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REMEDIAL DESIGN WORK PLAN FOR OPERABLE UNIT 3 (OU 3) SITE 8 NAS CECIL FIELD FL

6/1/1998

BROWN AND ROOT ENVIRONMENTAL

Remedial Design Workplan
for
Operable Unit 3
Site 8
Naval Air Station Cecil Field
Jacksonville, Florida

Southern Division
Naval Facilities Engineering Command
Contract Number N62467-94-D-0888

Contract Task Order 039

June 1998

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REMEDIAL DESIGN WORKPLAN

FOR

OPERABLE UNIT 3
SITE 8
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

Submitted to:
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Naval Facilities Engineering Command
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The engineering design and professional options rendered in the planning documents that describe the OU3, Site 8, Groundwater Remedial Design, Naval Air Station Cecil Field, Jacksonville, Florida, were conducted or developed in accordance with commonly accepted procedures consistent with applicable standards of practice. These planning documents are intended to be implemented by Southern Division, Naval Facilities Engineering Command's Remedial Action Contract Contractor or Comprehensive Long-term Environmental Action, Navy Contractor. If conditions are determined to exist differently than those described in this document, then the undersigned professional engineer should be notified to evaluate the effects of any additional information on the design described in this report.

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LIST OF ACRONYMS AND ABBREVIATIONS

ABB-ES	ABB Environmental Services
bls	below land surface
BRA	Baseline Risk Assessment
BTX	benzene, toluene, xylenes
°C	degree centigrade
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	chemical of concern
DCA	dichloroethane
DCE	dichloreoethene
DO	dissolved oxygen
DOC	dissolved organic carbon
ECLR	excess lifetime cancer risk
FAA	Federal Facility Agreement
FAC	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
HI	Hazard Index
mg/kg	milligram per kilogram
mg/L	milligram per liter
ml	milliliter
mV	millivolt
µg/L	microgram per liter
NAS	Naval Air Station
NCP	National Oil and Hazardous Substance Pollution Contingency Plan
nM	nano molar
ORP	oxidation/reduction potential
OU	Operable Unit
PCB	polychlorinated biphenyl
PEL	probable effect level
RAO	remedial action objective
ROD	Record Of Decision
SARA	Superfund Reauthorization Act
SOUTHNAVFACENGCOM	Southern Division Naval Facilities Engineering Command
SVOC	semi-volatile organic compound
TRPHs	total recoverable petroleum hydrocarbons

VOA	volatile organic analyte
VOC	volatile organic compound
U.S. EPA	United States Environmental Protection Agency

1.0 INTRODUCTION

1.1 INTRODUCTION

The purpose of this workplan is to specify procedures for collection and analyses of site-specific data to evaluate and monitor the effectiveness of intrinsic remediation (natural attenuation) for Operable Unit (OU) 3, Site 8, Boresite Range, Hazardous Storage Area, and Firefighting Training Area at Naval Air Station (NAS) Cecil Field, Jacksonville, Florida.

This work plan consists of three sections, as follows:

- Section 1.0, Introduction.

- Section 2.0, Site Background and Setting, describes the site characteristics and summarizes the data collected to date and the interpretation of this data.

- Section 3.0, Long-Term Monitoring Plan, outlines the long-term data requirements to assess the effectiveness of intrinsic remediation and presents the requirements for 5-year site reviews.

1.2 DESCRIPTION OF THE RECORD OF DECISION (ROD)

The Site 8 Record of Decision (ROD) (ABB Environmental Services, Inc. [ABB-ES], 1997b) documents how natural attenuation was selected as the groundwater remedy in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act (SARA), and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The selected groundwater remedy for Site 8 is as follows:

- Restrict the use of surficial aquifer groundwater;

- Monitor groundwater for the presence of volatile organic compounds (VOCs), particularly 1,1-dichloroethene (1,1-DCE), and semivolatile organic compounds (SVOCs);

- Monitor groundwater for parameters that indicate the presence of naturally occurring biological, physical, and chemical processes that reduce VOC and SVOC concentrations;

- Monitor the groundwater for a period of 30 years (or less if 1,1-DCE concentrations meet State of Florida drinking water standards sooner); and

- Review the status of the groundwater quality every 5 years for 30 years (or less if 1,1-DCE concentrations meet State of Florida drinking water standards sooner).

To date intrinsic remediation parameters have been collected around the perimeter of the site and evaluated. This work plan describes the sampling and data requirements of the long-term monitoring program.

1.3 DESCRIPTION OF INTRINSIC REMEDIATION

Intrinsic remediation is the process of naturally remediating a dissolved contaminant plume and reducing contaminant concentrations and mass *in situ* by biotic and abiotic mechanisms.

Benefits of intrinsic remediation include:

- Complete transformation of contaminants to innocuous products;
- Destruction of contaminants, not just transferring them to another phase, location, or medium;
- Completely passive technique; and
- Cost-effective technique as compared to intrusive technologies.

Based upon findings from field investigations, it appears that natural attenuation of groundwater contaminants may be occurring at Site 8.

The underlying principle of intrinsic remediation is to allow natural attenuation to continue without interruption. To verify that this is occurring, long-term groundwater monitoring is performed on a regularly scheduled basis.

2.0 SITE BACKGROUND AND SETTING

2.1 LOCATION, DESCRIPTION, AND HISTORY

Site 8, Boresite Range, Hazardous Waste Storage Area, and Firefighting Area is located approximately 1,600 feet south of the east-and-west flightline, 3,500 feet west of the north-and-south flightline, 700 feet north of Perimeter Road, and 1,000 feet north of Sal Taylor Creek. Site location is shown on Figures 2-1 and 2-2.

The main features of Site 8 are a taxiway which extends from the east-and-west flightline, a concrete pad at the end of that taxiway, the boresite backstop 600 feet southwest of the concrete pad, the open field between the concrete pad and the backstop, and an access road. The areas north and northwest of the site are open, grassy fields. The areas southwest, south, and east of the site are planted with pine trees. On either side of the boresite range are drainage ditches. Site lay-out is shown on Figure 2-3.

From 1970 to 1988, Site 8 was used as a boresite testing area for aircraft gunnery. Aircraft would taxi to the concrete pad and "sight in" their guns by firing at targets in front of the backstop.

From 1975 to 1988, Site 8 was also used as a firefighting training area. Training activities took place in three bermed (but unlined) pits, two located adjacent and northwest of the concrete pad, one adjacent to and southwest of the concrete pad. As part of training aircraft frames were placed in the pits, doused with flammable liquids, ignited, and extinguished.

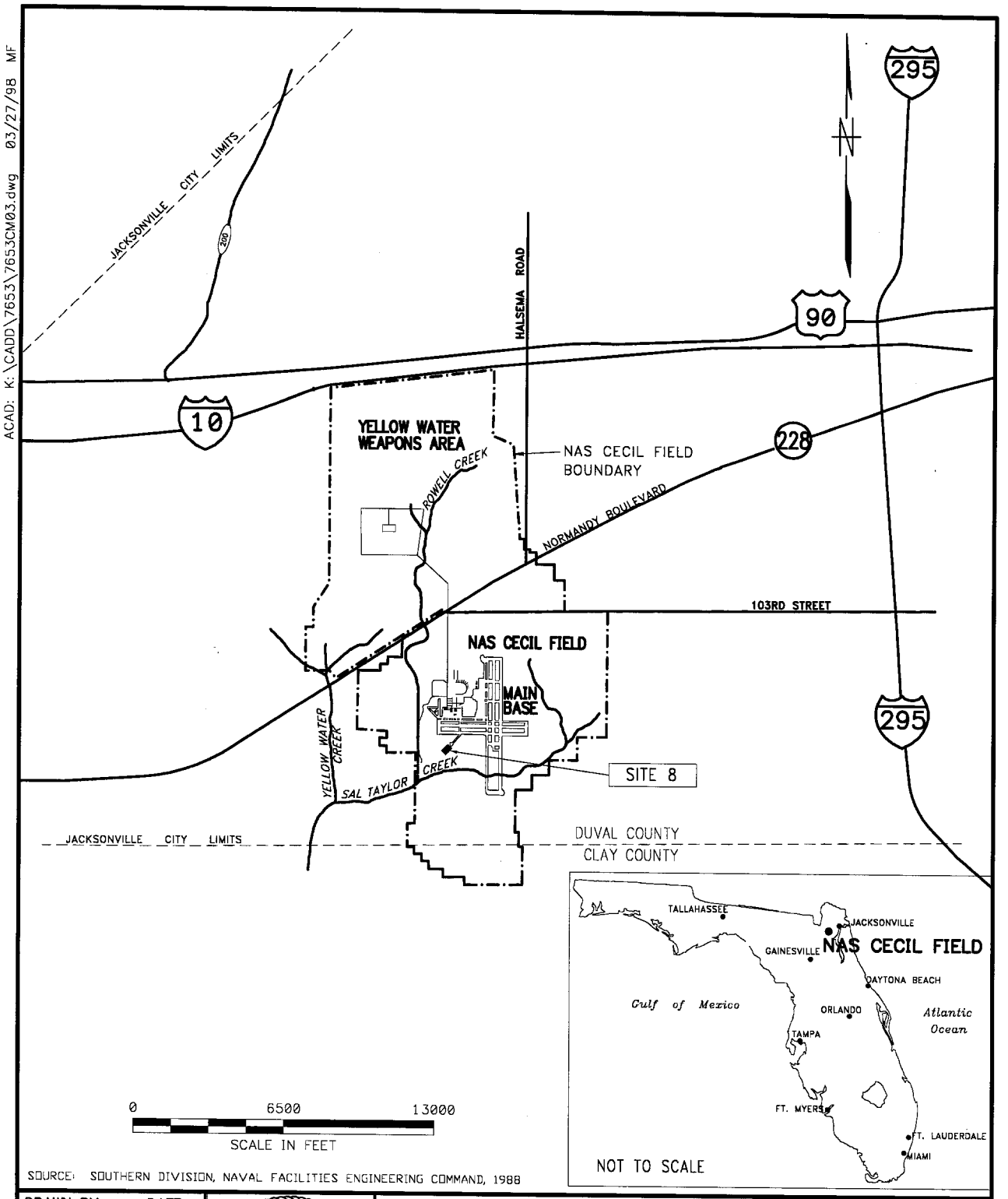
From the late 1970's to 1980 Site 8 was used for the storage of drummed hazardous wastes. Drums were stored in the southern part of the open field between the concrete pad and boresite backstop. Reportedly, some of the drums were shot through and their contents spilled upon the ground.

Currently, Site 8 is used for loading ordnance onto aircraft. Loading activities take place on the taxiway.

2.2 PHYSICAL AND GEOLOGICAL CONDITIONS

2.2.1 Topography

Most of Site 8 is located on a broad slope which dips gently to the south and southwest. The grade of the slope increases in the southern part of the site, from south of the boresite backstop to Perimeter Road, where the topographic relief is nearly flat. Site topography is shown on Figure 2-3.



DRAWN BY MF DATE 3/27/98	DEPARTMENT OF THE NAVY SOUTHERN DIV FACILITIES ENGINEERING COMD	GENERAL LOCATION MAP SITE 8, OPERABLE UNIT 3 NAVAL AIR STATION CECIL FIELD JACKSONVILLE, FLORIDA	CONTRACT NO. 7653
CHECKED BY DATE			APPROVED BY DATE 4/3/98
COST/SCHED-AREA			APPROVED BY DATE
SCALE AS NOTED			DRAWING NO. FIGURE 2-1 REV. 0

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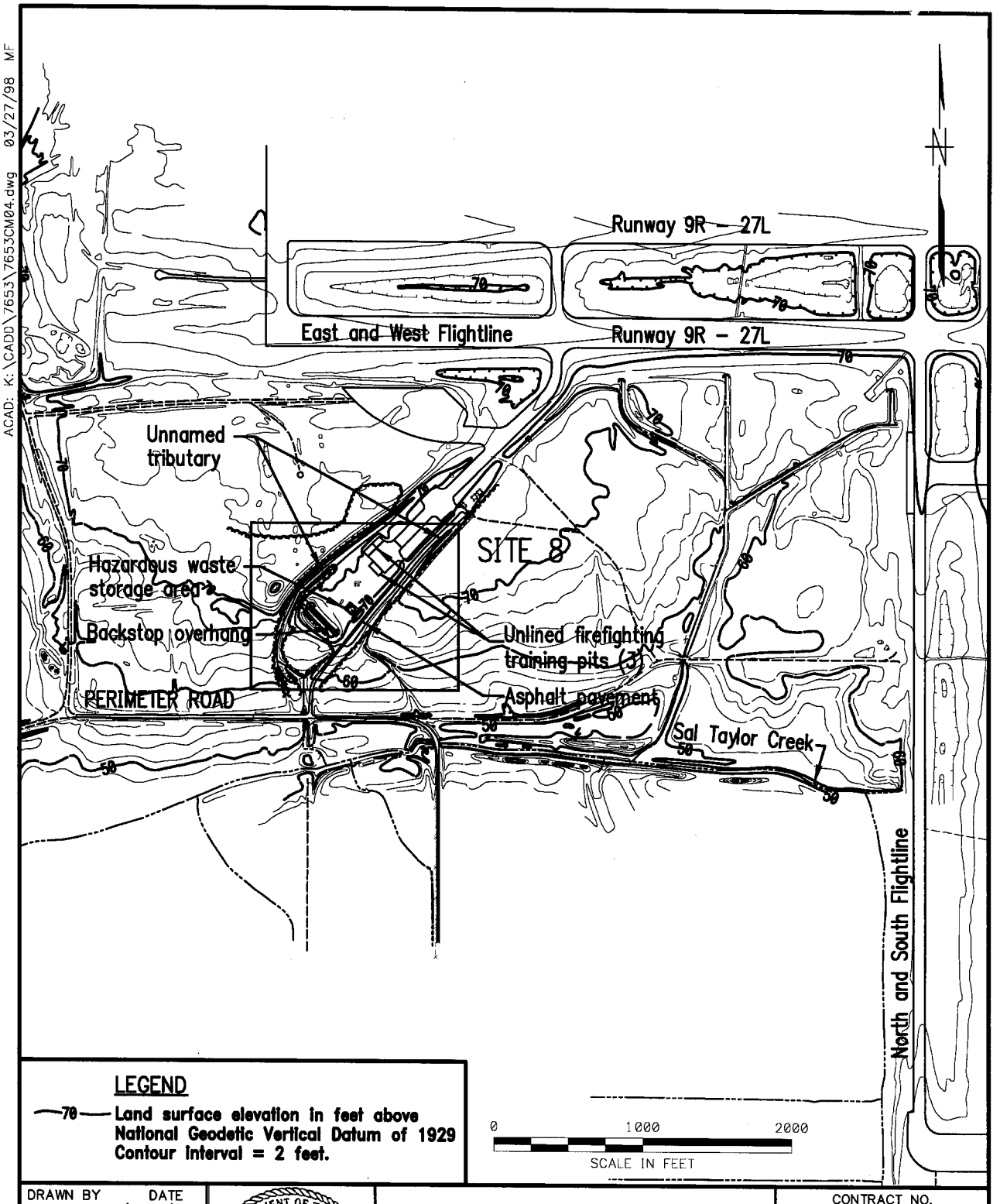

LEGEND

—70— Land surface elevation in feet above National Geodetic Vertical Datum of 1929 Contour interval = 2 feet.

DRAWN BY MF DATE 3/27/98	DEPARTMENT OF THE NAVY ★ SOUTHERN DIV FACILITIES ENGINEERING COMMAND ★	SITE LOCATION MAP SITE 8, OPERABLE UNIT 3 NAVAL AIR STATION CECIL FIELD JACKSONVILLE, FLORIDA	CONTRACT NO. 7653
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COST/SCHED-AREA			APPROVED BY DATE
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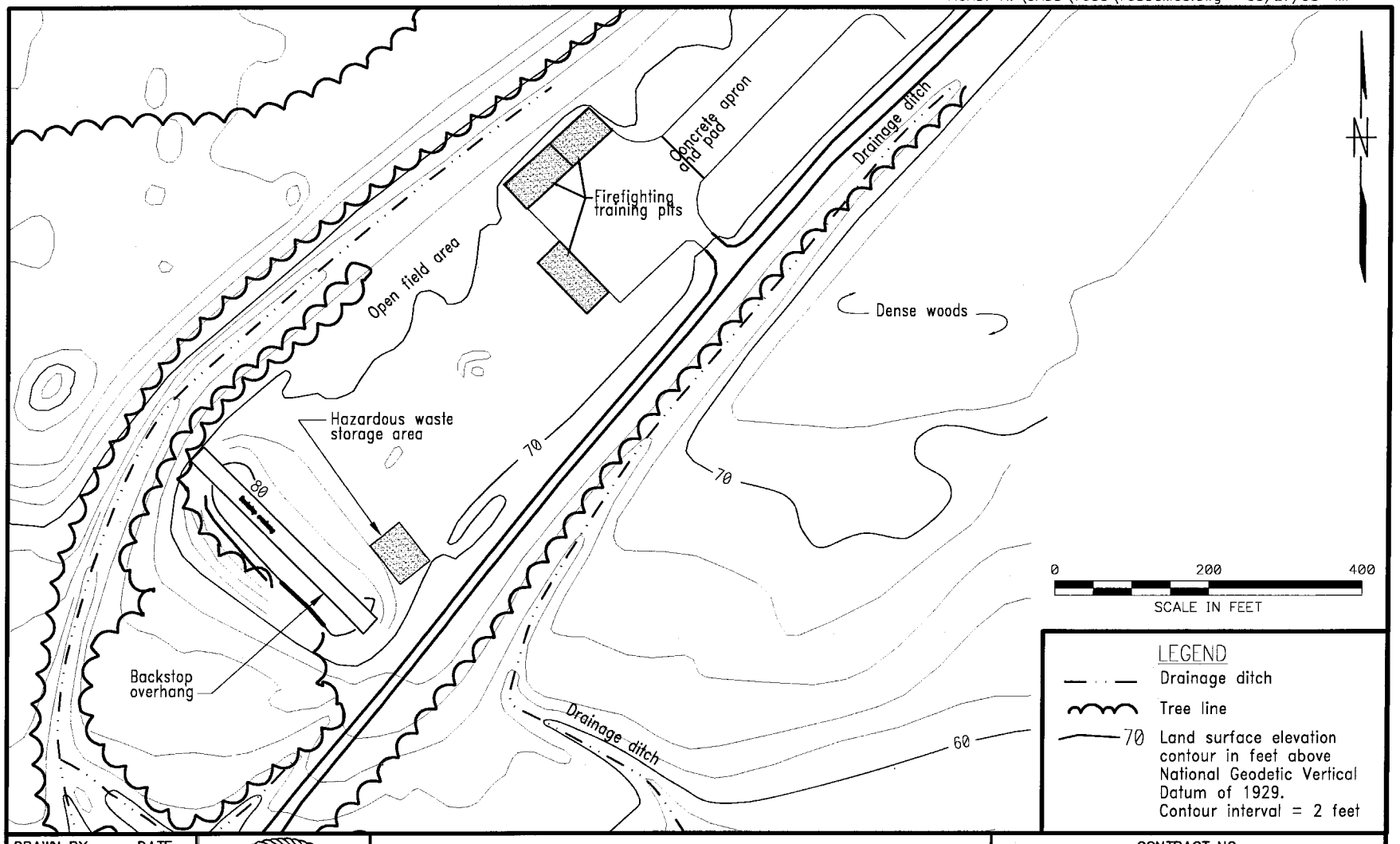

DRAWN BY MF DATE 3/27/98	DEPARTMENT OF THE NAVY SOUTHERN DIV FACILITIES ENGINEERING COMD	SITE LAYOUT AND TOPOGRAPHY SITE 8, OPERABLE UNIT 3 NAVAL AIR STATION JACKSONVILLE, FLORIDA PROJECT LOCATION	CONTRACT NO. 7653
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COST/SCHED-AREA			APPROVED BY DATE
SCALE AS NOTED			DRAWING NO. FIGURE 2-3 REV. 0

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2.2.2 Geology

Site 8 is underlain by approximately 80 feet of fine- to medium-grained sand. In the northern part of the site, a clay to clayey sand layer occurs between 4 and 14 feet below land surface (bls). This clayey layer is not continuous across the site and was only encountered in the vicinity of the firefighting training pits and in an area northwest of the concrete pad and taxiway.

At approximately 80 feet bls is a sandy clay unit with dolomite pebbles and stringers. The thickness of this sandy clay unit varies from 0 to 14 feet. Underlying this sandy clay unit is a dolomite layer which is at least 5 feet thick.

2.2.3 Hydrogeology

Underlying Site 8 are three water-bearing formations: 1) a surficial aquifer, 2) an intermediate aquifer, and 3) the Floridan Aquifer. Between each formation is an aquitard, i.e., a less permeable unit. Only the surficial aquifer was investigated at Site 8.

The surficial aquifer is unconfined and composed of fine- to medium-grained sand with minor amounts of silt and clay stringers extending down to approximately 80 feet bls and underlain by sandy clay and dolomite. The surficial aquifer is considered to behave as one hydrological unit.

Water table depths in the surficial aquifer are typically between 2 and 6 feet bls. Seasonally, groundwater may discharge to the drainage ditch in the southeastern part of the site. Groundwater flow is to the south toward Perimeter Road and Sal Taylor Creek, at an average rate of 55 feet per year. Water elevation data indicate that the vertical groundwater flow direction is downward at Site 8. However, during wet periods of the year, vertical groundwater flow direction may be upward along the lower parts of the eastern drainage ditch.

2.3 NATURE AND EXTENT OF CONTAMINATION

The primary source of contamination at Site 8 was the liquid wastes, i.e., waste solvents, paints and paint thinners, and fuel, used to ignite aircraft frames. Training activities have ceased and waste materials are no longer stored at Site 8; therefore, there is no current source for continued contamination.

Results of environmental sampling performed at Site 8 can be summarized as follows.

2.3.1 Surface Soil

VOCs, SVOCs, total recoverable petroleum hydrocarbons (TRPHs) and inorganic compounds were detected in surface soil. TRPHs and beryllium were detected at concentrations (up to 3,100 mg/kg and up to 0.27 mg/kg) greater than their respective State of Florida guidance values for residential areas of 350 milligrams per kilogram (mg/kg) and 0.2 mg/kg.

2.3.2 Subsurface Soil

TRPHs were detected in one subsurface soil sample in the southern firefighting training pit at a concentration (9,000 mg/kg) greater than the State of Florida guidance value for residential areas of 350 mg/kg.

2.3.3 Groundwater

Organic and inorganic compounds were detected in several groundwater samples. Figure 2-4 illustrates analytical results for organic compounds which is the data most relevant to intrinsic remediation. Figure 2-4 also shows the estimated contour of the TRPHs and VOCs plumes. It should be noted that, although the term of plume is used to designate the areas of contaminated groundwater, no free product was detected in any of the sampled wells.

A chlorinated VOC, 1,1-DCE, was detected in three shallow wells at concentrations (up to 95 µg/L) greater than the State of Florida and Federal drinking water standard of 7 microgram per liter (µg/L). All three of these wells are located in the wooded area east of the site access road and downgradient from Site 8.

Three petroleum-related VOCs, benzene, toluene, and xylenes (BTX), were detected in three shallow wells at concentrations (benzene up to 1.1 µg/L, toluene up to 66.5 µg/L, xylene up to 23 µg/L) equal to or slightly greater than the State of Florida primary (1 µg/L) or secondary (20 µg/L) drinking water standards. All three of these wells were located downgradient from the firefighting training pits.

One SVOC, bis-(2-ethylhexyl)phthalate, was detected in two deep wells near the western firefighting training pits and east of the access road at concentrations (up to 12 µg/L) greater than the State of Florida primary drinking water standard of 6 µg/L. Two other SVOCs, naphthalene and 2-methylnaphthalene, were detected in three shallow wells at concentrations (37 µg/L and 25 µg/L) greater than the State of Florida guidance value of 6.8 µg/L.

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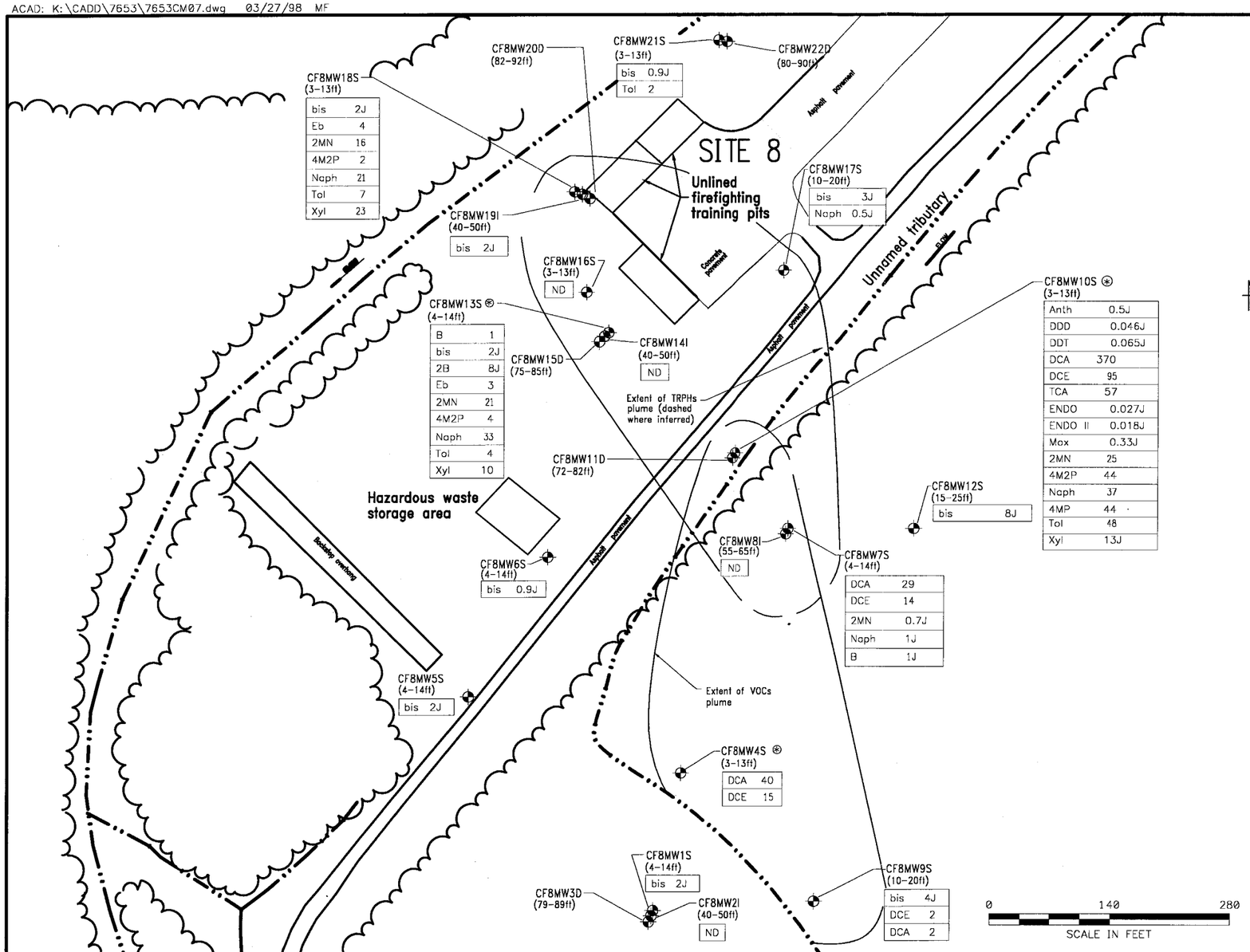

Florida Department of Environmental Protection
Groundwater Guidance Concentrations

Analytical Parameter		Regulatory value and type	
B	Benzene	1	PD
Eb	Ethylbenzene	700/30	PD/SD
Tol	Toluene	1,000/40	PD/SD
Xyl	Xylene	10,000/20	PD/SD
2B	2-Butanone	4,200	G
4M2P	4-Methyl-2-pentanone	350	G
DCA	1,1-Dichloroethane	700	G
DCE	1,1-Dichloroethene	7	PD
TCA	1,1,1-Trichloroethane	200	PD
Anth	Anthracene	2,100	G
2MN	2-methylnaphthalene	6.8 Total	G
Naph	Naphthalene	6.8 Total	G
bis	bis (2-Ethylhexyl) phthalate	6	PD
4MP	4 Methylphenol	35	G
P	Phenol	10	G
Ald	Aldrin	NG	
DDD	4,4'-Dichlorodiphenyldichloroethane	0.1	G
DDE	4,4'-Dichlorodiphenyldichloroethene	0.1	G
DDT	4,4-Dichlorodiphenyltrichloroethane	0.1	G
ENDO	Endosulfan sulfate	0.3	G
ENDO II	Endosulfan II	0.35	G
Mox	Methoxychlor	40	PD

NOTE:
All values reported in micrograms per liter.

PD	Primary drinking water standard
SD	Secondary drinking water standard
NG	No regulatory value given
J	Estimated value
G	Guidance value
ND	Not detected

LEGEND

CF8MW22D	Existing monitoring well with designation
	S = Shallow
	I = Intermediate
	D = Deep
	Drainage ditch
	Tree line
790	Value indicates a concentration equal to or greater than a State or Federal drinking water standard
⊛	Average of sample and duplicate
(10-20ft)	Monitoring well screen interval in feet below land surface

NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

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DEPARTMENT OF THE NAVY SOUTHERN DIV FACILITIES ENGINEERING COMD

GROUNDWATER ANALYTICAL RESULTS FOR ORGANIC COMPOUNDS SITE 8, OPERABLE UNIT 3 NAVAL AIR STATION CECIL FIELD JACKSONVILLE, FLORIDA

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Two pesticides, 4,4'-DDT, 4,4'-DDD were detected in one shallow well at concentrations (0.065 µg/L and 0.046 µg/L) lower than the State of Florida guidance value of 0.1 µg/L. Another pesticide, Aldrin for which there is no State of Florida guidance value, was detected in a deep well at a very low concentration (0.003 µg/L).

Aluminum was detected at concentrations (up to 15,300 µg/L) greater than the State of Florida secondary drinking water standard of 200 µg/L and the NAS Cecil Field screening criterion of 13,000 µg/L. Iron was detected at concentrations (up to 3,270 µg/L) greater than the State of Florida secondary drinking water standard of 300 µg/L but lower than the NAS Cecil Field screening criterion of 7,800 µg/L.

2.3.4 Surface Water

Only one inorganic compound, cyanide, was detected in two samples at concentrations (up to 57.3 µg/L) exceeding the State of Florida guidance value of 5.2 µg/L. Both of these sample were collected in the eastern drainage ditch.

2.3.5 Sediment

Only Aroclor-1260 was detected in three samples at concentrations (up to 0.038 mg/kg) exceeding the State of Florida threshold effect level (TEL) of 0.022 mg/kg, the concentration at which a compound may start to have an effect upon an organism in the media of concern. Two of these samples were collected in the western drainage ditch and the third was collected in the eastern drainage ditch. None of these Aroclor-1260 detections exceeded the State of Florida probable effect level (PEL) of 0.19 mg/kg, the concentration at which a compound probably has an effect upon an organism in the media of concern.

2.4 SUMMARY OF RISKS TO HUMAN HEALTH AND THE ENVIRONMENT

The Baseline Risk Assessment (BRA) (ABB-ES, 1997a) provides the basis for taking action and identifies the exposure pathways to be addressed by the remedial action. Both human health and ecological risks were identified at Site 8.

2.4.1 Human Health Risks

Both cancer and non-cancer human health risks were estimated in accordance with the NCP. The NCP establishes as acceptable an excess lifetime cancer risk (ELCR) in the range of 1.0×10^{-6} to 1.0×10^{-4} (U.S. EPA, 1990a) or a non-cancer hazard index (HI) of 1.0 or less. The State of Florida establishes as acceptable an ELCR of 1.0×10^{-6} or less and an HI of 1.0 or less. Potential human health risks were

evaluated for current and assumed future land use scenarios for exposure to surface soil, subsurface soil, groundwater, and surface water.

Surface Soil

No unacceptable human health risks were identified for exposure to surface soil for any current land use scenarios. Under future land use, exposure of an adult or child resident to surface soil could result in an ELCR of 6.0×10^{-6} due to detected concentrations of beryllium. This is within the U.S. EPA's acceptable range but slightly above the State of Florida's threshold. Future non-cancer risks from exposure to surface soil would be acceptable with a maximum HI of 1.0 for a child resident.

Subsurface Soil

No unacceptable human health risks were identified for exposure to subsurface soil for any current or future land use scenarios.

Groundwater

No unacceptable human health risks were identified for exposure to groundwater for any current land use scenarios. Under future land use, use of the surficial groundwater for drinking purposes by an adult or child resident could result in an ELCR of 6.0×10^{-5}, due almost entirely to the detected concentrations of 1,1-DCE. This is within the U.S. EPA's acceptable range but slightly above the State of Florida's threshold.

Surface Water

Under current and future land use exposure of an adult or adolescent trespasser to surface water could result in an ELCR of 2.0×10^{-6} due to detected concentrations of Aroclor-1260. This is within the U.S. EPA's acceptable range but slightly above the State of Florida's threshold. However, such exposure would require the use of the drainage ditches for recreational purposes, which is neither practicable or amenable since, under normal conditions, the water in these ditches is only a few inches deep.

2.4.2 Ecological Risks

Risks may exist for terrestrial plants and aquatic organisms due to detected aluminum concentrations in the surface water and the groundwater potentially discharging to the drainage ditches in the southeastern part of the site. Risks may also exist for macroinvertebrates due to detected concentrations of Aroclor-1260 in the drainage ditches sediment. However, as noted earlier, detected concentrations of Aroclor-

1260 only slightly exceeded the State of Florida TEL and were far below the State of Florida PEL. Ecological risks have been determined in a very conservative manner and may be overestimated. In addition, the drainage ditches where most of these risks would occur provide a very limited habitat for both plants and animals. No unacceptable risks exist for plants or animals downstream of Site 8.

2.5 GROUNDWATER INTRINSIC REMEDIATION DATA

Groundwater was sampled and analyzed for intrinsic remediation parameters in 1996 and 1997. These parameters included: dissolved oxygen (DO); nitrites and nitrates; ferrous iron; sulfate and sulfide; methane, ethane, and ethene; oxidation/reduction potential (ORP); dissolved organic carbon (DOC); carbon dioxide and alkalinity; and chloride. Results of these samplings and analyses are shown on Table 2-1.

A comparison of the 1995 and 1997 groundwater analytical results for chlorinated VOCs showed that concentrations of such compounds as DCE and dichloroethane (DCA) have decreased in wells where a carbon source is present in the form of petroleum contamination, including wells CF8MW7S and CF8MW10S. In wells where no such carbon source is present (CF8MW4S and CF8MW9S), no decrease in chlorinated VOCs concentrations was measured. A comparison of the 1995 and 1997 groundwater analytical results for BTX showed no significant change in concentrations.

TABLE 2-1

SUMMARY OF INTRINSIC REMEDIATION PARAMETERS
SITE 8 GROUNDWATER
NAS CECIL FIELD

Parameter	1996			1997		
	Range/ Detection Frequency	Location of Maximum	Average of Detects	Range/ Detection Frequency	Location of Maximum	Average of Detects
Dissolved Oxygen	0-2.81 (3/18)	CF8MW8I	1.37	ND to 0.4 (8/18)	CF8MW22D	0.23
Nitrites	ND	--	ND	ND	--	ND
Nitrates	ND-0.12 (8/18)	CF8MW8I	0.058	ND	--	ND
Ferrous Iron	ND-2.59 (17/18)	CF8MW12S	0.909	0.1 to 1.2 (18/18)	CF8MW4S	0.61
Sulfates	0.34-9.95 (18/18)	CF8MW16S	3.67	ND to 16.1 (13/18)	CF8MW7S	5.4
Dissolved Sulfides	NA	--	--	ND to 2.4 (6/18)	CF8MW10S	1.03
Methane	ND-7.0 (8/18)	CF8MW13S	2	ND to 3.79 (14/18)	CF8MW13S	0.681
Ethane	NA	--	--	ND	--	ND
Ethene	NA	--	--	ND	--	ND
ORP (mV)	NA	--	--	-224 to +211 (17/18)	CF8MW21S*	-97
DOC	NA	--	--	ND to 42 (12/18)	CF8MW13S	12.6
Carbon Dioxide	NA	--	--	35 to 180 (18/18)	CF8MW16S	98.3
Alkalinity (as $CaCO_3$)	NA	--	--	10 to 200 (18/18)	CF8MW15D	63.6
Chlorides	NA	--	--	10 to 60 (18/18)	CF8MW7s	23.6

NOTES:

NA: Not analyzed
ND: Not detected at the analytical method detection limit
--: No information because of NA
* : Location of most reductive conditions (-224 mV)

3.0 LONG-TERM MONITORING PLAN

3.1 OVERVIEW

The objective of long-term groundwater is to evaluate the performance, progress and effectiveness of intrinsic remediation in reducing contaminants and retarding their migration. To achieve this objective, this monitoring plan is designed to measure plume migration and contaminant level trend over time, while verifying that intrinsic remediation is occurring. In the event that data collected under this monitoring plan indicate that intrinsic remediation is insufficient to protect human health and the environment, a contingency plan will be developed to augment or replace the intrinsic remediation alternative. This decision will be made as part of the 5-year review process.

3.2 MONITORING WELL LOCATIONS

A network of fifteen monitoring wells will be used to measure long-term plume migration and natural attenuation. As shown on Figure 3-1, long-term monitoring wells will be located upgradient, within, and immediately downgradient of the VOCs and TRPHs plumes. As previously noted, although the term of plume is used to designate the areas of VOCs and TRPHs, contamination in groundwater, no free product was detected in any of the wells sampled. Long-term monitoring wells located upgradient of the VOCs plume will include existing wells CF8MW12S, CF8MW13S, CF8MW17S, and CF8MW18S. Monitoring well CF8MW12S is also located upgradient of the TRPHs plume. Long-term monitoring wells located within the VOCs plume will include existing wells CF8MW4S, CF8MW7S, CF8MW8I, CF8MW9S, and CF8MW10S. Long-term monitoring wells located within the TRPHs plume will include CF8MW7S, CF8MW8I, CF8MW10S, CF8MW13S, CF8MW17S, and CF8MW18S. Long-term monitoring wells located downgradient of the VOCs plume will include existing wells CF8MW1S, CF8MW2I, and CF8MW3D and new wells CF8MW23S and CF8MW24I. Only one long-term monitoring well, existing well CF8MW6S, will be located downgradient of the TRPHs plume.

Long-term monitoring wells include the twelve existing wells (CF8MW1S, CF8MW2I, CF8MW3D, CF8MW4S, CF8MW7S, CF8MW8I, CF8MW9S, CF8MW10S CF8MW12S, CF8MW13S, CF8MW17S, and CF8MW18S) identified in the ROD (ABB-ES, 1997b) plus one additional existing well (CF8MW6S) and two new wells (CF8MW23S and CF8MW24I). The rationale for the addition of existing well CF8MW6S is to provide a monitoring location downstream of the TRPHs plume. The rationale for the addition of new wells CF8MW23S and CF8MW24I is to provide shallow and intermediate monitoring locations downstream of the VOCs plume eastward of the southeastern drainage ditch. This ditch may intercept the contaminated groundwater flowing in a southwesterly direction and divert it southward prior to it reaching

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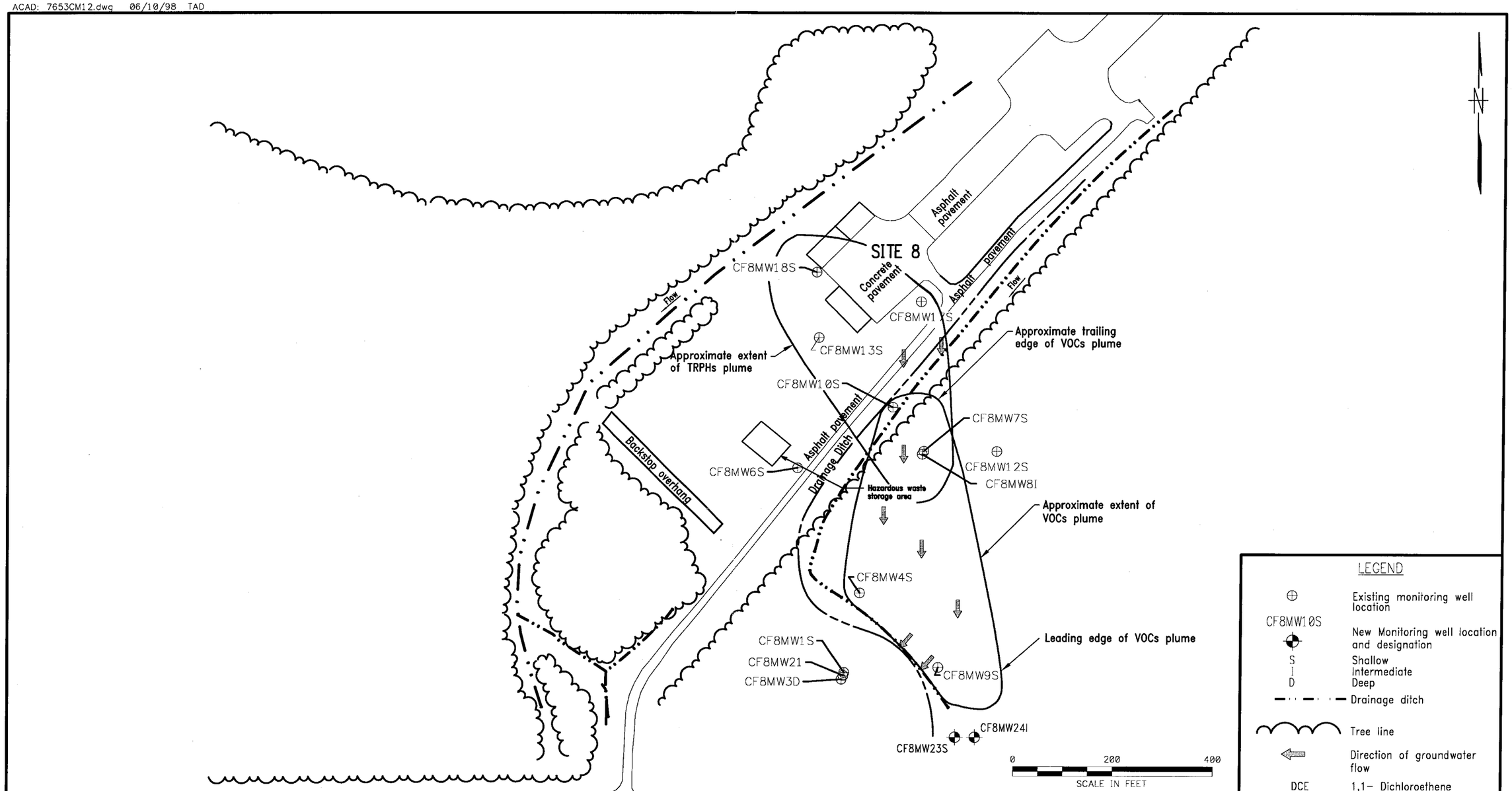

NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY MF DATE 3/30/98
CHECKED BY DATE
COST/SCHED-AREA
SCALE AS NOTED

DEPARTMENT OF THE NAVY SOUTHERN DIV FACILITIES ENGINEERING COMD

LONG-TERM MONITORING WELL LOCATIONS
SITE 8, OPERABLE UNIT 3
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

CONTRACT NO. 7653
APPROVED BY DATE 06/26/98
APPROVED BY DATE
DRAWING NO. FIGURE 3-1
REV. 2

FORM CADD NO. SDIV_BH.DWG - REV 0 - 1/20/98

existing downgradient monitoring well cluster CF8MW1S/CF8MW2I/CF8MW3D located west of that ditch. Therefore, a monitoring location is required east of this southeastern drainage ditch.

3.3 NEW MONITORING WELLS INSTALLATION

One (1) new shallow (CF8MW23S) and one (1) new intermediate (CF8MW24I) new monitoring wells will be installed approximately 200 feet downgradient of the leading edge of the VOCs plume, as shown on Figure 3-1. Monitoring well installation and well development procedure will comply with Southern Division, Naval Facilities Engineering Command's (SOUTHNAVFACENGCOM's) "Guidelines for Groundwater Monitoring Well Installation" (SOUTHNAVFACENGCOM, 1989) and with U.S. EPA's "Handbook of Suggested Practices for the Design and Installation of Groundwater Monitoring Wells" (U.S. EPA, 1990b). In addition, monitoring well installation will comply with Florida Administrative Code (FAC), Chapter 62-532.

New monitoring well CF8MW23S will be installed to a depth of 25 feet bgs with the last 10 feet being screened. New monitoring well CF8MW24I will be installed to a depth of 50 feet bgs with the last 10 feet being screened.

3.4 RESIDUAL MANAGEMENT PRACTICES

The new long-term monitoring wells will be installed downgradient of the VOCs plume in an area assumed to be non contaminated. Accordingly, during the installation of the new long-term monitoring wells, residual management practices will be conducted as follows:

- Earthen residual shall be spread around the boring.
- Purge water collected during well development will be discharged either on the ground downgradient of the well or to the nearest drainage ditch.

3.5 GROUNDWATER SAMPLING AND ANALYSIS

A site-specific groundwater sampling and analysis plan will be prepared. Groundwater will be sampled and analyzed for a period of up to 30 years to verify that the contaminant mass and mobility are being effectively reduced. Water-level measurements will also be performed during each sampling event for all Site 8 monitoring wells (i.e., 24 wells). Intrinsic remediation parameters will be analyzed as listed in Table 3-1 in all shallow monitoring wells. VOCs, SVOCs, and inorganics identified as groundwater chemicals of concern (COCs) in Section 2.3.3 of this work plan will be analyzed as shown on Table 3-2 in all monitoring

TABLE 3-1

INTRINSIC REMEDIATION PARAMETERS
LONG-TERM GROUNDWATER MONITORING PROGRAM
SITE 8 - NAS CECIL FIELD
PAGE 1 OF 2

Parameter	Method[2]/ Reference	Data Use	Sample Volume, Container, & Preservation	Field or Fixed Base Laboratory
Temperature	170.1. Direct-reading thermometer	Biological processes are temperature dependent.	100-250 ml in glass or plastic container. Analyze immediately	Field
Dissolved Oxygen	HACH test kit	Concentration of less than 1 mg/L indicates anaerobic conditions.	Follow test kit instructions. Analyze to nearest 0.2 mg/L	Field
pH	150.1. Direct-reading meter	Biological processes are pH sensitive.	100-250 ml in glass or plastic container. Analyze immediately	Field
Conductivity	120.1. Direct-reading meter	General water quality parameter used to verify that site samples are obtained from the same groundwater system.	100-250 ml in glass or plastic container. Analyze immediately	Field
Alkalinity	310.1. Manual titrimetric	General water quality parameter used to verify that site samples are obtained from the same groundwater system and to measure the buffering capacity of the groundwater.	100-250 ml in glass or plastic container. Analyze within 6 hours.	Field
Ferrous Iron (Fe^{+2})	HACH test kit	Presence of ferrous iron may indicate presence of an anaerobic degradation process due to depletion of oxygen, nitrate, and manganese.	Follow test kit instructions. Analyze to nearest 0.1 mg/L	Field
Nitrate (NO_3^-), Nitrite (NO_2^-)	Ion chromatography	Substrates for microbial respiration if oxygen is depleted.	250 ml in plastic container. Cool to 4°C.	Fixed
Sulfate (SO_4^{-2})	Ion chromatography	Substrate for microbial respiration if oxygen is depleted.	250 ml in plastic container. Cool to 4°C.	Fixed
Oxidation/Reduction Potential (ORP)	Standard Methods A2580B	ORP provides information on environmental conditions and to interpret the nature and state of chemical compounds and biological conditions within the groundwater. ORP typically ranges from +200mV in normal aerobic, oxidating conditions to -400mV in strongly anaerobic, reductive conditions.	10-250 ml in glass container filling from the bottom. Analyze immediately	Field
Dissolved Sulfide (S^{-2})	EPA 376.1	Product of sulfate-based anaerobic degradation. Analyze in conjunction with sulfate.	40 ml in volatile organic analyte (VOA) vial with butyl gray Teflon lined cap. Cool to 4°C.	Fixed
Hydrogen Sulfide (H_2S)	HACH test kit	If groundwater lacks ferrous iron but contains concentrations of sulfate greater than 1 mg/L and hydrogen sulfide greater than 0.05 mg/L, sulfate reduction is the predominant process.	Follow test kit instructions. Analyze to nearest 0.01 mg/L	Field

TABLE 3-1

INTRINSIC REMEDIATION PARAMETERS
LONG-TERM GROUNDWATER MONITORING PROGRAM
SITE 8 - NAS CECIL FIELD
PAGE 2 OF 2

Parameter	Method[2]/ Reference	Data Use	Sample Volume, Container, & Preservation	Field or Fixed Base Laboratory
Methane, Ethane, Ethene	RSK SOP-147	Presence of methane indicates biological degradation via an anaerobic pathway utilizing CO_2 as an electron acceptor. An ORP of less than -200mV could be indicative of methanogenesis. Ethane and ethene are also analyzed to indicate biological degradation of chlorinated VOCs.	40 ml in volatile organic analyte (VOA) vial with butyl gray Teflon lined cap. Cool to 4°C.	Fixed
Carbon Dioxide (CO_2)	HACH test kit CA-23	Presence of free CO_2 dissolved in groundwater is unlikely because of alkalinity buffering. However, if detected, CO_2 concentrations can be compared with background values to determine whether or not they are elevated, which could indicate an aerobic process for bacterial degradation of petroleum hydrocarbons.	Follow test kit instructions. Analyze immediately.	Field
Dissolved Hydrogen (H_2)	Bubble strip method	Can be used to evaluate oxidation/reduction processes.	Follow protocol in Appendix II of "Protocol for Assessing the Natural Attenuation of Chlorinated Ethenes in Ground Water Systems (Chapelle, 1996.)	Field
Dissolved Organic Carbon (DOC)	Standard Methods A5310 C	Provides an indirect indication of possible microbial activity by quantifying potentially available substrate.	100 ml in amber-colored glass with Teflon lined cap. Preserve with sulfuric acid to pH less than 2.0 and cool to 4°C.	Fixed
Major/minor ions, including calcium (Ca), magnesium (Mg), sodium (Na), potassium (K), ammonium (NH_4), chloride (Cl)), bromide (Br), Phosphate (PO_4), and dissolved inorganic carbon	Ion chromatography	Provides additional information on microbial conditions.	250 ml in plastic container. Cool to 4°C.	Fixed

NOTES:

1 Table adapted from Overview of the Technical Protocol for Natural Attenuation of Chlorinated Aliphatic Hydrocarbons in Ground Water (Wiedemeier, et al,1995).
2 Method refers to U.S. EPA test methods. Standard Methods are based on Standard Methods for the Examination of Water and Wastewater (Clesceri, et al, 1992)

TABLE 3-2

SUMMARY OF CHEMICALS OF CONCERN ANALYTICAL REQUIREMENTS
LONG-TERM GROUNDWATER MONITORING PROGRAM
SITE 8 - NAS CECIL FIELD

Parameter	Sample Container	Container Volume	Preservation[1]	Maximum Holding Time	Analytical Methodology
VOCs	Glass, black phenolic plastic screw cap, Teflon-lined	2x40 mL	Cool to 4°C, dark, HCl to pH < 2	14 days	U.S. EPA-CLP SOW for Organic Analysis, Low Concentration (Doc. #OLC02.0)[2]
SVOCs	Amber glass, Teflon-lined cap	1,000 mL	Cool to 4°C, dark	Extraction 7 days; analysis within 40 days	U.S. EPA SW-846 Method 8270B[3]
Inorganic Compounds (total & dissolved)	Polyethylene bottle, plastic cap, plastic liner	1,000 m L	Cool to 4°C, HNO_3 to pH < 2	Within 180 days; mercury within 28 days	U.S. EPA-CLP SOW for Inorganic Analysis, Multi-Media, Multi-Concentration (Doc. #ILM04.0)[4]

NOTES:

1 Preservation agents: HCl = Hydrochloric acid, HNO_3 = Nitric Acid
2 U.S. EPA (United States Environmental Protection Agency) CLP, 1994. Statement of Work for Organic Analysis, Low Concentration, OLC02.0.
3 U.S. EPA (United States Environmental Protection Agency) SW-846, 1994. Test Methods for Evaluating Solid Waste, Method 8370B.
4 U.S. EPA (United States Environmental Protection Agency) CLP, 1995, Statement of Work for Inorganic Analysis, Multi-Media, Multi-Concentration; ILM04.0.

wells. Groundwater COCs include 1,1-DCE, benzene, toluene, xylenes, bis-(2-ethylhexyl)phthalate, naphthalene, 2-methylnaphthalene, aluminum, and iron.

During the first 5-year period, sampling and analysis will be conducted quarterly for the first year and semi-annually thereafter. If the data collected during this initial period supports the anticipated efficiency of intrinsic remediation, monitoring frequency may be reduced to once per year. If data collected at any time during the monitoring program indicate plume migration or a risk to human health and the environment, the sampling frequency will be adjusted accordingly and a contingency plan will be developed and implemented.

3.6 EVALUATION CRITERIA

The primary evaluation criterion to determine the effectiveness of intrinsic remediation will be a decrease in the concentrations of COCs detected in the groundwater, in particular that of 1,1-DCE. Remediation will be deemed to have been achieved when these concentrations have reached the values listed in Table 3-3.

In addition, testing results for the parameters listed in Table 3-2 will be used to determine whether intrinsic remediation is taking place and to evaluate the possibility of reaching cleanup goals. The following guidelines will be used for this evaluation:

Oxidation/Reduction Potential (ORP): Dechlorination of VOCs generally requires reductive conditions. ORP values of less than +50 millivolts (mV) indicate that reducing conditions are possible and values of less than -100mV indicate a very high possibility of reducing conditions.

Dissolved Oxygen (DO): Values of 0.5 milligrams per liter (mg/L) or greater indicate unfavorable conditions for reductive dechlorination. However, if values exceed 1.0 mg/L, certain chlorinated VOCs, such as vinyl chloride, may be aerobically degraded.

Nitrates (NO_3^-): Values of 1.0 mg/L or greater indicate that reductive dechlorination may be inhibited.

Ferrous Iron (Fe^{2+}): Values greater than 1.0 mg/L indicate that reductive dechlorination is possible.

Sulfates (SO_4^{2-}): Values greater than 20 mg/L indicate that reductive dechlorination may be inhibited.

Sulfides (S^{2-}): Values greater than 1.0 mg/L indicate that reductive dechlorination is possible.

TABLE 3-3

INTRINSIC REMEDIATION CLEANUP GOALS
LONG-TERM GROUNDWATER REMEDIATION PROGRAM
SITE 8 - NAS CECIL FIELD

Chemical	Cleanup Goal (µg/L)	Source
1,1-DCE	7.0	State of Florida Guidance
Benzene	1.0	State of Florida Primary Drinking Water Standard
Toluene	40.0	State of Florida Secondary Drinking Water Standard
Xylenes	20.0	State of Florida Secondary Drinking Water Standard
bis-(2-ethylhexyl)phthalate	6.0	State of Florida Primary Drinking Water Standard
Naphthalene	20	State of Florida Guidance
Aluminum	13,100	NAS Cecil Field Screening Criteria

Methane (CH_4): Values greater than 1.0 mg/L indicate that reductive dechlorination is occurring but that vinyl chloride may accumulate.

Carbon Dioxide (CO_2), Chlorides (Cl^-), Alkalinity (as $CaCO_3$): Values greater than twice background levels indicate that complete degradation of organic COCs is occurring.

Hydrogen (H_2): Values greater than 1.0 nM indicate that reductive dechlorination is possible, but vinyl chloride may accumulate.

3.7 LONG-TERM MONITORING REPORTS

Within 60 days of each sampling event, a report will be prepared. These long-term monitoring reports will describe sampling activities, present sampling analytical results, score the natural attenuation process and provide conclusions and recommendations for future actions, as may be required. Initially, scoring of the natural attenuation process will be performed in accordance to the Technical Protocol For Evaluating Natural Attenuation of Chlorinated Solvents in Groundwater (Wiedmieir *et al*, 1996). Scoring protocol will be regularly updated based upon review of the most recent literature. If scoring shows limited evidence (6 to 14 points) or inadequate evidence (0 to 5 points) for biodegradation of chlorinated organic compounds, a recommendation will be made that the selected remedy be reevaluated. Long-term monitoring reports will be submitted to the Navy.

3.8 FIVE-YEAR REVIEWS

Five-year reviews will be conducted at Site 8 in accordance with CERCLA, Section 121(c) and the NCP, Section 300.430(f)-4(ii).

3.8.1 Background

Five-year reviews are conducted at sites where remedial action results in hazardous substances, pollutants, or contaminants (i.e., COCs) remaining on site. Remedial action at Site 8 does not consist of removal of contaminants, therefore these contaminants will remain on site until they are naturally attenuated.

Typically U.S. EPA conducts 5-year reviews. However, remedial action at NAS Cecil Field is being implemented under a Federal Facility Agreement (FAA) and, as such, the Navy is responsible for conducting these reviews.

3.8.2 Purpose

Five-year reviews are conducted to evaluate whether or not the remedies selected in the ROD remain protective of human health and the environment.

3.8.3 Execution

The 5-year review process will consist of the following:

- Review of background documents concerning Site 8, including long-term monitoring reports;
- Identification and review of new regulatory standards as may have been promulgated since the signing of the ROD or since the previous 5-year review;
- Site visit to conduct a visual inspection;
- Preparation of a 5-year review report, including conclusions and recommendations for future actions as may be required; and
- Public meeting to present the results of the review and any actions as may have been taken as a result of this review.

3.8.4 Reporting

A report will be prepared at the end of each 5-year review period. The 5-year review reports will include the following elements:

- An introduction, including a summary of site characteristics;
- A brief discussion of remedial action objectives (RAOs) and discussion of the applicable or relevant and appropriate requirements (ARARs);
- A description of monitoring and maintenance activities at the site;
- A presentation of monitoring results, including an evaluation of changes in monitoring parameters;

- An evaluation of how well the selected remedy has protected human health and the environment, including a formal statement of protectiveness of human health and the environment, a determination of remaining risks, and an analysis of potential deterioration of the remedy;

- A presentation of cost incurred;

- A summary description of the site visit;

- Documentation of areas of noncompliance, as may apply;

- Recommendations for future response actions, as may be required; and

- A statement as to when, if necessary, the next 5-year review shall be completed.

The 5-year review reports will be submitted to the Navy, U.S. EPA Region IV, and the Florida Department of Environmental Protection (FDEP).

4.0 INSTITUTIONAL CONTROLS

Institutional controls will consist of administrative measures taken to prevent exposure of human receptors to the groundwater of the surficial aquifer. Use of this groundwater will be controlled through deed restrictions or land use plans. Annual reminders of these restrictions and plans will be sent to all owners or residents of properties affected by contaminated groundwater. A formal request will be made to the agencies administrating the well installation permit program in Duval County to not issue permit for installation of drinking water which would pump water from the surficial aquifer.

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