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FINAL REMEDIAL INVESTIGATION FEASIBILITY STUDY WORK PLAN APPENDIX M1 FOR OERABLE UNIT 3 (OU 3) NAS JACKSONVILLE FL
3/1/1995
ABB ENVIRONMENTAL

APPENDIX M 1
OF THE OPERABLE UNIT (OU) 3 REMEDIAL INVESTIGATION AND FEASIBILITY STUDY WORKPLAN

OU 3 QUALITY ASSURANCE PROJECT PLAN

FOR

NAVAL AIR STATION
JACKSONVILLE, FLORIDA

Prepared by:

ABB Environmental Services, Inc.
2120 Washington Boulevard, Suite 300
Arlington, Virginia 22204

Prepared for:

Department of the Navy, Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive
North Charleston, South Carolina 29418

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TABLE OF CONTENTS

Operable Unit 3 Quality Assurance Project Plan
NAS Jacksonville
Jacksonville, Florida

TABLE OF CONTENTS (Continued)

Operable Unit 3 Quality Assurance Project Plan
NAS Jacksonville
Jacksonville, Florida

LIST OF FIGURES

Operable Unit 3 Quality Assurance Project Plan
NAS Jacksonville
Jacksonville, Florida

LIST OF TABLES

GLOSSARY

ABB-ES	ABB Environmental Services, Inc.
CFR	Code of Federal Regulations
DQCR	Daily Quality Control Report
FDEP	Florida Department of Environmental Protection
FFA	Federal Facility Agreement
FOL	field operations leader
FS	Feasibility Study
FSP	Field Sampling Plan
$m\ell$	milliliters
NAS	Naval Air Station
NEESA	Naval Energy and Environmental Support Activity
OU	Operable Unit
QAP	Quality Assurance Plan
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
RI	Remedial Investigation
SOP	Standard Operating Procedure
USDOT	U.S. Department of Transportation
USEPA	U.S. Environmental Protection Agency
VOC	volatile organic compound

1.0 INTRODUCTION

In accordance with the Federal Facility Agreement (FFA), the Navy through the Southern Division of the Naval Facilities Engineering Command, has agreed to prepare and implement a Remedial Investigation and Feasibility Study (RI/FS) workplan for potential sources of contamination (PSC) at the Naval Air Station (NAS) in Jacksonville, Florida. Operable Unit (OU) 3 will be investigated during the RI/FS implementation process.

1.1 PROJECT BACKGROUND. The purpose of the RI/FS is to: (1) establish the presence of constituents of concern; (2) determine the areal and vertical distribution of constituents of concern in the soil, sediment, surface water, and groundwater; (3) evaluate the potential for migration of constituents of concern to surrounding environments; (4) assess the risks to human health and the environment of constituents detected at OU 3; (5) establish remedial action objectives; and (6) identify potential alternatives to meet the remedial action objectives.

To accomplish these objectives, the Navy will be required to conduct several data collection tasks, which include drilling soil borings, installing monitoring wells, determining the elevation of groundwater, and collecting environmental samples of soil and groundwater for chemical and physical parameter analyses.

To ensure the quality of the field and laboratory data produced during the implementation of the RI/FS at OU 3, an OU 3 Quality Assurance Project Plan (QAPP) has been prepared. The QAPP has been prepared according to the guidelines set forth by the U.S. Environmental Protection Agency (USEPA) in *Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans* (QAMS-005/80) and by the Navy in *Sampling and Chemical Analysis Quality Assurance Requirements for the Navy Installation Restoration Program* (Naval Energy and Environmental Support Activity [NEESA] 20.2-047B). This QAPP follows the format of the OU 1 QAPP (Geraghty & Miller, Inc., 1991) and the Quality Assurance Program Plan included as Appendix 4.4.1 of the Basic Site Workplan (Volume 4). When possible, sections of the OU 1 QAPP have been incorporated verbatim and sections of the Basic Site Workplan QAPP have been incorporated by reference into this OU 3 QAPP. The OU 3 QAPP and Quality Assurance Program Plan will be available to the field and laboratory personnel to provide guidance concerning methodologies of data collection, proper recordkeeping protocols, data quality objectives, and procedures for data review.

1.2 SITE BACKGROUND. The site background is described in Chapter 2.0 of the OU 3 RI/FS workplan.

1.3 FIELD QUALITY CONTROL AND QUALITY ASSURANCE SAMPLING. Quality assurance information related to specific sample handling and analytical procedures is presented in Attachments A, B, and C of the Sampling and Analysis Plan (Appendix 4.4.1, Book 2 of Volume 4 of the Naval Installation Restoration Program Plan for Naval Air Station Jacksonville, Geraghty & Miller, 1991).

During implementation of the field sampling program described in the Field Sampling Plan (FSP) of the OU 3 RI/FS workplan (Appendix M 2), field quality control and field quality assurance samples will be collected to assess the reproducibility of the field collection techniques, the quality of preservation reagents and sample bottles, and the adequacy of field decontamination procedures.

__1.4 DATA ANALYsis AND REPORT PREPARATION__. After the completion of each sampling and analytical program, the analytical data will be reviewed and laboratory results will be validated. The data will be classified for usability as described in Chapter 9.0 of the QAPP (Appendix 4.4.1, Volume 4) and summarized in appropriate tables, charts, and figures in accordance with data management procedures described in Volume 1 of the Naval Installation Restoration Program Plan, Organization and Planning. Reporting will be in accordance with Appendix 4.3, Final Product/Report Quality Assurance Quality Control (QA/QC) Plan, in the Basic Site Workplan, Volume 4.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITY

The overall project organization and the responsibilities associated with the job functions required to implement the OU 3 RI/FS workplan are described in Chapter 9.0 of the OU 3 RI/FS workplan. The primary and secondary analytical laboratories are defined in Chapter 2.0 of the Basic Sampling and Analysis Plan QAPP (Appendix 4.4.1 of Volume 4).

3.0 QUALITY ASSURANCE OBJECTIVES

The quality assurance objectives that will apply to data generated during this investigation are presented in Tables 3-1, 3-2, and 3-3.

Table 3-1
Analytical Methods and Data Precision, Accuracy, and Completeness Objectives for the Remedial Investigation

Operable Unit 3 Quality Assurance Project Plan
NAS Jacksonville
Jacksonville, Florida

		Method	Precision[1]	Accuracy[1]	Completeness	Practical Quantitation Limit
Parameter	Matrix	Analysis	Percent RPD of Duplicate[2]	Spike Percent Recovery Range[3]	Percent	Water = µg/ℓ[4] Soil = mg/kg4[4]
Metals						
Aluminum	Water	200.7 CLP-M	0-20	75-125	96	50
	Soil/Sediment	200.7 CLP-M	0-35	75-125	96	5
Antimony	Water	200.7 CLP-M	0-20	75-125	96	50
	Soil/Sediment	200.7 CLP-M	0-30	75-125	96	5
Arsenic	Water	206.2 CLP-M	0-20	75-125	96	10
	Soil/Sediment	206.2 CLP-M	0-30	75-125	96	1
Barium	Water	200.7 CLP-M	0-20	75-125	96	10
	Soil/Sediment	200.7 CLP-M	0-30	75-125	96	1
Beryllium	Water	200.7 CLP-M	0-20	75-125	96	5
	Soil/Sediment	200.7 CLP-M	0-30	75-125	96	0.5
Cadmium	Ground Water	200.7 CLP-M	0-20	75-125	96	5
	Surface Water	213.2 CLP-M	0-20	75-125	96	1
Calcium	Water	200.7 CLP-M	0-20	75-125	96	10
	Soil/Sediment	200.7 CLP-M	0-35	75-125	96	5
Chromium	Water	200.7 CLP-M	0-20	75-125	96	10
	Soil/Sediment	200.7 CLP-M	0-30	75-125	96	1
Cobalt	Water	200.7 CLP-M	0-20	75-125	96	10
	Soil/Sediment	200.7 CLP-M	0-35	75-125	96	5
Copper	Water	200.7 CLP-M	0-20	75-125	96	25
	Soil/Sediment	200.7 CLP-M	0-30	75-125	96	2.5
Iron	Water	200.7 CLP-M	0-20	75-125	96	10
	Soil/Sediment	200.7 CLP-M	0-35	75-125	96	5
Lead	Water	239.2 CLP-M	0-20	75-125	96	5
	Soil/Sediment	239.2 CLP-M	0-30	75-125	96	0.5
Magnesium	Water	200.7 CLP-M	0-20	75-125	96	50
	Soil/Sediment	200.7 CLP-M	0-35	75-125	96	5
Manganese	Water	200.7 CLP-M	0-20	75-125	96	10
	Soil/Sediment	200.7 CLP-M	0-35	75-125	96	5
Mercury	Water (all)	245.1 CLP-M	0-20	75-125	96	0.2
	Soil/Sediment	245.5 CLP-M	0-30	75-125	96	0.03
Nickel	Water	200.7 CLP-M	0-20	75-125	96	40
	Soil/Sediment	200.7 CLP-M	0-30	75-125	96	4
Potassium	Water	200.7 CLP-M	0-20	75-125	96	Dependent on
	Soil/Sediment	200.7 CLP-M	0-35	75-125	96	ICP conditions

See notes at end of table.

Table 3-1 (Continued)
Analytical Methods and Data Precision, Accuracy, and Completeness Objectives for the Remedial Investigation

Operable Unit 3 Quality Assurance Project Plan
NAS Jacksonville
Jacksonville, Florida

Parameter	Matrix	Method Analysis	Precision[1] Percent RPD of Duplicate[2]	Accuracy[1] Spike Percent Recovery Range[3]	Completeness Percent	Practical Quantitation Limit Water = µg/ℓ[4] Soil = mg/kg4[4]
Metals (continued)						
Selenium	Water	270.2 CLP-M	0-20	75-125	96	5
	Soil/Sediment	270.2 CLP-M	0-30	75-125	96	1
Silver	Ground Water	200.7 CLP-M	0-20	75-125	96	10
	Surface Water	272.2 CLP-M	0-20	75-125	96	1
	Soil/Sediment	200.7 CLP-M	0-30	75-125	96	1
Sodium	Water	200.7 CLP-M	0-20	75-125	96	50
	Soil/Sediment	200.7 CLP-M	0-35	75-125	96	5
Thallium	Water	279.2 CLP-M	0-20	75-125	96	10
	Soil/Sediment	279.2 CLP-M	0-30	75-125	96	1
Vanadium	Water	200.7 CLP-M	0-20	75-125	96	10
	Soil/Sediment	200.7 CLP-M	0-35	75-125	96	5
Zinc	Water	200.7 CLP-M	0-20	75-125	96	20
	Soil/Sediment	200.7 CLP-M	0-30	75-125	96	2
Other						
Cyanide	Water	335.2 CLP-M	0-20	75-125	96	10
	Soil/Sediment	335.2 CLP-M	0-35	75-125	96	5
Radiological						
Water	See Table 3-2	See Table 3-2	See Table 3-2	See Table 3-2	See Table 3-2	
	Soil/Sediment	See Table 3-2	See Table 3-2	See Table 3-2	See Table 3-2	See Table 3-2
Organics						
Volatiles	Water	624 CLP-M	See Table 3-2	See Table 3-2	See Table 3-2	See Table 3-2
	Soil/Sediment	624 CLP-M	See Table 3-2	See Table 3-2	See Table 3-2	See Table 3-2
Base-Neutral	Water	625 CLP-M	See Table 3-2	See Table 3-2	See Table 3-2	See Table 3-2
Acid Extractables	Soil/Sediment	625 CLP-M	See Table 3-2	See Table 3-2	See Table 3-2	See Table 3-2
PCBs	Water	608 CLP-M	See Table 3-2	See Table 3-2	See Table 3-2	See Table 3-2
PCBs	Soil/Sediment	608 CLP-M	See Table 3-2	See Table 3-2	See Table 3-2	See Table 3-2
Dioxin	Soil	8280	See Table 3-2	See Table 3-2	See Table 3-2	See Table 3-2

[1] Precision and accuracy where applicable will be evaluated according to procedures in U.S. Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes. EPA-600/4-79-020, revised March 1983, and in the USEPA Control Laboratory Program (CLP) statement of work (SOW) (most current version).

[2] RPD = [(S-D)/(S+D)/2] x 100 for samples > 5 times RDL.
RPD not calculated (NC), result < DL.
For results < 5x DL, values must agree within ± DL as specified by EPA-CLP.
Inorganics, SOW (most current version).

[3] %Relative standard deviation.

[4] Detection limit will vary depending on matrix differences that result in sample dilution and for soils, detection limit will also vary depending on moisture content of sample if results are reported as dry weight.

Notes: RPD = relative percent difference.
µg/ℓ = micrograms per liter.
mg/kg = milligrams per kilogram.

Table 3-2
Practical Quantitation Limits, Accuracy, Precision, and Completeness Objectives of Organics Analyses for the Remedial Investigation

Operable Unit 3 Quality Assurance Project Plan
NAS Jacksonville
Jacksonville, Florida

Parameters	Precision[1] Percent RPD of Duplicates Water	Precision[1] Percent RPD of Duplicates Soils	Accuracy[1,2] Spike Percent Recovery Water	Accuracy[1,2] Spike Percent Recovery Soils	Completeness Percent	Practical Quantitation Limit[3] Water (µg/ℓ)	Practical Quantitation Limit[3] Soils (µg/kg)
Volatile Organics (TCL 624 CLP-M)							
Acetone	0-40	0-47	47-143	32-163	96	25	25
Benzene	0-11	0-21	76-127	66-142	96	5	5
Bromodichloromethane	0-40	0-42	35-155	37-160	96	5	5
Bromoform	0-40	0-33	46-169	48-152	96	5	5
Bromomethane	0-65	0-61	10-170	10-160	96	10	10
2-Butanone	0-40	0-38	46-153	37-161	96	10	10
Carbon disulfide	0-40	0-40	53-148	43-169	96	5	5
Carbon tetrachloride	0-40	0-36	71-140	67-138	96	5	5
Chlorobenzene	0-13	0-21	75-130	60-133	96	5	5
Chloroethane	0-80	0-72	10-160	12-147	96	10	10
2-Chloroethylvinyl ether	0-94	0-83	10-199	10-184	96	10	10
Chloroform	0-40	0-43	60-140	51-139	96	5	5
Chloromethane	0-60	0-87	10-140	10-130	96	10	10
Dibromochloromethane	0-40	0-49	56-142	53-140	96	5	5
1,1-Dichloroethane	0-43	0-38	10-169	58-161	96	5	5
1,2-Dichloroethane	0-40	0-37	56-146	47-143	96	5	5
1,1-Dichloroethene	0-14	0-22	61-145	59-172	96	5	5
trans-1,2-Dichloroethene	0-40	0-40	56-146	56-146	96	5	5
1,2-Dichloropropane	0-55	0-46	10-162	10-178	96	5	5
cis-1,3-Dichloropropene	0-62	0-53	10-162	10-163	96	5	5
trans-1,3-Dichloropropene	0-45	0-49	26-160	21-139	96	5	5
2-Hexanone	0-40	0-38	49-151	47-153	96	10	10
Ethylbenzene	0-40	0-40	38-152	27-161	96	5	5
4-Methyl-2-pentanone	0-40	0-49	46-152	40-163	96	10	10
Methylene chloride	0-40	0-39	41-177	40-162	96	5	5
Styrene	0-42	0-40	34-176	37-163	96	5	5
1,1,2,2-Tetrachloroethane	0-40	0-38	54-142	47-138	96	5	5
Tetrachloroethene	0-40	0-29	70-140	52-139	96	5	5
Toluene	0-13	0-21	76-125	59-139	96	5	5
1,1,1-Trichloroethane	0-40	0-28	55-150	42-147	96	5	5
1,1,2-Trichloroethane	0-40	0-34	53-152	41-183	96	5	5
Trichloroethene	0-14	0-24	71-120	62-137	96	5	5
Vinyl Acetate	0-50	0-54	39-151	36-173	96	10	10
Vinyl Chloride	0-87	0-69	10-181	10-168	96	10	10
Xylenes (Total)	0-40	0-39	50-150	38-137	96	5	5
Miscellaneous Volatile Organics (624 CLP-M)							
n-Butyl acetate	0-40	0-50	50-140	40-160	96	50	50
Ethyl acetate	0-40	0-50	40-150	35-170	96	50	50

See notes at end of table.

Table 3-2 (Continued)
Practical Quantitation Limits, Accuracy, Precision, and Completeness Objectives of Organics Analyses for the Remedial Investigation

Operable Unit 3 Quality Assurance Project Plan
NAS Jacksonville
Jacksonville, Florida

Parameters	Precision[1] Percent RPD of Duplicates Water	Precision[1] Percent RPD of Duplicates Soils	Accuracy[1,2] Spike Percent Recovery Water	Accuracy[1,2] Spike Percent Recovery Soils	Completeness Percent	Practical Quantitation Limit[3] Water (μg/ℓ)	Practical Quantitation Limit[3] Soils (μg/kg)
Base-Neutral Extractables (TCL) (625 CLP-M)							
Acenaphthene	0-31	0-19	46-118	31-137	96	10	330
Acenaphthylene	0-40	0-40	36-140	36-140	96	10	330
Anthracene	0-40	0-25	40-140	40-125	96	10	330
Benzo(a)anthracene	0-40	0-32	29-140	29-112	96	10	330
Benzo(b)fluoranthene	0-40	0-40	20-140	20-118	96	10	330
Benzo(k)fluoranthene	0-42	0-42	25-140	25-130	96	10	330
Benzo(g,h,i)perylene	0-56	0-56	10-140	10-102	96	10	330
Benzo(a)pyrene	0-40	0-38	25-160	25-160	96	10	330
Benzyl Alcohol	0-50	0-50	15-140	15-112	96	10	330
Butyl benzyl phthalate	0-40	0-20	10-140	10-118	96	10	330
Bis(2-chloroethoxy)methane	0-43	0-43	36-160	36-160	96	10	330
Bis(2-chloroethyl)ether	0-40	0-33	34-168	34-168	96	10	330
Bis(2-chloroisopropyl)ether	0-46	0-46	14-153	14-153	96	10	330
Bis(2-ethylhexyl)phthalate	0-40	0-40	10-153	10-153	96	10	330
4-Bromophenyl phenyl ether	0-40	0-23	53-140	53-126	96	10	330
4-Chloroaniline	0-50	0-50	10-150	10-150	96	10	330
2-Chloronaphthalene	0-40	0-20	60-140	66-118	96	10	330
4-Chlorophenyl phenyl ether	0-33	0-33	25-158	25-158	96	10	330
Chrysene	0-48	0-48	17-168	17-168	96	10	330
Dibenz(a,h)anthracene	0-70	0-70	10-227	10-227	96	10	330
Dibenzofuran	0-40	0-25	25-140	25-120	96	10	330
Di-n-butyl phthalate	0-50	0-50	10-140	10-120	96	10	330
1,2-Dichlorobenzene	0-40	0-31	32-140	32-129	96	10	330
1,3-Dichlorobenzene	0-41	0-41	25-140	25-115	96	10	330
1,4-Dichlorobenzene	0-28	0-27	36-97	28-104	96	10	330
3,3-Dichlorobenzidine	0-80	0-80	10-260	10-260	96	20	670
Diethylphthalate	0-40	0-30	10-140	10-114	96	10	330
Dimethylphthalate	0-40	0-27	10-140	10-112	96	10	330
2,4-Dinitrotoluene	0-38	0-47	24-96	28-89	96	10	330
2,6-Dinitrotoluene	0-40	0-29	50-158	50-158	96	10	330
Di-n-octylphthalate	0-50	0-50	10-150	10-150	96	10	330
Fluoranthene	0-40	0-33	26-140	26-137	96	10	330
Fluorene	0-40	0-21	59-140	59-121	96	10	330
Hexachlorobenzene	0-40	0-25	10-152	10-152	96	10	330
Hexachlorobutadiene	0-40	0-26	24-140	24-116	96	10	330
Hexachlorocyclopentadiene	0-50	0-50	10-150	10-150	96	10	330
Hexachloroethane	0-40	0-25	40-140	40-113	96	10	330
Indeno(1,2,3-cd)pyrene	0-45	0-45	10-171	10-171	96	10	330
Isophorone	0-60	0-60	21-196	21-196	96	10	330
2-Methylnaphthalene	0-40	0-30	35-140	35-125	96	10	330

See notes at end of the table.

Table 3-2 (Continued)
Practical Quantitation Limits, Accuracy, Precision, and Completeness Objectives of Organics Analyses for the Remedial Investigation

Operable Unit 3 Quality Assurance Project Plan
NAS Jacksonville
Jacksonville, Florida

Parameters	Precision[1] Percent RPD of Duplicates Water	Precision[1] Percent RPD of Duplicates Soils	Accuracy[1,2] Spike Percent Recovery Water	Accuracy[1,2] Spike Percent Recovery Soils	Completeness Percent	Practical Quantitation Limit[3] Water (μg/ℓ)	Practical Quantitation Limit[3] Soils (μg/kg)
Base-Neutral Extractables (TCL) (625 CLP-M) (continued)							
Naphthalene	0-40	0-32	39-140	39-127	96	10	330
2-Nitroaniline	0-50	0-50	10-150	10-150	96	50	1,700
3-Nitroaniline	0-50	0-50	10-150	10-150	96	50	1,700
4-Nitroaniline	0-50	0-50	10-150	10-150	96	50	1,700
Nitrobenzene	0-40	0-39	35-180	35-180	96	10	330
N-Nitrosodi-n-propylamine	0-50	0-38	10-150	41-126	96	10	330
N-Nitroso-diphenylamine	0-50	0-50	10-150	10-150	96	10	330
Phenanthrene	0-40	0-21	54-140	54-120	96	10	330
Pyrene	0-31	0-36	26-127	35-142	96	10	330
1,2,4-Trichlorobenzene	0-28	0.23	39-98	38-107	96	10	330
Acid Extractables (TCL) (625 CLP-M)							
Benzoic acid	0-50	0-50	10-150	10-150	96	50	1,700
4-Chloro-3-methylphenol	0-42	0-33	23-97	26-103	96	10	330
2-Chlorophenol	0-40	0-50	27-123	25-102	96	10	330
2,4-Dichlorophenol	0-40	0-26	39-140	39-135	96	10	330
2,4-Dimethylphenol	0-40	0-26	32-140	32-119	96	10	330
2,4-Dinitrophenol	0-49	0-49	24-140	24-96	96	50	1,700
4,6-Dinitro-2-methylphenol	0-93	0-93	10-181	10-181	96	50	1,700
2-Methylphenol	0-50	0-50	10-150	10-150	96	10	330
4-Methylphenol	0-50	0-50	10-150	10-150	96	10	330
4-Nitrophenol	0-50	0-50	10-80	11-114	96	50	1,700
2-Nitrophenol	0-40	0-35	29-182	29-182	96	10	330
Pentachlorophenol	0-50	0-47	9-103	17-109	96	50	1,700
Phenol	0-42	0-35	12-89	26-90	96	10	330
2,4,5-Trichlorophenol	0-40	0-35	25-137	25-137	96	10	330
2,4,6-Trichlorophenol	0-40	0-32	37-144	37-144	96	10	330
PCBs (608 CLP-M)							
PCB-1016	0-40	0-50	50-120	50-130	96	0.5	80
PCB-1221	0-40	0-50	50-120	50-130	96	0.5	80
PCB-1232	0-40	0-50	50-120	50-130	96	0.5	80
PCB-1242	0-40	0-50	50-120	50-130	96	0.5	80
PCB-1248	0-40	0-50	50-120	50-130	96	0.5	80
PCB-1254	0-40	0-50	50-120	50-130	96	0.5	80
PCB-1260	0-40	0-50	50-120	50-130	96	0.5	80

See notes at end of table.

Table 3-2 (Continued)
Practical Quantitation Limits, Accuracy, Precision, and Completeness Objectives of Organics Analyses for the Remedial Investigation

Operable Unit 3 Quality Assurance Project Plan
NAS Jacksonville
Jacksonville, Florida

	Precision[1]		Accuracy[1,2]		Completeness	Practical Quantitation Limit[3]	
	Percent RPD of Duplicates		Spike Percent Recovery				
Polychlorinated Dibenzo-P-Dioxins and Polychlorinated Dibenzofurans-8280							
1 2,3,7,8-Tetrachlorodibenzo-P-Dioxin (2,3,7,8-TCDD)	0-50	0-50	60-140	60-140	80	0.01	1
2 Polychlorinated Dibenzofurans (PCDFs)	0-50	0-50	60-140	60-140	80	0.01	1
3 Polychlorinated Dibenzo-P-Dioxins (PCDDs)	0-50	0-50	60-140	60-140	80	0.01	1
Radiological Parameters							
Gross alpha	0-17	0-17	77-111	77-111	95	0.1 pCi/ℓ	0.5 pCi/kg
Gross beta	0-24	0-24	73-121	73-121	95	0.3 pCi/ℓ	0.5 pCi/kg
Radium-226	0-40	0-40	55-135	55-135	95	0.5 pCi/ℓ	0.5 pCi/kg
Radium-228	0-23	0-23	76-122	76-122	95	0.5 pCi/ℓ	0.5 pCi/kg

[1] As applied to project methods specified in Table 3-1.
[2] As determined from spiking actual sample matrix, these objectives are very near to those specified by U. S. Environmental Protection Agency (USEPA) in SW-846, 3rd Edition, September 1986.
[3] Practical quantitation limits will vary depending on matrix differences that result in sample dilution and for soils, practical quantitation limit will also very depending on moisture content of sample if results are reported as dry weight. Instrument detection limits are approximately 10 times less than the practical quantitation limits. Any compound detected between the detection limit and practical quantitation limit will be reported and qualified as estimated (J flag).

Notes: RPD = relative percent difference.
μg/ℓ = micrograms per liter.
μg/kg = micrograms per kilogram.
TCL = target compound list.
CLP = Contract Laboratory Program.
PCB = polychlorinated biphenyl.
pCi/ℓ = picocuries per liter.
pCi/kg = picocuries per kilogram.

Table 3-3
Quality Assurance (QA) Frequency and Objectives for Field Measurements

Operable Unit 3 Quality Assurance Project Plan
NAS Jacksonville
Jacksonville, Florida

Parameter	Analyses[1] Method	Precision	Accuracy (recovery)	Completeness (percent
pH	150.1	0.05 units	±0.2 units	95
Conductivity (K)	120.1	+/-10%	±2%	95
Temperature (T)	170.1 2550B[2]	0.1 °C 0.1 °C	±0.2 °C ±0.5 °C	95 95
Dissolved oxygen	360.1	0.1 mg/ℓ	±1%	95
Salinity	2520B[2]	+/-10%[3]	±6.5%	95
Volatile organic compounds (VOCs) in soil gas	[4]	30% RPD	±30%	95

QA Sample Frequency Analysis	Initial Calibration	Calibration Check	Matrix Reagent Blank	Matrix Spike (percent)	Spike Duplicate (percent)
pH, K, T, DO, Salinity	Daily	Every 4 hours	--	--	--
VOCs	Weekly[5]	Daily	Daily	5	5

Parameter	Reagent Water Spike	Reagent Water Spike Duplicate	Sample Duplicate
pH, K, DO, Salinity	--	--	Daily
VOCs	Not applicable	Not applicable	5

[1] Methods for Chemical Analysis of Water and Wastes, EPA 600/4-79-200, revised March 1983.
[2] Standard Methods for the Examination of Water and Wastewater, 17th Edition.
[3] For salinity measurement between 0 and 20 parts per thousand.
[4] Soil gas samples will be analyzed using a Photovac 10S50 Gas chromatograph equipped with a photoionization detector.
[5] An initial calibration will be run at the beginning of each week. If the continuing calibration check sample exceeds ±25% of the expected value, a new initial calibration is performed.

Notes: % = percent.
°C = degrees Celsius.
mg/ℓ milligrams per liter.
RPD = relative percent difference.

4.0 SAMPLING PROCEDURES

The sampling equipment, sampling procedures, general equipment decontamination, and recordkeeping procedures that will be used during this investigation are described in the FSP Chapter 3.0 (Appendix M 2) of the OU 3 RI/FS workplan.

4.1 SAMPLE CONTAINERS. Sample containers used for the collection of all samples will be new containers that have been prepared according to the procedures specified in the analytical methods.

Table 4-1 summarizes, in general, the sample containers, handling, and preservation procedures required for each type of sample or parameter. Actual container sizes will be specified by the laboratory. Sample containers will be kept closed until use.

4.2 SAMPLE LABELS AND SAMPLING LOGS. Samples collected for chemical analysis will be labeled prior to sample collection. At a minimum, the sample label will include the sample identification number, the date and time of collection, the sample matrix, the analyses requested, the preservatives used, and the initials of the person collecting the sample. The sample identification system for the OU 3 RI is detailed in Subsection 3.1.2.1 of the FSP. Sample collection data, including information contained on the labels, will be recorded in the bound field log book as the samples are collected. All recorded entries will be made in indelible ink. No erasures will be made. If an error is made, a correction will be made by drawing one line through the error, initialing the error, and starting a new entry on the next line. Sample containers will be placed on ice in coolers immediately after sampling.

A soil and sediment sampling log as described in the FSP will be completed for the collection of every soil, sediment, and solid waste sample. A water sampling log will be completed during the collection of groundwater and surface water samples. These logs will be completed as samples are collected. Field QC samples will be clearly identified on the appropriate field sampling log and in the field log book. Specifics regarding sample documentation are presented in Subsection 3.1.1 of the FSP.

Further details regarding sampling procedures can be found in the Basic Sampling and Analysis Plan (Appendix 4.4.1 of Volume 4) and the FSP Appendix M 2 of this workplan.

Table 4-1
Sample Container, Preservative and Holding Time Specifications

Operable Unit 3 Quality Assurance Project Plan
NAS Jacksonville
Jacksonville, Florida

Parameter	Container	Sample Preservative	Holding Time
Groundwater and Surface Water			
Volatile organics	Three 40-mℓ glass VOC vials, no headspace	1:1 HCl to pH <2, cool to 4 °C	14 days
Base, Neutral, and Acid Extractables	Two 1-liter amber glass bottles	Cool to 4 °C	Extract in 7 days, analyze within 40 days of extraction.
PCBs	Two 1-liter amber glass bottles	Cool to 4 °C	Extract in 7 days, analyze within 40 days of extraction.
Dioxin	2-liter amber glass bottle	Cool to 4 °C	Extract in 7 days, analyze within 40 days of extraction.
Metals	1-liter poly-ethylene bottle	HNO_3 to pH <2	6 months, mercury 28 days.
Cyanide	500 mℓ poly-ethylene bottle	NaOH pH >12, cool to 4 °C	14 days
Radiochemistry	1-gallon container	HNO_3 to pH <2	6 months
Soils and Sediment			
Volatile organics	8-ounce glass	None	14 days
Base, neutral, and acid extractables and PCBs	8-ounce glass	None	Extract in 7 days, analyze within 40 days of extraction.
Dioxin	8-ounce glass	None	Extract in 7 days, analyze within 40 days of extraction.
Metals and cyanide	8-ounce glass	None	6 months, mercury 28 days.
Radiochemistry	8-ounce glass	None	6 months

Notes: mℓ = milliliter.
°C = degrees Celsius.
HCl = hydrochloric acid.
HNO_3 = nitrate acid.
mℓ = milliliter.
PCB = polychlorinated biphenyl.

5.0 SAMPLE CUSTODY

Sample custody is a vital aspect of remedial investigations as the generated data could be required for use as evidence in a court of law. The samples must be traceable from the time of sample collection until the time the data are introduced as evidence in enforcement proceedings.

5.1 FIELD RECORD LOG BOOK. The key aspect of documenting sample custody is through recordkeeping. Bound field log books with sequentially numbered pages will be maintained during the duration of the field work to document the collection of each sample. In addition, logs for sample and core (geologic logs), monitoring well completion, and soil, sediment, and water sampling will be completed for each well drilled and each sample collected. Loose-leaf log sheets will be arranged in sequential order and bound together upon completion of each sampling event. Logs and documentation will be completed in indelible ink, dated, and signed by the field person conducting the work. Details of field documentation are presented in Subsection 3.1.1 of the FSP.

5.2 SAMPLE LABELING. Sample containers will be labeled at the time of sampling with the information specified in Section 4.2. At the time of sampling the identification number assigned to each sample will be recorded on the appropriate sample log or similar form (see Figures 4-2, 4-3, and 4-4 of the QAPP, Appendix 4.4.1). After each bottle is filled and before it is placed in the cooler for temporary storage, the sampling personnel will initial the label to document proper sample handling. The sample numbering system incorporates identifiers for the Operable Unit, sample matrix, and the sample location and is described in Subsection 3.1.2.1 of the FSP.

5.3 SAMPLE CONTAINER CUSTODY. The sample containers provided by the subcontracted laboratories for this project will be prepared in accordance with each analytical method. The containers will be shipped from the laboratory to the site by common carrier in sealed cartons or coolers that have been sealed for shipment. The laboratory will include a shipping form listing containers shipped and the purpose of each container. This list will become part of the chain-of-custody record.

5.4 SAMPLE CUSTODY, SHIPMENT, AND LABORATORY RECEIPT. Samples are considered "in custody" if one of the following conditions are not violated:

1. the responsible person maintains possession;

2. after the samples are received, they remain in the view of, or in the physical possession of, responsible persons;

3. samples are maintained in sealed or locked containers so that no unauthorized person can tamper with them; or

4. samples are maintained in a secured area, restricted from unauthorized personnel.

The field samples will be handled according to two classifications: field measurements and offsite laboratory analyses.

5.4.1 Field Measurements Field measurements are made immediately after the sample has been collected. The data will be recorded directly in bound field logbooks along with identifying information on sampling conditions and location. Field measurements will include, but are not limited to, the following: pH, temperature, conductivity, and turbidity.

5.4.2 Laboratory Measurements These measurements refer to samples collected and preserved in the field and shipped to the appropriate offsite laboratory for chemical analyses. Identifying information on sampling conditions and location will be recorded as indicated in Section 5.1 of this QAPP, together with a record of the required analyses for each of the samples collected.

Sample custody will be maintained by ABB-ES personnel. At the end of each sampling day and prior to the transfer of the samples offsite, chain-of-custody entries will be made for the samples using the standard chain-of-custody form. The information on the chain-of-custody form and the sample container labels will be checked on the sample field log entries, and samples will be recounted before they leave the sampling site. Upon transfer of custody, the chain-of-custody form will be signed and dated by the sample team leader. Because common overnight carriers (e.g., Federal Express, Purolator Courier, etc.) will not sign chain-of-custody forms, the forms will be placed in the cooler prior to shipping.

A signed, dated, custody seal will be placed over the lid opening of the sample cooler to indicate if the cooler has been opened during shipment or prior to receipt by the laboratory.

Laboratory custody procedures are outlined in the laboratory Quality Assurance Plans (QAPs) provided as Appendices C, D, and E of the Basic Site Workplan QAPP (Volume 4, Appendix 4.4.1).

5.5 SHIPMENT OF SAMPLES. Samples collected during field investigations or in response to a hazardous materials incident will be classified by the field operations leader (FOL) prior to shipment, as either environmental or hazardous material samples. In general, environmental samples include drinking water, groundwater and surface water, background and control soils, sediment, municipal and industrial wastewater effluents, biological specimens, or any samples that are not expected to be contaminated with high levels of hazardous materials. Environmental samples will be packed prior to shipment using the following procedures.

1. Select a sturdy cooler in good repair. Secure and tape the drain plug with fiber tape. Line the cooler with a large heavy duty plastic trash bag.

2. Allow sufficient room in all bottles (except volatile organic compounds [VOCs]) to compensate for any pressure and temperature changes (approximately 10 percent of the volume of the container).

3. Be sure the lids on all bottles are tight (will not leak).

4. Wrap all glass bottles in separate polyethylene bubble pack and seal with tape.

5. Wrap triplicate 40-milliliter (mℓ) VOC vials into separate polyethylene bubble pack and seal with tape.

6. Pack the sample containers in the cooler securely so they do not shift during shipment. Leave space in the top of the cooler for bags of ice.

7. Securely fasten the top of the large garbage bag with tape.

8. Place bags of ice on top of the samples.

9. Place completed chain-of-custody forms into a plastic bag, seal the bag and tape it inside the top of the cooler. Close the cooler and securely tape (preferably with fiber tape) the top of the cooler shut. Chain-of-custody seals will be affixed to the top and sides of the cooler so that the cooler cannot be opened without breaking the seal.

10. The shipping containers will be marked "THIS END UP," and arrow labels, which indicate the proper upward position of the container, will be affixed to the container. A label containing the name and address of the shipper will be placed on the outside of the container. Labels used in the shipment of hazardous materials (e.g., Cargo Only Aircraft, Flammable Solids, etc.) will not be permitted on the outside of the container used to transport environmental samples and will not be used.

Samples collected from bulk storage tanks, or soil, sediment, or water samples from areas suspected of being highly contaminated will be shipped as a hazardous material according to U.S. Department of Transportation (USDOT) regulations described in the Code of Federal Regulations (40 CFR 171 through 177).

6.0 CALIBRATION PROCEDURES AND FREQUENCY

Calibration procedures for field instruments are summarized in the Equipment Maintenance and Calibration Procedures presented in Attachment G of the Basic Site Workplan (Attachment G, in Book 2 of Volume 4). Other field equipment used for analyzing samples in the field or conducting geophysical surveys, that are not described in Attachment G, will be calibrated and operated in accordance with the manufacturers' recommendations. A log will be kept on calibration and maintenance procedures for each instrument used during field operations at OU 3.

7.0 ANALYTICAL PROCEDURES

7.1 LABORATORY ANALYTICAL PROCEDURES. Analyses of samples collected will be performed by the selected laboratories in accordance with protocols and quality assurance procedures established by the USEPA and the Navy. Navy Levels C and D quality control and data deliverable requirements, which are equivalent to USEPA Levels III and IV analytical support, will be performed on samples collected at OU 3. Quality control requirements for Navy Level C and D are described in *Sampling and Chemical Analysis Quality Assurance Requirements for the Navy Installation Restoration Program* (NEESA 20.2-047B).

7.2 FIELD MEASUREMENTS. Field measurements will be made according to methods specified in Table 3-3.

8.0 INTERNAL QUALITY CONTROL CHECKS

Internal QC checks are those procedures used during the phases of the work that are designed to control the individual processes involved in data generating activities. Internal QC checks of sampling procedures and laboratory analyses will be conducted periodically throughout the investigation at pre-determined intervals. The following discussion describes the required QC checks to be performed for both the field and laboratory activities.

8.1 INTERNAL FIELD SAMPLING QUALITY CONTROL CHECKS. Internal QC checks for field sampling (i.e., field QC samples) will consist of the preparation and submittal of equipment blanks, field blanks, trip (travel) blanks, and field replicates (i.e., field duplicates) at frequencies described in Table 8-1 and Table 2-5 of the FSP. Although the number of QC samples changes, the types of field QC samples remain the same regardless of the level of QC implemented. Descriptions of each type of QC sample can be found in Chapter 8.0 of the Basic Site QAPP (Appendix 4.4.1 of Volume 4)

Table 8-1
Field Quality Control (QC) Samples Required for Each Matrix per Sampling Event

Operable Unit 3 Quality Assurance Project Plan
NAS Jacksonville
Jacksonville, Florida

Type of Sample	Inorganics	Organics
Trip Blank (for volatile organic analysis only)	NA[1]	1 per cooler
Equipment Rinsate[2]	1 per day	1 per day
Field Blank	1 per source per 10-day shift	1 per source per 10-day shift
Material Blanks[3]	1 per field program	1 per field program
Drilling Water and Decontamination Water	1 at beginning and end of field work	1 at beginning and end of field work.
Matrix Spike/Matrix Spike Duplicates	5 percent of the samples	5 percent of the samples
Field Replicates[4]	10 percent of the samples for Level D. 5 percent of the samples for Level E.	10 percent of the samples for Level D. 5 percent of the samples for Level E.

[1] NA = not applicable.
[2] Equipment rinsate samples are collected daily; however, only samples from every other day are analyzed. Other samples are held and analyzed only if evidence of contamination exists.
[3] Bentonite grout and filter sand.
[4] The replicate must be taken from the same sample that will become the laboratory matrix spike/matrix spike duplicate for organics or for the sample used as a laboratory duplicate in inorganic analysis.

8.2 INTERNAL LABORATORY QUALITY CONTROL CHECKS. Internal laboratory control checks used by the contracted laboratories are described in the appropriate reference for each analytical method performed.

9.0 DATA REDUCTION, VALIDATION, AND REPORTING

The data reduction, validation, and reporting procedures that will be used during this investigation are described in the Data Analysis Plan (Appendix 4.2, Volume 4) and in Chapter 9.0 of the Basic Site QAPP (Appendix 4.4.1, Volume 4).

The data reduction, validation, and reporting procedures used by the laboratories are described in the laboratory Generic QAPs presented as Attachments A, B, and C of the QAPP (Book 2 of Volume 4).

Level D QC will be performed on offsite laboratory analyses; however, Level C validation may only be performed on the data results unless circumstances require full Level D validation. In general, at least 10 percent of the samples validated will be done at full Level D validation. Level D requirements are described in *Sampling and Chemical Analysis Quality Assurance Requirements for the Navy Installation Restoration Program* (NEESA 20.2-047B) and in Attachment A of the Data Analysis Plan in Appendix 4.2 of Volume 4 of the Basic Site Workplan.

10.0 PERFORMANCE AND SYSTEM AUDITS

Performance and system audits for sampling and analysis operations consist of onsite review of field and laboratory quality assurance systems and onsite review of equipment for sampling, calibration, and measurement.

10.1 FIELD SYSTEM AUDIT. The QA Manager will make scheduled and/or non-scheduled visits to the site to evaluate the performance of field personnel and general field operations in progress. The QA Manager will observe the performance of the field operations team during each activity, such as water-level readings and sampling rounds. A systems audit of field operations personnel by the project QA officer will be performed during selected field events, and a field audit report of the sampling event and team will be maintained on file and will be included in monthly progress reports.

10.2 LABORATORY PERFORMANCE AND SYSTEM AUDITS. The performance and system audits performed by the laboratories are described in the Laboratory General QAPs (Attachments A, B, and C, Book 2 of Volume 4).

10.3 REGULATORY AUDITS. It is understood that field personnel and subcontractor laboratories also are subject to quality assurance audits by the Navy, Florida Department of Environmental Protection (FDEP), and USEPA.

11.0 PREVENTIVE MAINTENANCE

11.1 FIELD EQUIPMENT. Preventive maintenance procedures are described in Attachment G of the Basic Site Workplan QAPP. Records of calibration and maintenance activities for each piece of equipment will be maintained in log books assigned to each instrument, as discussed in Subsection 3.1.4 of the FSP.

11.2 LABORATORY EQUIPMENT. The preventive maintenance procedures used by the laboratories are described in the laboratory Generic QAPs, which are included as Attachments A, B, and C of the QAPP (Book 2 of Volume 4).

12.0 ASSESSMENT OF DATA PRECISION, ACCURACY, AND COMPLETENESS

The assessment of data precision, accuracy, and completeness that will be used during the investigation is described in Chapter 12.0 of the Basic Site Workplan QAPP (Appendix 4.4.1 of Volume 4).

The procedures used by the laboratories to assess data precision, accuracy, and completeness are described in the laboratory Generic QAPs, which are presented as Attachments A, B, and C of the QAPP (Book 2 of Volume 4).

13.0 CORRECTIVE ACTION

13.1 FIELD CONDITIONS. During implementation of the OU 3 FSP, the field personnel will be responsible for the proper operation of field instruments, of satisfactory work progression, and for compliance with the QAPP for work performed.

If a problem is detected by the field personnel, the Navy Remedial Project Manager and the ABB-ES Task Order Manager will be notified concurrently by the FOL at which time the problem will be further investigated and corrective action will begin. Similarly, if a problem is identified during a routine audit by the program QA Manager or the USEPA or FDER Project Manager or QA Officer, an immediate investigation will be undertaken and the corrective measures deemed necessary will be implemented as quickly as possible.

13.2 LABORATORY CORRECTIVE ACTION. The corrective action procedures used by the laboratories are described in the laboratory Generic QAPs (Attachments A, B, and C, Book 2 of Volume 4).

13.3 REPORTING OF CORRECTIVE ACTIONS. In the cases where corrective actions of field procedures were required, a written report describing the nature of the problem, an evaluation of the cause, if known, and the action taken will be prepared by the ABB-ES FOL in conjunction with the Remedial Investigation (RI) leader, and submitted to the ABB-ES Task Order Manager, Program QA Manager (if not the author of the report).

Reports of corrective actions taken during the implementation of the OU 3 RI/FS workplan will be provided to the Navy according to the frequency and procedures specified in the Data Analysis Plan (Appendix 5.2 of Volume 4, Basic Site Workplan).

14.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT

Each day that field activities are conducted onsite, a representative of the field team will complete a Daily Quality Control Report (DQCR) (Figure 14-1) or similar form. These reports will be transmitted weekly to the Project QA Officer for review and inclusion into the project file. These DQCRs, along with associated field records and laboratory data, form the basis of the Quality Control Report.

Figure 14-1 Data Quality Control Report

REFERENCES

Geraghty & Miller, Inc., 1991b, Navy Installation Restoration Program Plan, Naval Air Station, Jacksonville, Florida. Volume 4: Basic Site Work Plan: prepared for SOUTHNAVFACENGCOM, September, updated 1992.

Naval Energy and Environmental Support Activity (NEESA), 1988, Sampling and Chemical Analysis Quality Assurance Requirements for the Navy Installation Restoration Program: Port Hueneme, California, June.