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WORK PLAN DELINEATION AND CONFIRMATION SAMPLING TO SUPPORT THE REMOVAL ACTION AT THE TRUMAN ANNEX WATER TOWER SITE WITH TRANSMITTAL LETTER NAS KEY WEST FL

5/28/2004

TETRA TECH NUS

TETRA TECH NUS, INC.

AIK-04-0100

May 28, 2004

Project Number HK N0639 *via FedEx*

Commander
Department of the Navy
SOUTHDIV NAVFACENGCOM
ATTN: Jim Reed (Code ES33)
P.O. Box 190010
North Charleston, South Carolina 29419-9010

Reference: CLEAN Contract No. N62467-94-D-0888
Contract Task Order No. 0349

Subject: Work Plan Delineation and Confirmation Sampling to Support the Removal Action at the Truman Annex Water Tower Site, Rev. 0, Naval Air Station, Key West, Florida

Dear Mr. Reed:

I have enclosed a CD containing the PDF file for the Final Work Plan Delineation and Confirmation Sampling to Support the Removal Action at the Truman Annex Water Tower Site, Rev. 0, Naval Air Station, Key West, Florida. The file is being distributed to some of the members of the NAS Key West Partnering Team via U.S. mail for their convenience and to meet TtNUS's contractual obligation under CTO 0349. I am not expecting to receive any comments on this document.

Please call me at (803) 649-7963, extension 345, if you have any questions regarding the enclosed document.

Sincerely,

C. M. Bryan
Project Manager

CMB:spc

c: Ms. Debbie Wroblewski (Cover Letter Only)
Ms. T. Vaught, FDEP
Mr. R. Courtright, NAS Key West
Mr. T. Ballard, USEPA Region IV
Mr. M. Perry/File
Files 0639-7-1-1

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Work Plan
for
Delineation and Confirmation Sampling to Support the Expedited Removal Action at the Truman Annex Water Tower Site

Naval Air Station
Key West, Florida

Southern Division
Naval Facilities Engineering Command

Contract Number N62467-94-D-0888
Contract Task Order 0349

May 2004

Rev. 0
5/28/04

WORK PLAN

FOR

DELINEATION AND CONFIRMATION SAMPLING TO SUPPORT THE EXPEDITED REMOVAL ACTION AT THE TRUMAN ANNEX WATER TOWER SITE

NAVAL AIR STATION
KEY WEST, FLORIDA

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

Submitted to:
Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive
North Charleston, South Carolina 29406

Submitted by:
Tetra Tech NUS
661 Andersen Drive
Foster Plaza 7
Pittsburgh, Pennsylvania 15220

CONTRACT NUMBER N62467-94-D-0888
CONTRACT TASK ORDER 0349

MAY 2004

PREPARED UNDER THE SUPERVISION OF:

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AIKEN, SOUTH CAROLINA

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACRONYMS

bls	below land surface
BRAC	Base Realignment and Closure
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLEAN	Comprehensive Long-term Environmental Action Navy
CTO	Contract Task Order
DPT	Direct-Push Technology
DQO	Data Quality Objective
DRMO	Defense Reutilization and Marketing Office
EM	electromagnetic
FDEP	Florida Department of Environmental Protection
GPR	Ground Penetrating Radar
GPS	Global Positioning System
IDW	investigation-derived waste
MHz	megahertz
MS	matrix spike
MSD	matrix spike duplicate
NAS	Naval Air Station
NAVFAC EFD SOUTH	Southern Division, Naval Facilities Engineering Command
PCB	Polychlorinated Biphenyl
QA	quality assurance
QC	quality control
RCRA	Resource Conservation and Recovery Act
SARA	Superfund Amendments and Reauthorization Act
SOP	Standard Operating Procedure
SSI	Supplemental Site Inspection
SVOC	Semi-Volatile Organic Compound
TAL	Target Analyte List
TCL	Target Compound List
TtNUS	Tetra Tech NUS, Inc.
XRF	x-ray fluorescence

1.0 INTRODUCTION

Tetra Tech NUS, Inc. (TtNUS) has been contracted by the Department of the Navy, Southern Division, Naval Facilities Engineering Command (NAVFAC EFD SOUTH) to perform delineation and confirmation sampling to support the expedited removal action at the Truman Annex Water Tower site at the Naval Air Station (NAS) Key West, Florida. This Work Plan was prepared under the Comprehensive Long-term Environmental Action Navy (CLEAN) Contract Number N62467-94-D-0888, Contract Task Order (CTO) Number 0349.

The document is based on available NAS Key West background information and findings from the Decision Document for Ten Base Realignment and Closure (BRAC) Sites (TtNUS, 2002a) and Sampling Results for the Truman Annex Water Tower (Falcon, 2003).

1.1 REPORT ORGANIZATION

This Work Plan consists of six chapters. Chapters 1 and 2 provide the introduction, purpose, and scope of the document; a facility description; and a characterization of the Truman Annex Water Tower Site. Chapters 3 through 6 provide the elements of the investigation process used during the sampling support activities.

1.2 SITE BACKGROUND AND HISTORY

Several installations in various parts of the lower Florida Keys comprise NAS Key West. The Navy manages 6,323 acres of land divided into 20 separate tracts in the lower Florida Keys, concentrated around Key West and Boca Chica Key (Figure 1-1) in southern Monroe County (Brown and Root Environmental, 1998). Key West, one of the two most western major islands of the Florida Keys, is approximately 150 miles southwest of Miami and 90 miles north of Havana, Cuba. Key West connects to the mainland by the Overseas Highway (U.S. Highway 1). The environmental setting at Key West is described in the Supplemental Site Inspection (SSI) Work Plan for BRAC Parcels at Truman Annex (TtNUS, 1998).

The Defense Reutilization and Marketing Office (DRMO) Waste Storage Area at Truman Annex (Figure 1-2) was used primarily to store metal debris, including motors, vehicles, boats, refugee debris, and fuel trucks. Some hazardous materials were also stored at the DRMO Waste Storage Area. The DRMO Waste Storage Area was remediated in 1999. Approximately 16,000 tons of soil were removed from the area and replaced with clean backfill. The excavated area is shown in Figure 1-2. In 2003, the area was transferred from Navy ownership to the City of Key West. A water tower remained on the property. The water tower and a 170-feet by 171.95-feet area immediately surrounding the tower were retained by NAS Key West. In 2003, the water tower was removed. However, prior soil contamination

resulting from lead-based paint used on the water tower was identified. Low concentrations of PCBs, SVOCs and Inorganic chemicals have also been detected in the surface soil at the water tower site.

1.3 PURPOSE AND SCOPE

TtNUS will conduct the sampling activities at NAS Key West under the authority of the BRAC Act of 1992. Execution of the sampling activities will be performed in accordance with the guidelines in place under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and the Superfund Amendments and Reauthorization Act of 1986 (SARA). The objective is to gather information to support a reclassification of this property. The sampling activities will include delineation of the nature and extent of contaminated soils at the water tower site to determine areas for soil excavation and confirmation sampling to confirm the effectiveness of the remediation of soil contamination.

During the execution of the sampling activities, modifications to the scope of work or sample collection procedures may be required to satisfy program objectives. In the event that factors or conditions are revealed that require a modification of the Work Plan, technical memoranda will be used to document the modification. The modification would be enacted upon gaining consensus between reviewers from the lead regulatory agency [Florida Department of Environmental Protection (FDEP)], the lead agency (U.S. Navy), and the contractor responsible for executing the scope of work (TtNUS). Collectively, this group is known as the NAS Key West Partnering Team.

AIK-04-0100

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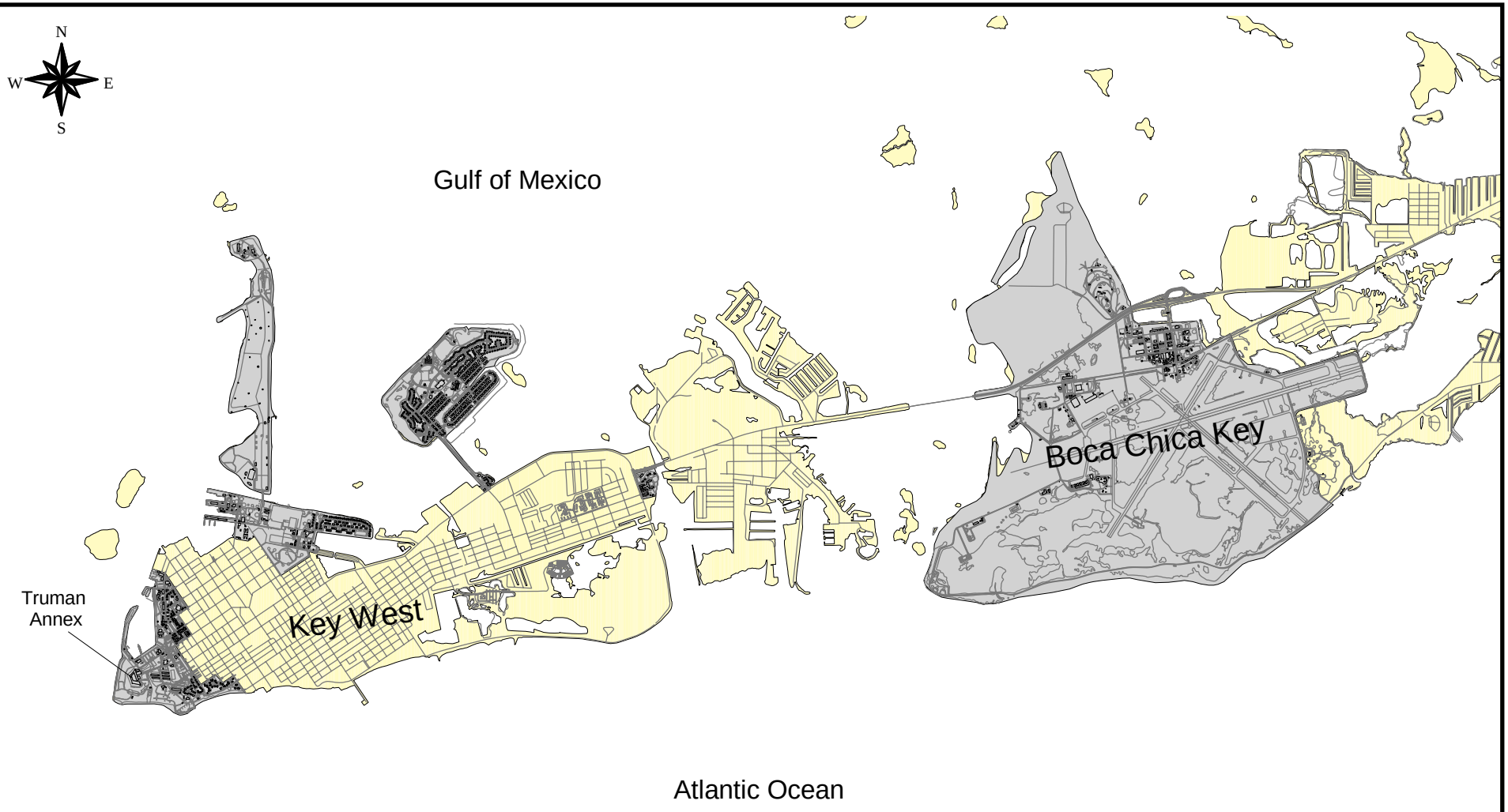
CTO 0349



NO.	DATE	REVISIONS

DRAWN BY EHM	DATE 05/17/2004
CHECKED BY ACL	DATE 05/18/2004
COST/SCHED-AREA	
SCALE AS NOTED	

WORK PLAN FOR DELINEATION AND CONFIRMATION SAMPLING
FACILITY LOCATION MAP
TRUMAN ANNEX WATER TOWER SITE
NAVAL AIR STATION
KEY WEST, FLORIDA

CONTRACT NO. N0693	
APPROVED BY CMB	DATE 05/18/2004
APPROVED BY	DATE
FIGURE NO. 1-1	REV. 0

Rev. 0
5/28/04

K:\WATER TOWER PROJECT.APR LAYOUT: WORK PLAN FIGURE 1-1 BY: EHM DATE: 05/17/2004

AIK-04-0100

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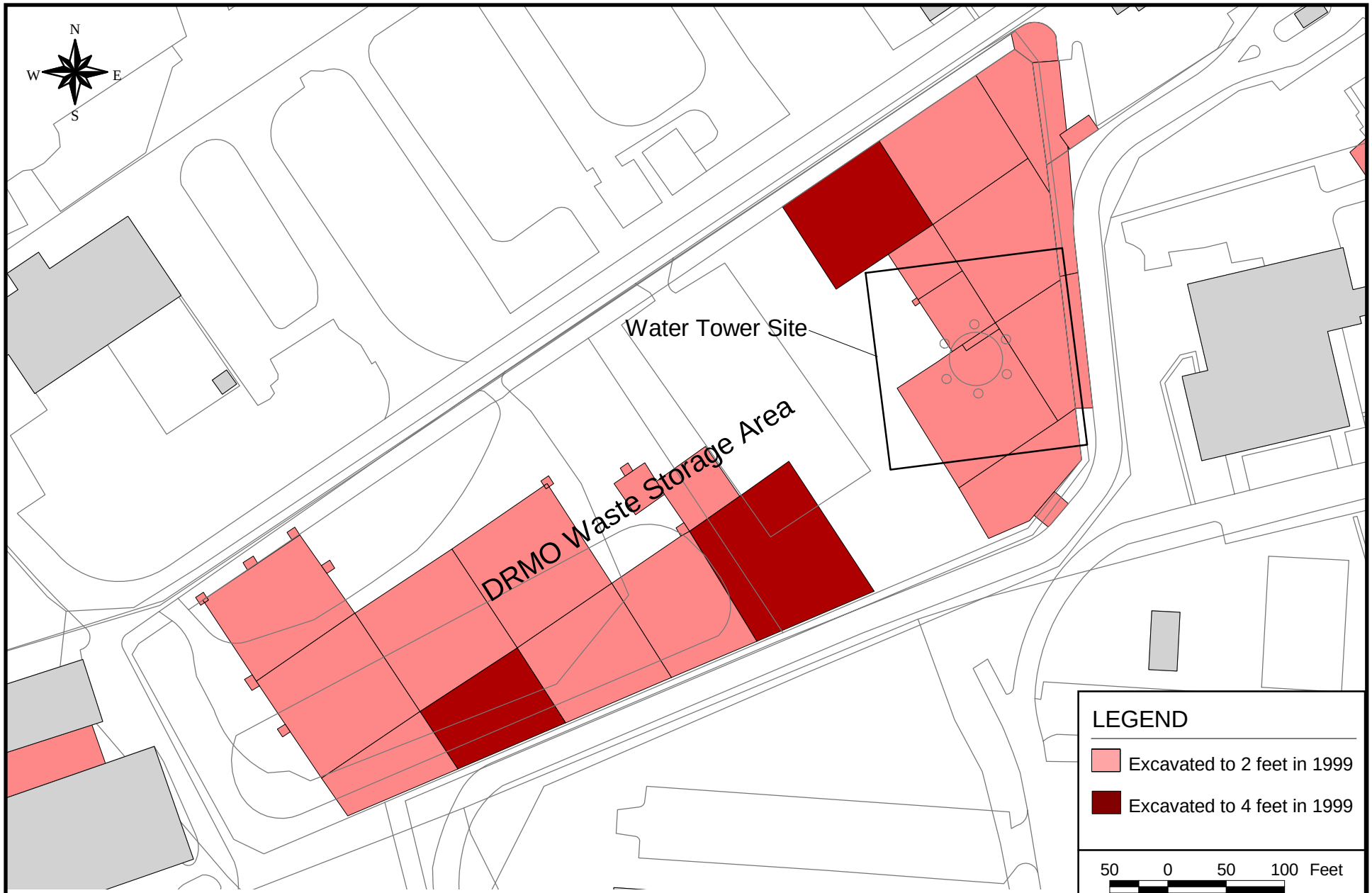
CTO 0349



NO.	DATE	REVISIONS

DRAWN BY EHM DATE 05/17/2004

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COST/SCHED-AREA

SCALE AS NOTED

WORK PLAN FOR DELINEATION AND CONFIRMATION SAMPLING
SITE LOCATION MAP
TRUMAN ANNEX WATER TOWER SITE
NAVAL AIR STATION
KEY WEST, FLORIDA

CONTRACT NO. N0693

APPROVED BY CMB DATE 05/18/2004

APPROVED BY _____ DATE _____

FIGURE NO. 1-2

REV. 0

Rev. 0
5/28/04

K:\WATER TOWER PROJECT.APR LAYOUT: WORK PLAN FIGURE 1-2 BY: EHM DATE: 05/17/2004

2.0 DATA QUALITY OBJECTIVES

2.1 DATA QUALITY OBJECTIVES PROCESS

The Data Quality Objective (DQO) Process (U.S. Environmental Protection Agency, 1994) was used as a tool in the Work Plan to determine the type, quantity, and quality of data needed to support the conclusions and recommendations for BRAC parcels categorized as “grey.” As a systematic planning tool based on the scientific method, the seven-step DQO Process helps establish criteria for defensible decision-making at the onset of a study and develops a data-collection design based on these criteria. The steps identify such information as the goal of the investigation, the inputs needed to reach the goal and make a decision, the temporal and areal boundaries of the investigation, the level of confidence required to support a decision, and finally, a sampling design that is adequate to support the decision-making process. This Work Plan utilizes the DQO process described in the SSI Work Plan for BRAC Parcels at Truman Annex (TtNUS, 1998).

2.2 DATA QUALITY OBJECTIVES

Data quality objectives are documented in the SSI Work Plan for BRAC Parcels at Truman Annex (TtNUS, 1998).

3.0 SAMPLING AND ANALYSIS PLAN

This Chapter describes the Sampling and Analysis Plan, including sampling objectives; sample types, frequencies, and locations; sampling procedures; sampling handling and analysis; surveying; performance system audits; and quality assurance (QA) reports.

3.1 SAMPLING OBJECTIVES

The analytical results will be used to determine the areas that will require excavation and confirm the effectiveness of remediation activities.

3.2 SAMPLE TYPES, FREQUENCIES, AND LOCATIONS

3.2.1 Delineation Sampling

A total of 80 soil borings will be installed using direct-push technology (DPT) for delineation of contamination at the Truman Annex Water Tower site. A 42.5-foot by 43-foot grid was used to determine delineation sample locations (Figure 3-1). Within each gridblock, five soil borings will be installed to a depth of 2 feet below land surface (bls). Samples will be collected from each boring (0 to 2 feet bls) and composited for laboratory analysis. This method was chosen due to its cost effectiveness regarding analytical costs in conjunction with the percent accuracy in finding contaminated areas. All discrete and composite samples will be analyzed in the field for lead using x-ray fluorescence (XRF) to provide immediate results. The analytical results for composite samples will be used for field decisions. The analytical results for discrete samples will be used for information.

A geophysical investigation (Section 4.0) will be performed to locate footings for the water tower. After the geophysical investigation is completed the soil adjacent to the tower footings will be sampled and the samples will be analyzed in the field for Polychlorinated Biphenyls (PCBs) using immunoassay to provide immediate results for field decisions.

Soil sampling will be performed in accordance with FDEP Standard Operating Procedures (SOPs) (FDEP, 2002). All sampling locations will be cleared by TtNUS prior to sampling. The field staff will also provide detailed documentation of sampling activities, including field notes and photographs, for future reference by the Navy. All composite soil samples will be analyzed at a fixed-base laboratory for following suites of parameters:

- Target Analyte List (TAL) Metals plus Tin
- Target Compound List (TCL) Semivolatile Organic Compounds (SVOCs)

The composite samples taken from gridblocks 6, 7, 10, and 11 will also be analyzed at a fixed-base laboratory for TCL PCBs.

Table 3-1 summarizes the analyses required for this field effort.

A comparison of residential action levels to analytical results for composite samples will be made yielding a favorable or nonfavorable comparison for each gridblock. If the comparison is favorable (i.e., parameter concentrations are less than the selected action level), then the gridblock will be considered "clean" and that area will not be excavated. If the comparison is not favorable, the gridblock will be slated for excavation. Action levels are provided in Tables 3-2, 3-3, and 3-4.

3.2.2 Confirmation Sampling

Following soil excavation, TtNUS will collect confirmation samples using hand trowels to confirm that all contaminated soils are removed. The potential area of excavation is shown on Figure 3-1. The samples will be collected from evenly dispersed sample locations within the limits of the excavation. A minimum of one sample will be taken from the center of each sidewall of the excavation (four samples). If two or more contiguous gridblocks are excavated then a sample will be taken from the center of each sidewall of each excavated gridblock.

Samples will be analyzed in the field for lead using XRF to provide immediate results for field decisions. If the XRF results for a sample location indicate that contaminated soil remains, in-situ XRF testing will be repeated at least twice at that specific sample location. Additional excavation can be performed if needed based on these results.

Soil sampling will be performed in accordance with FDEP SOPs (FDEP, 2002). The field staff will also provide detailed documentation of sampling activities, including field notes and photographs, for future reference by the Navy. The soil samples will be analyzed at a fixed-base laboratory for following suites of parameters:

- Target Analyte List (TAL) Metals plus Tin
- Target Compound List (TCL) Semivolatile Organic Compounds (SVOCs)

The samples taken from gridblocks 6, 7, 10, and 11 will also be analyzed at a fixed-base laboratory for TCL PCBs.

If a comparison of residential action levels to analytical results for a confirmation sample indicates that the contaminant removal is incomplete, additional samples will be taken to determine the extent of additional excavation. The additional samples would be taken from points located 5 feet on either side of the sample location that exceeds the action level. This process repeated until the "hot spots" requiring

removal have been defined. The radius of excavation around the contaminated sample points would be 5 feet. Excavation will be set at 2 feet bls.

3.2.3 Quality Control (QC) Samples

QC samples will be collected as specified in the FDEP SOP FQ1000 – Field Quality Control Requirements (FDEP, 2002) and the Tetra Tech Corporate QA Manual (TtNUS, 2002b). Duplicate samples will be collected at the rate of one per 10 samples. Matrix spike and matrix spike duplicate (MS/MSD) samples will be collected at the rate of one per 20 samples per matrix. Equipment blanks and field blanks will also be collected at a minimum of 5 percent of each reported test result/matrix combination.

3.3 SAMPLE IDENTIFICATION

Base and Site Designations

The base designation for Naval Air Station Key West is KW. The site designation for the water tower site is C03.

Soil Sample Identification

A sample tracking number will consist of a five- to six-segment, alphanumeric code that identifies the Site number, investigation phase, location, sample type, depth, month and year of sample event, and the Quality Control (QC) designation. The sample type and QC designations will only be used if applicable. Any other pertinent information regarding sample identification will be recorded in the field logbook.

The alphanumeric coding to be used in the sample system and examples of possible sample identification numbers follow:

ANN	-	Site Number
A	-	Investigation Phase
NN	-	Location
A	-	Sample Type
NN	-	Depth (if applicable)
NNNN	-	Month and Year
AAA	-	QC Designation (if applicable)

Character Type:

A = Alpha

N = Numeric

Investigation Phase:

D = Delineation

V = Confirmation

Sample Type:

C = Composite (if applicable)

Location:

Grid Cell Number (Figure 3-1)

Example 1: A composite delineation sample collected from grid cell number 1 at Site C03 at a depth of 0-2 feet, during the June 2004 sampling event would be called C03D-01-C-02-0604.

Example 2: The composite delineation sample, MS, and MSD collected from grid cell number 2 at Site C03 during the June 2004 sampling event would be called C03D-02-C-02-0604, C03D-02-C-02-0604MS, C03D-02-C-02-0604MSD.

Rinsate, and field blanks will be identified by base designation, type of blank, and the date of collection. For example, the fixed-base analytical rinseate blank collected on June 4, 2004 would be called KWRB060404.

TABLE 3-1

**PARAMETER GROUPS FOR SOIL ANALYSIS
TRUMAN ANNEX WATER TOWER SITE WORK PLAN
NAVAL AIR STATION
KEY WEST, FLORIDA**

Parameter	Number of Composite Samples
Soil (Delineation Samples)	
TAL Metals plus Tin	18
TCL SVOCs	18
TCL PCBs	5
Soil (Confirmation Samples)	
TAL Metals plus Tin	(a)
TCL SVOCs	(a)
TCL PCBs	(a)
Aqueous (Rinse Blank Samples)	
TAL Metals plus Tin	3
TCL SVOCs	3
TCL PCBs	3

(a) The number of confirmation samples will be determined in the field based on the size and shape of the excavated area.

TAL Metals plus Tin – Method SW-846 6010B
TCL SVOCs – Method SW-846 8270C
TCL PCBs – Method SW-846 8081A/8082

TABLE 3-2

METAL ACTION LEVELS
TRUMAN ANNEX WATER TOWER SITE WORK PLAN
NAVAL AIR STATION
KEY WEST, FLORIDA

Parameter	Chemical Abstract Service Number	Residential Action Level	Units
Aluminum	7429-90-5	72,000	mg/kg
Antimony	7440-36-0	26	mg/kg
Arsenic	7440-38-2	2.66	mg/kg
Barium	7440-39-3	110	mg/kg
Beryllium	7440-41-7	120	mg/kg
Cadmium	7440-43-9	75	mg/kg
Calcium	7440-70-2	0	mg/kg
Chromium	7440-47-3	210	mg/kg
Cobalt	7440-48-4	4,700	mg/kg
Copper	7440-50-8	110	mg/kg
Cyanide	57-12-5	30	mg/kg
Iron	7439-89-6	23,000	mg/kg
Lead	7439-92-1	400	mg/kg
Magnesium	7439-95-4	400	mg/kg
Manganese	7439-96-5	0	mg/kg
Mercury	7439-97-6	1,600	mg/kg
Nickel	7440-02-0	3.4	mg/kg
Potassium	7440-09-7	110	mg/kg
Selenium	7782-49-2	0	mg/kg
Silver	7440-22-4	390	mg/kg
Sodium	7440-23-5	390	mg/kg
Thallium	7440-28-0	0	mg/kg
Tin	7440-31-5	5.5	mg/kg
Vanadium	7440-62-2	44,000	mg/kg
Zinc	7440-66-6	15	mg/kg

TABLE 3-3

SVOC ACTION LEVELS
TRUMAN ANNEX WATER TOWER SITE WORK PLAN
NAVAL AIR STATION
KEY WEST, FLORIDA
PAGE 1 OF 2

Parameter	Chemical Abstract Service Number	Residential Action Level	Units
2,4,5-trichlorophenol	95-95-4	6,000,000	µg/kg
2,4,6-trichlorophenol	88-06-2	72,000	µg/kg
2,4-dichlorophenol	120-83-2	130,000	µg/kg
2,4-dimethylphenol	105-67-9	910,000	µg/kg
2,4-dinitrophenol	51-28-5	66,000	µg/kg
2,4-dinitrotoluene	121-14-2	1,300	µg/kg
2,6-dinitrotoluene	606-20-2	1,000	µg/kg
2-chlorophenol	95-57-8	82,000	µg/kg
2-methylnaphthalene	91-57-6	80,000	µg/kg
2-methylphenol	95-48-7	2,400,000	µg/kg
2-nitroaniline	88-74-4	5,700	µg/kg
2-nitrophenol	88-75-5	0	µg/kg
3,3'-dichlorobenzidine	91-94-1	2,100	µg/kg
3-nitroaniline	99-09-2	23,000	µg/kg
4-chloro-3-methylphenol	59-50-7	410,000	µg/kg
4-chloroaniline	106-47-8	190,000	µg/kg
4-methylphenol	106-44-5	250	µg/kg
4-nitroaniline	100-01-6	5,200	µg/kg
4-nitrophenol	100-02-7	390,000	µg/kg
Acenaphthene	83-32-9	1,900,000	µg/kg
Acenaphthylene	208-96-8	1,100,000	µg/kg
Anthracene	120-12-7	18,000,000	µg/kg
Benzo(a)anthracene	56-55-3	1,400	µg/kg
Benzo(a)pyrene	50-32-8	100	µg/kg
Benzo(b)fluoranthene	205-99-2	1,400	µg/kg
Benzo(g,h,i)perylene	191-24-2	2,300,000	µg/kg
Benzo(k)fluoranthene	207-08-9	15,000	µg/kg
Carbazole	86-74-8	53,000	µg/kg
Chrysene	218-01-9	140,000	µg/kg
Dibenzo(a,h)anthracene	53-70-3	100	µg/kg
Dibenzofuran	132-64-9	280,000	µg/kg
Fluoranthene	206-44-0	2,900,000	µg/kg
Fluorene	86-73-7	2,200,000	µg/kg
Hexachlorobenzene	118-74-1	500	µg/kg
Hexachlorobutadiene	87-68-3	6,300	µg/kg
Hexachlorocyclopentadiene	77-47-4	2,400	µg/kg
Hexachloroethane	67-72-1	34,000	µg/kg

TABLE 3-3

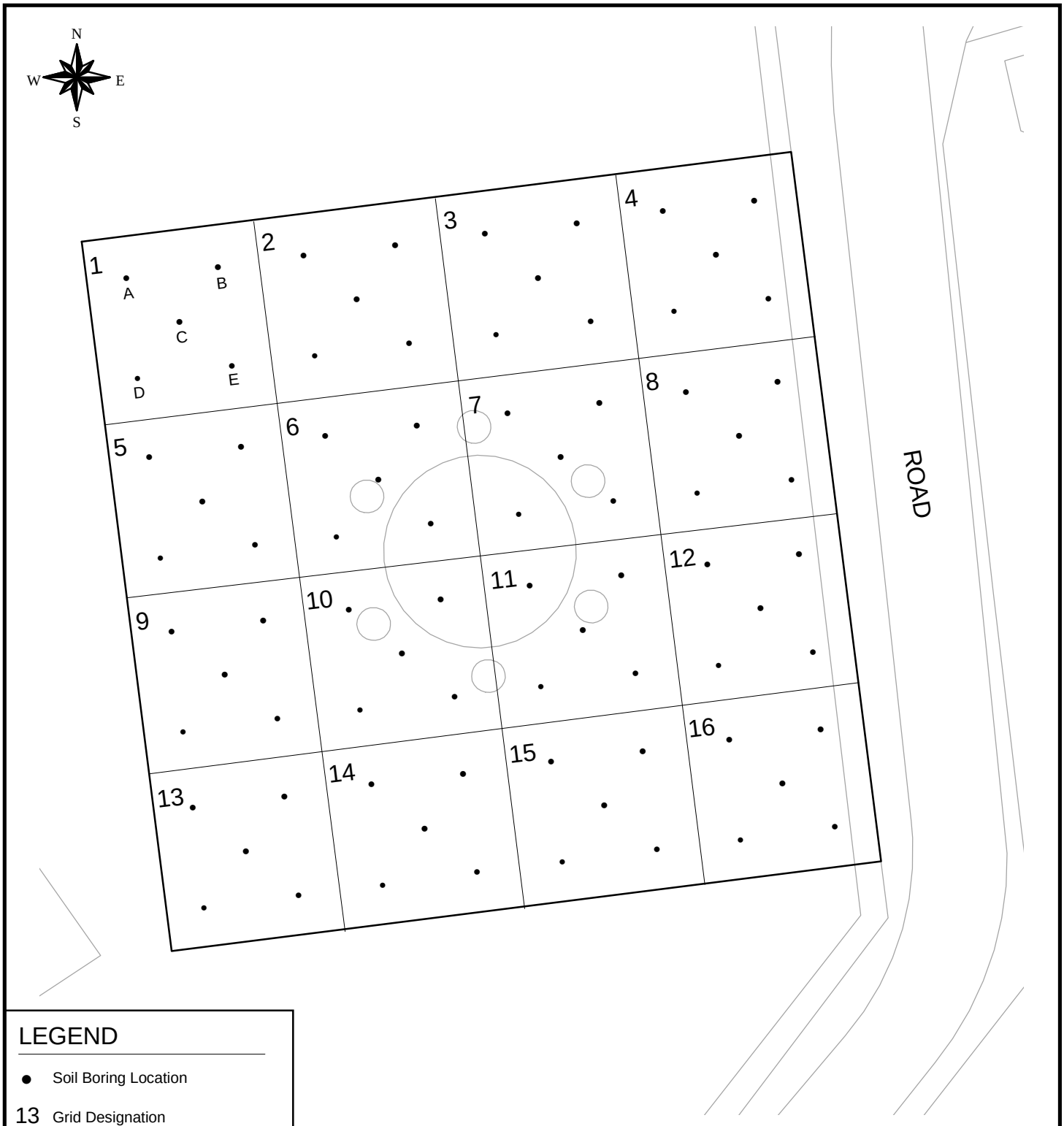
SVOC ACTION LEVELS
TRUMAN ANNEX WATER TOWER SITE WORK PLAN
NAVAL AIR STATION
KEY WEST, FLORIDA
PAGE 2 OF 2

Parameter	Chemical Abstract Service Number	Residential Action Level	Units
Indeno(1,2,3-cd)pyrene	193-39-5	1,500	µg/kg
Isophorone	78-59-1	340,000	µg/kg
Naphthalene	91-20-3	40,000	µg/kg
Nitrobenzene	98-95-3	14,000	µg/kg
n-nitroso-di-n-propylamine	621-64-7	90	µg/kg
n-nitrosodiphenylamine	86-30-6	170,000	µg/kg
Pentachlorophenol	87-86-5	7,700	µg/kg
Phenanthrene	85-01-8	2,000,000	µg/kg
Phenol	108-95-2	900,000	µg/kg
Pyrene	129-00-0	2,200,000	µg/kg

TABLE 3-4

PCB ACTION LEVELS
TRUMAN ANNEX WATER TOWER SITE WORK PLAN
NAVAL AIR STATION
KEY WEST, FLORIDA

Parameter	Chemical Abstract Service Number	Residential Action Level	Units
Aroclor-1016	12674-11-2	500	µg/kg
Aroclor-1221	11104-28-2	500	µg/kg
Aroclor-1232	11141-16-5	500	µg/kg
Aroclor-1242	53469-21-9	500	µg/kg
Aroclor-1248	12672-29-6	500	µg/kg
Aroclor-1254	11097-69-1	500	µg/kg
Aroclor-1260	11096-82-5	500	µg/kg



LEGEND

- ● Soil Boring Location
- 13 Grid Designation
- A Boring Designation (Typical)

10 0 10 20 30 Feet

NO.	DATE	REVISIONS

DRAWN BY EHM DATE 05/17/2004
CHECKED BY ACL DATE 05/18/2004
COST/SCHED-AREA
SCALE AS NOTED

WORK PLAN FOR DELINEATION
AND CONFIRMATION SAMPLING
PROPOSED DELINEATION SAMPLING LOCATIONS
TRUMAN ANNEX WATER TOWER SITE
NAVAL AIR STATION
KEY WEST, FLORIDA

CONTRACT NO. N0693
APPROVED BY CMB DATE 05/18/2004
APPROVED BY ____ DATE ____
FIGURE NO. 3-1
REV. 0

K:\WATER TOWER PROJECT.APR LAYOUT: WORK PLAN FIGURE 1-3 BY:EHM DATE: 05/17/2004

4.0 GEOPHYSICAL INVESTIGATION

Geophysical methods including ground penetrating radar (GPR) and electromagnetic (EM) equipment will be used to perform a survey of the Truman Annex Water Tower foundation and surrounding area (approximately 170-feet by 170-feet). The survey is intended to:

- Identify and mark the locations of the subsurface tower footing structures.
- Identify and mark any utilities in the area.

A Geonics EM61 High Sensitivity Metal Detector meter (EM61) will be used to investigate the presence of metallic objects including reinforcing bars/mesh in the tower footings, metallic utilities, and any other objects that may be in the area. GPR will be used to investigate the possible presence of non-metallic utilities.

4.1 EM61 HIGH SENSITIVITY METAL DETECTOR SURVEY

The EM61 is a high-sensitivity, high-resolution, time-domain metal detector that is used to detect both ferrous and non-ferrous metallic objects. It consists of a transmitter that generates a pulsed primary magnetic field, which induces eddy currents in nearby metallic objects. Two receiver coils measure the decay of these currents. By making the measurements at a relatively long time interval after the primary pulse is transmitted, the response is practically independent of the electrical conductivity of the ground.

The EM61 data will be collected along traverses oriented perpendicular and parallel to the sampling grid lines (Figure 3-1). For the traverses oriented roughly north-south, the line spacing will be 5 feet. For the traverses oriented roughly east-west, the line spacing will be 10 feet. The EM61 data will be interpreted in real-time and anomalies will be marked in the field with pin flags or paint.

4.2 GPR SURVEY

A GSSI SIR 3000 GPR device equipped with a 400 megahertz (MHz) transducer will be used to perform the investigation. GPR techniques are based upon the rapid and repetitive transmission of EM signals (pulses) generated from the device's transducer and propagated into the subsurface. The transmitted EM signal travels through the subsurface and is reflected at interfaces where contrasts in the electrical properties of the media are present. Interfaces where GPR reflections occur include changes in soil mineralogy, soil texture, moisture content, or the presence of a buried man-made feature such as a utility, pipe, or concrete structures. The device's transducer receives the reflected portion of the transmitted EM signal. The two-way travel time and reflected signal amplitude versus the horizontal distance the instrument has traveled are displayed on the output of the instrument.

The time it takes a GPR signal to travel from the transducer, reflect off of a target, and return to the transducer is called the two-way reflection time. Two-way reflection times are displayed in units of nanoseconds and vary depending on the electrical properties of the subsurface materials. GPR signals in clayey soils, fill, shale, or saline groundwater attenuate rapidly due to the high conductivity, limiting the depths of investigation. Conversely, the depth of investigation is often much greater in dry sandy soils relative to clayey soils.

GPR data will be collected along traverses oriented perpendicular and parallel to the sampling grid lines (Figure 3-1). For the traverses oriented roughly north-south, the line spacing will be 10 feet. For the traverses oriented roughly east-west, the line spacing will be 20 feet. The GPR data will be interpreted in real-time and anomalies will be marked in the field with pin flags or paint.

4.3 ANOMALY LOCATIONS

The locations of the anomalies marked in the field will be determined using a handheld global positioning system (GPS) device and indicated on a basemap of the area.

5.0 INVESTIGATION-DERIVED WASTE HANDLING

A small volume of Investigation-Derived Waste (IDW) is expected to be generated during field sampling due to the use of DPT and manual sampling techniques. Prior remediation activities have disturbed and homogenized the surface soil at the water tower site. Thus, any IDW that is generated will be placed back into the soil boring at each respective sampling location.

6.0 SURVEYING

Handheld global positioning system (GPS) or direct measurements will be used to locate all sample locations and geophysical anomalies. An X-Y-Z coordinate system will be used to identify locations. Each location will be measured from a reference point tied to the state plane system, where the X coordinate describes the east-west axis location (Easting) and the Y coordinate describes the north-south axis location (Northing). All locations will be reported using the Florida State Plane Coordinate System-Eastern Zone. Elevations and horizontal locations will be measured to the nearest tenth of a foot.

All excavations will be surveyed by a certified land surveyor. An X-Y-Z coordinate system will be used to identify locations. Each location will be measured from a reference point tied to the state plane system, where the X coordinate describes the east-west axis location (Easting) and the Y coordinate describes the north-south axis location (Northing). The vertical coordinates (Z coordinates) of each excavation will be surveyed in reference to the National Geodetic Vertical Datum. All surveyed locations will be reported using the Florida State Plane Coordinate System-Eastern Zone. Existing installation benchmarks will serve as the horizontal and vertical data for the survey. Elevations and horizontal locations will be measured to the nearest hundredth of a foot.

7.0 REPORTING

Results from this investigation will be presented in a Field Summary Report to the Navy. The report will document delineation sampling, soil removal, and confirmation sampling at the water tower site. Survey data for the excavated area will also be included in the report. The report will be submitted in final form to the Navy.

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