteria for soils were arsenic, beryllium, lead, and manganese.
- TPH were detected in the subsurface throughout the Site exceeding RIDEM Residential Direct Exposure Criteria at depths ranging from 3 to 11 feet below ground surface (bgs). Petroleum contamination was observed visually in the central portion of the Site in soils sampled immediately above the water table.

4.0 POTENTIAL HAZARDS

This section presents an assessment of the chemical, biological, and physical hazards that may be encountered during the tasks specified under SHSP Section 1.1. Additional information can be found in the Appendix B Material Safety Data Sheets and Appendix C Activity Hazard Analysis.

4.1 Chemical Hazards

The contaminants of concern for workers at the site are PAH, TPH, arsenic, beryllium, lead, and manganese. Exposure to these compounds may occur through inhalation of contaminated dust particles, inhalation of volatile contaminants, dermal absorption, skin contamination, or accidental ingestion of the contaminant.

Providing that dust levels are kept low, cross contamination via ingestion is the primary route of exposure to metals and PAH. Inhalation is the primary route of exposure to TPH. The action levels for the contaminants of concern were based upon the known concentration of the contaminants present in soil and groundwater, their physical and chemical properties, and toxicity. Symptoms of exposure to these potential site contaminants, especially if they are encountered in their pure form, can range from irritation of skin, mucous membranes and other sensitive tissues such as the eyes, to nausea and vomiting, fatigue, lightheadedness/dizziness and headache. Potential damage of major organ systems (e.g., liver, kidneys, lungs, central nervous system, blood forming organs, reproductive system) could result from chronic exposure or acute exposure to high concentrations of the materials. TPH may cause central nervous system (CNS) and lung damage. Some of the site contaminants that may potentially be encountered are suspected carcinogens.

Table 4-1 contains a summary of the toxicological and chemical properties of the compounds that may be encountered during field activities.

Table 4-1
Chemical Data

COMPOUNDS	ACGIH TLV	OSHA PEL	NIOSH IDLH	ROUTES OF EXPOSURE	SYMPTOMS OF EXPOSURE	TARGET ORGANS	PHYSICAL DATA
Arsenic	0.01 mg/m^3	0.01 mg/m^3	100 mg/m^3	Inhalation, Absorption, Contact, Ingestion	Ulceration of nasal septum, dermatitis, gastrointestinal disturbances, respiratory irritation, hyperpigmentation of the skin, carcinogen	Liver, kidneys, skin, lungs, lymphatic system	MW: 74.9; Sp. Gr.: 5.73
Beryllium	0.002 mg/m^3	0.002 mg/m^3	4 mg/m^3	Inhalation, Contact, Ingestion	Contact dermatitis, nausea, vomiting, diarrhea, lung fibrosis, dyspnea and weight loss, suspected carcinogen	Lungs	MW: 9.01; Sp. Gr.: 1.85
Lead	0.05 mg/m^3	0.05 mg/m^3	200 mg/m^3	Inhalation, Ingestion, Contact	Weakness, lassitude, insomnia, facial pallor, anorexia, weight loss, malnutrition, constipation, abdominal pain, colic, anemia, gingival lead line, tremor, paralysis of wrist and ankle, irritation of eyes, hypertension	Gastrointestinal tract, CNS, kidneys, blood, gingival tissue	MW: 207.2; Sp. Gr.: 11.34; VP: 1 mm Hg @ 973°C
Manganese	5 mg/m^3	5 mg/m^3	Not Listed	Inhalation	Irritation of respiratory tract and mucous membranes, metal fume fever, eye irritation	CNS, kidneys, liver, respiratory system	MW: 54.94; Sp. Gr.: 7.20; VP: 1 mm Hg @ 1292°C
PAHs as coal tar pitch volatiles	0.2 mg/m^3	0.2 mg/m^3	Not Listed	Inhalation, Contact, Absorption	Eye and skin irritation, headaches, nausea, vomiting, suspected carcinogen	Eyes, skin, lungs	MW: varies; IP: varies; Sp. Gr.: 1.2; VP: 0.2-1.0 mm Hg

Table 4-1
Chemical Data

COMPOUNDS	ACGIH TLV	OSHA PEL	NIOSH IDLH	ROUTES OF EXPOSURE	SYMPTOMS OF EXPOSURE	TARGET ORGANS	PHYSICAL DATA
TPH	5 mg/m^3	500 ppm	Not Listed	Inhalation, Contact, Ingestion	Eye and skin irritation, headache, drowsiness, dizziness, fatigue, nausea, vomiting, diarrhea	Respiratory system, CNS, mucous membranes	MW: varies; Sp. Gr.: 0.8939; LEL: 1.1%; UEL: 7.3%; VP: varies

Abbreviations:
ACGIH = American Conference of Governmental Industrial Hygienists
CNS = Central Nervous System
IDLH = Immediately Dangerous to Life and Health
LEL = Lower Explosive Limit
MW = Molecular Weight
NIOSH = National Institute for Occupational Safety and Health
OSHA = Occupational Safety & Health Administration
PEL = Permissible Exposure Limit
ppm = Parts Per Million
Sp. Gr. = Specific Gravity
TLV = Threshold Limit Value
UEL = Upper Explosive Limit
VP = Vapor Pressure

4.2 Biological Hazards

During the course of the project, there is a potential for workers to encounter biological hazards such as animals, insects, and plants.

4.2.1 Animals

During site operations, animals such as dogs, cats, raccoons, skunks, mice, and snakes may be encountered. Workers will use discretion and avoid all contact with animals. If these animals present a problem, efforts will be made to remove these animals from the site by contacting a licensed pest control technician.

4.2.2 Insects

Insects, such as mosquitoes, ticks, bees, and wasps may be present during certain times of the year. Workers will be encouraged to wear repellents (DEET for Ticks) when working in areas where insects are expected to be present. If insects are prevalent, efforts will be made to remove them from the site by contacting a licensed pest control technician.

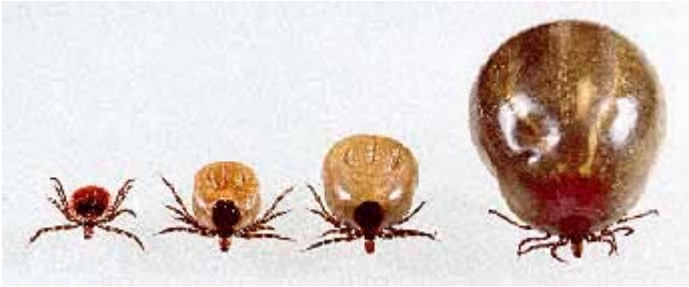
Rocky Mountain Ticks

Left to Right: female, male

4.2.2.1 Lyme Disease

Since the site is located in the mid-Atlantic region, the potential for coming into contact with deer ticks exists. Lyme disease is caused by an infection from a deer tick that is about the size of the head of a pin. After a blood feeding, the tick becomes engorged and may vomit its stomach contents into the host. A microorganism (spirochete) may be transmitted into the bloodstream that may lead to Lyme disease. The feeding time is 24 to 48 hours. The effects of the disease vary from person to person, which often makes it difficult to diagnose. Typically, the incubation period ranges from two days to two weeks. In most cases, the infected area will resemble a red bull's eye with concentric rings. Within the same period, flu-like symptoms may develop. If left untreated, the red ringed area will eventually fade and Lyme disease may further develop into an arthritis-like condition.

Deer tick - Black Legged tick



The changing face as the deer tick engorges
Left to Right: unengorged female, 1/4 engorged, 1/2 engorged and fully engorged

The best method for stopping insect borne disease is to avoid the bite. Control measures to prevent Lyme Disease include the following:

- Avoid dense or high brush, when possible.
- Wear light colored clothing.
- Spray DEET on your skin and Permethrin on clothing, and work boots.
- Tuck pant legs into socks and shirts into gloves, if possible.
- Self/Buddy check of neck, hairline, groin, and body after working in areas that may contain deer ticks.
- Wear light colored tyvek or clothing.
- Wear booties over work boots.
- Look for ticks upon returning from field work.
- Shower as soon as possible.
- If a tick is found, suffocate it with baby oil applied to the tick, then remove it by pulling gently at the head with tweezers or better, the Pro-Tick removal system (see below).
- Report any of the above symptoms and all tick bites to the SHSO for evaluation. Employees bitten by deer ticks during the course of employment or one who finds an engorged tick on their body, will be given a medical examination.
- Analysis of the tick for Spirochete may be warranted. Administration of antibiotic therapy may be also be warranted. Either action may be taken with the concurrence of the Corporate Medical Consultant.

A source for Pro-Tick removal systems as well as Deet and Permethrin based lotions and sprays as well as sun screen can be found on-line at http://www.scs-mall.com/store/

The following is from the "Pro-Tick Remover" ad on the above web site: Pro-Tick Remedy (now includes a 5X magnifier) makes this sometimes difficult and distasteful task easier than any other tool. The Pro-Tick has consistently tested superior when tested against other tick removers and tweezers. Here's a quote from a research paper published in 1995. ***" . . . while others (tick removers and tweezers) broke the tip of the hypostrome and chelicerae (mouthparts) in at least one tick. The Pro-Tick remedy succeeded in removing all fifty-one ticks without damaging any mouthparts . . . results indicate that the Pro-Tick Remedy removed the most tick cement while causing the least damage . . ."*** More recent tests against nymph ticks (the dangerous immature ones) showed that the Pro-Tick Remedy removes nymph ticks better than any other instrument.

4.2.3 Snakes

Snakes are a hazard in forests and wetlands. If you see a snake, avoid it! If you are bitten, try to identify the snake and seek emergency medical help immediately. Venomous snakes native to this area include:

- **Northern Copperhead:** This snake grows to 24" to 36" in length. The Northern Copperhead Snake has a stocky body that may be copper, orange, or pinkish in color. Dark, chestnut-colored bands cross the body, breaking the color pattern into alternating bands of darker and lighter color. Young copperheads are lighter in color than the adults, and they have a yellow-tipped tail that they often flick.

- **Timber Rattlesnake:** It often lives on rocky hillsides and in wooded areas. The Timber Rattlesnake has a head and body that are pinkish-gray to yellowish-brown with a pattern of dark bands on the back and a grayish-white belly. The tail is black with a rattle. The size of an average adult is 3 - 4.5 feet long.

4.2.4 Plants

Plants such as poison ivy and poison oak may be prevalent at the site during certain times of the year. Workers will be trained to recognize these plants and to minimize contact with them. Employees may wear PPE to reduce the potential for exposure. Pre-exposure topical lotions such as Tecnu may be applied prophylactically. "Ivy Block" is an easy to use non-prescription, pre-exposure lotion. You apply it like sunscreen to all exposed skin. It dries quickly and the active ingredient, bentoquatam, guards you against the harmful oil in poison ivy, oak and sumac. Remove lotion with running water and soap after risk of exposure has ended. Toll FREE ORDER LINE (800) 421-1223.

The use of Clorox wipes to decontaminate reusable clothing to preclude exposure to poison ivy may prove valuable. Gloves should be worn during decontamination and removal of PPE.

4.3 Physical Hazards

Most safety hazards are discussed in the AHA in Appendix C. In addition to the AHA, general work rules and other safety procedures are described in Section 10 of this SHSP.

4.3.1 Heat Stress

Heat stress is a significant potential hazard, which is greatly exacerbated with the use of PPE in hot environments. A heat stress prevention program will be implemented when ambient temperatures exceed 70ºF for personnel wearing impermeable clothing and for other personnel when the wet bulb globe temperature (WBGT) index exceeds the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV). The following are the main elements of the TtEC Health and Safety Program (EHS 4-6) related to temperature extremes, which can be found in Appendix D.

- Selection of PPE to reduce the risk of heat related illness
- Hydration.
- Cool rest areas.
- Engineering Controls (i.e., air conditioned cabs, drenching).
- Administrative Controls (work schedules, acclimatization, work/rest regimens).
- PPE (i.e., ice vests, vortex tubes).
- Monitoring (body core temperature, pulse rate).
- Identification of heat related illnesses (heat cramps, heat exhaustion, and heat stroke).
- Employee training.

4.3.2 Cold Stress

At certain times of the year, workers may be exposed to the hazards of working in cold environments. Potential hazards in cold environments include frostbite, trench foot or immersion foot, hypothermia as well as slippery surfaces, brittle equipment, poor judgment, and unauthorized procedural changes. The following are the main elements of the TtEC Health and Safety Program (EHS 4-6) related to temperature extremes, which can be found in Appendix D.

- PPE (i.e. hard hat liners, boot and glove liners, insulated coveralls).
- Engineering controls (i.e. heaters, wind shields, covered metal handles).
- Administrative controls (i.e. work/warm up schedule, acclimatization).
- Recognition of Cold Stress Related Injury (frostbite and hypothermia).
- Warm rest area.

- Employee training.

4.3.3 Noise

Noise is a potential hazard associated with the operation of heavy equipment, power tools, pumps, and generators. All employees routinely working within ten feet of these operations will wear hearing protection. All employees receive a pre-employment audiogram as part of their physical examination. High noise areas will be so designated.

4.3.4 Underground Utilities

When intrusive work activities are conducted on site the threat of contact with underground utilities exists. Underground utilities include lines such as electrical, gas, and sewer. An assessment of the presence of underground utilities will be made before conducting any intrusive activities. In preparing the AHA, TtEC's EHS Procedure 3-15 was considered.

All steps will be taken to locate underground utilities as per EHS 3-15, which can be found in Appendix E. This will include white lining the area of intrusive activities, calling the Rhode Island State One-Call System, having utilities located and when on private property, use of a private locating service to perform a geophysical survey. Based on the location of intrusive activities electrical and gas lines are not anticipated. The only utility lines in the vicinity are sewer or stormwater pipes.

4.3.5 Excavation and Trenching

Excavation will be conducted in accordance with the TtEC Excavation and Trenching Program, EHS 6-3, which incorporates the requirements of 29 CFR 1926, Subpart P – Excavations. This program includes the designation of a "competent person" by the PM and approval by the PESM. A checklist of competency elements must be completed to assess ability of the designated competent person to fulfill the requirements of EHS 6-3, which can be found in Appendix F. A competency determination must be completed and documented prior to assignment.

The Excavation and Trenching Program also includes requirements for the monitoring of potentially hazardous atmospheres; protection from water hazards; analyzing and maintaining the stability of adjacent structures; daily competent person inspections; soil classification; sloping and benching; protective systems; and training.

Trenching to a depth greater than four feet will require atmospheric monitoring and the use of ladders for safe entry/egress. The competent person will determine the need for cave-in protection. If trenches exceed five feet in depth, cave-in protection will be implemented in accordance with the Trenching Program, EHS 6-3.

The competent person will have an adequate combination of experience and training to classify soil types and select protective systems outlined in EHS 6-3. Training and experience pertaining to qualification as a competent person will be documented will include the following:

- Knowledge of general safety practices related to working in/near open excavations.
- Inspection requirements and techniques.

The competent person will be responsible for the following:

- Day-to-day oversight and inspection of open excavations and trenches.
- Conducting soil classifications.
- Selection of protective systems.
- Providing the SHSO with all required documentation on a daily basis.

4.3.6 Falls

Fall protection, in the form of safety nets, guardrails, or personal fall arrest systems, will be provided as needed and whenever any worker is exposed to a fall distance of greater than six feet. TtEC's Fall Protection Program, EHS 3-8, will be followed for providing the proper body harness and anchor point to avoid falls, which can be found in Appendix G. All fall protection equipment must meet American National Standards Institute (ANSI) Z359.1 requirements. A "competent person," able to evaluate the hazards of fall protection systems and stop work when required, will be appointed by the PM.

4.3.7 Hazardous Energy Control

Energy-using devices as well as overhead/underground power lines and downed electrical wires pose a danger of shock or electrocution if workers contact/sever them during site operations. The requirements of TtEC Procedure EHS 6-4 Lock Out/Tag Out, which can be found in Appendix H, will be followed whenever work is to be done on any energy-using device. Training will be provided to anyone involved in any phase of this work.

The following safe work practices will be implemented:

- A licensed electrician will be used when locating/hooking up/disconnecting electrical circuits, locking out, and verifying that electrical energy was de-energized. A licensed electrician will also be used for the installation and testing of all electrical power.
- Ground fault circuit interrupter (GFCI) will be used on all 15 amp, 20 amp, and 120 volt circuits.
- Inspect all extension cords daily for structural integrity, ground continuity, and damage. Inspect extension cord connections. Extension cords must be of the "hard" or "extra hard" service type.
- Elevate or cover electric wire or flexible cord passing through work area to protect it from damage by foot traffic, vehicles, sharp corners, projections, or pinching.
- Keep plugs and receptacles out of water unless they are approved submersible-types.
- Ground all electrical circuits in accordance with the National Electrical Code (NEC) or other applicable standards and regulations.
- A minimum 15-foot safe separation distance will be maintained between equipment and 50 kV overhead electrical lines. This distance will increase 0.4 inches for each 1 kV above 50 kV.

4.3.8 Hand and Power Tools

Tools are such a common part of construction work that often hazards are unrecognized. Workers must learn to recognize the hazards associated with the different types of tools and the safety precautions necessary to prevent injuries from those hazards. To prevent accidents resulting from the use of hand and power operated hand tools, the following safe work practices will be implemented and enforced.

Broken, defective, burned, or mushroomed tools will not be used. They will be reported and turned in for replacement. The proper tool and equipment will be selected and used for each task. For example, a wrench will not be used as a hammer or a screwdriver as a chisel. Leaving tools on scaffolds, ladders, or any overhead working surface is not allowed. Racks, bins, hooks, or other suitable storage space must be proved to permit convenient arrangement of tools. The practice of throwing tools from one location to another, from one employee to another, or dropping them to lower levels will be prohibited. When it is necessary to pass tools or material under the above conditions, suitable containers and/or ropes must be used.

Wooden tool handles must be sound, smooth, and in good condition and securely fastened to the tool. Sharp-edged or pointed tools will never be carried in employee's pockets. Only non-sparking tools will be used in locations where sources of ignition may cause a fire or explosion. Tools requiring heat-treating will be tempered, formed, dressed, and sharpened by workmen experienced in these operations. Tools designed to accommodate guards must be equipped with such guards when in use.

All rotating, reciprocating, or moving parts of equipment (belts, gears, shafts, flywheels) must be guarded to prevent contact by employees using such equipment. All hand-held power tools (i.e., circular saws, chain saws, and percussion tools) without a positive accessory holding means must be equipped with a constant pressure switch that will shut off the power when pressure is released. A positive "on-off" control must be provided on platen sanders, grinders with wheels 2" in diameter or less, routers, planers, laminate trimmers, nibblers, shears, scroll saws, and jigsaws with blade shanks ¼" wide or less.

A momentary contact "on-off" control must be provided on all hand-held powered drills, tapers, fasteners, drivers, horizontal, vertical, and angle grinders with wheels greater than 2" in diameter. Besides safety hazards, the use of power tools sometimes creates potential health hazards as well. The use of jackhammering and chiseling equipment often results in silica and nuisance dust exposures that can be controlled by wetting the work surfaces.

In addition to dust hazards, the hand vibration inherent in the use of some power tools may result in a restriction of blood flow to the hands and fingers, causing numbness and tingling. If workers consistently experience these symptoms after the use of power tools, they will contact their supervisor so that steps may be taken to prevent further harm to the nerves and blood vessels in their hands. The use of a different tool, changes to the offending tool to reduce vibrations, and/or the use of gloves are recommended to prevent vibration.

Electric tools – Electric tools present several dangers to the user; the most serious is the possibility of electrocution. The following safe work procedures for electric tools must be implemented and enforced. Tools must:

- Have a three-wire cord with ground and be grounded.
- Be double insulated.
- Be powered by a low-voltage isolation transformer.

Never remove the third prong from the plug. Electrical tools will not be used in damp or wet locations and will always be used within their design limitations. A GFCI must be used or the tool must be double insulated to protect the worker from electrical shock hazards. However, gloves will not be worn when they are potential entanglement hazards with reciprocating or rotating tools.

Powered Abrasive Wheel Tools - Power abrasive wheel tools present a special safety problem because they may release fragments. The following safe work procedures for powered abrasive wheel tools need to be implemented and enforced. Portable grinding tools must be equipped with safety guards to protect workers from fragments as well as the moving wheel surface. Inspecting and sound or ring testing abrasive wheels prior to mounting is required to ensure that they are free from cracks or defects. Checking to ensure that the abrasive wheel Revolutions Per Minute (RPM) rating is appropriate for the tool will also help prevent wheel failures. The following work rules are appropriate when using a power grinder:

- Always use eye protection and a face shield.
- Turn off the power when not in use.
- Never clamp a hand-held grinder in a vise.
- To prevent the wheel from cracking, the user will ensure that it fits freely on the spindle.
- Grinding wheel users will never stand directly in front of the wheel during start-up because there is always a possibility that the wheel may disintegrate (explode) when accelerating at full speed.

Pneumatic Tools – Pneumatic tools are powered by compressed air and include chippers, drills, jackhammers, and sanders. The following safe work procedures for pneumatic tools must be implemented and enforced. Pneumatic tools that shoot nails, rivets, or staples that operate at pressures more than 100 lb./in^2 must be equipped with a special device to keep fasteners from being ejected unless the muzzle is pressed against the work surface. Safety lashing will be installed at connections between tool and hose at all quick makeup type connections. All hoses exceeding ½" inside diameter must have a safety device at the supply source or branch line to reduce pressure in the event of hose failure. Eye protection is required for employees working with pneumatic tools.

Airless spray guns that atomize paints and fluids at high pressures (1,000 lbs./in^2 or more) must be equipped with automatic or visual manual safety devices that will prevent pulling the trigger until the safety device is manually released. Workers operating a jackhammer are required to wear safety glasses, safety footwear, and hearing protection. Compressed air guns will never be pointed toward anyone. A safety clip or retainer must be installed to prevent attachments from being unintentionally shot from the barrel of the tool.

Liquid-Fueled Tools – Liquid-filled tools are usually powered by gasoline. Vapors that can burn or explode and give off dangerous exhaust gases are the most serious hazards associated with liquid-filled tools. The following safe work procedures for liquid-filled tools need to be implemented and enforced at the site.

Gas or fuel will be handled, transported, and stored in Underwriters Laboratories (UL)/National Fire Protection Association (NFPA) approved flammable liquid containers. These containers, also known as safety cans, are no more than five gallons in capacity and have a spring-closing lid and spout cover that

will safely relieve internal pressure when subjected to fire exposure. Type 2 cans are preferred. Before refilling the tank for a fuel-powered tool, the user must shut down the engine and allow it to cool to prevent accidental ignition of hazardous vapors. Effective ventilation and/or PPE are necessary when using a fuel-powered tool inside a closed area. Fire extinguishers must be readily available in the work area.

Powder-Actuated Tools – Powder-actuated tools operate like a loaded gun and will be treated with the same respect and precautions. Only assigned, trained, and qualified operators should operate powder-actuated tools. The following safe work practices and procedures for powder-actuated tools will be implemented and enforced. All powder-actuated tools must meet ANSI A10.3 requirements for design, operation, and maintenance. Powder-actuated tools must never be used in an explosive or flammable atmosphere. Before using a powder-actuated tool, the worker will inspect it to determine that it is clean, that all moving parts operate freely, and that the barrel is free from obstructions.

Never point the tool at anyone. Do not load a tool unless it is being used immediately. Never leave a loaded tool unattended, especially where it would be available to unauthorized persons. Suitable eye and face protection is essential when using a powder-actuated tool. In case of misfire, the operator will hold the tool in the operating position for at least 30 seconds, then attempt to operate the tool for a second time. If the tool misfires again, wait another 30 seconds (still holding the tool in the operating position) and then proceed to remove the explosive load from the tool in accordance with the manufacturer's instructions.

If the tool develops a defect during use, it will be tagged and taken out of service immediately until it is properly repaired. Warning signs will be posted within the area of operation of any powder-actuated tool. Powder-actuated tool operators must be certified by the tool supplier.

5.0 AHA

An AHA has been developed for each task. The AHA considers the hazards discussed in Section 4.0.

An additional or expanded AHA will be developed by the SHSO, or subcontractors, for all unanticipated work and/or prior to working on a new task.

The AHA will be used to instruct workers on the hazards of the associated activities during a safety meeting.

AHA are included in Appendix C for the following phases of work:

- Mobilization and installation of temporary facilities.
- Installation of security fence.
- Installation and maintenance of soil erosion and sediment control measures.
- Construction of temporary decontamination facilities.
- Construction of soil staging area.
- Construction of stone revetment.
- Investigate buried structure evidenced by manhole cover (was under Central Mound), may be a former oil/water separator.
- Excavate contaminated soil.
- Backfill the excavated areas.

- Installation of pipes and risers if all of the total petroleum hydrocarbons (TPH) cannot be removed.
- Load soil for off-site transportation and disposal following waste characterization by others.
- Upgrade of existing two storm lines that cross the site.
- Construct gravel road along shoreline at top of revetment (double as walking trail).
- Restore gravel parking lot to the site the way it was before mound removal started.
- Seeding.
- Perform site restoration.
- Demobilize resources.

Subcontracted work will be evaluated for hazards in a manner consistent with self-performed work. The SHSO is responsible to obtain and review AHA from subcontractors or will develop accurate AHA for subcontracted work.

6.0 PERSONAL PROTECTIVE EQUIPMENT

For the purposes of PPE selection, the PESM and SHSO are considered competent persons. The signatures on the front of this SHSP constitute certification of the hazard assessment. As established in this SHSP, the initial level of PPE will be modified Level D for all activities. Sampling data and past experience indicate a relatively low hazard for exposure.

For activities not covered by an AHA, the SHSO will conduct the hazard assessment and select the PPE using the form provided Appendix I and will certify the assessment by signing the form. PPE selection will be made in consultation with the PESM. Modifications for initial PPE selection may also be made by the SHSO in consultation with the PESM. A written justification for downgrades will be provided to the PESM for approval by the Navy as a CRF.

Table 6-1 describes PPE for site tasks.

6.1 Hazard Assessment for Selection of Personal Protective Equipment

The initial levels of protection were selected by performing a hazard assessment taking into consideration the following:

- Potential chemical and physical hazards present or suspected.
- Work operations to be performed.
- Potential routes of exposure.
- Characteristics, capabilities, and limitations of PPE.
- Hazards that the PPE presents or magnifies.

The primary routes of exposure for the contaminants are skin contact and inhalation. Ingestion is a secondary route of exposure. During excavation of contaminated soil there is a potential for skin contact with chemical contaminants; the SHSO will need to exercise judgment in determining an upgrade in level of PPE. Additionally, the type of respiratory protection will be dependent on real-time air monitoring

Table 6-1
Personal Protective Equipment Selection

TASK	HEAD	EYES/FACE	FEET	HANDS	BODY	HEARING	RESPIRATORY
Site Clearing	HH; if necessary	SG, if necessary	STB	LWG	WC	EP as needed	Initial level of protection: D
Construction of soil staging area and stone revetment	HH	SG	STB	LWG	WC	EP as needed	Initial level of protection: D Upgrades based on real time readings and conditions
Excavation of contaminated soil	HH	SG	STB	Tyvek	WC	EP as needed	Initial level of protection: D Upgrades based on real time readings and conditions
Backfilling of excavated areas	HH	SG	STB	LWG	WC	EP as needed	Initial level of protection: D
Waste characterization and loading of soil for off-site disposal	HH	SG	STB	Nit	Tyvek	EP as needed	Initial level of protection: D Upgrades based on real time readings and conditions
Site restoration	HH	SG	STB	LWG	WC	EP as needed	Initial level of protection: D

Legend:
EP = Ear Plugs
HH = Hard Hat
LWG = Leather Work Gloves
Nit = Nitrile Gloves
SG = Safety Glasses
STB= Steel Toe Boots
WC = Work Clothes

results. The air monitoring program, along with use of respirators equipped with organic vapor cartridges, if necessary, will provide adequate respiratory protection to minimize potential exposure via inhalation. Strict adherence to decontamination and personal hygiene procedures will effectively eliminate skin contact and ingestion as potential routes of exposure.

6.2 Respirator Cartridge Change-out Schedule

A respirator cartridge change-out schedule has been developed in order to comply with 29 CFR 1910.134. The respirator cartridge change-out schedule for this project is as follows:

- Cartridges will be removed and disposed of after four hours of use, when cartridges become wet, or wearer experiences breakthrough, whichever occurs first.
- If the humidity exceeds 85%, then cartridges will be removed and disposed of after two hours of use.

Respirators will not be stored at the end of the shift with contaminated cartridges left on. Cartridges will not be reused on another shift, regardless of previous use time.

The schedule was developed based on the following scientific information and assumptions:

- Analytical data that is available regarding site contaminants.
- Using the Rules of Thumb provided by the American Industrial Hygiene Association (AIHA).
- All of the chemicals have boiling points greater than 70° C.
- Total airborne concentration of contaminants is anticipated to be less than 200 parts per million (ppm).
- The humidity is expected to be less than 85%.
- Desorption of contaminants (including those with poor warning properties) after partial use of the chemical cartridge can occur after a short period (hours) without use (i.e. overnight) and result in a non-use exposure.

The following is a partial list of factors that may affect the usable cartridge service life and/or the degree of respiratory protection attainable under actual workplace conditions. These factors have been considered when developing the cartridge change-out schedule.

- Type of contaminant(s).
- Contaminant concentration.
- Relative humidity.
- Breathing rate.
- Temperature.
- Changes in contaminant concentration, humidity, breathing rate, and temperature.
- Mixtures of contaminants.
- Accuracy in the determination of the conditions.
- The contaminant concentration in the workplace can vary greatly. Consideration must be given to the quality of the estimate of the workplace concentration.
- Storage conditions between multiple uses of the same respirator cartridges. It is recommended that the chemical cartridges be replaced after each work shift. Contaminants adsorbed on a cartridge can migrate through the carbon bed without airflow.

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(to be provided in future versions of the SHSP)

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(to be provided in future versions of the SHSP)

- Age of the cartridge.
- Condition of the cartridge and respirator.
- Respirator and cartridge selection.
- Respirator fit.
- Respirator assembly, operation, and maintenance.
- User training, experience, and medical fitness.
- Warning properties of the contaminant.
- The quality of the warning properties will be considered when establishing the chemical cartridge change schedule. Good warning properties may provide a secondary or back-up indication for cartridge change-out.

7.0 AIR MONITORING

The following sections contain information describing the type, frequency, and location of real time air monitoring.

7.1 Real Time Air Monitoring

This section addresses the real time air monitoring that will be conducted, including instrumentation selection, frequency, and location of air sampling. At a minimum, real-time air monitoring will be conducted during construction of soil staging area and stone revetment, excavation of contaminated soil, and waste characterization and loading of soil for off-site disposal. Air monitoring will continue in this manner until sufficient data is developed to consider a frequency reduction or cessation for a particular activity. Table 7-1 lists the Real Time Air Monitoring Action Levels to be used in all work areas. Table 7-2 presents a breakdown of each main activity and provides the instrumentation, frequency, and location of real-time air monitoring for the site. All air monitoring readings will be recorded, regardless of concentrations.

The following instruments will be used for real-time air monitoring:

- Photoionization Detector (PID) with an 10.6 eV lamp.
- Combustible Gas Indicator/Oxygen (CGI/O_2).
- Dust Meter.

Measurements will be recorded during the above activities, at a minimum. The monitoring for organic vapors and dust will consist of measurements recorded at the breathing zone (BZ) height in the area of highest employee exposure risk.

Monitoring for combustible gases will be conducted during any activities that may generate combustible gas or vapors.

Based on real time air monitoring readings and site conditions, the SHSO or designee may increase/decrease the frequency at which the readings are taken, using professional judgment. Real-time air monitoring will be conducted in order to confirm the “no exposure scenario.”

Real-time air monitoring results for on-site activities will be reviewed with craft labor periodically by the SHSO in site daily health and safety briefings.

Table 7-1
Real Time Air Monitoring Action Levels

Air Monitoring Instrument	Monitoring Location	Action Level	Site Action	Reason
PID w/10.6 lamp	Breathing Zone	0 – 50 ppm	Level D	Conservative action level based on the potential exposure to TPH.
	Breathing Zone	50 – 250 ppm	Level C	Based on increasing potential for exposure to TPH
	Breathing Zone	>250 ppm	Cease activities, contact PM and PESM for further instruction	Assume conservative protection factor for respirators
CGI/O_2	Breathing Zone	1% LEL< conc.< 10% LEL	Investigate possible cause, use caution	Increasing potential for ignition of vapors
	Breathing Zone	Conc. > 10% LEL	Cease activities, contact PM and PESM for further instruction	Potential for ignition of vapors
Dust Meter	Breathing Zone	2.5 mg/M^3	Level C	Based on increasing potential for exposure to TPH

7.2 Frequency and Location of Real Time Air Monitoring

Table 7-2 provides the frequency and location of real time air monitoring.

Table 7-2
Frequency and Location of Air Monitoring

Activity	Air Monitoring Instrument	Frequency And Location
Intrusive activities	PID, CGI/O_2, and Dust Meter	Twice per day (AM and PM) upwind and downwind provided that action levels are not exceeded. Increase frequency to every 15 minutes if action level is exceeded.

7.3 Integrated Air Monitoring

Integrated air monitoring will not be performed due to the nature of the work and the contaminants.

7.4 Data Quality Assurance

7.4.1 Calibration

Instrument calibration will be documented and included in a dedicated Health and Safety Logbook or on separate calibration pages. All instruments will be calibrated before and after each shift. Calibration

checks may be used during the day to confirm instrument accuracy. Duplicate readings may be taken to confirm individual instrument response.

7.4.2 Operations

All instruments will be operated in accordance with the manufacturer's specifications. Manufacturers' literature, including an operations manual for each piece of air monitoring equipment will be maintained on-site by the SHSO for reference.

7.4.3 Data Review

The SHSO will interpret all monitoring data based on Table 7-1 and professional judgment. The SHSO will review the monitoring and sampling data with the PESM to evaluate the potential for worker exposure and upgrades/downgrades in level of protection.

7.5 Noise Monitoring

Noise monitoring will not be conducted. Hearing protection will be worn by workers in proximity to heavy equipment, fans, blowers, and pumps. When equipment requires the wearing of ear muffs the equipment will be labeled as hazardous to hearing and the hazard radius noted on the warning.

8.0 ZONES, PROTECTION AND COMMUNICATION

8.1 Site Control

Site zones are intended to control the potential spread of contamination throughout the site and to assure that only authorized individuals are permitted into potentially hazardous areas. A three-zone approach will be utilized. It will include an Exclusion Zone (EZ), Contamination Reduction Zone (CRZ), and a Support Zone (SZ). Specific zones will be established on the work site when operations begin. A map showing these zones will be developed on site and posted in the on-site office. All maps will be posted at the site and used during initial site-specific training.

This project is a hazardous waste remediation project and any person working in an area where the potential for exposure to site contaminants exists will only be allowed access after providing the SHSO with evidence of proper training and medical documentation.

The zones are based upon current knowledge of proposed site activities. It is possible that the zone configurations may be altered due to work plan revisions. Should this occur, the site zones will be adjusted accordingly.

The following will be used for guidance in revising these preliminary zone designations, if necessary:

Support Zone – The SZ is an uncontaminated area (i.e., trailers, offices, etc.) that will be the field support area for most operations. The SZ provides for field team communications and staging for emergency response. Appropriate sanitary facilities and safety equipment will be located in this zone. Potentially contaminated personnel/materials are not allowed in this zone. The only exception will be appropriately packaged/decontaminated and labeled samples.

Contamination Reduction Zone – The CRZ is established between the EZ and the SZ. The CRZ contains the contamination reduction corridor and provides an area for decontamination of personnel and portable hand-held equipment, tools, and heavy equipment. A personnel decontamination area will be prepared at each exclusion zone. The CRZ will be used for EZ entry and egress in addition to access for heavy equipment and emergency support services.

Exclusion Zone – All activities that may involve exposure to site contaminants, hazardous materials, and/or hazardous conditions should be considered an EZ. This zone will be clearly delineated by cones, tape, or other means. The SHSO may establish more than one EZ where different levels of protection may be employed or different hazards exist. The size of the EZ will be determined by the SHSO allowing adequate space for the activity to be completed, considering field members and the need for emergency equipment. Any excavated grid will be considered as an exclusion zone. Once the grid is excavated and backfilled, it will no longer be in an exclusion zone.

Site personnel and visitors must log in and out of the EZ and CRZ daily.

8.2 Contamination Control

8.2.1 Personnel Decontamination Station

Personnel hygiene, coupled with diligent decontamination, will significantly reduce the potential for exposure of off-site areas to contaminants from the site. When participating in potentially dust-raising activities it will be crucial for field personnel to adhere to the following personal hygiene guidelines:

- Wash hands and face after leaving the CRZ.
- Every effort will be made to reduce dust production through engineering controls (i.e., watering, if deemed necessary based on weather conditions).

8.2.2 Minimization of Contact With Contaminants

During completion of all site activities, personnel will attempt to minimize contact with contaminated materials. This involves a conscientious effort to keep “clean” during site activities. This may ultimately minimize the degree of decontamination required and the generation of waste materials from site operations.

8.2.3 Personnel Dry Decontamination Sequence

When decontamination is needed, a dry decon will be used whenever possible. Personnel decontamination procedures are as follows:

- Perform dry decon if contact with contaminants occurred.
- Remove exterior protective clothing carefully and dispose of same.
- Remove and clean respirator, if applicable.
- Remove gloves without touching outside surface of gloves and dispose of same.
- Wash hands and face thoroughly.

8.2.4 Heavy Equipment Decontamination

Heavy equipment and hand held equipment that has come into contact with contaminated material will be decontaminated upon completion of the required project operations and after traveling from the EZ into other work zones at the site. All equipment decontamination will be dry by brushing off soils and sediments.

Heavy equipment will not be permitted to leave the EZ unless it has been thoroughly decontaminated and visually inspected by the SHSO or his designee.

8.3 Communication

The following communications equipment will be specified as appropriate:

- Radios – Hand-held two-way radios are utilized as appropriate by field teams for communication with the on-site office.
- Telephones – A telephone will be located in the on-site office in the SZ for communication with emergency support services/facilities.
- Air Horns – Air horns will be carried by field teams or will be strategically located within the EZ and will be maintained as the means for announcing emergency evacuation procedures and backup for other forms of communication.
- Hand Signals – Hand signals will be used by field teams along with the buddy system. These signals will be known by the entire field team before operations commence and their use will be covered during site-specific training. Typical hand signals are as following:

SIGNAL	MEANING
Hand gripping throat	Out of air, can't breathe
Grip on a partner's wrist or placement of both hands around a partner's waist.	Leave the area immediately, no debate.
Hands on top of head	Need general assistance
Hands raised above head	Need immediate assistance
Thumbs up	Okay, I'm all right, I understand.
Thumbs down	No, negative.

9.0 MEDICAL SURVEILLANCE PROCEDURES

All contractor and subcontractor personnel performing field work where potential exposure to contamination exists are required to have passed a medical surveillance examination in accordance with 29 CFR 1910.120(f).

The TtEC Medical Surveillance Program is described in detail in EHS 4-5 of the Health and Safety Program. The Corporate Medical Consultant is WorkCare, located in Orange, California. Dr. Peter Greaney, the Director, is Board certified in occupational medicine.

9.1 Medical Surveillance Requirements

A physician's medical release for work will be confirmed by the SHSO before an employee can work in the EZ. The examination will be taken annually at a minimum and upon termination of hazardous waste site work if the last examination was not taken within the previous six months. Additional medical testing may be required by the PESM in consultation with the Corporate Medical Consultant and the SHSO if an over-exposure or accident occurs, if an employee exhibits symptoms of exposure, or if other site conditions warrant further medical surveillance.

9.2 Medical Data Sheet

A medical data sheet is provided in Appendix J. This medical data sheet is voluntary and should be completed by all on-site personnel and will be maintained at the site. Where possible, this medical data sheet will accompany the personnel needing medical assistance. The medical data sheet will be maintained in a secure location, treated as confidential, and used only on a need-to-know basis.

10.0 SAFETY CONSIDERATIONS

10.1 General Health and Safety Work Rules

A list of work rules and general safe work practices has been included from the TtEC Health and Safety Program, EHS 3-6. These rules have been incorporated as Appendix K. The work rules will be posted in a conspicuous location at the site.

10.2 General Construction Hazards

The following is a list of applicable safety considerations for the major tasks. Further information is provided in the specific AHA and the specific TtEC Health and Safety Program.

- Slips/Trips/Falls.
- Punctures/Cuts.
- Lifting/Materials Handling.

10.3 High Loss Potential Hazards

Activities that have the potential for a serious injury to occur, include the following:

- Excavation/Intrusive activities.
- Exposure to underground utility lines.
- Heavy Equipment.

10.3.1 Underground Utilities

Striking underground utilities is a possible hazard whenever intrusive activities are conducted. All steps will be taken to locate underground utilities as per EHS 3-15 (see Appendix E, Underground Utilities). This includes white lining the area of intrusive activity and calling the “One-Call” number to have underground utilities located and marked. On private property, a locating service and/or a geophysical

survey will be needed. Based on the location of intrusive activities electrical and gas lines are not anticipated. The only utility lines in the vicinity are sewer or stormwater pipes.

Underground utility avoidance requires a “competent person” be designated. "Competent person" means one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

The Competent Person will be responsible for:

- Obtaining a copy of, and understanding the applicable regulations for the State of Rhode Island.
- Contacting the appropriate One-Call agency or private locating service, as applicable.
- Recording One-Call locate numbers.
- If necessary, renewing One-Call locate numbers before expiration.
- Ensuring that white-lining of the area of intrusive work is performed.
- Ensuring that a “positive response” has been received from every utility owner/operator identified by the One-Call agency and that they have located their underground utilities and have appropriately marked any potential conflicts with the areas of planned intrusive activities.
- Completion of the *Underground Utilities Locating and Marking Checklist* and the *Underground Utilities Management Checklist* .
- Reviewing applicable AHA with all project members before work begins.
- Conducting training on communication protocols to be used by the intrusive activities observer and equipment operator.
- Ensuring implementation of appropriate work practices during intrusive activities.
- Conducting daily inspections of the intrusive activities area to make sure that all markings are intact.
- Maintaining required records.
- Providing the SHSO with all required documentation on a daily basis.

11.0 WASTE DISPOSAL PROCEDURES

All discarded materials, waste materials, or other objects will be handled in such a way as to preclude the potential for spreading contamination, creating a sanitary hazard, or causing litter to be left on site. Transportation and Disposal (T&D) of waste material will be performed in accordance with the work plan.

The following waste materials will be generated during remedial activities:

- Excavated soil and fill that may contain elevated concentrations of PAH, TPH, and lead.
- Used silt fence and turbidity curtain.
- Polyethylene liner from the staging area.
- Dewatering liquid.
- PPE consisting of Tyvek, booties, gloves, etc. from intrusive activities in potentially contaminated areas.
- Decontamination solids and liquids from equipment and personnel decontamination activities.
- Stone from the equipment decontamination facility.

Excavated soil and fill will be disposed of by a subcontractor to the Navy. Waste characterization sampling of the excavated material will be performed by Environmental Multiple Award Contractor (EMAC). TtEC will load material into the subcontractor's off-site disposal vehicles.

Used silt fence and turbidity curtain materials will be disposed of off-site along with excavated soil. Disposal classification will be based upon the waste classification of the excavated soil.

The polyethylene liner used at the staging area will be disposed of off-site along with excavated soil. Disposal classification will be based upon the waste classification of the excavated soil.

During the time that the staging area is located on a planned excavation grid cell, water that collects within the staging area will be allowed to infiltrate the ground surface. When excavation has been completed at all grid cells except for the cell containing the staging area and the staging area is relocated to a non-excavation area, any water that accumulates will be collected and characterized for off-site disposal.

PPE (Tyvek, gloves, booties) generated during intrusive work that is potentially contaminated will be disposed of off-site along with excavated soil. Disposal classification will be based upon the waste classification of the excavated soil. Any PPE generated during clean work activities will be disposed of as non-hazardous solid waste at a permitted Resource Conservation and Recovery Act (RCRA) Subtitle D landfill. As PPE is removed, it will be placed in segregated labeled containers to separate PPE from contaminated areas from PPE from clean work areas.

All of the equipment in contact with contaminated materials will be decontaminated before removal from the site or before use for construction in clean areas. Solid residues generated from decontamination of equipment will be disposed of off-site along with the excavated soil. Any solids that are generated from decontaminated equipment that was used in a clean area will be considered clean and used on-site as common fill.

Liquid waste generated on-site will include equipment and personnel decontamination water. Decontamination water will be collected in United States Department of Transportation (USDOT) approved containers or frac tanks and sampled for waste classification. Decontamination water that meets surface water discharge standards will be discharged directly to Narragansett Bay. Although an Rhode Island Pollutant Discharge Elimination System (RIPDES) permit will not be required for discharge, the site activities will comply with the substantive RIPDES permit requirements including discharge standards and discharge sampling and monitoring requirements. Decontamination water that does not meet discharge standards will be sampled for waste classification and treated at an off-site waste treatment facility.

Stone used to construct the equipment decontamination facility will be disposed of off-site along with excavated soil. Disposal classification will be based upon the waste classification of the excavated soil.

Additional waste disposal procedures may be developed with the ESQ department regulatory specialist as applicable.

12.0 EMERGENCY RESPONSE PLAN

This section establishes procedures and provides information for use during a project emergency. Emergencies happen unexpectedly and quickly, and require an immediate response; therefore, contingency planning and advanced training of staff is essential. Specific elements of emergency support procedures which are addressed in the following subsections include communications, local emergency support units, preparation for medical emergencies, first aid for injuries incurred on site, record keeping, and emergency site evacuation procedures.

12.1 Responsibilities

12.1.1 PESM

The PESM is Grey Coppi, CIH, CSP.

The PESM oversees and approves the Emergency Response/Contingency Plan and performs audits to determine that the plan is in effect and that all pre-emergency requirements are met. The PESM acts as a liaison to applicable regulatory agencies and notifies OSHA of reportable accidents.

12.1.2 SHSO

The SHSO is to be determined.

The SHSO is responsible for ensuring that all personnel are evacuated safely and that machinery and processes are shut down or stabilized in the event of a stop work order or evacuation. The SHSO is required to immediately notify the PESM of any fatalities or catastrophes (three or more workers injured and hospitalized) so that the PESM can notify OSHA within the required time frame. The PESM will be notified of all OSHA recordable injuries, fires, spills, releases, or equipment damage in excess of $500 within 24 hours. The SHSO also serves as the alternate EC.

12.1.3 EC

The EC is Dan Sullivan.

The EC will make contact with Local Emergency Response personnel prior to beginning work on site. In these contacts the EC will inform interested parties about the nature and duration of work expected on the site and the type of contaminants and possible health or safety effects of emergencies involving these contaminants. The EC will locate emergency phone numbers and identify hospital routes prior to beginning work on site. The EC will make necessary arrangements to be prepared for any emergencies that could occur.

The EC will implement the Emergency Response/Contingency Plan whenever conditions at the site warrant such action.

12.1.4 Site Personnel

Site personnel are responsible for knowing the Emergency Response/Contingency Plan and the procedures contained herein. Personnel are expected to notify the EC of situations that could constitute a site emergency.

12.2 Communication

A variety of communication systems may be utilized during emergency situations. These are discussed in the following sections.

12.2.1 Radio Communication

The primary form of communication during an emergency between field groups in the EZ and the EC will be radio communications. Each field team within the EZ will have a radio. During an emergency situation, the lines will be kept clear so that all field teams can receive instructions.

12.2.2 Telephone Communication

A telephone will be maintained in the on-site office (i.e., pump house or treatment building).

12.2.3 Air Horns

Air horns will be used to alert site personnel of emergencies. The following signals will be used:

- Two short blasts – shut down equipment, clear radio channels, await instructions.
- Three short blasts – injured employee, first-aid providers respond.
- One continuous blast – site evacuation.

Air horns can be found in the on-site office and site vehicles. The procedure to activate the air horns consists of depressing the air horn button or switch while pointing it in the direction of the area to be signaled. Air horns should be tested at least monthly to ensure that they are working properly.

12.2.4 Hand Signals

Field teams will use hand signals (Section 8.3) where necessary for communication during an emergency.

12.3 Local Emergency Support Units

In order to be able to deal with any emergency that might occur during remedial activities at the site, Table 12-1 Emergency Telephone Numbers will be posted prominently in the on-site office and in all places where telephone service is available.

A route map from the site to the nearest hospital is in Appendix L. This map will be posted adjacent to the above emergency telephone numbers in the on-site office and in all places where telephone service is available. It will also be placed in all on-site vehicles.

12.4 Pre-Emergency Planning

TtEC will communicate directly with administrative personnel from the emergency room at the hospital in order to determine whether the hospital has the facilities and personnel needed to treat cases of trauma resulting from exposure to any of the contaminants expected to be found on the site. Instructions for finding the hospital will be posted conspicuously in the on-site office and in each site vehicle.

Before the field activities begin, the local emergency response personnel will be notified of the schedule for field activities and about the materials that are thought to exist on the site so that they will be able to respond quickly and effectively in the event of a fire, explosion, or other emergency.

Table 12-1
Emergency Telephone Numbers

Contact	Firm or Agency	Telephone Number
Police	Newport Police Department	(401) 847-1306
Fire	Newport Fire Department	(401) 847-4647
Hospital	Newport Hospital	(401) 846-6400
Environmental Coordinator, Cornelia Mueller	Base	To be determined
PM, Carl Tippmann	TtEC	Office (215) 702-4044 Cell (908) 419-2906
PS, Dan Sullivan	TtEC	Office to be determined Cell (617) 834-7211
SHSO	To be determined	To be determined
PESM, Grey Coppi	TtEC	Office (973) 630-8101
Navy ROICC, Robert Krivinskas	Navy EFANE	To be determined
Navy PM, Curtis Frye	EFANE	(610) 595-0567 Ext. 142
Poison Control Center		1-800-222-1222
National Response Center		1-800-424-8802

12.5 Emergency Medical Treatment

The procedures and rules in this SHSP are designed to prevent employee injury. However, should an injury occur, no matter how slight, it will be reported to the SHSO immediately. First-aid equipment will be available on site at the following locations:

- First Aid Kit: On-Site Office and Site Vehicles
- Emergency Eye Wash (ANSI Z.358.1-1998 for a 15 minute flush): On-Site Office and CRZ

During the site safety briefing, project personnel will be informed of the location of the first aid station(s). Unless they are in immediate danger, severely injured persons will not be moved until paramedics can attend to them. Some injuries, such as severe cuts and lacerations or burns, may require immediate treatment. Any first aid instructions that can be obtained from doctors or paramedics, before an emergency-response squad arrives at the site or before the injured person can be transported to the hospital, will be followed closely.

TtEC will provide at least two personnel with current First Aid and Cardiopulmonary Resuscitation (CPR) certification on each active work shift. When personnel are transported to the hospital, the SHSO will provide a copy of the Medical Data Sheet to the paramedics and treating physician.

Only in **non-emergency** situations will an injured person be transported to the hospital by means other than an ambulance. For minor injuries, contact WorkCare, at 800-455-6155 for the location of the nearest clinic or alternatively, utilize the local clinic that performed pre-employment examination.

12.6 Emergency Site Evacuation Routes and Procedures

In order to mobilize the manpower resources and equipment necessary to cope with a fire or other emergency, a clear chain of authority will be established. The EC will take charge of all emergency response activities and dictate the procedures that will be followed for the duration of the emergency. The EC will report immediately to the scene of the emergency, assess the seriousness of the situation, and direct whatever efforts are necessary until the emergency response units arrive. At their discretion, the EC also may order the closure of the site for an indefinite period.

All project personnel will be instructed on proper emergency response procedures and locations of emergency telephone numbers during the initial site safety meeting. If an emergency occurs, including but not limited to fire, explosion, or significant release of toxic gas into the atmosphere, an air horn will be sounded at the site. The horn will sound continuously for one blast, signaling that immediate evacuation of all personnel is necessary due to an immediate or impending danger. All heavy equipment will be shut down and all personnel will evacuate the work areas and assemble at the assigned locations.

The EC will give directions for implementing whatever actions are necessary. Any project team member may be assigned to be in charge of emergency communications during an emergency. The project team member will attend the site telephone specified by the EC from the time the alarm sounds until the emergency has ended.

After sounding the alarm and initiating emergency response procedures, the EC will check and verify that access roads are not obstructed. If traffic control is necessary, as in the event of a fire or explosion, a project team member, who has been trained in these procedures and designated at the site safety meeting, will take over these duties until local police and fire fighters arrive.

The EC will remain at the site to provide any assistance requested by emergency-response squads as they arrive to deal with the situation. A map showing evacuation routes, meeting places, and location of emergency equipment will be developed on-site and will be posted in all on-site offices and vehicles and used during site-specific training.

12.6.1 Evacuation Drills

An evacuation drill will be conducted within two weeks of mobilization to test the emergency notification and response system.

The drill will simulate situations that may be likely to occur on-site. The SHSO will critique the drill according to TtEC Health and Safety Program, EHS 2-1.

12.7 Fire Prevention and Protection

In the event of a fire or explosion, procedures will include immediately evacuating the site (air horn will sound for a single continuous blast), and notification of local fire and police departments. No personnel will fight a fire beyond the stage where it can be put out with a portable extinguisher (incipient stage).

12.7.1 Fire Prevention

The major workplace fire hazards are flammable liquids and fuels, motorized vehicles, and equipment.

Fires will be prevented by adhering to the following precautions:

- Good housekeeping and storage of materials.
- Storage of flammable liquids and gases away from oxidizers.
- No smoking in the EZ or any work area.
- No hot work without a properly executed hot work permit.
- Shutting off engines to refuel.
- Grounding and bonding metal containers during transfer of flammable liquids.
- Use of UL approved flammable storage cans.
- Fire extinguishers rated at least 5 pounds ABC located on all heavy equipment, in the on-site office, and near all hot work activities.
- Monthly inspections of all fire extinguishers.

12.7.2 Fire Protection

A map of all fire extinguisher locations will be developed on-site and posted in the on-site office.

The person responsible for the maintenance of fire prevention and/or control equipment is the SHSO.

The person responsible for the control of fuel source hazards is the SHSO.

12.8 Overt Chemical Exposure

The following are standard procedures to treat chemical exposures. Other, specific procedures detailed on the Material Safety Data Sheet (MSDS) or recommended by the Corporate Medical Consultant will be followed, when necessary. He may be reached at 800-455-6155.

SKIN AND EYE CONTACT: Use copious amounts of water. Rinse affected areas thoroughly, then provide appropriate medical attention. Eyes and skin should be rinsed for 15 minutes upon chemical contamination.

INHALATION: Move to fresh air. Decontaminate and transport to hospital or local medical provider.

INGESTION: Decontaminate and transport to emergency medical facility.

PUNCTURE WOUND OR LACERATION: Decontaminate and transport to emergency medical facility.

12.9 Decontamination During Medical Emergencies

If emergency life-saving first aid and/or medical treatment is required, normal decontamination procedures may need to be abbreviated or postponed. The SHSO or designee will accompany contaminated victims to the medical facility to advise on matters involving decontamination, when necessary. The outer garments can be removed if they do not cause delays, interfere with treatment, or aggravate the problem. Respiratory equipment must always be removed. Protective clothing can be cut away. If the outer contaminated garments cannot be safely removed on-site, a plastic barrier placed between the injured individual and clean surfaces will be used to help prevent contamination of the inside of ambulances and/or medical personnel. Outer garments may then be removed at the medical facility. No attempt will be made to wash or rinse the victim if their injuries are life threatening, unless it is known that the individual has been contaminated with an extremely toxic or corrosive material which could also cause severe injury or loss of life to emergency response personnel. For minor medical problems or injuries, the normal decontamination procedures will be followed.

12.10 Accident/Incident Reporting

As soon as first aid and/or emergency response needs have been met, the following parties are to be contacted by telephone:

- PESM - Grey Coppi, CIH, CSP, (973) 630-8101.
- PM – Carl Tippmann (215) 702-4044, cell (908) 419-2906.
- The employer of any injured worker who is <u>not</u> a TtEC employee.

Written confirmation of verbal reports are to be submitted within 24 hours. The accident/incident report is found in the TtEC Health and Safety Program EHS 1-7. If the employee involved is not a TtEC employee, their employer will receive a copy of the report.

12.11 Adverse Weather Conditions

In the event of adverse weather conditions, the SHSO or designee will determine if work can continue without potentially risking the safety of all field workers. Some of the items to be considered prior to determining if work should continue are:

- Potential for heat/cold stress injuries.
- Treacherous weather-related working conditions (i.e., hail, rain, snow, ice, high winds).
- Limited visibility (i.e., fog).
- Potential for electrical storms.
- Other major incidents.

Site activities will be limited to daylight hours, or when suitable artificial light is provided, and acceptable weather conditions prevail. The SHSO will determine the need to cease field operations or observe daily weather reports and evacuate, if necessary, in case of severe inclement weather conditions.

12.12 Spill Control and Response

All small hazardous spills/environmental releases will be contained as close to the source as possible. Whenever possible, the MSDS will be consulted to assist in determining the best means of containment and cleanup. For small spills, sorbent materials such as sand, sawdust, or commercial sorbents will be placed directly on the substance to contain the spill and aid recovery. Any acid spills will be diluted or neutralized carefully prior to attempting recovery. Berms of earthen or sorbent materials can be used to contain the leading edge of the spills. Drains or drainage areas will be blocked. All spill containment materials will be properly disposed. An EZ of 50-100 feet around the spill area will be established depending on the size of the spill.

The following steps, in order, should be taken by the EC:

- Determine the nature, identity, and amounts of major spill components.
- Make sure all unnecessary persons are removed from the spill area.
- Notify appropriate response teams and authorities and PM as well as PESM.
- Use proper PPE.
- If a flammable liquid, gas, or vapor is involved, remove all ignition sources and use non-sparking and/or explosive proof equipment to contain or clean up the spill (i.e., diesel only vehicles, air operated pumps, etc).
- If possible, try to stop the leak with appropriate material.
- Remove all surrounding materials that can react or compound with the spill.
- Contact Tom Teeling at (215) 702-4078 for spill reporting information and assistance.

12.13 Emergency Equipment

The following minimum emergency equipment will be kept and maintained on-site:

- Industrial first aid kit.
- Burn kit.
- Portable eye washes (one per field team) (ANSI Z.358.1-1998 for 15 minute flush).
- Air horns (one per field team).
- Fire extinguishers (one per on-site office/vehicle and located at hot work stations).
- Two-way radios.
- Absorbent material.

12.14 Postings

The following information will be posted at various, conspicuous locations throughout the site:

- Emergency telephone numbers.
- Diagrams showing the location of fire extinguishers and emergency equipment.
- Emergency exit, evacuation routes, and staging area.
- Hospital route map.

12.15 Restoration and Salvage

After an emergency, prompt restoration of utilities, fire protection equipment, medical supplies, and other equipment will reduce the possibility of further losses. Some of the items that may need to be addressed include:

- Refilling fire extinguishers.
- Refilling medical supplies.
- Recharging eyewashes and/or showers.
- Replenishing spill control supplies.
- Replacing used air horns.

13.0 TRAINING

13.1 General Health and Safety Training

In accordance with TtEC policy, and pursuant to 29 CFR 1910.120, hazardous waste site workers will, at the time of job assignment, have received a minimum of 40 hours of initial health and safety training for hazardous waste site operations unless otherwise noted in the above reference. At a minimum, the training will have consisted of instruction in the topics outlined in the standard. Personnel who have not met the requirements for initial training will not be allowed to work in any site activity in which they may be exposed to hazards (chemical or physical).

13.1.1 Three Day Supervised On the Job Training

In addition to the required initial hazardous waste operations training, each employee will have received three days of directly supervised on-the-job training. This training will address the duties the employees are expected to perform.

13.2 Annual Eight-Hour Refresher Training

Annual eight-hour refresher training will be required of all hazardous waste site field personnel in order to maintain their qualifications for fieldwork. The training will cover a review of CFR 1910.120 requirements and related company programs and procedures.

13.3 Supervisory Training

Personnel acting in a supervisory capacity will have received 8 hours of instruction in addition to the initial 40 hours training.

13.4 Site-Specific Training

Prior to commencement of field activities, all field personnel assigned to the project will have completed training that will specifically address the activities, procedures, monitoring, and equipment used in the site operations. It will include site and facility layout, hazards, and emergency services at the site and will highlight all provisions contained within this SHSP. This training will also allow field workers to clarify anything they do not understand and to reinforce their responsibilities regarding safety and operations for their particular activity.

13.5 On-Site Safety Briefings

Project personnel and visitors will be given on-site health and safety briefings daily by the SHSO to assist site personnel in safely conducting their work activities. The briefings will include information on new operations to be conducted, changes in work practices or changes in the site's environmental conditions, as well as periodic reinforcement of previously discussed topics. The briefings will also provide a forum to facilitate conformance with safety requirements and to identify performance deficiencies related to safety during daily activities or as a result of safety inspections. The meetings will also be an opportunity for the SHSO to periodically update the workers on air monitoring results. Prior to starting any new activity, a training session using the AHA will be held for workers involved in the activity.

13.6 First Aid and CPR

The SHSO will identify those individuals requiring First Aid and CPR training in order to ensure that emergency medical treatment is available during field activities. The training will be consistent with the requirements of the American Red Cross Association and include Bloodborne Pathogens training.

13.7 Hazard Communication

Hazard communication training will be provided in accordance with the requirements contained in the TtEC Health and Safety Program, EHS 4-2.

14.0 LOGS, REPORTS AND RECORD KEEPING

The following is a summary of required health and safety logs, reports and record keeping.

14.1 CRF

A CRF is to be completed for initiating a change to the SHSP. The Navy, PESM and PM or designee approval is required. The original will be kept in the project file. Approved changes will be reviewed with affected field personnel at a safety briefing. Copies will be distributed to the Client Representative.

14.2 Medical and Training Records

Copies or verification of training (40 hour, 8 hour, supervisor, site-specific training and documentation of three day on the job) and medical clearance for hazardous waste site work and respirator use will be maintained on-site. Records for all subcontractor employees will also be kept on-site. All employee medical records will be maintained by the Corporate Medical Consultant – Work Care in accordance with TtEC Health and Safety Program, EHS 1-9.

14.3 On-Site Log

A log of personnel on-site each day will be kept by the PS or designee.

14.4 Weekly/Monthly Safety Reports

The SHSO will complete and submit weekly and monthly safety reports to the PESM. The reports are provided Appendix M.

14.5 Exposure Records

All personal air monitoring results, laboratory reports, calculations, and air sampling data sheets are part of an employee exposure record. These records will be maintained by the SHSO during site work. At the end of the project they will be maintained according to 29 CFR 1910.1020 and TtEC Health and Safety Program, EHS 1-9.

14.6 Accident/Incident Reports

Completion of all incident and investigation reports will be in accordance with TtEC Health and Safety Program, EHS 1-7.

14.7 OSHA Form 300

An OSHA Form 300 will be kept at the project site. All recordable injuries or illnesses will be recorded on this form. At the end of the project, the original will be sent to the PESM for maintenance. Subcontractor employers must also meet the requirements of maintaining an OSHA 300 form. The incident report form referenced in Section 12.10 meets the requirements of the OSHA Form 301 (supplemental record) and must be maintained with the OSHA Form 300 for all recordable injuries or illnesses.

14.8 Health and Safety Logbook

The SHSO will maintain a logbook during site work. The daily site conditions, personnel, air monitoring results and significant events will be recorded. The original logbook will become part of the exposure records file.

14.9 Hazard Communication Program/MSDS

MSDS will be obtained for applicable substances and will be included in the site hazard communication file. The hazard communication program will be maintained on site in accordance with 29 CFR 1910.1200 and TtEC Health and Safety Program EHS 4-2.

14.10 Work Permits

All work permits, including confined space entry, hot work, lockout/tagout, and line breaking permits will be maintained in the project files.

15.0 FIELD PERSONNEL REVIEW

This form serves as documentation that field personnel have read, or have been informed of, and understand the provisions of the SHSP. It is maintained on-site by the SHSO as a project record.

Each field person will sign this section after site-specific training is completed and before being permitted to work on site.

I have read, or have been informed of, this Site-Specific Health and Safety Plan for Soil Removal and Revetment Construction at OFFTA at NAVSTA Newport in Newport, RI, and understand the information presented. I will comply with the provisions contained therein.

Name (Print and Sign)	Date

16.0 REFERENCES

American Conference of Governmental Industrial Hygienists, Inc., 1992, Documentation of the Threshold Limit Values and Biological Exposure Indices; 6th Ed., ACGIH, Cincinnati, Ohio.

American Conference of Governmental Industrial Hygienists, Inc., 1987, Guidelines For The Selection of Chemical Protective Clothing; Third Edition, ACGIH, Cincinnati, Ohio, February 1987.

American Conference of Governmental Industrial Hygienists, Inc., 2004, Threshold Limit Values For Chemical Substances And Physical Agents In The Work Environment And Biological Exposure Indices; ACGIH, Cincinnati, Ohio.

Federal Acquisition Regulation, F.A.R. Clause 52.236-13: Accident Prevention.

NIOSH/OSHA/USCG/EPA, 1985, Occupational Safety and Health, Guidance Manual For Hazardous Waste Site Activities; October 1985.

NIOSH Pocket Guide to Chemical Hazards, 1997, U.S. Department of Health and Human Services; Public Health Service, Centers for Disease Control and Prevention, June 1997.

Sax, N. Irving, 1992, Dangerous Properties of Industrial Materials, 8th Ed; Van Nostrand Reinhold Co. Inc., New York, NY.

TtEC , TtEC Health and Safety Program.

U.S. Army Corps of Engineers, 1996, Safety and Health Requirements Manual; EM 385-1-1.

U.S. Department of Labor, Occupational Safety and Health Administration, 1989, 29 CFR Part 1910 Hazardous Waste Operations and Emergency Response, draft rule, March 6, 1989; Construction Industry Standards, 29 CFR 1926; and General Industry Standards, 29 CFR 1910.

U.S. Environmental Protection Agency, Standard Operating Safety Guides; July 1988.

U.S. Environmental Protection Agency, no date, Response Safety Decision-Making; Course Manual, Office of Emergency and Remedial Response, Hazardous Response Support Division.

Appendix A

Change Request Form

To be included in the next submittal

Appendix B

Material Safety Data Sheets

To be included in the next submittal

Appendix C

Activity Hazard Analysis

To be included in the next submittal

Appendix D

Temperature Extremes

To be included in the next submittal

Appendix E

Underground Utilities

To be included in the next submittal

Appendix F

Excavation and Trenching

To be included in the next submittal

Appendix G

Fall Protection

To be included in the next submittal

Appendix H

Lock Out/Tag Out

To be included in the next submittal

Appendix I

Personal Protective Equipment Selection Form

To be included in the next submittal

Appendix J

Medical Data Sheet

To be included in the next submittal

Appendix K

Work Rules

To be included in the next submittal

Appendix L

Hospital Route Map

To be included in the next submittal

Appendix M

Weekly/Monthly Safety Report

To be included in the next submittal

APPENDIX D

Soil Erosion and Sediment Control Plan

To be included in the next submittal

APPENDIX E

Technical Specifications

To be included in the next submittal

APPENDIX F

Revetment Design

REVETMENT DESIGN

This section explains the methodology applied for the preliminary design of the revetment and outlines the steps needed to be taken to finalize it. The assumptions made during the preliminary design as well as input required for the next steps are also included.

1. *Existing Conditions Data*

Existing data is based on material provided in the pre-design report (TtNUS, 2004b), and Environmental Planning Study (for Waterfront Security Barrier Alternatives at the U.S. Naval Station Newport and Naval War College , SAIC, 2004). Other resources mentioned in this Appendix were obtained through various sources to be used for the final design.

For the purposes of the preliminary design, rough estimates of nearshore and Narragansett Bay ("Bay") bathymetry were obtained from USGS topographic maps and NOAA Chart (13223) for the area. Representative transects were drawn from the pre-design report (TtNUS, 2004b) contour lines to establish a basis for a typical revetment cross-section. Additional survey transects perpendicular to shoreline (extending beyond the limit of the OFFTA area towards NW and NE corners, with a horizontal spacing enough to capture different shoreline characteristics (slopes, existing structures, surface cover, etc.) will be useful for the next design stage. This information is mainly required since west side slopes fall off into a deep channel fairly quickly, which impacts both design waves and location of the structure toe. Transects should go out a minimum of 200 ft from the shoreline to capture bottom features beyond MLW.

Wind data needed to generate the waves within the Bay were obtained from NOAA Station number 8452660 located at Newport, RI (41o 30.3' N, 71o 19.6 W). Approximately 5 years of wind data were acquired for analysis. Furthermore, design wind speeds and directions corresponding to specified return periods or occurrence percentages obtained or interpolated from SAIC (2004) report will be utilized for the next design stage.

Tidal datum and elevations were obtained from NOAA Station number 8452660 at Newport, RI. A table is included in this section to illustrate the elevation differences. According to this table, National Geodetic Vertical Datum (NGVD) 1929 datum is 1.05 ft above the MLW datum. We have assumed that this MLW datum is same as the Navy MLW for the site, as mentioned in TtNUS report.

Astronomical water levels were obtained from FEMA FIRM (Flood Insurance Rate Map) for the site will be supplemented by the extreme water levels provided in SAIC report (2004). However, any other existing data or report with this information should be provided.

2. *Site Characterization for Design*

Site specific conditions will be established by merging the data cited above. These conditions will include, but not limited to, water levels, winds, topography, etc., as outlined in this document. Any assumptions made for the preliminary design will be stated.

3. *Design Criteria*

Design criteria will be established in accordance with Unified Facilities Criteria (UFC 4-150-06) for Military Harbors and Coastal Facilities (2001) with the help of available data and analysis performed to date. UFC guidance will be supplemented with USACE Coastal Engineering Manual (CEM (EM-1110-2-1100)).

The following design criteria is established for the preliminary design, and the Navy shall approve any modification for the final stage.

- Intended Function: To absorb wave action, protect sensitive environments, and prevent sediment scouring at the foot of the slope.
- Life of the structure: 50-years will be used where applicable.
- Risk Level: Initial damage level of S=2 (as defined in EM-1110-2-1100) or smaller will be used.
- Design Level: 50-year recurrence interval.

Based on the design criteria and discussions with Navy representatives, the alternative with single slope, toe protection, and crest will be further analyzed. This analysis will dictate the final design stage.

The following items will be considered in the final design:

- Existing structures inventory and structural details on shoreline: There are 3 (or 4) outfall structures to be incorporated into revetment design.
- Any physical or regulatory obstacles they may affect the design, including weight restrictions on bridges, security considerations, etc. : No physical obstacle on bridges.
- Revetment termination requirements: Boat launch ramp on east end and outfall structure on west will be used for the terminus of the revetment.
- What is the design life and risk acceptable (future use and first cost versus long term maintenance cost)?: See above.
- Define the "absorbing" revetment term as intended by Navy? : A revetment with a relatively mild side slope (1v:4h on west end and transitioning to 1v:3h in middle to 1v:2h on east end).
- Clarification with regulators requirements for habitat protection enhancement; and need to establish maximum "footprint" allowed. We will use MLW line for the seaward limit as shown in Figures 10 through 13, and not to be exceeded in final design.

4. *Preliminary Design*

Wind data was obtained from NOAA Station (8452660), and utilized to define the wave climate at the marina. Directional (22.5° bins) averages and maximums wind speeds with percent occurrences were derived from the data. A wind rows was generated and included in the appendix section. Wave hindcast tables also include the daily average as well as maximums per each directional fetch.

A total of nine fetches were created with 22.5° intervals, from south to north. The fetches from the rest of the directions were not existant or considered to be negligible for wave generation purposes. These fetches match with the wind directional bins. The fetch lengths also determine the averaging period for the wind speed for that specific bin. Daily and maximum wind speeds were adjusted for wave generation based on the averaging interval.

Winds blowing across the Bay generate waves that will impact the revetment. A wave climate was developed from wind data for the project site. Wind-generated waves are estimated as a function of the wind speed, wind duration, water depth, and fetch (the distance over which the wind acts on the water). Directional averages and maximum wind speeds were than utilized to generate the waves for the site. The waves generated by the wind data were predicted using a computer model (ACES) developed by the U.S. Army Corps of Engineers (USACE). This program provides simplified estimates for wave growth over open-water and restricted fetches, such as the Narragansett Bay, in deep and shallow water for a point of interest.

The results of ACES model are included in this section. The wave characteristics, significant wave height, peak period, and mean wave direction, were listed for each fetch direction. Since ACES outputs the spectral significant wave height (H_{mo}), a conversion to significant wave height (H_s) was made for further analysis.

The wave characteristics determined here was used as an input condition to transform the waves in to the site. Specifically, calculated wave heights for all fetch directions were transformed by using simplified approach of the ACES software. The transformation included natural processes like, refraction, shoaling and breaking as a part of the software output.

Armor stability was determined by ACES software for two conditions, hourly averaged and maximum wind conditions for the most critical wave conditions determined above. Breaking wave conditions were used in all cases since it provides more conservative values at this stage. Stability table is also included in this section. Design water levels, as a part of the design criteria, will ultimately govern the armor stability in combination with the corresponding wave characteristics.

The existence of the navigable waters around the OFFTA shoreline warrants the possibility boat wakes reaching to the revetment. Conservative assumptions made for the nominal size and speed of a boat expected to cruise in the vicinity of the site. Results of the analysis are summarized in a table in this section. It is assumed that the nominal boat sizes (type, draft, speed, tonnage) cruising around the Coasters Island shoreline will be provided to us for the next design stage. In the final design, these waves will be analyzed for impacts at various angles of wave attack associated with the variable exposure of shoreline.

Toe protection for potential scour is provided. Current effects will be considered only for toe scour potential.

Slope stability analysis will be performed on a 2 (horizontal): 1 (vertical) slope or steeper during the final design.

5. *Final Design*

Preliminary design will be finalized including stability and overtopping, and structural integrity by the guidelines specified by the UFC, and CEM (EM-1110-2-1100) published by the USACE. Additional data on nearby areas obtained from Navy sources will be utilized. Final design will entail all elevations, dimensions, slopes, and weights of any protection units in regards to the revetment.

Final design will be reviewed by the guidelines specified in the Engineering Procedures of TtEC. Comments will be incorporated into design before the plans and specifications are published. It is assumed that the comments are going to be minor at this level of design.

6. *Plans and Specifications*

Single sheet for a plan view and up to 2 sheets for details based on number of transects will be prepared in regards to revetment design.

Custom specifications for a rubble revetment, including armor, and sub armor or core, and a geotextile layer will be prepared for construction.

7. *Design Memorandum*

Design assumptions, criteria, methodology as well as calculations will be summarized in a document.

TETRA TECH

SUBJECT

ORIGINATOR CHECKED

PROJECT

TC/P NO.

DATE PAGE OF PAGES

A - NOAA STATION # 8452660 INFO

A1 - STATION INFO

A2 - DATA INVENTORY

A3 - TIME SERIES PLOT OF WIND/GUST/DIRECTION

A4 - TIME SERIES PLOT OF WATER LEVEL

A5 - MATLAB CODE FOR DATA ANALYSIS/PLOT

A6 - DATUM INFORMATION

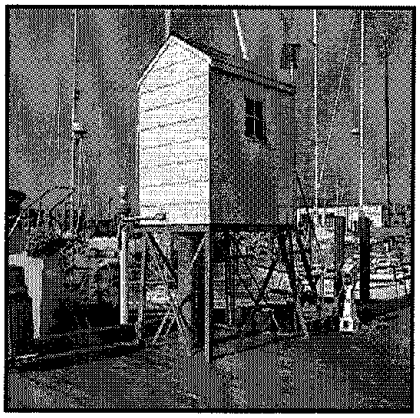
NOAA/NOS CO-OPS

Center for Operational Oceanographic Products and Services (CO-OPS)

Station Information for Newport, RI

Water Level Station Information:

Station Name: **Newport, RI**
Station Identification Number: **8452660**
Latitude: **41° 30.3' N**
Longitude: **71° 19.6' W**
Date Established: **Sep 11 1930**
Maximum Water Level: **9.46 ft. above MHHW** (09/21/1938)
Minimum Water Level: **-3.09 ft. below MLLW** (02/03/1976)
Mean Range: **3.47 ft.**
Diurnal Range: **3.85 ft.**
Tidal and Geodetic Datums: **Click HERE**
Bench Mark Data Sheet: **Click HERE**



Click image for larger image.

EPOCH Update Information: NEW

EPOCH Datum Comparison:	**Click HERE -**	check datum differences between the old epoch (1960-1978) and the new epoch (1983-2001)
Superceded Bench Mark Data Sheet:	**Click HERE -**	bench mark sheet on the old Tidal Datum Epoch (1960-1978)
Superceded Datums:	**Click HERE -**	datums on the old Tidal Datum Epoch (1960-1978)
Mean Sea Level Differences List:	**Click HERE -**	mean sea level differences between the two epochs for all stations.

Mean Sea Level Difference: for 8452660 Newport, RI	**1983-2001**	**1960-1978**	**Difference:**
	3.63 ft.	3.44 ft.	0.19 ft.

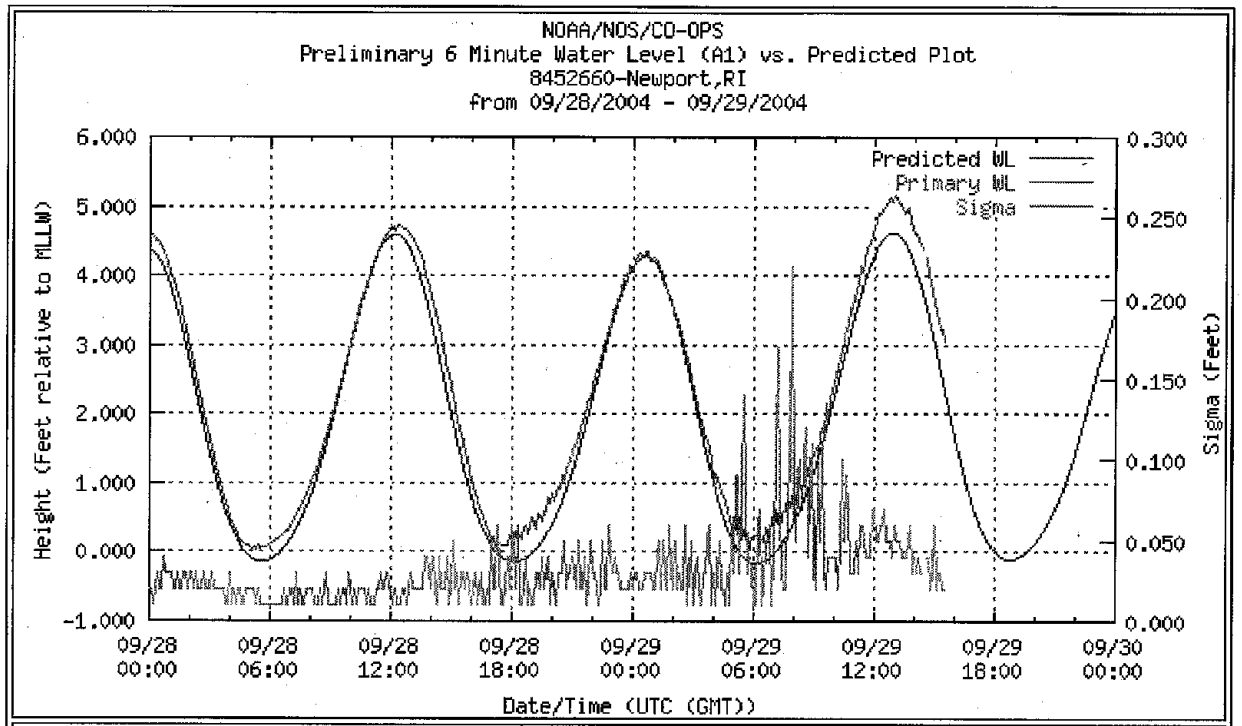
Data Types Available:

Primary Water Level
Backup Water Level
Wind

A1

Air Temperature
Water Temperature
Barometric Pressure

Current Water Level Data Plot



Sigma - Standard deviation of 1 second samples used to compute the water level height.

Retrieve Data Listing

Data Inventory
Station Data Plots
Water Level Data Listing (preliminary)
Water Level Data Listing (historical)
Meteorological/Oceanographic Data Listing

Location:

To reach the tidal bench marks from the traffic circle at the intersection of James T. Connell Memorial Road (State Route 238) and State Route 138 proceed west for 0.5 km (0.3 mi) to Coasters Harbor Island U.S. Naval Complex gate. Continue west on Luce Avenue for 0.2 km (0.1 mi) to Perry Road, south on Perry for 0.2 km (0.1 mi) to a small boat pier. The gage and staff are located at the east end of the pier. The bench marks are located within U.S. Naval Complex.

Station Location Drawing

Click HERE for Drawing
(Not for navigational use)

A1

Station Location Map

Click HERE for Map
(Not for navigational use)

For other questions contact us at:

NOAA, National Ocean Service
Center for Operational Oceanographic
Products and Services (CO-OPS)
1305 East-West Highway
Silver Spring, Maryland 20910 U.S.A.

Telephone: 1-301-713-2877 or 2890
Fax: 1-301-713-4437
Website: http://co-ops.nos.noaa.gov
E-mail: Stephen.Lyles@noaa.gov

A1

NOS INVENTORY OF WATER LEVEL AND ANCILLARY DATA

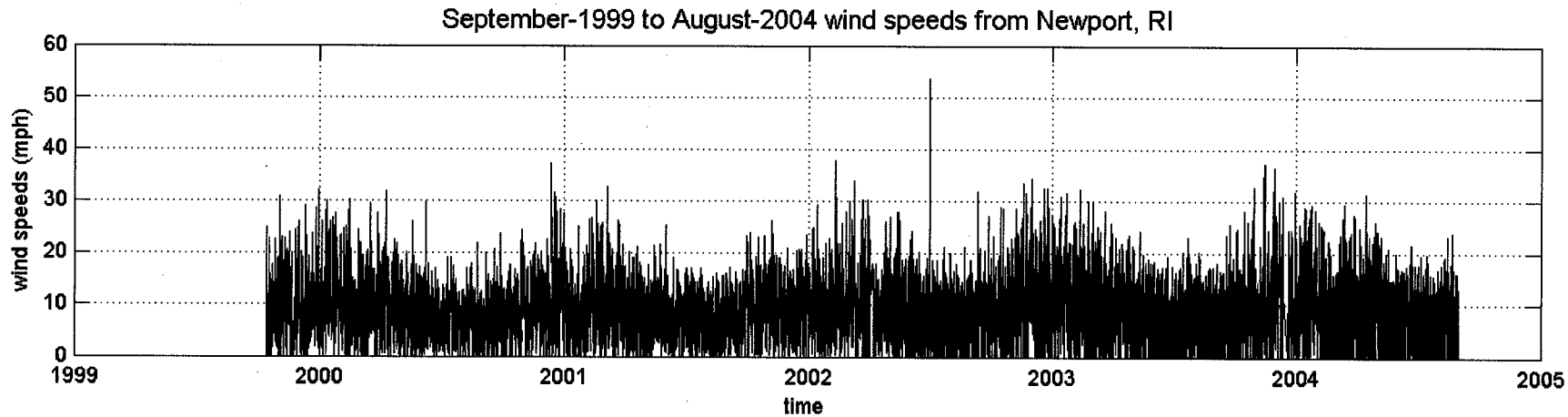
Station -- Unique seven character identifier for the station
D -- A one character identifier for the data collection platform at a station
SE -- A two character identifier for the data sensor has been inferred.
PC -- A two character identifier for the product code The product code indicates the interval of data
W1 - six minute, W2 - Hourly, W3 - High and Low Waters,
W4 - Daily means, W5 - monthly means, W6 - Yearly means,
W7 - Tidal Datums
Begin Time -- Date and time of the first occurrence of that particular data type for that Station, DCP, and Sensor.
End Time -- Date and time of the last occurrence of that particular data type for that Station, DCP, and Sensor. For example - 1920 to 1990 indicates first occurrence of data in 1920 and last occurrence in 1990, even if 50 years of data are missing in the middle
Data Type -- A short description of the data.

Times are on UTC (GMT)

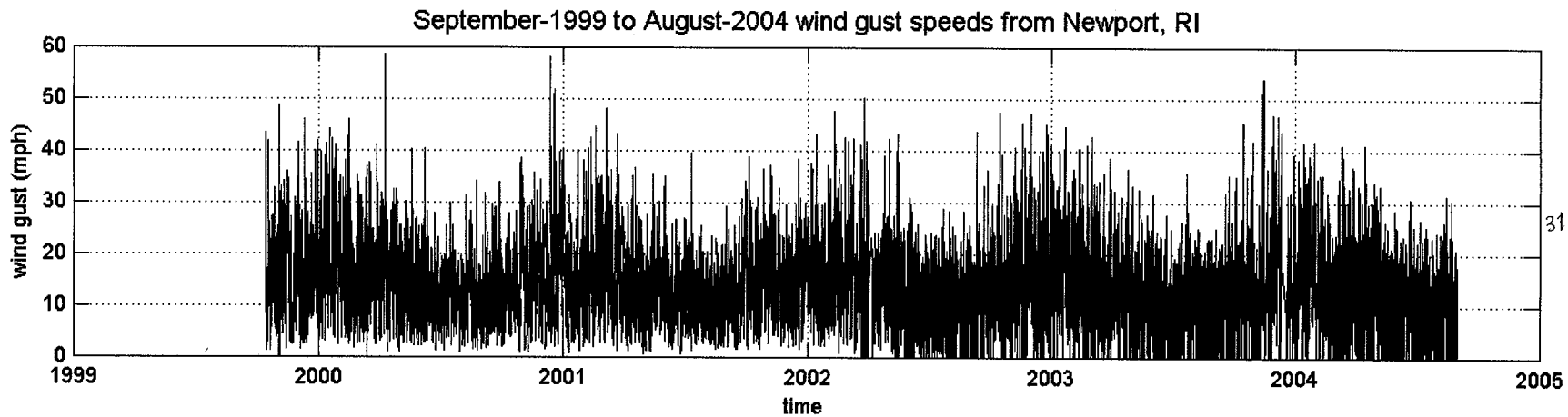
8452660 Newport, RI

Station	D	SE	PC	Begin Time	End Time	Data Type
8452660	1	C1	C1	10/13/1999 20:00	09/29/2004 15:12	Wind
8452660	1	D1	D1	08/20/1999 18:00	09/29/2004 15:12	Air Temperature
8452660	1	E1	E1	09/12/1995 17:00	09/29/2004 15:12	Water Temperature
8452660	1	F1	F1	08/19/1999 18:00	09/29/2004 15:12	Barometric Pressure
8452660	1	G1	G1	02/26/1999 11:00	09/29/2004 15:12	Water Conductivity
8452660	1	H1	H1	12/31/1999 22:00	12/31/1999 22:54	Water Current
8452660	1	J1	J1	12/31/1999 22:00	12/31/1999 22:45	Rain Fall
8452660			P2			Acc Harmonic Const
8452660			W1	11/01/1995 00:00	09/12/2004 23:54	Acc 6-Minute
8452660	1	A1	W1	01/01/2001 00:00	09/29/2004 15:12	6-Minute
8452660	1	B1	W1	01/01/2001 00:24	09/29/2004 14:48	6-Minute
8452660	1	T1	W1	11/08/1997 10:00	11/08/1997 10:18	Pressure 6-Minute
8452660			W2	09/10/1930 00:00	08/31/2004 23:00	Acc Hourly Height
8452660			W3	08/23/1976 05:36	08/31/2004 23:54	Acc High/Low
8452660			W5	10/01/1930 00:00	08/31/2004 23:54	Acc Monthly Mean
8452660			W6	01/01/1999 00:00	12/31/2001 23:54	Acc Annual Mean
8452660			W7			Acc Station Datum
8452660			W8			Published BM

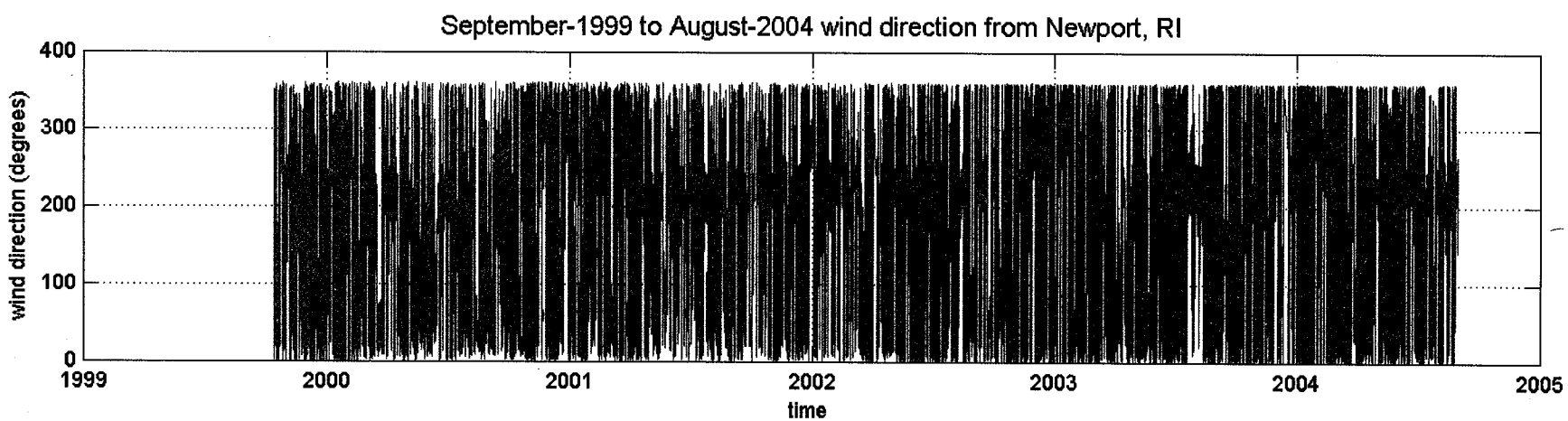
A2



19.82 mph

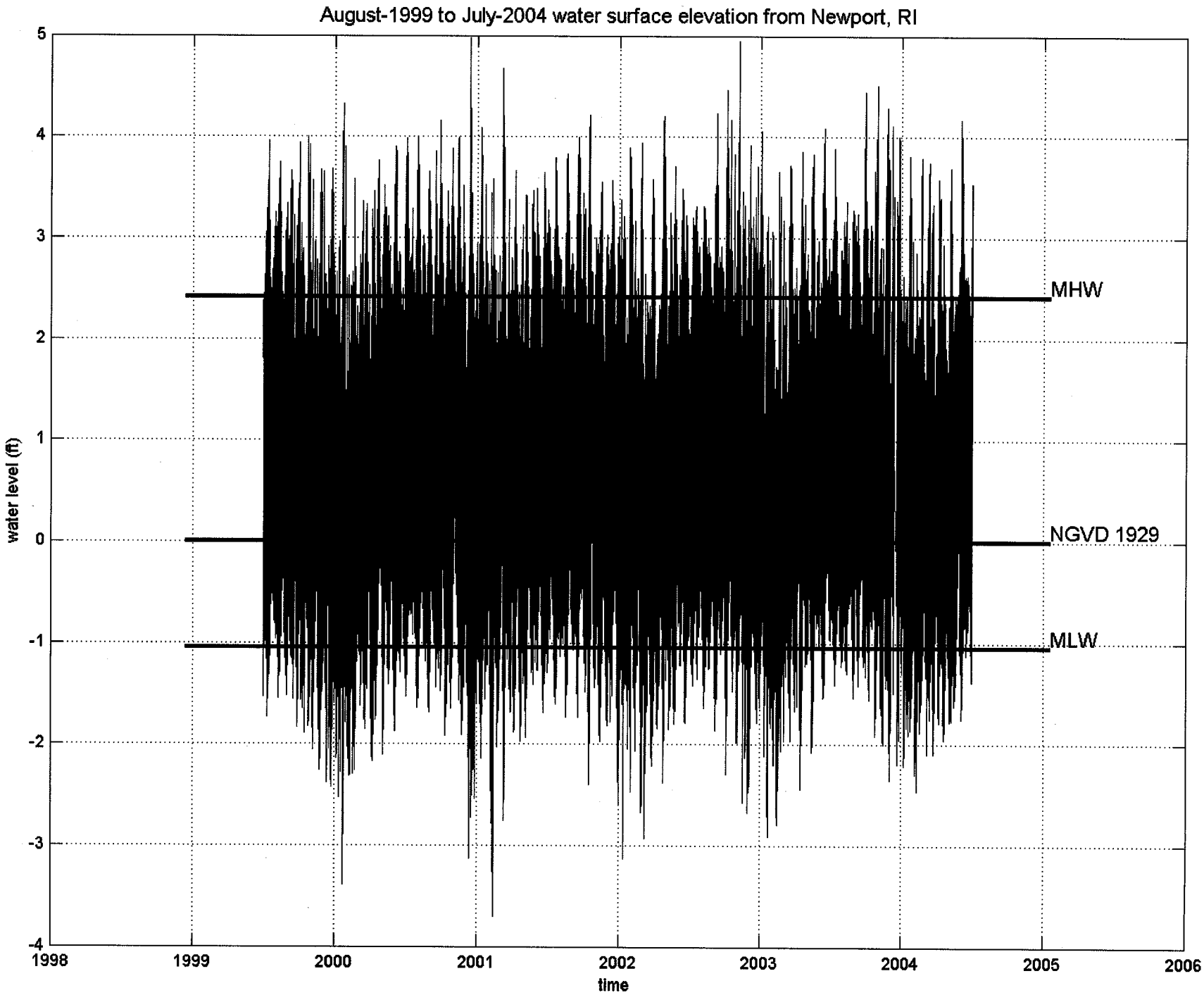


31.79 mph



-186.07°

A3


August-1999 to July-2004 water surface elevation from Newport, RI
water level (ft)
time
MHW
NGVD 1929
MLW
5
4
3
2
1
0
-1
-2
-3
-4
1998
1999
2000
2001
2002
2003
2004
2005
2006

A4

```
clear;
% this routine plots both Water level and Wind Speed/Dir information

%load the files

%WIS
load X07011999WL06302000.txt
load X07012000WL06302001.txt
load X07012001WL06302002.txt
load X07012002WL06302003.txt
load X07012003WL06302004.txt

load X08311999WS08302000.txt
load X08312000WS08302001.txt
load X08312001WS08302002.txt
load X08312002WS08302003_1.txt
load X08312003WS08302004_1.txt
load X08312002WS08302003_2.txt
load X08312003WS08302004_2.txt

% merge data dets as one

WL=[X07011999WL06302000;X07012000WL06302001;X07012001WL06302002;X07012002WL06302003;↙
X07012003WL06302004];
WS=[X08311999WS08302000;X08312000WS08302001;X08312001WS08302002;X08312002WS08302003_1;↙
X08312002WS08302003_2;...
    X08312003WS08302004_1;X08312003WS08302004_2];
clear X*

WL_time=datenum(WL(:,2),WL(:,3),WL(:,4),WL(:,5),0,0);
WL_el=WL(:,6);

WS_time=datenum(WS(:,3),WS(:,4),WS(:,5),WS(:,6),WS(:,7),0);
WS_speed=WS(:,8)*2.236936;
WS_dir=WS(:,9);
WS_gust=WS(:,10)*2.236936;

% some data is 6 min averages, therefore convert them to hourly averages;
WS_time_hr=[min(WS_time):1/24:max(WS_time)];
WS_speed_hr=interp1(WS_time,WS_speed,WS_time_hr);
WS_gust_hr=interp1(WS_time,WS_gust,WS_time_hr);
WS_dir_hr=interp1(WS_time,WS_dir,WS_time_hr);

clear WL
clear WS

% start plotting by crearing new figures and subplots

% 1976-1995 wis data 95


figure
```

```
orient landscape
subplot(3,1,1)
box
plot(WS_time_hr,WS_speed_hr,'k-')
grid on
title('September-1999 to August-2004 wind speeds from Newport, RI')
xlabel('time ','Fontsize',8)
ylabel('wind speeds (mph)','Fontsize',8)
%axis([0 8000 0 30])
set(gca,'Fontsize',8)
datetick

subplot(3,1,2)
box
plot(WS_time_hr,WS_gust_hr,'b-')
grid on
title('September-1999 to August-2004 wind gust speeds from Newport, RI')
xlabel('time ','Fontsize',8)
ylabel('wind gust (mph)','Fontsize',8)
set(gca,'Fontsize',8)
%axis([0 8000 0 30])
datetick

subplot(3,1,3)
box
plot(WS_time_hr,WS_dir_hr,'g-')
grid on
title('September-1999 to August-2004 wind direction from Newport, RI')
xlabel('time ','Fontsize',8)
ylabel('wind direction (degrees)','Fontsize',8)
set(gca,'Fontsize',8)
%axis([0 8000 0 30])
datetick


figure
box
orient landscape
hold on
plot(WL_time,WL_el-1.19,'b-')
grid on
title('August-1999 to July-2004 water surface elevation from Newport, RI')
xlabel('time ','Fontsize',8)
ylabel('water level (ft)','Fontsize',8)
%axis([0 8000 0 30])
set(gca,'Fontsize',8)

plot([WL_time(1)-200 WL_time(end)+200],[0 0],'k-','linewidth',2)
plot([WL_time(1)-200 WL_time(end)+200],[2.41 2.41],'k-','linewidth',2)
plot([WL_time(1)-200 WL_time(end)+200],[-1.05 -1.05],'k-','linewidth',2)

text([WL_time(end)+200],[0.1],'NGVD 1929')
```

```
text([WL_time(end)+200],[2.51],'MHW')
text([WL_time(end)+200],[-.95],'MLW')

datetick

roseplot(WS_speed,WS_dir);

figure
freqplot(WS_speed,WS_dir,[0:5:40],22.5);
```

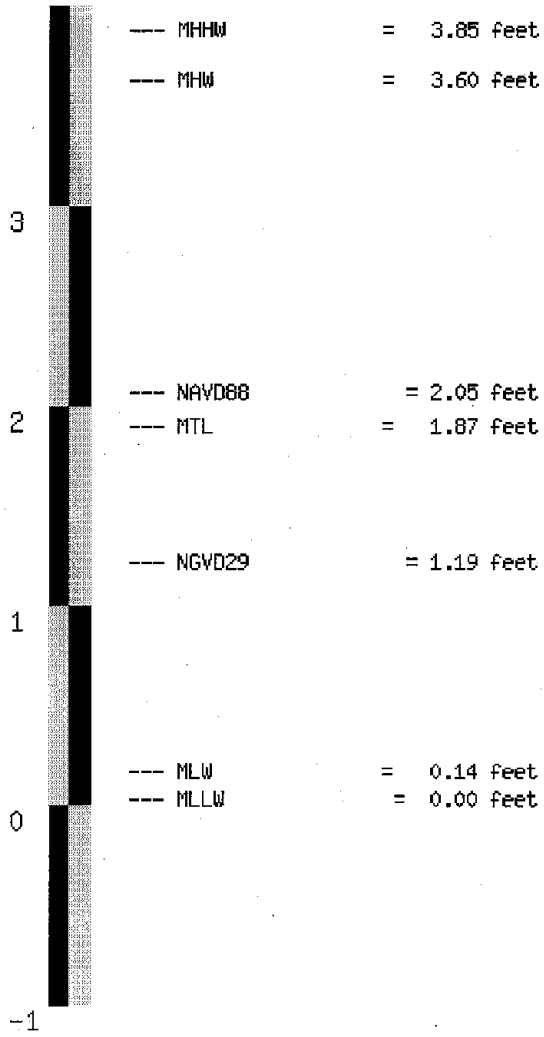
```
% just to find the wdirectional averages
% run plot_data first


WS_calm = find(WS_speed_hr == 0);
WS_speed_hr(WS_calm)=nan;
WS_dir_hr(WS_calm)=nan;
calm=length(WS_calm);
total_records=length(WS_speed_hr);
WS_percent_calm=(calm/total_records)*100;

dirpar=-11.25:22.5:360;
%dirpar(2:end)=dirpar(2:end)+.1;
sumb=0;

for i=1:length(dirpar)-1

    a=find(WS_dir_hr >= dirpar(i) & WS_dir_hr < dirpar(i+1));

    WS_temp=WS_speed_hr(a);
    WS_meanspd(i)=mean(WS_temp(~isnan(WS_temp)));
    WS_maxspd(i)=max(WS_speed_hr(a));

    WG_temp=WS_gust_hr(a);
    WG_meanspd(i)=mean(WG_temp(~isnan(WG_temp)));
    WG_maxspd(i)=max(WS_gust_hr(a));

end

WS_meanspd=WS_meanspd';
WS_maxspd=WS_maxspd';
WG_meanspd=WG_meanspd';
WG_maxspd=WG_maxspd';
```

Newport RI
BM 8452660

		DATUM wrt		
	meters	MLLW ft	NGVD'29 ft	MLW ft
HIGHEST OBSERVED WATER LEVEL (09/21/1938)	4.056	13.30	12.11	13.17
MEAN HIGHER HIGH WATER (MHHW)	1.174	3.85	2.66	3.71
MEAN HIGH WATER (MHW)	1.099	3.60	2.41	3.47
NORTH AMERICAN VERTICAL DATUM-1988 (NAVD)	0.622	2.04	0.85	1.90
MEAN TIDE LEVEL (MTL)	0.571	1.87	0.68	1.74
MEAN SEA LEVEL (MSL)	0.529	1.74	0.55	**1.60**
NGVD 1929		1.19	**0.00**	1.05
MEAN LOW WATER (MLW)	0.042	0.14	-1.05	**0.00**
MEAN LOWER LOW WATER (MLLW)	**0.000**	**0.00**	-1.19	-0.14
LOWEST OBSERVED WATER LEVEL (02/03/1976)	-0.943	-3.09	-4.28	-3.23

Date created
Thu Sep 30 13:18:59 EDT 2004

Elevation Information for PID = LW0493, VM = 221
Station_ID --- 8452660



The NAVD 88 and the NGVD 29 elevations related to MLLW were computed from Bench Mark, 845 2660 TIDAL 6, at the station.

Displayed tidal datums are Mean Higher High Water(MHHW), Mean High Water (MHW), Mean Tide Level(MTL), Mean Low Water(MLW), and Mean Lower Low Water(MLLW) referenced on 1983-2001 Epoch

A6

TETRA TECH

SUBJECT

PROJECT

TC/P NO.

ORIGINATOR CHECKED

DATE PAGE OF PAGES

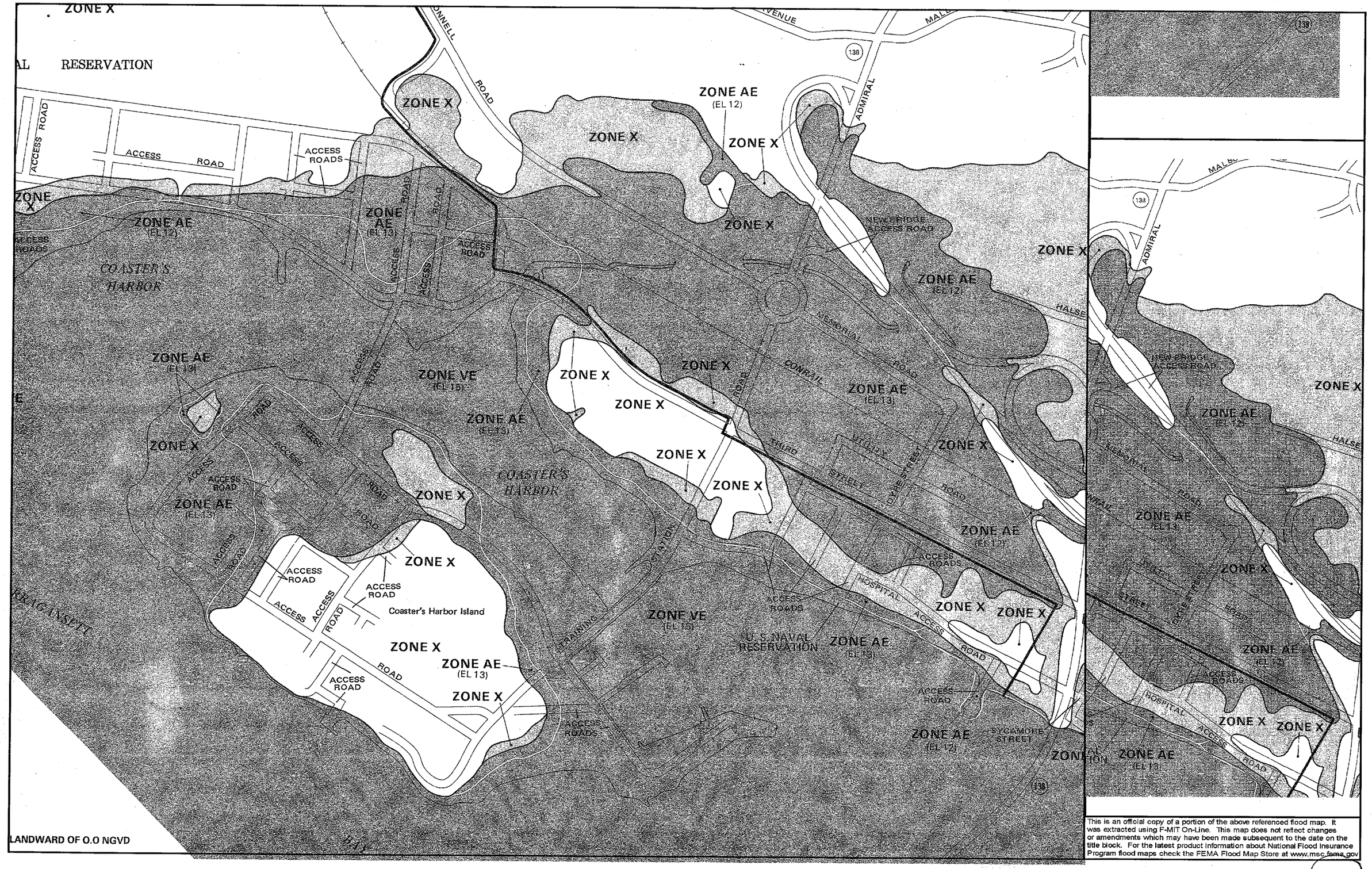
B - FEMA

B1 - ASTRONOMICAL WATEL LEVEL ELEVATIONS
B2 - FIRM

FEMA ELEVATIONS

	10-year	50-year	100-year	500-year
Atlantic Ocean Within Community	6.8	11	12.9	17.5
Narragansett Bay Entire Shoreline	**6.7**	**10**	**11.6**	**15.4**

Source: FEMA FIS Report Community # 445403



This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

B2

TETRA TECH

SUBJECT

ORIGINATOR CHECKED

PROJECT

TC/P NO.

DATE PAGE OF PAGES

C — WIND DATA ANALYSIS

C1 - EQUIVALENT DURATION ADJUSTMENT
C2 - " SPEED "
C3 - DIRECTIONAL AVERAGES AND MAXIMUMS
C4 - WIND ROSE FOR HOURLY AVERAGE
C5 - EXTREMAL ANALYSIS FOR WIND

TETRA TECH	SUBJECT Eqv. Duration of wind speed	PROJECT OFFTA-Newport RI
	ORIGINATOR TW CHECKED	TC/P NO. 2282.1182.1105
		DATE 10/4/04 PAGE A OF C1 PAGES

→ Hourly wind speeds vary from 30 mph to 38 mph.
→ Two, typical, fetch lengths are ~13,000 ft & 9,000 ft.

Conversion

30 mph ≅ 13 m/s
38 mph ≅ 17 m/s

13,000′ ≅ 4 km
9,000′ ≅ 3 km

FOR GUST:

45 mph ≃ 20 m/s
58 mph ≃ 26 m/s

EM 1110-2-1100 (Part II)
30 Apr 02

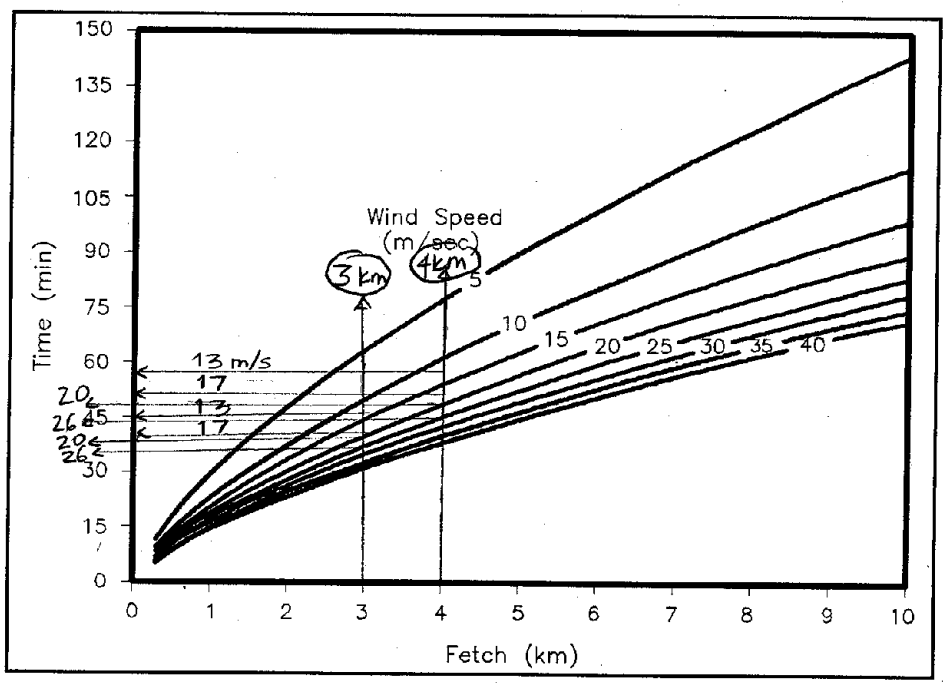


Figure II-2-3. Equivalent duration for wave generation as a function of fetch and wind speed

HOURLY, FOR 3 km fetches, Eqv. dur. = 40-45 mins USE 40′.
4 km " , Eqv. dur = 50-55 min USE 50′.

GUST, FOR 3 km " , Eqv. dur = 35-40 mins. USE 35′.
4 km " , Eqv. dur = 45-50 min. USE 45′.

TETRA TECH	SUBJECT Eqv. wind speed based on Eqv. Dur.	PROJECT OFFTA - Newport, RI
	ORIGINATOR MU CHECKED	TC/P NO. 2282.1182.1105
		DATE 10/4/04 PAGE ___ OF C2 PAGES

Given the eqv. durations (REF page no A)

Wind speeds were converted with appropriate averaging interval for the typical fetch lengths!

GIVEN

U1=	13	mps	t=	3600	sec
U2=	17	mps	t=	3600	sec
U3=	20	mps	t=	3600	sec
U4=	26	mps	t=	3600	sec

REQUESTED TO

t=	2400	sec
t=	3000	sec
t=	2100	sec
t=	2700	sec

CONVERT TO HOURLY AND THEN FIND RATIO TO REQUESTED

Ut/3600	Ui/U3600	Ut/Ui
0.999652	1.00631	0.993383
0.999652	1.002405	0.997253
0.999652	1.008964	0.990771
0.999652	1.004171	0.995499

RESULTS WITH GIVEN EQV> DURATION

U	40	min=	13	mps	28.9	mph
U	50	min=	17	mps	37.9	mph
U	35	min=	20	mps	44.3	mph
U	45	min=	26	mps	57.9	mph

CEM, Coastal Engineering Manual, 2002. US army Corps of Engineers
Engineering Manual EM 1110-2-1100, Part II, pp.II-2-3.

Newport, RI Wind Data Statistics
OFFTA

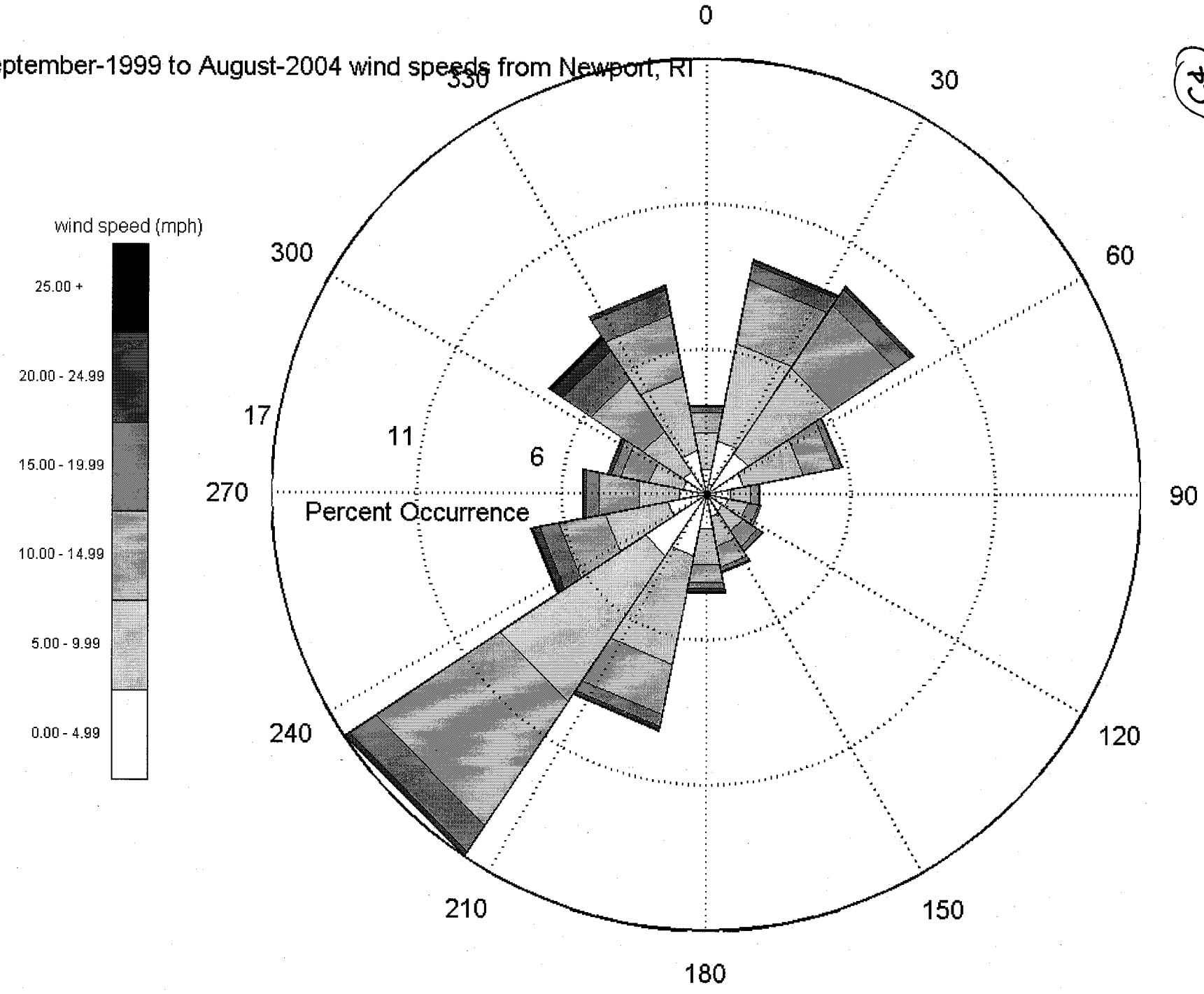
		Hourly Speed (mph)		Gust (mph)	
No.	Direction (from)	Directional Max	Directional Mean	Directional Max	Directional Mean
1	N	29.1	8.6	44.1	15.3
2	NNE	27.5	8.9	43.2	15.0
3	NE	32.9	9.0	48.1	14.2
4	ENE	25.3	7.6	43.6	12.8
5	E	24.2	6.3	42.9	12.0
6	ESE	26.4	7.7	43.2	13.2
7	SE	28.2	9.0	41.2	14.2
8	SSE	30.9	8.4	48.8	13.3
9	S	31.5	8.7	58.4	12.8
10	SSW	37.8	8.2	47.6	11.9
11	SW	28.6	9.4	48.3	13.9
12	WSW	37.1	10.0	57.9	15.4
13	W	29.3	9.3	51.7	15.2
14	WNW	29.3	9.8	43.4	16.3
15	NW	32.0	11.4	45.9	18.4
16	NNW	30.0	9.7	43.4	17.1

COOPS Data for Station No. 8452660 Newport, RI

C3

September-1999 to August-2004 wind speeds from Newport, RI

C4



Project: OFFTA

Group: ~~Wave~~ WIND

Case: Extremal significant

Extremal Significant Wave Height Analysis

N:	16	NU:	0
NT:	60	K:	5
Lambda:	12.00	Mean:	29.81
Standard deviation:	3.87		

		Weibull Distribution			
	FT-I	k=0.75	k=1.00	k=1.40	k=2.0
Correlation:	0.97	0.95	0.97	0.98	0.98
Sum square of residuals:	0.02	0.19	0.04	0.02	0.01
Return Period (Yr)	Hs(ft)	Hs(ft)	Hs(ft)	Hs(ft)	Hs(ft)
2	33.52	32.94	33.36	33.68	33.88
5	37.18	36.82	37.06	37.15	37.17
10	39.92	39.95	39.85	39.64	39.42
25	43.53	44.33	43.55	42.77	42.15
50	46.25	47.81	46.34	45.04	44.08
100	48.98	51.41	49.14	47.25	45.90

WARNING: RETURN PERIODS > 15 Yrs May Not Be Meaningful.

95% Confidence Interval (Lower Bound - Upper Bound) Units: ft

		Weibull Distribution			
Return Period (Yr)	FT-I	k=0.75	k=1.00	k=1.40	k=2.0
5	32.0 - 42.4	29.4 - 44.3	31.0 - 43.1	32.2 - 42.1	32.7 - 41.7
10	33.3 - 46.6	30.3 - 49.6	32.3 - 47.4	33.6 - 45.7	34.1 - 44.7
25	34.9 - 52.1	31.6 - 57.0	34.0 - 53.1	35.3 - 50.2	35.8 - 48.5
50	36.2 - 56.3	32.7 - 62.9	35.2 - 57.5	36.6 - 53.5	37.0 - 51.1
100	37.4 - 60.5	33.8 - 69.1	36.4 - 61.8	37.8 - 56.7	38.2 - 53.6

Percent chance for significant wave height equalling or exceeding return period

Return Period (Yr)	Period of concern (Yr)					
	2	5	10	25	50	100
2	75	97	100	100	100	100
5	36	67	89	100	100	100
10	19	41	65	93	99	100
25	8	18	34	64	87	98
50	4	10	18	40	64	87
100	2	5	10	22	39	63

C5

FISHER-TIPPETT TYPE I (FT-I) DISTRIBUTION

F(Hs) = EXP(-EXP(-(Hs-B)/A))

A = 3.930 ft

B = 21.119 ft

Project: OFFTA
Group: ~~Wave~~ WIND

Correlation = 0.9713

Sum Square of Residuals = 0.0236 ft

Rank	Hsm (ft)	F(Hs<=Hsm) Eq. 3	Ym Eq. 5	A*Ym+B (ft) Eq. 4	Hsm - (A*Ym+B) (ft)
1	38.00	0.9907	4.671	39.4759	-1.4759
2	37.00	0.9741	3.639	35.4169	1.5831
3	33.00	0.9574	3.135	33.4369	-0.4369
4	32.00	0.9408	2.796	32.1070	-0.1070
5	31.00	0.9242	2.540	31.0996	-0.0996
6	31.00	0.9075	2.333	30.2853	0.7147
7	30.00	0.8909	2.158	29.5997	0.4003
8	29.00	0.8743	2.007	29.0059	-0.0059
9	29.00	0.8576	1.873	28.4809	0.5191
10	29.00	0.8410	1.753	28.0093	0.9907
11	28.00	0.8244	1.644	27.5803	0.4197
12	28.00	0.8077	1.544	27.1861	0.8139
13	27.00	0.7911	1.451	26.8207	0.1793
14	26.00	0.7745	1.364	26.4796	-0.4796
15	25.00	0.7578	1.283	26.1593	-1.1593
16	24.00	0.7412	1.206	25.8567	-1.8567

Return Period Table with 95% Confidence Interval

Return Period (Yr)	Hs (ft) Eq. 6	SIGR (ft) Eq. 10	Hs-1.28 *SIGR (ft)	Hs+1.28 *SIGR (ft)
2	33.52	2.30	30.21	36.84
5	37.18	3.61	31.98	42.37
10	39.92	4.62	33.27	46.56
25	43.53	5.97	34.94	52.12
50	46.25	6.99	36.19	56.32
100	48.98	8.02	37.44	60.52

WEIBULL DISTRIBUTION k = 0.75

F(Hs) = 1-EXP(-((Hs-B)/A)**k)

A = 2.064 ft

B = 23.302 ft

Correlation = 0.9523

Sum Square of Residuals = 0.1916 ft

Rank	Hsm (ft)	F(Hs<=Hsm) Eq. 3	Ym Eq. 5	A*Ym+B (ft) Eq. 4	Hsm - (A*Ym+B) (ft)
1	38.00	0.9919	8.140	40.1002	-2.1002
2	37.00	0.9754	5.732	35.1312	1.8688
3	33.00	0.9588	4.697	32.9952	0.0048
4	32.00	0.9423	4.046	31.6516	0.3484

Project: OFFTA
Group: ~~Wave~~ WIND

5	31.00	0.9258	3.576	30.6827	0.3173
6	31.00	0.9092	3.212	29.9316	1.0684
7	30.00	0.8927	2.917	29.3223	0.6777
8	29.00	0.8762	2.670	28.8124	0.1876
9	29.00	0.8596	2.459	28.3760	0.6240
10	29.00	0.8431	2.274	27.9960	1.0040
11	28.00	0.8265	2.112	27.6605	0.3395
12	28.00	0.8100	1.967	27.3610	0.6390
13	27.00	0.7935	1.836	27.0914	-0.0914
14	26.00	0.7769	1.717	26.8467	-0.8467
15	25.00	0.7604	1.609	26.6232	-1.6232
16	24.00	0.7439	1.510	26.4180	-2.4180

Return Period Table with 95% Confidence Interval

Return Period (Yr)	Hs (ft) Eq. 6	SIGR (ft) Eq. 10	Hs-1.28 *SIGR (ft)	Hs+1.28 *SIGR (ft)
2	32.94	3.33	28.15	37.74
5	36.82	5.17	29.37	44.27
10	39.95	6.68	30.33	49.58
25	44.33	8.81	31.65	57.02
50	47.81	10.50	32.69	62.93
100	51.41	12.26	33.76	69.06

WEIBULL DISTRIBUTION k = 1.00

F(Hs) = 1-EXP(-((Hs-B)/A)**k)

A = 4.034 ft

B = 20.540 ft

Correlation = 0.9670

Sum Square of Residuals = 0.0408 ft

Rank	Hsm (ft)	F(Hs<=Hsm) Eq. 3	Ym Eq. 5	A*Ym+B (ft) Eq. 4	Hsm - (A*Ym+B) (ft)
1	38.00	0.9912	4.736	39.6460	-1.6460
2	37.00	0.9747	3.676	35.3694	1.6306
3	33.00	0.9581	3.173	33.3406	-0.3406
4	32.00	0.9416	2.840	31.9970	0.0030
5	31.00	0.9250	2.591	30.9908	0.0092
6	31.00	0.9085	2.391	30.1862	0.8138
7	30.00	0.8919	2.225	29.5157	0.4843
8	29.00	0.8754	2.083	28.9409	0.0591
9	29.00	0.8588	1.958	28.4379	0.5621
10	29.00	0.8423	1.847	27.9908	1.0092
11	28.00	0.8257	1.747	27.5882	0.4118
12	28.00	0.8092	1.657	27.2223	0.7777
13	27.00	0.7927	1.573	26.8868	0.1132
14	26.00	0.7761	1.497	26.5770	-0.5770

Project: OFFTA
Group: ~~Wave~~ WIND

15	25.00	0.7596	1.425	26.2894	-1.2894
16	24.00	0.7430	1.359	26.0209	-2.0209

Return Period Table with 95% Confidence Interval

Return Period (Yr)	Hs (ft) Eq. 6	SIGR (ft) Eq. 10	Hs-1.28 *SIGR (ft)	Hs+1.28 *SIGR (ft)
2	33.36	2.81	29.31	37.41
5	37.06	4.19	31.02	43.09
10	39.85	5.25	32.29	47.41
25	43.55	6.66	33.95	53.15
50	46.34	7.74	35.20	57.49
100	49.14	8.82	36.44	61.84

WEIBULL DISTRIBUTION k = 1.40

F(Hs) = 1-EXP(-((Hs-B)/A)**k)

A = 7.679 ft

B = 16.137 ft

Correlation = 0.9756

Sum Square of Residuals = 0.0157 ft

Rank	Hsm (ft)	F(Hs<=Hsm) Eq. 3	Ym Eq. 5	A*Ym+B (ft) Eq. 4	Hsm - (A*Ym+B) (ft)
1	38.00	0.9905	3.002	39.1894	-1.1894
2	37.00	0.9740	2.521	35.4937	1.5063
3	33.00	0.9574	2.273	33.5897	-0.5897
4	32.00	0.9409	2.101	32.2721	-0.2721
5	31.00	0.9243	1.968	31.2531	-0.2531
6	31.00	0.9077	1.860	30.4162	0.5838
7	30.00	0.8912	1.767	29.7025	0.2975
8	29.00	0.8746	1.685	29.0779	-0.0779
9	29.00	0.8581	1.613	28.5209	0.4791
10	29.00	0.8415	1.547	28.0168	0.9832
11	28.00	0.8250	1.487	27.5554	0.4446
12	28.00	0.8084	1.431	27.1292	0.8708
13	27.00	0.7918	1.380	26.7325	0.2675
14	26.00	0.7753	1.331	26.3608	-0.3608
15	25.00	0.7587	1.286	26.0106	-1.0106
16	24.00	0.7422	1.243	25.6791	-1.6791

Return Period Table with 95% Confidence Interval

Return Period (Yr)	Hs (ft) Eq. 6	SIGR (ft) Eq. 10	Hs-1.28 *SIGR (ft)	Hs+1.28 *SIGR (ft)
2	33.68	2.44	30.16	37.19
5	37.15	3.47	32.16	42.15
10	39.64	4.22	33.56	45.72

Project: OFFTA
Group: ~~Wave~~ WIND

25	42.77	5.18	35.31	50.23
50	45.04	5.88	36.58	53.51
100	47.25	6.56	37.80	56.70

WEIBULL DISTRIBUTION k = 2.00

F(Hs) = 1-EXP(-((Hs-B)/A)**k)

A = 13.650 ft

B = 9.551 ft

Correlation = 0.9798

Sum Square of Residuals = 0.0086 ft

Rank	Hsm (ft)	F(Hs<=Hsm) Eq. 3	Ym Eq. 5	A*Ym+B (ft) Eq. 4	Hsm - (A*Ym+B) (ft)
1	38.00	0.9899	2.144	38.8149	-0.8149
2	37.00	0.9733	1.904	35.5388	1.4612
3	33.00	0.9568	1.772	33.7442	-0.7442
4	32.00	0.9402	1.678	32.4607	-0.4607
5	31.00	0.9236	1.604	31.4436	-0.4436
6	31.00	0.9071	1.541	30.5914	0.4086
7	30.00	0.8905	1.487	29.8520	0.1480
8	29.00	0.8739	1.439	29.1947	-0.1947
9	29.00	0.8574	1.396	28.6002	0.3998
10	29.00	0.8408	1.356	28.0549	0.9451
11	28.00	0.8242	1.319	27.5496	0.4504
12	28.00	0.8077	1.284	27.0771	0.9229
13	27.00	0.7911	1.251	26.6322	0.3678
14	26.00	0.7745	1.221	26.2108	-0.2108
15	25.00	0.7580	1.191	25.8094	-0.8094
16	24.00	0.7414	1.163	25.4255	-1.4255

Return Period Table with 95% Confidence Interval

Return Period (Yr)	Hs (ft) Eq. 6	SIGR (ft) Eq. 10	Hs-1.28 *SIGR (ft)	Hs+1.28 *SIGR (ft)
2	33.88	2.29	30.59	37.18
5	37.17	3.11	32.69	41.65
10	39.42	3.69	34.11	44.73
25	42.15	4.40	35.82	48.48
50	44.08	4.90	37.02	51.13
100	45.90	5.38	38.15	53.64

TETRA TECH

SUBJECT

ORIGINATOR CHECKED

PROJECT

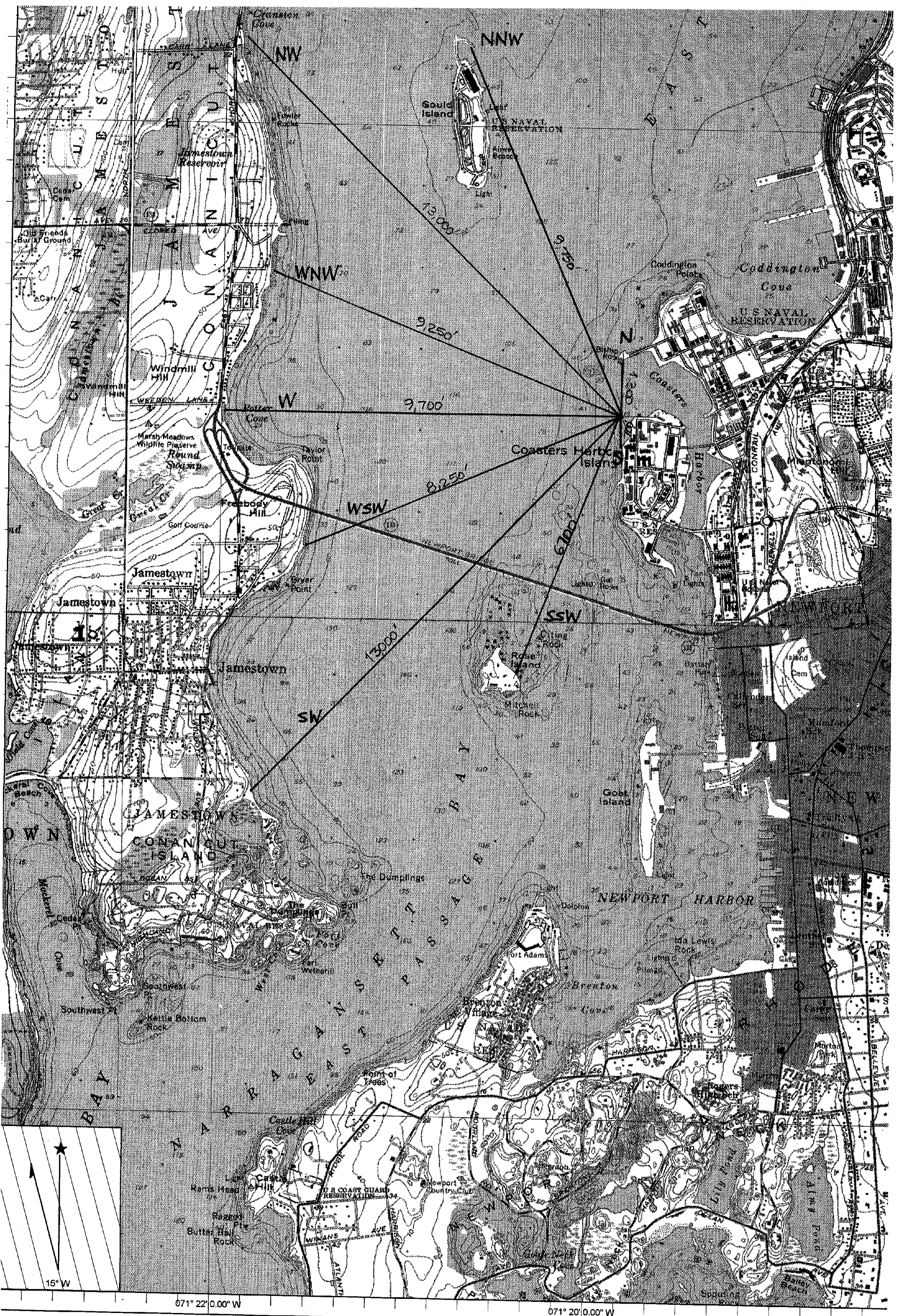
TC/P NO.

DATE PAGE OF PAGES

D - WAVES

D1 - FETCH DIRECTIONS AND LENGTHS
D2 - WAVE HINDCAST
D3 - WAVE CONVERSION ($H_{mo} \rightarrow H_s$)
D4 - WAVE TRANSFORMATION TO SITE
- Table
- Outputs

D5 - BOAT WAKES



Name: PRUDENCE ISLAND
Date: 9/29/2004
Scale: 1 inch equals 2000 feet

Location: 041° 30' 40.3" N 071° 19' 31.7" W

D1

Newport, RI Wave Hindcast
OFFTA

Direction			From Hourly Speed				From Gust			
			Wind Speed, Adjusted mph	Wave Hindcast			Wind Speed, Adjusted mph	Wave Hindcast		
No.	Avg. Bin ° from N			MWD, degrees North	H_{mo}, ft	T_p, sec		MWD, degrees North	H_{mo}, ft	T_p, sec
1	0	N	29	321	2.3	2.9	44	321	3.7	3.5
2	22.5	NNE	27	No Fetch			43	No Fetch		
3	45	NE	33				48			
4	67.5	ENE	25				43			
5	90	E	24				43			
6	112.5	ESE	26				43			
7	135	SE	28				41			
8	157.5	SSE	31				48			
9	180	S	31	209	2.4	3.0	58	209	4.8	4.0
10	202.5	SSW	38	220	3.3	3.4	47	220	4.1	3.7
11	225	SW	28	225	2.4	2.9	48	225	4.2	3.8
12	247.5	WSW	37	230	3.2	3.3	58	230	5.1	4.1
13	270	W	29	268	2.2	2.8	51	268	4.0	3.6
14	292.5	WNW	29	311	2.4	3.0	43	311	3.7	3.6
15	315	NW	32	314	2.7	3.1	46	314	4.0	3.7
16	337.5	NNW	30	318	2.5	3.0	43	318	3.7	3.6

CEDAS 2.01, 2002. ACES Software by US Army Corps of Engineers.

D2

Newport, RI Wave Conversion
OFFTA

Direction			From Hourly Speed				From Gust			
			Wind Speed, Adjusted mph	Wave Hindcast			Wind Speed, Adjusted mph	Wave Hindcast		
No.	Avg. Bin ° from N			MWD, degrees North	*H_s, ft	T_p, sec		MWD, degrees North	*H_s, ft	T_p, sec
1	0	N	29	321	2.4	2.9	44	321	3.7	3.5
2	22.5	NNE	27	No Fetch			43	No Fetch		
3	45	NE	33				48			
4	67.5	ENE	25				43			
5	90	E	24				43			
6	112.5	ESE	26				43			
7	135	SE	28				41			
8	157.5	SSE	31				48			
9	180	S	31	209	2.5	3.0	58	209	4.9	4.0
10	202.5	SSW	38	220	3.3	3.4	47	220	4.2	3.7
11	225	SW	28	225	2.4	2.9	48	225	4.3	3.8
12	247.5	WSW	37	230	3.2	3.3	58	230	5.3	4.1
13	270	W	29	268	2.2	2.8	51	268	4.0	3.6
14	292.5	WNW	29	311	2.4	3.0	43	311	3.8	3.6
15	315	NW	32	314	2.7	3.1	46	314	4.1	3.7
16	337.5	NNW	30	318	2.5	3.0	43	318	3.7	3.6

CEDAS 2.01, 2002. ACES Software by US Army Corps of Engineers.

* USE Hmo to Hs converstion at 18 ft of water. REF: Design of Coastal Revetments, Bulkheads and Seawals, EQ. 2-3. EM 1110-2-1614.

Newport, RI Wave Transformation
OFFTA

Direction			From Hourly Speed				From Gust			
			Wind Speed, Adjusted* mph	Transformed Wave**			Wind Speed, Adjusted* mph	Transformed Wave**		
No.	Avg. Bin ° from N			MWD, degrees North	H_i, ft	T_p, sec		MWD, degrees North	Hi, ft	T_p, sec
1	0	N	29	321	2.1	2.9	44	321	3.3	3.5
2	22.5	NNE	27	No Fetch			43	No Fetch		
3	45	NE	33				48			
4	67.5	ENE	25				43			
5	90	E	24				43			
6	112.5	ESE	26				43			
7	135	SE	28				41			
8	157.5	SSE	31				48			
9	180	S	31	209	2.2	3.0	58	209	4.3	4.0
10	202.5	SSW	38	220	**2.9**	**3.4**	47	220	3.7	3.7
11	225	SW	28	225	2.1	2.9	48	225	3.8	3.8
12	247.5	WSW	37	230	2.8	3.3	58	230	**4.6**	**4.1**
13	270	W	29	268	1.9	2.8	51	268	3.5	3.6
14	292.5	WNW	29	311	2.1	3.0	43	311	3.3	3.6
15	315	NW	32	314	2.4	3.1	46	314	3.6	3.7
16	337.5	NNW	30	318	2.2	3.0	43	318	3.3	3.6

CEDAS 2.01, 2002. ACES Software by US Army Corps of Engineers.

* Adjusted for the equivalent duration for the fetch length

** Use Ks, shoaling coefficient & Kr, refraction Coefficient from ACES Wave Transformation

USE Hi = 2.9 ft, Tp= 3.4 sec for average conditions
USE Hi = 4.6 ft, Tp= 4.1 sec for extreme conditions

Convert to Hd, as required by the methodology required!

D4

Project: OFFTA
Group: OFFTA

Case: Irregular wave transformation (Goda)

Irregular Wave Transformation (Goda's Method)

Item	Subject Wave	Deepwater Wave	Units	Item	Subject Wave	Deepwater Wave	Units
Wave height (Ho)		3.300	ft	Hs	3.237	3.321	ft
Sig wave period (Ts)	3.400	3.400	sec	Hmean	1.962	2.066	ft
Water depth (d)	18.000	65.996	ft	Hrms	2.214	2.331	ft
Nearshore slope (cot phi)	50.000	50.000		H10%	4.041	4.458	ft
Principal dir (theta)	42.956	45.000	deg	H02%	4.952	5.301	ft
				Hmax	5.755	6.208	ft
Shoaling Coeff. (Ks)	0.950	1.000		Effec refract coeff (Kr)	0.921		
Surf Beat RMS (zeta)	0.055	0.030	ft	Depth/height (d/Ho)	5.447	20.000	
Wave setup (Sw)	-0.005	-0.004	ft	Rel water depth (d/Lo)	0.304	1.116	
Wave steepness (Ho/Lo)	0.056	0.056					

Project: OFFTA
Group: OFFTA

Case: Snell's law

Linear Wave Theory / Snell's Law

Breaking criteria 0.78

Item	Known Wave	Subject Wave	Deepwater Wave	Units
Wave height (H)	1.00	0.92	1.07	ft
Wave period (T)	3.40			sec
Water depth (d)	18.00	3.50		ft
Crest angle (alpha)	45.00	24.82	47.25	deg
Wavelength (L)	57.00	33.83	59.19	ft
Celerity (C)	16.76	9.95	17.41	ft/sec
Group Velocity (Cg)	9.64	8.78	8.70	ft/sec
Energy density (E)	8.00	6.84	9.23	ft-lb/ft²
Energy flux (P)	77.10	60.06	80.31	ft-lb/s-ft
Ursell parameter (HL^2/d^3)	0.56	24.69		
Steepness (H/L)			0.02	

Nearshore slope (cot):	50.00
Breaker height (Hb):	1.51 ft
Breaker depth (db):	1.73 ft

D4

Ship Generated Waves
Sorensen (1997)

Vessel Type	Tug	
Vessel Length, ft (L_v)	72	
Vessel Beam, ft (B)	30	
Vessel Draft, ft (D)	13	
Vessel Speed, kt (V)	10	
Vessel Displacement, tons (W)	500	
Distance from Sailing Line, ft (x)	200	
Water Depth, ft (d)	12	
Specific Weight of Water, lb/ft^3 (g)	63.0	
Froude Number (F)	0.86	Valid from 0.2 to 0.8
Dimensionless Distance from Sailing Line (x*)	7.98	
Dimensionless Depth (d*)	0.48	
Coefficient (a)	-0.70	
Coefficient (b)	0.89	
Coefficient (c)	0.33	
Coefficient (a)	0.11	
Coefficient (b)	-0.34	
Exponent (d)	-0.15	
Exponent (n)	-0.38	
Dimensionless Maximum Wave Height (H_m*)	0.05	
Block Coefficient	0.57	
Dimensionless Length	3.0	
Dimensionless Beam	1.2	
Dimensionless Draft	0.5	
Coefficient (A)	2.52	*
Coefficient (B)	0.08	*
Revised Dimensionless Maximum Wave Height (Hm**)	0.05	
Maximum Wave Height, ft (H_m)	1.2	
Cusp Angle from Sailing Line, degrees (Q)	28.76	
Wave Celerity, ft/sec (C)	14.8	
Celerity Squared (C^2)	219.25	
Wave Length, ft (L)	18.0	**
Celerity Squared check (C^2)	219.38	
Wave Period, sec (T)	1.2	

* Use block coefficient, dimensionless length, dimensionless beam, and dimensionless draft to select values from Table 1 (see Notes).

** Iterate to match "C^2" to "C^2 check".

Sorensen, Robert M. (1997) *Prediction of Vessel-Generated Waves with Reference to Vessels Common to the Upper Mississippi River System*. Prepared for U.S. Army Engineer Distrct, Rock Island, U.S. Army Engineer Distrct, St. Louis, U.S. Army District, St. Paul, ENV Report 4, December 1997.

D5

Ship Generated Waves
Sorensen (1997)

Vessel Type	Yacht	
Vessel Length, ft (L_v)	85	
Vessel Beam, ft (B)	20	
Vessel Draft, ft (D)	7	
Vessel Speed, kt (V)	7	
Vessel Displacement, tons (W)	200	
Distance from Sailing Line, ft (x)	100	
Water Depth, ft (d)	12	
Specific Weight of Water, lb/ft^3 (g)	64.0	
Froude Number (F)	0.60	Valid from 0.2 to 0.8
Dimensionless Distance from Sailing Line (x*)	5.44	
Dimensionless Depth (d*)	0.65	
Coefficient (a)	-1.00	
Coefficient (b)	1.33	
Coefficient (c)	-0.35	
Coefficient (a)	0.06	
Coefficient (b)	-0.34	
Exponent (d)	-0.15	
Exponent (n)	-0.36	
Dimensionless Maximum Wave Height (H_m*)	0.03	
Block Coefficient	0.53	
Dimensionless Length	4.8	
Dimensionless Beam	1.1	
Dimensionless Draft	0.4	
Coefficient (A)	3.50	*
Coefficient (B)	0.08	*
Revised Dimensionless Maximum Wave Height (Hm**)	0.02	
Maximum Wave Height, ft (H_m)	0.4	←
Cusp Angle from Sailing Line, degrees (Q)	34.97	
Wave Celerity, ft/sec (C)	9.7	
Celerity Squared (C^2)	93.85	
Wave Length, ft (L)	5.8	**
Celerity Squared check (C^2)	93.28	
Wave Period, sec (T)	0.6	←

* Use block coefficient, dimensionless length, dimensionless beam, and dimensionless draft to select values from Table 1 (see Notes).

** Iterate to match "C^2" to "C^2 check".

Sorensen, Robert M. (1997) *Prediction of Vessel-Generated Waves with Reference to Vessels Common to the Upper Mississippi River System*. Prepared for U.S. Army Engineer Distrct, Rock Island, U.S. Army Engineer Distrct, St. Louis, U.S. Army District, St. Paul, ENV Report 4, December 1997.

TETRA TECH

SUBJECT

ORIGINATOR CHECKED

PROJECT

TC/P NO.

DATE PAGE OF PAGES

E - STABILITY

E1 - CASE 1 _ HUDSON EQN. /ACES

E2 - CASE 2 - " /ACES

E3 - RUNUP /OVERTOPPING

- Case1
- Case2

E4 - OVERTOPPING WITH FREEBOARD

- CREST ELEVATION

Project: OFFTA
Group: OFFTA

Case: 1 Breakwater design using Hudson and related

Breakwater Design Using Hudson and Related Equations

Armor unit weight (Wr):	165.000	lb/ft³
Wave height (Hi):	3.700	ft
Stability coefficient (KD):	2.100	
Layer coefficient (k delta):	1.000	
Average porosity (P):	40.000	%
Cotan of structure slope (cot theta):	4.000	
No. of units comprising thickness of layer (n):	2.000	
Single armor unit weight (w):	252.886	lb
Minimum crest width (B):	3.45887	ft
Average layer thickness (r):	2.30592	ft
No single armor units per unit surface area (Nr):	902.723	per 1000 ft²

E1

Project: OFFTA
Group: OFFTA

Case: 1 Rubble mound revetment design

Rubble Mound Revetment Design

Significant wave ht (Hs):	2.90 ft
Significant wave period (Ts):	3.10 sec
Cotan of nearshore slope (cot phi):	50.00
Water depth at toe of revetment (ds):	5.50 ft
Cotan of structure slope (cot theta):	4.00
Unit weight of rock (wr):	165.00 ft
Permeability coefficient (P):	0.10
Damage level (S):	0.25
Breaking criteria:	0.78

Stone Size Gradation

Armor Layer

Thickness: 2.22074 ft

% less than by weight	Weight	Dimension
	lb	ft
0 (min)	28.24	0.56
15	90.35	0.82
50	225.88	1.11
85	442.73	1.39
100 (max)	903.53	1.76

Filter Layer

Thickness: 1.00000 ft

% less than by weight	Weight	Dimension
	lb	ft
0 (min)	0.07	0.08
15	0.12	0.09
50	0.42	0.14
85	1.41	0.20
100 (max)	2.38	0.24

Irregular wave runup (ft)

Expected maximum:	2.83	ft	Conservative:	3.56 ft
Surf Parameter:	0.86			
CERC Stability Number:	1.44		Dutch Stability Number:	1.65

(5)

Project: OFFTA
Group: OFFTA

Case: 2 Breakwater design using Hudson and related

Breakwater Design Using
Hudson and Related Equations

Armor unit weight (Wr):	165.000	lb/ft³
Wave height (Hi):	5.840	ft
Stability coefficient (KD):	2.100	
Layer coefficient (k delta):	1.000	
Average porosity (P):	40.000	%
Cotan of structure slope (cot theta):	4.000	
No. of units comprising thickness of layer (n):	2.000	
Single armor unit weight (w):	994.392	lb
Minimum crest width (B):	5.45941	ft
Average layer thickness (r):	3.63961	ft
No single armor units per unit surface area (Nr):	362.353	per 1000 ft²

E2

Project: OFFTA
Group: OFFTA

Case: 2 Rubble mound revetment design

Rubble Mound Revetment Design

Significant wave ht (Hs):	4.60 ft
Significant wave period (Ts):	4.10 sec
Cotan of nearshore slope (cot phi):	50.00
Water depth at toe of revetment (ds):	9.00 ft
Cotan of structure slope (cot theta):	4.00
Unit weight of rock (wr):	165.00 ft
Permeability coefficient (P):	0.10
Damage level (S):	0.25
Breaking criteria:	0.78

Stone Size Gradation

Armor Layer

Thickness: 3.60976 ft

% less than by weight	Weight	Dimension
	lb	ft
0 (min)	121.27	0.90
15	388.05	1.33
50	970.13	1.80
85	1901.45	2.26
100 (max)	3880.50	2.87

Filter Layer

Thickness: 1.00000 ft

% less than by weight	Weight	Dimension
	lb	ft
0 (min)	0.32	0.12
15	0.53	0.15
50	1.80	0.22
85	6.06	0.33
100 (max)	10.21	0.40

Irregular wave runup (ft)

Expected maximum:	4.65 ft		Conservative:	5.85 ft
Surf Parameter:	0.91			
CERC Stability Number:	1.44		Dutch Stability Number:	1.61

E2

Project: OFFTA
Group: OFFTA

Case: 1 Wave runup and overtopping on impermeable structures

Wave Runup and Overtopping on Impermeable Structures

Wave type: Irregular Slope type: Rough

Rate estimate: Runup and Overtopping

Breaking criteria:	0.780				
Incident significant wave ht (Hi):	4.600	ft	Runup for significant waves (R):	2.773	ft
Peak wave period (T):	4.100		Onshore wind velocity (U):	0.000	ft/sec
COTAN of nearshore slope (cot phi):	50.000		Deepwater significant wave (Ho):	4.898	ft
Water depth at structure toe (ds):	8.000	ft	Relative height (ds/Ho):	1.633	
COTAN of structure slope (cot theta):	4.000		Wave steepness (Ho/gT^2):	0.009	
Structure height above toe (hs):	10.000	ft	Overtopping coef(alpha):	0.080	
Rough slope coefficient(a):	0.775		Overtopping coef(Q*o):	0.017	
Rough slope coefficient(b):	0.361		Overtopping rate (Q):	0.221	$ft^3/s\text{-}ft$

E3

Project: OFFTA
Group: OFFTA

Case: 2 Wave runup and overtopping on impermeable structures

Wave Runup and Overtopping on Impermeable Structures

Wave type: Irregular Slope type: Rough

Rate estimate: Runup and Overtopping

Breaking criteria:	0.780				
Incident significant wave ht (Hi):	2.900	ft	Runup for significant waves (R):	1.687	ft
Peak wave period (T):	3.100		Onshore wind velocity (U):	0.000	ft/sec
COTAN of nearshore slope (cot phi):	50.000		Deepwater significant wave (Ho):	3.113	ft
Water depth at structure toe (ds):	5.000	ft	Relative height (ds/Ho):	1.606	
COTAN of structure slope (cot theta):	4.000		Wave steepness (Ho/gT^2):	0.010	
Structure height above toe (hs):	9.000	ft	Overtopping coef(alpha):	0.080	
Rough slope coefficient(a):	0.775		Overtopping coef(Q*o):	0.017	
Rough slope coefficient(b):	0.361		Overtopping rate (Q):	0.000	$ft^3/s\text{-}ft$

E3

TETRA TECH	SUBJECT OVERTOPPING	PROJECT OFFTA - Newport RI
		TC/P NO. 2282.1182.1105
	ORIGINATOR HU CHECKED	DATE 10/6/04 PAGE ___ OF E4 PAGES

As per EM 1110-2-1614

$$Q' = C_0 e^{C_1 F'} e^{C_2 m} \quad , C_0 = 0.4578 \ , C_1 = -29.45, C_2 = 0.8464$$

where, $Q' = \dfrac{Q}{(g H_{mo}^3)^{1/2}}$, dimensionless overtopping

$F' = \dfrac{F}{(H_{mo}^2 L_o)^{1/3}}$, dimensionless freeboard

Q, dimensional overtopping
F, " freeboard
H_{mo}, spectral significant wave height
L_o, deep water wave length
g, gravitational acc.

CASE 1

$$F' = \frac{(8' - 5')}{(3.2^2 * 5.12 * 3.3^2)^{1/3}} = 0.36$$

$$Q' = 0.4578\, e^{-29.45 * 0.36} \cdot e^{0.8464 * 4} = 0.00034$$

$$Q = Q' (g \cdot H_{mo}^3)^{1/2} = 0.00034 (32.2 * 3.2^3)^{1/2} = 0.011 \text{ cfs/ft}$$
$$\cong 1 \text{ l-s/m}$$

CASE 2

$$F' = \frac{8' - 7'}{(5.3^2 * 5.12 * 4.1^2)^{1/3}} = 0.075$$

$$Q' = 0.4578\, e^{-29.45 * 0.075} \cdot e^{0.8464 * 4} = 1.51$$

$$Q = 1.51 (32.2 * 5.3^3)^{1/2} = 104 \text{ cfs/ft}$$
$$\cong 9.692 \text{ l-s/m} \equiv \text{SUBMERGED!}$$

TETRA TECH

SUBJECT

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PROJECT

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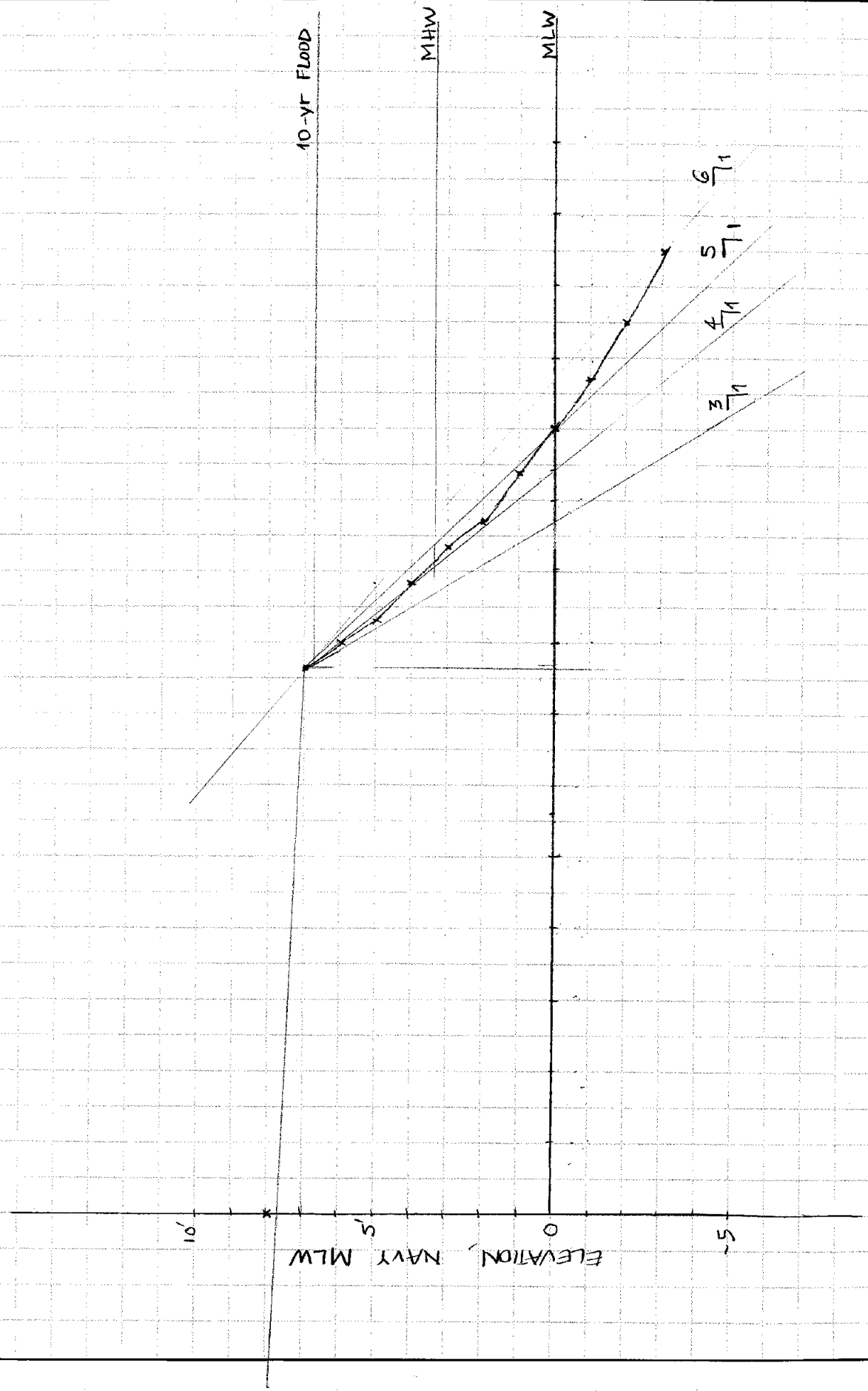
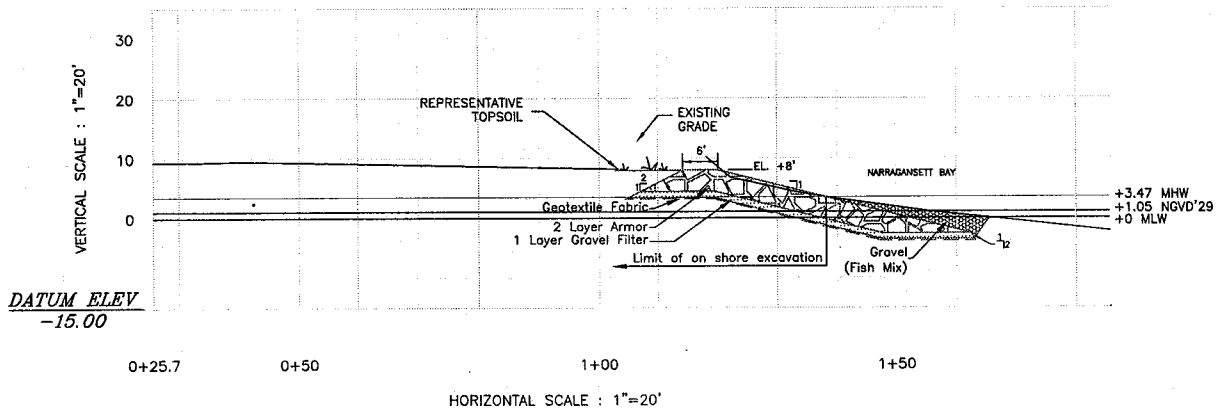
F- TYPICAL SECTION

F1 - POTENTIAL SLOPES
F2 - SECTION A-A' REVETMENT CROSS SECTIONS
F3 - SECTION B-B' REVETMENT CROSS SECTIONS
F4 - SECTION C-C' REVETMENT CROSS SECTIONS

TETRA TECH	SUBJECT TYP. X-SECTION POTENTIAL SLOPES ORIGINATOR MM CHECKED	PROJECT OFFTA-Newport, RI TC/P NO. 2282.1132.1105 DATE 10/6/04 PAGE ___ OF F1 PAGES



SECTION A–A'



F2

NOTES:

1.) VERTICAL DATUM MLW AS DEFINED BY NOAA AT BENCHMARK # 8452660 (NEWPORT, RI)

2.) DATUM FOR EXISTING GRADE IS DEFINED AS THE NAVY MLW, WHICH ASSUMED TO BE SAME AS NOTE 1 ABOVE.

U.S. Navy RAC
OFFTA Newport, Rhode Island

Figure 11
Section A–A'
Revetment Cross Sections

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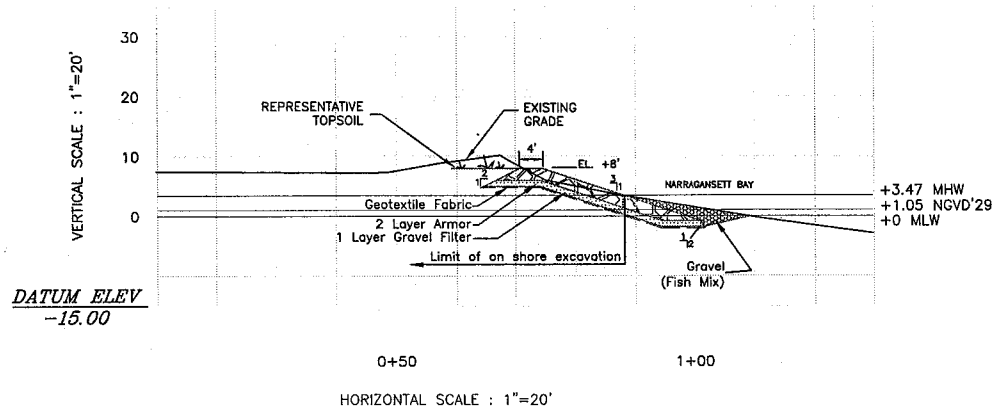
SECTION B–B'



NOTES:

1.) VERTICAL DATUM MLW AS DEFINED BY NOAA AT BENCHMARK # 8452660 (NEWPORT, RI)

2.) DATUM FOR EXISTING GRADE IS DEFINED AS THE NAVY MLW, WHICH ASSUMED TO BE SAME AS NOTE 1 ABOVE.

F-3

U.S. Navy RAC
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Figure 12
Section B–B'
Revetment Cross Sections

TETRA TECH EC, INC.

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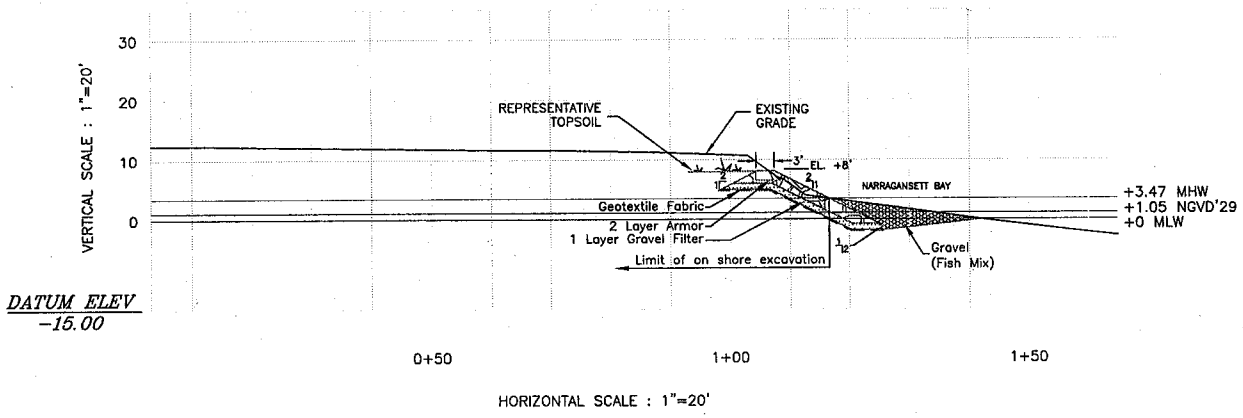
SECTION C–C'



NOTES:

1.) VERTICAL DATUM MLW AS DEFINED BY NOAA AT BENCHMARK # 8452660 (NEWPORT, RI)

2.) DATUM FOR EXISTING GRADE IS DEFINED AS THE NAVY MLW, WHICH ASSUMED TO BE SAME AS NOTE 1 ABOVE.

F4

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Figure 13
Section C–C'
Revetment Cross Sections

TETRA TECH EC, INC.

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