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THIRD QUARTER NATURAL ATTENUATION GROUNDWATER MONITORING REPORT YEAR 1 FOR OPERABLE UNIT 2 (OU 2) SITE 5 NAS CECIL FIELD FL

5/1/1999

TETRA TECH NUS INC

Third Quarter Natural Attenuation Groundwater Monitoring Report - Year 1

for

Operable Unit 2, Site 5

Naval Air Station Cecil Field

Jacksonville, Florida

Southern Division

Naval Facilities Engineering Command

Contract Number N62467-94-D-0888

Contract Task Order 0066

May 1999

THIRD QUARTER NATURAL ATTENUATION GROUNDWATER MONITORING REPORT – YEAR 1

FOR

OPERABLE UNIT 2, SITE 5
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

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CONTRACT NUMBER N62467-94-D-0888
CONTRACT TASK ORDER 0066

MAY 1999

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CERTIFICATION OF TECHNICAL
DATA CONFORMITY (MAY 1987)

The Contractor, Tetra Tech NUS, Inc., hereby certifies that, to the best of its knowledge and belief, the technical data delivered herewith under Contract No. N62467-94-D-0888 are complete and accurate and comply with all requirements of this contract.

DATE: May 19, 1999

NAME AND TITLE OF CERTIFYING OFFICAL: Mark Speranza, P.E.
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ACRONYMS

ABB-ES	ABB Environmental Services
BEHP	Bis(2-ethylhexyl) phthalate
BOD	Biochemical Oxygen Demand
BTEX	Benzene, Toluene, Ethylbenzene, and Total Xylene
CLEAN	Comprehensive Long-term Environmental Action Navy
COC	Chemical of Concern
COD	Chemical Oxygen Demand
CTO	Contract Task Order
DO	Dissolved oxygen
FDEP	Florida Department of Environmental Protection
HLA	Harding Lawson Associates
IRA	Interim Remedial Action
msl	Mean Sea Level
NAS	Naval Air Station
NTU	Nephelometric turbidity unit
ORP	Oxidation-reduction potential
OU	Operable Unit
RI	Remedial Investigation
ROD	Record of Decision
SOP	Standard Operating Procedure
SOUTHNAVFACENGCOM	Southern Division, Naval Facilities Engineering Command
SVOC	Semivolatile Organic Compound
TCE	Trichloroethene
TOC	Total organic carbon
T.O.C.	Top of casing
TRPH	Total Recoverable Petroleum Hydrocarbons
TtNUS	Tetra Tech NUS, Incorporated
U.S. EPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound

1.0 INTRODUCTION

This Third Quarter Natural Attenuation Groundwater Monitoring Report – Year 1 has been prepared under Contract Task Order (CTO) 0066 as part of the Comprehensive Long-Term Environmental Action Navy III (CLEAN) Contract No. N62467-94-D-0888 for the Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENGCOM). This report presents a summary of the work performed for the third quarter (February 1999) groundwater monitoring event at Operable Unit (OU) 2, Site 5 at the Naval Air Station (NAS) Cecil Field, located in Jacksonville, Florida.

Tetra Tech NUS, Incorporated (TtNUS) collected and analyzed groundwater samples from six monitoring wells in accordance with the methodologies and procedures outlined in the Initial Natural Attenuation Sampling Work Plan (TtNUS, 1998a), the Work Plan Addendum for Long-term Groundwater Monitoring at Sites 3, 5, 8, and 16 (TtNUS, 1998b), and the Region 4 Environmental Investigations Standard Operating Procedures and Quality Assurance Manual [U. S. Environmental Protection Agency (U.S. EPA), 1996]. Three groundwater monitoring events have been conducted in support of the OU 2, Site 5 remedial design:

- Baseline/first quarter sampling (Year 1) - August 1998
- Second quarter sampling (Year 1) - November/December 1998
- Third quarter sampling (Year 1) - February 1999

The purpose of this work is to obtain long-term data to assess the performance, progress, and effectiveness of natural attenuation processes at the site in reducing concentrations of contaminants and retarding their migration. The evaluation consists of measuring plume migration and geochemical and contaminant level trends over time. This report summarizes the results from the third quarter (February 1999) groundwater monitoring event and provides a comparison to results obtained from first and second quarter groundwater monitoring events.

This report consists of three sections and two appendices as listed below:

- Section 1.0 discusses the purpose of the report.

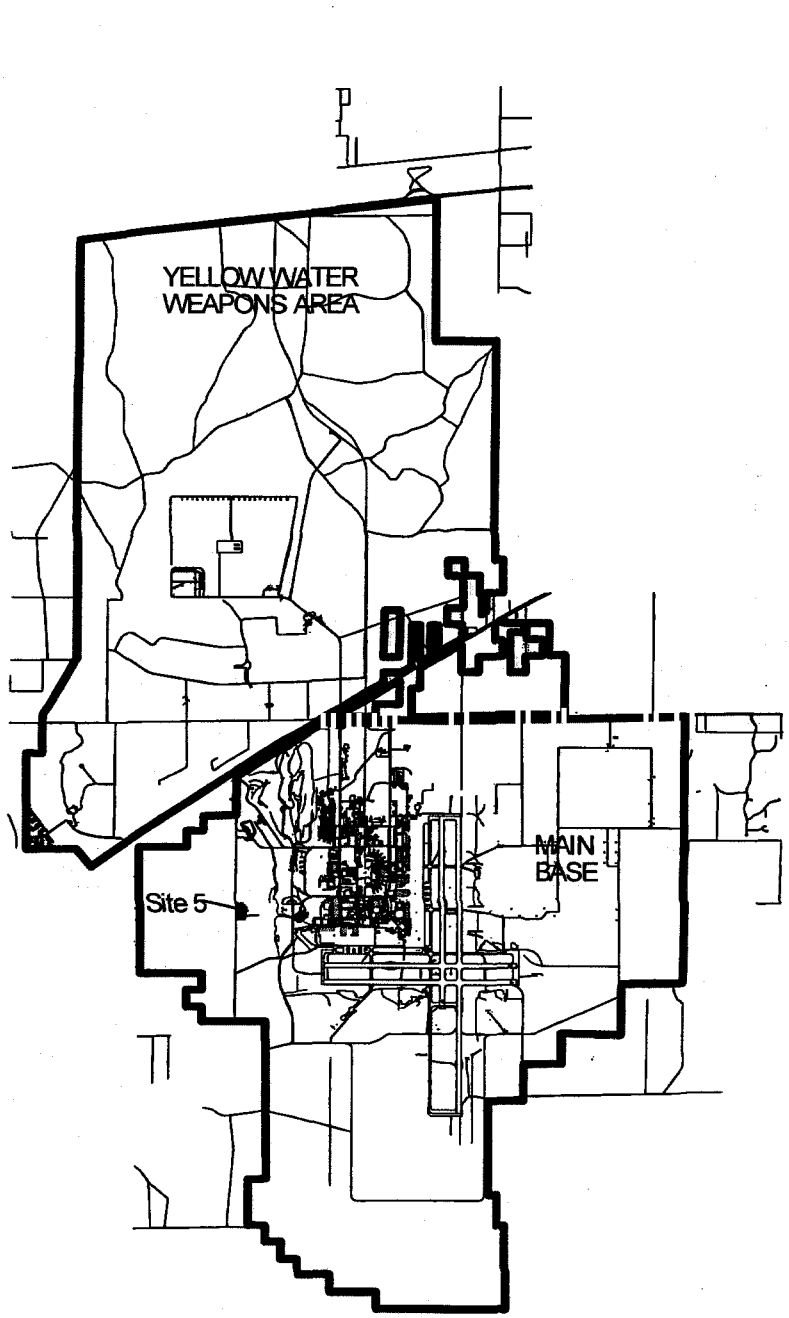
- Section 2.0 presents a summary of the analytical results at OU 2, Site 5 as they existed prior to the implementation of the natural attenuation remedy [Remedial Investigation (RI) data collected in 1993/1994].

- Section 3.0 presents the analytical results from the third quarter groundwater sampling event conducted in February 1999.

- Appendix A contains soil boring logs, monitoring well construction data, and well development forms for the two new wells installed in February 1999.

- Appendix B contains a summary of the February 1999 groundwater sample analytical results.

A description of the site history, location of waste disposal activities, site physical and geological conditions, and surface soil and subsurface soil contamination and a summary of the Record of Decision can be found in the Initial (First Quarter) Groundwater Monitoring Report for OU 2, Site 5 (TtNUS, 1998c). The site location map and site layout map are shown on Figures 1-1 and 1-2, respectively.



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COST/SCHEDULE-AREA			APPROVED BY — DATE —
SCALE AS NOTED			DRAWING NO. FIGURE 1-1 REV 0

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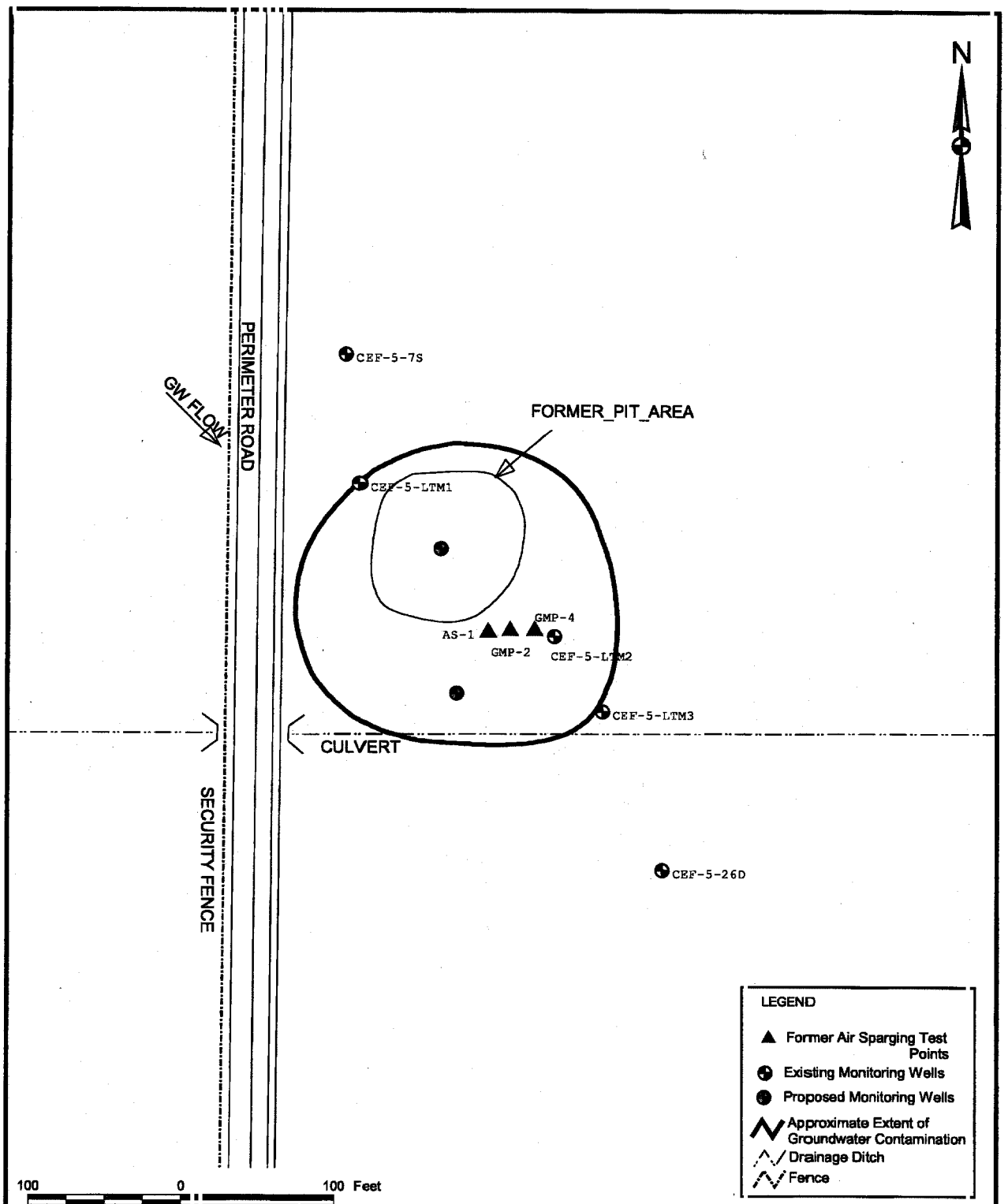

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SITE LOCATION MAP
OPERABLE UNIT 2, SITE 5
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

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2.0 SITE CHEMICALS OF CONCERN

Site chemicals of concern (COCs) were identified in the OU 2, Site 5 RI Report (ABB-ES, 1995) and are presented in Table 2-1 with target cleanup goals. An Interim Remedial Action (IRA) was conducted in 1995, and groundwater sampling activities were conducted during the Air Sparging Pilot Test in 1997. The results of volatile organic compound (VOC) and semivolatile organic compound (SVOC) analyses from the RI are presented on Figures 2-1 and 2-2, respectively. Analytical results from groundwater sampling activities for the RI and the Air Sparging Pilot Test are summarized on Tables 2-2 and 2-3.

A detailed description of the nature and extent of contamination can be found in the RI and has been summarized in the Initial (First Quarter) Groundwater Monitoring Report for OU 2, Site 5 (TtNUS, 1998c).

TABLE 2-1

TARGET CLEANUP LEVELS FOR GROUNDWATER CHEMICALS OF CONCERN OPERABLE UNIT 2, SITE 5 NAVAL AIR STATION CECIL FIELD JACKSONVILLE, FLORIDA

Chemical of Concern	Target Cleanup Goal[1]
Volatile Organic Compounds (µg/L)	
Acetone	700
Benzene	1
Trichloroethene	3
Ethylbenzene	30
Toluene	40
Total Xylenes	20
Semivolatile Organic Compounds (µg/L)	
4-Methylphenol	4
bis(2-Ethylhexyl) phthalate	6
Naphthalene	20
2,4-Dimethylphenol	140
Petroleum Hydrocarbons (µg/L)	
Total Recoverable Petroleum Hydrocarbons	5,000
Pesticides (µg/L)	
Alpha-Chlordane	2
beta-HCH	0.02
Inorganics (µg/L)	
Antimony	44.5[2]
Arsenic	50
Beryllium	4
Cadmium	6[2]
Chromium	100
Manganese	96.2[2]
Vanadium	49

1 Florida Department of Environmental Protection, Florida Administrative Code 62-777 unless otherwise noted (FDEP, 1999).

2 NAS Cecil Field Inorganic Background Data Set (HLA, 1998).

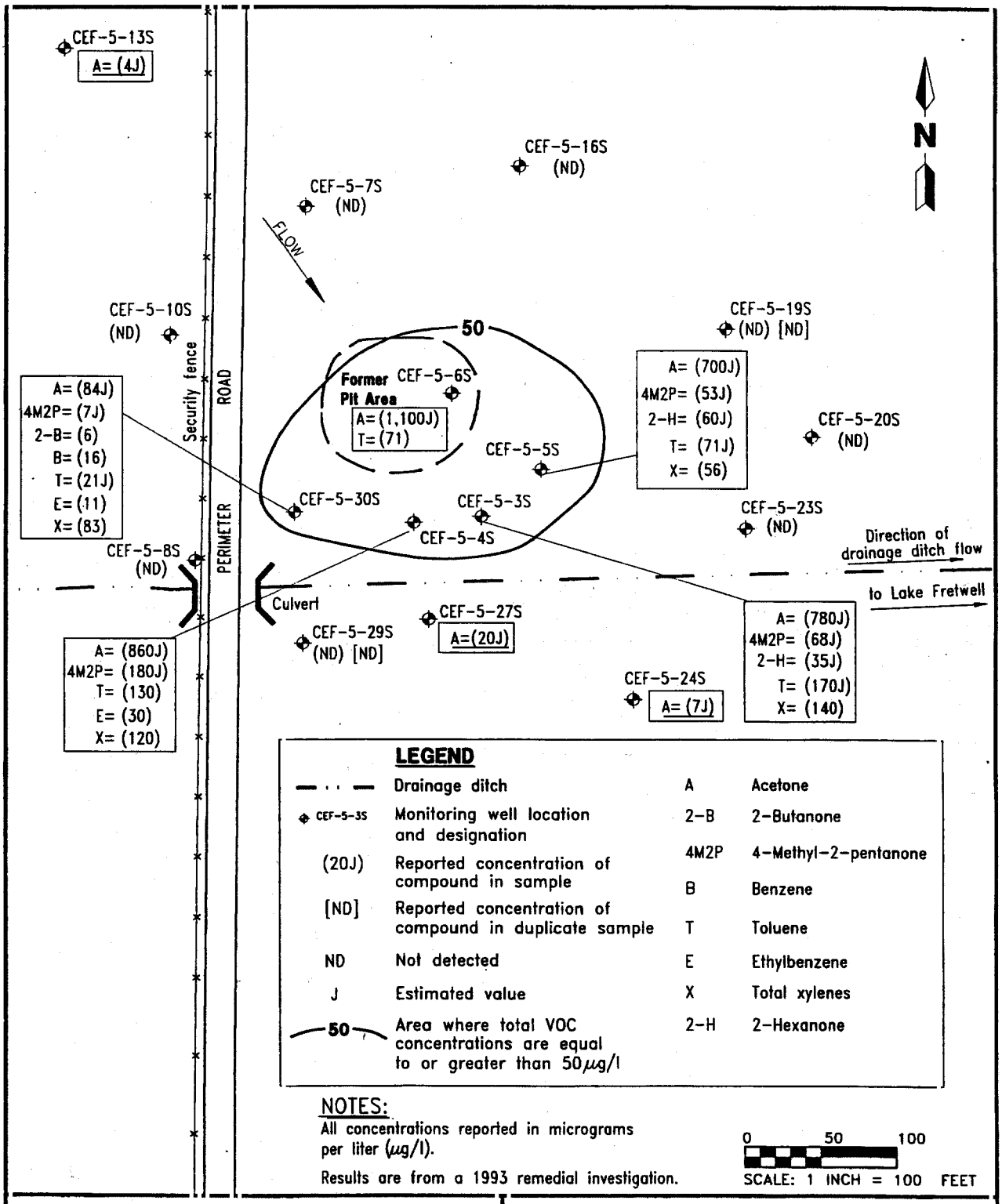

FIGURE 2-1
VOLATILE ORGANIC COMPOUNDS (VOCs) IN GROUNDWATER, UPPER SURFICIAL WELLS

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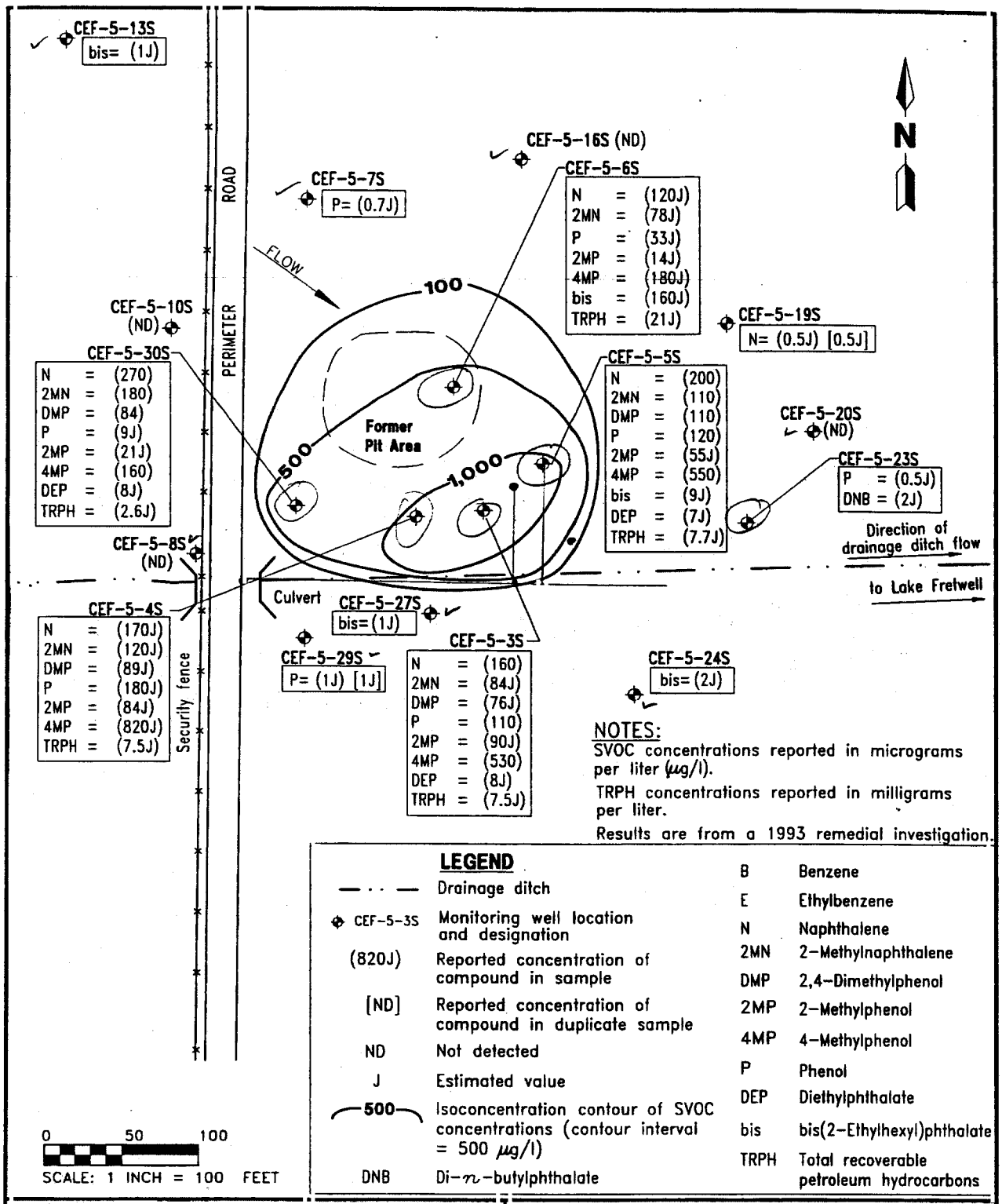
SITE 5
GROUNDWATER REMEDIAL DESIGN

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA



NOTES:
SVOC concentrations reported in micrograms per liter (µg/l).
TRPH concentrations reported in milligrams per liter.
Results are from a 1993 remedial investigation.

LEGEND

— · · —	Drainage ditch
CEF-5-3S	Monitoring well location and designation
(820J)	Reported concentration of compound in sample
[ND]	Reported concentration of compound in duplicate sample
ND	Not detected
J	Estimated value
500	Isoconcentration contour of SVOC concentrations (contour interval = 500 µg/l)
DNB	Di-n-butylphthalate
B	Benzene
E	Ethylbenzene
N	Naphthalene
2MN	2-Methylnaphthalene
DMP	2,4-Dimethylphenol
2MP	2-Methylphenol
4MP	4-Methylphenol
P	Phenol
DEP	Diethylphthalate
bis	bis(2-Ethylhexyl)phthalate
TRPH	Total recoverable petroleum hydrocarbons

FIGURE 2-2
SEMIVOLATILE ORGANIC COMPOUNDS (SVOCs) AND TOTAL RECOVERABLE PETROLEUM HYDROCARBONS (TRPH) IN GROUNDWATER, UPPER SURFICIAL WELLS

SITE 5
GROUNDWATER REMEDIAL DESIGN

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

TABLE 2-2

REMEDIAL INVESTIGATION AND AIR SPARGING PILOT TEST RESULTS FOR GROUNDWATER CHEMICALS OF CONCERN OPERABLE UNIT 2, SITE 5 NAVAL AIR STATION CECIL FIELD JACKSONVILLE, FLORIDA

Chemical of Concern	Frequency of Detection[1]	Maximum Concentration (µg/L)	Target Cleanup Goal[2]
VOLATILE ORGANIC COMPOUNDS (µg/L)			
Acetone	14/30	1,100	700
Benzene	3/30	16	1
Trichloroethene[4]	3/9	4.3	3
Ethylbenzer	5/30	41	30
Toluene	9/30	180	40
Total Xylenes	8/30	200	20
SEMIVOLATILE ORGANIC COMPOUNDS (µg/L)			
4-Methylphenol	9/30	820 J	4
bis(2-Ethylhexyl) phthalate	9/30	130 J	6
Naphthalene	10/30	270	20
2,4-Dimethylphenol	6/30	110	140
PETROLEUM HYDROCARBONS (µg/L)			
Total Recoverable Petroleum Hydrocarbons	---	160,000[5]	5,000
PESTICIDES (µG/L)			
alpha-Chlordane	1/30	0.15	2
beta-HCH	2/30	0.18	0.02
INORGANICS (µg/L)			
Antimony	2/30	29.4 J	44.5[3]
Arsenic	21/30	79 J	50
Beryllium	4/30	12.5	4
Cadmium	4/30	5.9	6[3]
Chromium	27/30	583 J	100
Manganese	23/30	263	96.2[3]
Vanadium	27/30	489	49

1 Frequency of detection is the number of samples in which the analyte was detected over the number of samples analyzed (excluding rejected values).
2 Florida Department of Environmental Protection, Florida Administrative Code 62-777, unless otherwise noted (FDEP, 1999).
3 NAS Cecil Field Inorganic Background Data Set (HLA, 1998).
4 Trichloroethene was detected in the air sparging pilot-scale test only.
5 From 1991 RI Data.
J = Estimated concentration.

TABLE 2-3

GROUNDWATER DATA SUMMARY
AIR SPARGING TEST
OPERABLE UNIT 2, PILOT–SCALE SITE 5
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

CHEMICAL OF CONCERN	AIR SPARGE WELL	GROUNDWATER MONITORING POINTS(1)	
	AS-1	GMP-2	GMP-4
VOLATILES (μg\L)			
Acetone	20	ND	ND
Benzene	NR	3.6	1.2
2-Butanone	6.2	NR	ND
Carbon disulfide	0.099	ND	NR
Ethylbenzene	NR	11	4.3
Methylene chloride	0.17	NR	NR
Toluene	0.82	42	11
Total Xylene	NR	98	20
Trichloroethene	NR	4.3	NR
Total VOCs	27	159	37
NATURAL ATTENUATION PARAMETERS (mg/L)			
Dissolved Oxygen	-	0	0
Carbon Dioxide	-	125	110

ND = Not Detected
NR = Not Reported

Shaded values exceed target cleanup goals.

1 Concentrations observed prior to the state of the air sparging pilot–scale system test.

3.0 ANALYTICAL RESULTS AND EVALUATION

The concentrations and distribution of COCs and natural attenuation indicator parameters in groundwater samples from the third quarter (February 1999) sampling activities are presented in this section. Two shallow groundwater monitoring wells were installed by TtNUS personnel in February 1999 based on recommendations from the second quarter monitoring report (see Figure 1-2). Boring logs, well construction information, and well development forms are presented in Appendix A. These wells, designated CEF-5-LTM-04 and CEF-5-LTM-05, are screened from approximately 5 to 15 feet bgs in the shallow surficial aquifer.

Groundwater samples were collected from six monitoring wells (four existing and two new) and analyzed at a fixed-based laboratory for chemical and selected natural attenuation parameters and in the field for selected natural attenuation indicator parameters as described in the Work Plan Addendum (TtNUS, 1998b). The wells were sampled in accordance with TtNUS standard operating procedures (SOPs) and the U.S. EPA Region 4 Environmental Investigation Standard Operating Procedures and Quality Assurance Manual for low-flow purging and sampling of monitoring wells (U.S. EPA, 1996). A field duplicate sample was collected from well CEF-5-LTM-02. GPL Laboratories in Gaithersburg, Maryland analyzed the groundwater samples collected during this field effort.

The purpose of this section is to present, in tabular and graphical form, the results of the third quarter groundwater monitoring event conducted in February 1999. A comprehensive annual report will be prepared based on the data from this sampling event, the previous two quarterly sampling events, and the next quarterly sampling event. The annual report will be similar in scope to the Baseline (First Quarter) Groundwater Monitoring Report for OU 2, Site 5 and will contain data interpretation regarding whether natural attenuation is occurring at the site and recommendations for future sampling.

The network of six monitoring wells located upgradient, within, and immediately downgradient of the VOC plume was used to measure long-term plume migration and natural attenuation parameters. The rationale for the location of these long-term monitoring wells is as follows:

Monitoring Well	Rationale
CEF-5-7S	Background/upgradient of plume
CEF-5-LTM-01, CEF-5-LTM-02, CEF-5-LTM-04, CEF-5-LTM-05	Within VOC plume
CEF-5-LTM-03	Downgradient of VOC plume

3.1 HYDROLOGIC CHARACTERISTICS

Water-level measurements were obtained from the six monitoring wells sampled with an electronic water-level indicator using the top of the well casing as the reference point. The water-level measurements and calculated potentiometric surface elevations for the three sampling events are summarized on Table 3-1. Potentiometric surface elevation contours are shown on Figure 3-1. Water-level measurements from wells CEF-5-LTM-04 and CEF-5-LTM-05 were not used in the generation of the potentiometric surface elevation contour map. Groundwater elevation data from these wells appeared to be anomalous compared to data from the other wells at the site. This apparent anomaly will be evaluated based on water-level measurements collected during future sampling events.

Potentiometric surface elevations for the February 1999 sampling event range from 65.75 feet above mean sea level (msl) to 67.40 feet msl. Groundwater flow is in a southeastward direction.

As calculated based on RI data, the average horizontal hydraulic gradient was estimated at 0.0047 foot per foot in an east to southeastward direction at OU 2, Site 5. The average hydraulic conductivities for the shallow, intermediate, and deep wells in the surficial aquifer system were estimated to be 1.2 feet per day, 11 feet per day, and 5.5 feet per day, respectively. The seepage velocity from the pit to the drainage ditch was estimated to be 0.023 feet per day (ABB-ES, 1995).

3.2 CHEMICAL OF CONCERN DISTRIBUTION

Frequencies of detection and ranges of positive values for analytical parameters are provided in Table 3-2. Table 3-3 provides a summary of the analytical results for VOCs, SVOCs, pesticides, total recoverable petroleum hydrocarbons (TRPH), and inorganic COCs for each well sampled. Appendix B contains the laboratory data sheets with sample analytical results. Figures 3-2, 3-3, 3-4, and 3-5 provide tag maps of the VOC, SVOC, TRPH, and inorganic analytical results, respectively,

The majority of COCs were not detected in excess of target cleanup goals. COCs detected above target cleanup goals during third quarter sampling included trichloroethene (TCE), benzene, total xylenes, 4-methylphenol, naphthalene, bis(2-ethylhexyl) phthalate (BEHP), TRPH, and vanadium. There is a marked decrease in COC concentrations in groundwater for COCs except TCE when compared to the results of the RI. Comparing third quarter analytical results to first and second quarter results shows that TCE, manganese, and vanadium concentrations decreased, and BEHP, and naphthalene concentrations increased slightly.

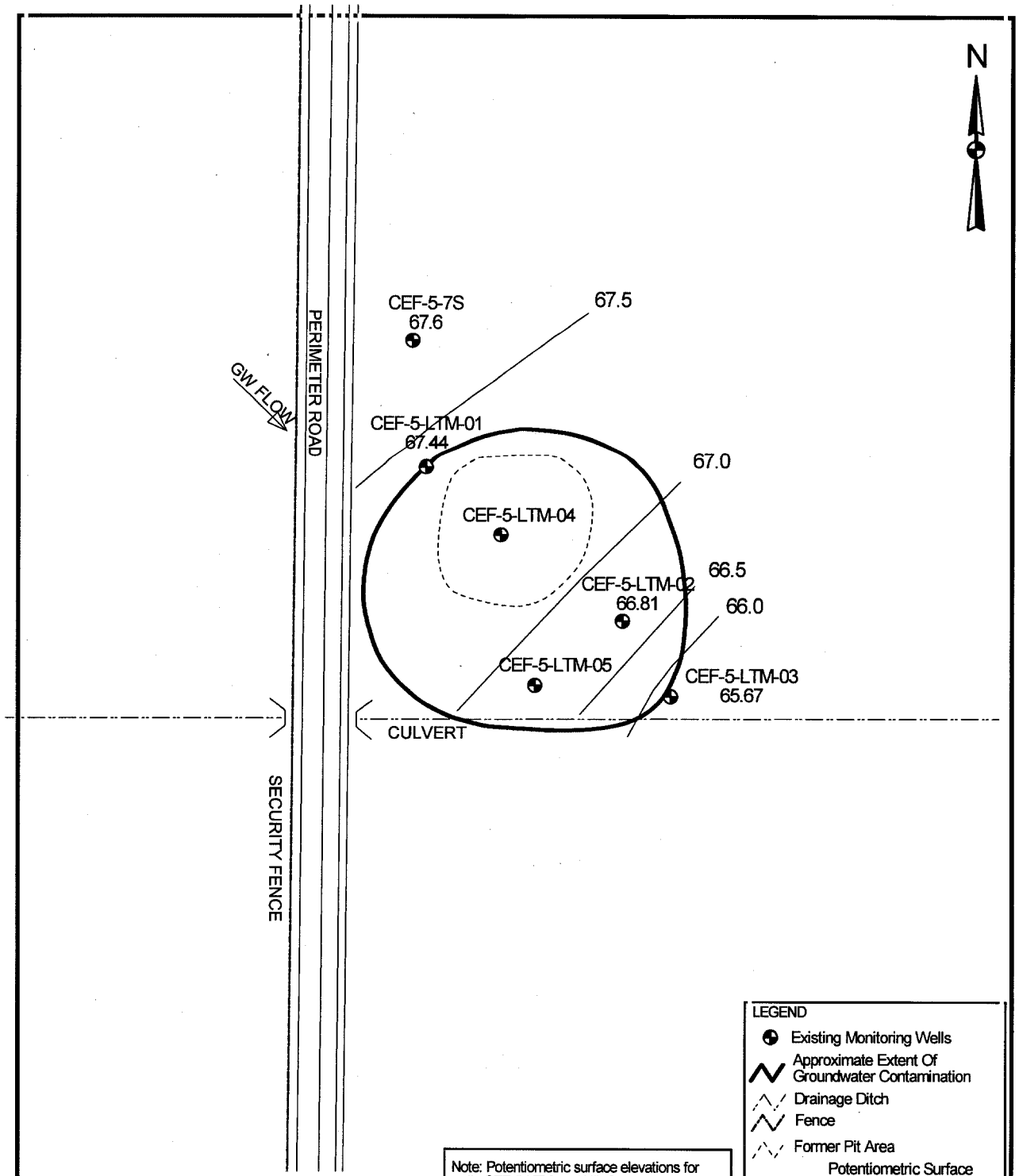
Because of the proximity of the drainage ditch located in the southern portion of the site, groundwater concentrations were compared to surface water criteria (FDEP, 1999). Groundwater concentrations in

TABLE 3-1

WATER-LEVEL MEASUREMENTS AND POTENTIOMETRIC SURFACE ELEVATIONS
OPERABLE UNIT 2, SITE 5
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

Well Number	Top of Casing Elevation	Ground Surface Elevation	August 1998		November 1998		February 1998	
			Depth to Groundwater (from T.O.C.)	Groundwater Elevation	Depth to Groundwater (from T.O.C.)	Groundwater Elevation	Depth to Groundwater (from T.O.C.)	Groundwater Elevation
CEF-5-7S	73.90	70.70	5.94	67.96	6.50	67.40	6.30	67.60
CEF-5-LTM-01	73.02	69.80	5.35	67.67	5.81	67.21	5.58	67.44
CEF-5-LTM-02	71.30	68.40	4.23	67.07	4.69	66.61	4.49	66.81
CEF-5-LTM-03	69.25	66.30	3.42	65.83	3.50	65.75	3.58	65.67
CEF-5-LTM-04	71.24	68.25	-	-	-	-	5.31	65.93
CEF-5-LTM-05	69.29	66.35	-	-	-	-	3.84	65.45

T.O.C. = Top of casing.
All elevations are in feet above mean sea level.
Wells CEF-5-LTM-04 and CEF-5-LTM-05 were installed in February 1999.



Note: Potentiometric surface elevations for wells CEF-5-LTM-04 AND CEF-5-LTM-05 were suspect and so not used to generate this map.

DRAWN BY YLI	DATE 04/07/99	POTENTIOMETRIC SURFACE ELEVATIONS OPERABLE UNIT 2, SITE 5 NAVAL AIR STATION CECIL FIELD JACKSONVILLE, FLORIDA	CONTRACT NUMBER 7898
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COST/SCHEDULE-AREA			APPROVED BY — DATE —
SCALE AS NOTED			DRAWING NO. FIGURE 3-1 REV 0

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TABLE 3-2

FREQUENCY OF DETECTIONS IN GROUNDWATER
OPERABLE UNIT 2, SITE 5
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

Parameter	First Quarter August 1998				Second Quarter November 1998				Third Quarter February 1999			
	Frequency of Detection	Range of Detections	Location of Max. Detection	Avg. of Detects	Frequency of Detection	Range of Detections	Location of Max. Detection	Avg. of Detects	Frequency of Detection	Range of Detections	Location of Max. Detection	Avg. of Detects
VOLATILES (µg/L)												
Acetone	1 / 1	12	CEF-05-LTM-02	12	ND	-	-	-	2 / 6	6.45 - 9.9	CEF-05-LTM-05	8.2
Benzene	3 / 6	0.2 - 0.6	CEF-05-LTM-02	0.3	1 / 5	0.6	CEF-05-LTM-02	0.6	3 / 6	0.6 - 2	CEF-05-LTM-05	1.1
Ethylbenzene	3 / 6	1 - 2.8	CEF-05-LTM-02	1.6	2 / 5	1.8 - 2.7	CEF-05-LTM-02	2.2	4 / 6	2.2 - 10.1	CEF-05-LTM-05	5.6
Toluene	2 / 6	1.5 - 1.8	CEF-05-LTM-01	1.6	2 / 5	3.5 - 5.2	CEF-05-LTM-01	4.3	4 / 6	5.3 - 28.1	CEF-05-LTM-05	12.3
Trichloroethene	4 / 6	0.3 - 12	CEF-05-LTM-01	6.2	2 / 5	1.1 - 5.6	CEF-05-LTM-01	3.3	4 / 6	1.35 - 33.7	CEF-05-LTM-04	13.6
Xylenes, Total	3 / 6	9.2 - 14	CEF-05-LTM-02	10.9	2 / 4	13.7 - 15.2	CEF-05-LTM-01	14.5	4 / 6	19.7 - 49	CEF-05-LTM-05	31.8
SEMIVOLATILES (ug/L)												
2,4-Dimethylphenol	2 / 5	1 - 10	CEF-05-LTM-02	5.5	1 / 4	6 - 8	CEF-05-LTM-02	7	4 / 6	1 - 20	CEF-05-LTM-05	7.6
4-Methylphenol	1 / 5	10	CEF-05-LTM-02	10	1 / 4	12 - 17	CEF-05-LTM-02	14	3 / 6	1 - 60	CEF-05-LTM-05	24.2
BEHP	0 / 4	-	-	-	0 / 4	-	-	-	2 / 6	1 - 8	CEF-05-LTM-04	4.5
Naphthalene	ND	-	-	-	2 / 4	15 - 32	CEF-05-LTM-02	21	4 / 6	2 - 82	CEF-05-LTM-05	35.4
PETROLEUM HYDROCARBONS (mg/L)												
TRPH	4 / 5	1.1 - 10.8	CEF-05-LTM-02	4.2	2 / 4	1.1 - 11.8	CEF-05-LTM-02	6.2	4 / 6	1.08 - 13	CEF-05-LTM-05	6.1
INORGANICS (ug/L)												
Chromium	1 / 5	6.7	CEF-05-LTM-03	6.7	ND	-	-	-	2 / 6	5.2 - 8.95	CEF-05-LTM-02	7.1
Manganese	5 / 5	6.2 - 216	CEF-05-LTM-02	105.5	4 / 4	10.2 - 30.1	CEF-05-LTM-02	18.1	6 / 6	6.2 - 29.1	CEF-05-LTM-04	16.9
Vanadium	3 / 5	22.3 - 140	CEF-05-LTM-02	68.2	3 / 4	5.9 - 94.3	CEF-05-LTM-02	34.8	6 / 6	1.2 - 235	CEF-05-LTM-05	55.7

ND = Not detected.
TRPH = Total recoverable petroluem hydrocarbons.
BEHP = bis(2-ethylhexyl) phthalate.

TABLE 3-3

SUMMARY OF CHEMICALS OF CONCERN IN GROUNDWATER
OPERABLE UNIT 2, SITE 5
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA
PAGE 1 OF 2

PARAMETER	Ground Water Target Cleanup Goal	Surface Water Target Cleanup Goal	CEF-5-7S			CEF-05-LTM-01				CEF-05-LTM-02				
			Aug-98	Nov-98	Feb-99	Aug-98		Nov-98	Feb-99	Aug-98	Nov-98		Feb-99	
						Sample	Duplicate				Sample	Duplicate	Sample	Duplicate
VOLATILES (ug/L)														
ACETONE	700	1,692	10 UR	10 UR	10 UR	10 UR	10 UR	10 UR	10 UR	12 J	10 UR	10 UR	6.5 J	6.4 J
BENZENE	1	71.28	1 U	1 U	1 U	0.2 J	0.2 J	1 U	1 U	0.6 J	0.6 J	0.6 J	0.8 J	0.8 J
ETHYLBENZENE	30	605	5 U	5 U	5 U	1 J	1 J	1.8 J	2.2 J	2.8 J	2.6 J	2.7 J	3.4 J	3.5 J
TOLUENE	40	475	5 U	5 U	5 U	1.8 J	1.5 J	5.2	5.5	5 U	3.5 J	3.5 J	5.4 J	5.2
TRICHLOROETHENE	3	80.7	3 U	3 U	3 U	11	12	5.6	7.9	1.8 J	1.1 J	1.1 J	1.4 J	1.3 J
XYLENES, TOTAL	20	370	5 U	5 U	5 U	9.6	9.2	15.2	19.7	14	13.7	13.9	20.3	21.4
SEMIVOLATILES (ug/L)														
2,4-DIMETHYLPHENOL	140	261	11 U	11 U	10 U	10 U	10 U	10 U	1 J	10 J	6 J	8 J	6 J	9 J
4-METHYLPHENOL	4	70	4 U	4 U	4 U	4 U	4 U	4 U	4 U	10	12	17	10	13 J
BEHP	6	0.02	4 U	4 U	4 U	12 U	4 U	4 U	1 J	4 U	4 U	4 U	4 U	21 U
NAPHTHALENE	20	26	6 U	6 U	6 U	6 U	6 U	15	15	7 U	23	32***	36***	49***
PESTICIDES (ug/L)														
ALPHA-CHLORDANE	2	0.00059	0.05 U	0.053 U	0.051 U	0.052 U	0.052 U	0.052 U	0.052 U	0.052 U	0.052 U	0.051 U	0.15***	0.14***
BETA-BHC	0.02	0.046	0.02 U	0.021 U	0.020 U	0.021 U	0.021 U	0.021 U	0.021 U	0.021 U	0.021 U	0.020 U	0.021 U	0.20 U
PETROLEUM HYDROCARBONS (mg/L)														
TRPH	5	5	0.5 U	0.5 U	0.5 U	3.43	1.1	1.1	1.08	10.8***	10.8***	11.8***	8.26***	8.36***
INORGANICS (ug/L)														
ANTIMONY	44.5*	4,300	5 U	5.0 U	3.8 U	5 U	5 U	5.0 U	2.6 U	5 U	5.0 U	5.0 U	2.6 U	2.6 U
ARSENIC	50	50	10 U	5.0 U	3.6 U	10 U	10 U	5.0 U	3.6 U	10 U	5.0 U	5.0 U	3.6 U	3.6 U
BERYLLIUM	4	0.13	3 U	3.0 U	0.10 U	3 U	3 U	3.0 U	0.10 U	3 U	3.0 U	3.0 U	0.10 U	0.11 U
CADMIUM	6*	**	3 U	3.0 U	0.36 U	3 U	3 U	3.0 U	0.30 U	3 U	3.0 U	3.0 U	0.30 U	0.30 U
CHROMIUM	100	-	5 U	5.0 U	1.5 U	5 U	5 U	5.0 U	0.73 U	5 U	5.0 U	5.0 U	16.9	2
MANANESE	96.2*	-	6.2	14.1	10.9	131	108	10.2	6.2	216	28.7	30.1	22.1	20.5
VANADIUM	49	-	22.3	6.4	7.9	5 U	5 U	5.0 U	1.2	140	89.9	94.3	76	78.5

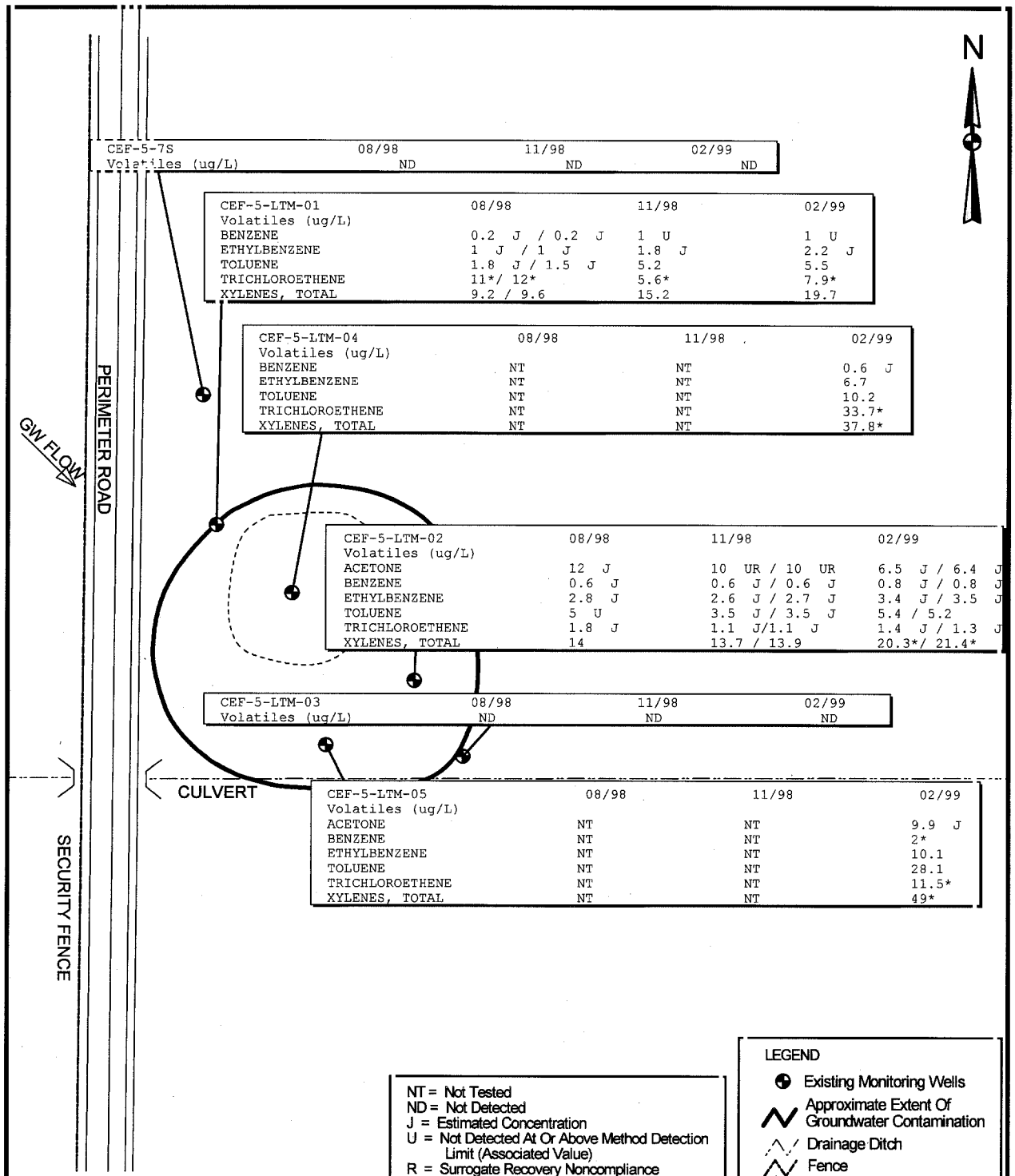
TABLE 3-3

SUMMARY OF CHEMICALS OF CONCERN IN GROUNDWATER
OPERABLE UNIT 2, SITE 5
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA
PAGE 2 OF 2

PARAMETER	Ground Water Target Cleanup Goal	Surface Water Target Cleanup Goal	CEF-5-LTM-3			CEF-5-LTM-04			CEF-5-LTM-05		
			Aug-98	Nov-98	Feb-99	Aug-98	Nov-98	Feb-99	Aug-98	Nov-98	Feb-99
VOLATILES (ug/L)											
ACETONE	700	1,692	10 UR	10 UR	10 UR	NA	NA	10 UR	NA	NA	9.9 J
BENZENE	1	71.28	1 U	1 U	1 U	NA	NA	**0.6 J**	NA	NA	2
ETHYLBENZENE	30	605 *	5 U	5 U	5 U	NA	NA	**6.7**	NA	NA	**10.1**
TOLUENE	40	475	5 U	5 U	5 U	NA	NA	10.2	NA	NA	28.1
TRICHLOROETHENE	3	80.7	3 U	3 U	3 U	NA	NA	33.7	NA	NA	11.5
XYLENES, TOTAL	20	370	5 U	5 U	5 U	NA	NA	37.8	NA	NA	49
SEMIVOLATILES (ug/L)											
2,4-DIMETHYLPHENOL	140	261	**1 J**	10 U	10 U	NA	NA	**2 J**	NA	NA	20
4-METHYLPHENOL	4	70	4 U	4 U	4 U	NA	NA	**1 J**	NA	NA	60
BEHP	6	0.02	4 U	4 U	4 U	NA	NA	8***	NA	NA	21 U
NAPHTHALENE	20	26	6 U	6 U	6 U	NA	NA	**2 J**	NA	NA	82***
PESTICIDES (ug/L)											
ALPHA-CHLORDANE	2	0.00059	0.052 U	0.052 U	0.051 U	NA	NA	0.053 U	NA	NA	0.051 U
BETA-BHC	0.02	0.046	0.021 U	0.021 U	0.020 U	NA	NA	0.021 U	NA	NA	0.020 U
PETROLEUM HYDROCARBONS (mg/L)											
TRPH	5	5	**1.47**	0.5 U	0.5 U	NA	NA	**2.01**	NA	NA	13***
INORGANICS (ug/L)											
ANTIMONY	44.5*	4,300	5 U	5.0 U	2.6 U	NA	NA	2.6 U	NA	NA	2.6 U
ARSENIC	50	50	10 U	5.0 U	3.6 U	NA	NA	3.6 U	NA	NA	3.6 U
BERYLLIUM	4	0.13	3 U	3.0 U	0.10 U	NA	NA	0.10 U	NA	NA	0.10 U
CADMIUM	6*	**	3 U	3.0 U	0.33 U	NA	NA	0.30 U	NA	NA	0.34 U
CHROMIUM	100	-	**6.7**	5.0 U	1.3 U	NA	NA	1.9 U	NA	NA	**5.2**
MANANESE	96.2*	-	**66.3**	**18.8**	**20.3**	NA	NA	**29.1**	NA	NA	**13.4**
VANADIUM	49	-	**42.5**	**5.9**	**8.6**	NA	NA	**4.3**	NA	NA	235

ND = Not detected.
U = Not detected at or above method detection limit (associated value).
J = Estimated concentration.
R = Surrogates recovery noncompliance.
Florida Department of Environmental Protection, Florida Administrative Code Chapter 62-777 (FDEP, 1999).
* NAS Cecil Field Inorganic Background Data Set (HLA, 1998).
** Surface water target cleanup goal dependent on hardness.
NA = Not applicable. CEF-5-LTM-04 and 05 were not installed until February 1999.

Bolded values exceed method detection limit.
Shaded values exceed groundwater target cleanup goal.
*** = Value exceeds surface water target cleanup goal.
TRPH = Total Recoverable Petroleum Hydrocarbons.
BEHP = bis(2-ehtylhexyl) phthalate.



CEF-5-7S	08/98	11/98	02/99
Volatiles (ug/L)	ND	ND	ND

CEF-5-LTM-01	08/98	11/98	02/99
Volatiles (ug/L)			
BENZENE	0.2 J / 0.2 J	1 U	1 U
ETHYLBENZENE	1 J / 1 J	1.8 J	2.2 J
TOLUENE	1.8 J / 1.5 J	5.2	5.5
TRICHLOROETHENE	11*/ 12*	5.6*	7.9*
XYLENES, TOTAL	9.2 / 9.6	15.2	19.7

CEF-5-LTM-04	08/98	11/98	02/99
Volatiles (ug/L)			
BENZENE	NT	NT	0.6 J
ETHYLBENZENE	NT	NT	6.7
TOLUENE	NT	NT	10.2
TRICHLOROETHENE	NT	NT	33.7*
XYLENES, TOTAL	NT	NT	37.8*

CEF-5-LTM-02	08/98	11/98	02/99
Volatiles (ug/L)			
ACETONE	12 J	10 UR / 10 UR	6.5 J / 6.4 J
BENZENE	0.6 J	0.6 J / 0.6 J	0.8 J / 0.8 J
ETHYLBENZENE	2.8 J	2.6 J / 2.7 J	3.4 J / 3.5 J
TOLUENE	5 U	3.5 J / 3.5 J	5.4 / 5.2
TRICHLOROETHENE	1.8 J	1.1 J/1.1 J	1.4 J / 1.3 J
XYLENES, TOTAL	14	13.7 / 13.9	20.3*/ 21.4*

CEF-5-LTM-03	08/98	11/98	02/99
Volatiles (ug/L)	ND	ND	ND

CEF-5-LTM-05	08/98	11/98	02/99
Volatiles (ug/L)			
ACETONE	NT	NT	9.9 J
BENZENE	NT	NT	2*
ETHYLBENZENE	NT	NT	10.1
TOLUENE	NT	NT	28.1
TRICHLOROETHENE	NT	NT	11.5*
XYLENES, TOTAL	NT	NT	49*

NT = Not Tested
ND = Not Detected
J = Estimated Concentration
U = Not Detected At Or Above Method Detection Limit (Associated Value)
R = Surrogate Recovery Noncompliance
* = Detected concentration exceeds target cleanup goal

LEGEND
- Existing Monitoring Wells
- Approximate Extent Of Groundwater Contamination
- Drainage Ditch
- Fence
- Former Pit Area

DRAWN BY	DATE
YLI	04/07/99
CHECKED BY	DATE
BD	1/30/99
COST/SCHEDULE-AREA	
SCALE	AS NOTED

VOLATILE ORGANIC COMPOUNDS IN GROUNDWATER
OPERABLE UNIT 2, SITE 5
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

CONTRACT NUMBER 7898
APPROVED BY — DATE —
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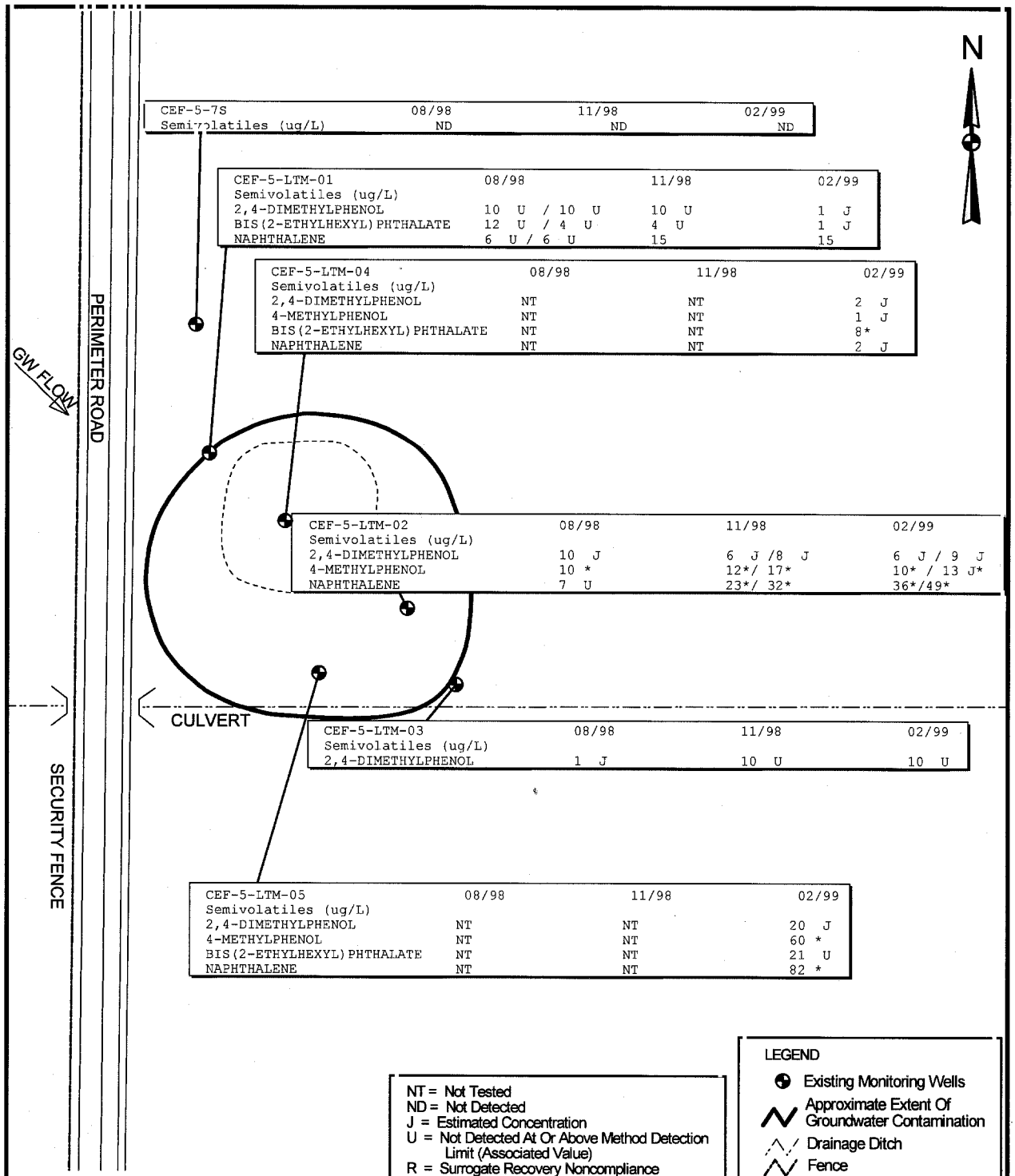

CEF-5-7S	08/98	11/98	02/99
Semivolatiles (ug/L)	ND	ND	ND

CEF-5-LTM-01	08/98	11/98	02/99
Semivolatiles (ug/L)			
2,4-DIMETHYLPHENOL	10 U / 10 U	10 U	1 J
BIS(2-ETHYLHEXYL) PHTHALATE	12 U / 4 U	4 U	1 J
NAPHTHALENE	6 U / 6 U	15	15

CEF-5-LTM-04	08/98	11/98	02/99
Semivolatiles (ug/L)			
2,4-DIMETHYLPHENOL	NT	NT	2 J
4-METHYLPHENOL	NT	NT	1 J
BIS(2-ETHYLHEXYL) PHTHALATE	NT	NT	8*
NAPHTHALENE	NT	NT	2 J

CEF-5-LTM-02	08/98	11/98	02/99
Semivolatiles (ug/L)			
2,4-DIMETHYLPHENOL	10 J	6 J /8 J	6 J / 9 J
4-METHYLPHENOL	10 *	12*/ 17*	10* / 13 J*
NAPHTHALENE	7 U	23*/ 32*	36*/49*

CEF-5-LTM-03	08/98	11/98	02/99
Semivolatiles (ug/L)			
2,4-DIMETHYLPHENOL	1 J	10 U	10 U

CEF-5-LTM-05	08/98	11/98	02/99
Semivolatiles (ug/L)			
2,4-DIMETHYLPHENOL	NT	NT	20 J
4-METHYLPHENOL	NT	NT	60 *
BIS(2-ETHYLHEXYL) PHTHALATE	NT	NT	21 U
NAPHTHALENE	NT	NT	82 *

NT = Not Tested
ND = Not Detected
J = Estimated Concentration
U = Not Detected At Or Above Method Detection Limit (Associated Value)
R = Surrogate Recovery Noncompliance
* = Detected concentration exceeds target cleanup goal

LEGEND
- Existing Monitoring Wells
- Approximate Extent Of Groundwater Contamination
- Drainage Ditch
- Fence
- Former Pit Area

DRAWN BY	DATE
YLI	04/07/99
CHECKED BY	DATE
BD	1/30/99

COST/SCHEDULE-AREA

SCALE
AS NOTED

SEMIVOLATILE ORGANIC COMPOUNDS IN GROUNDWATER
OPERABLE UNIT 2, SITE 5
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

CONTRACT NUMBER 7898

APPROVED BY — DATE —

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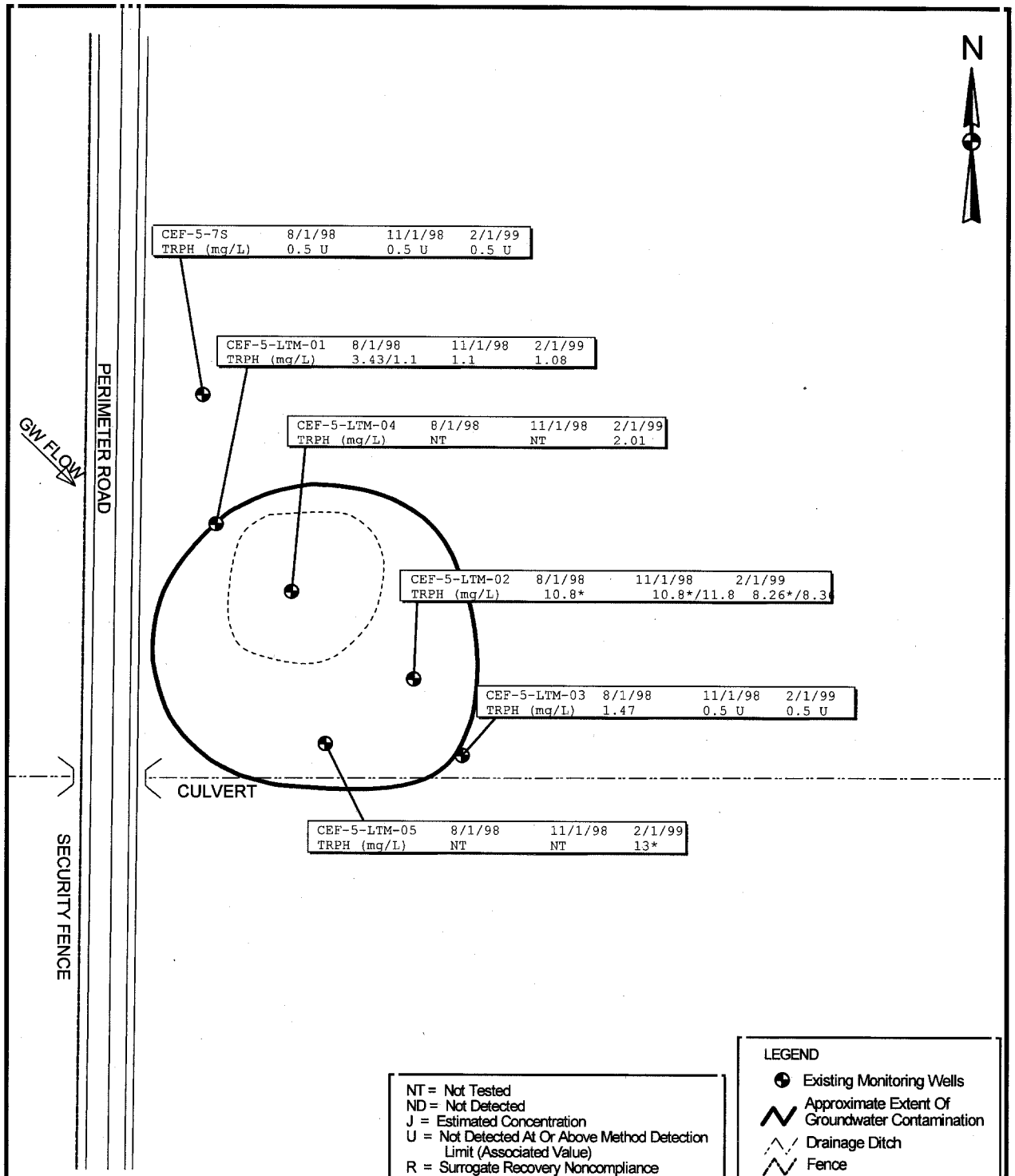

NT = Not Tested
ND = Not Detected
J = Estimated Concentration
U = Not Detected At Or Above Method Detection Limit (Associated Value)
R = Surrogate Recovery Noncompliance
* = Detected concentration exceeds target cleanup goal

LEGEND
- Existing Monitoring Wells
- Approximate Extent Of Groundwater Contamination
- Drainage Ditch
- Fence
- Former Pit Area

DRAWN BY	DATE
YLI	04/07/99
CHECKED BY	DATE
BD	1/30/99

COST/SCHEDULE-AREA

SCALE
AS NOTED

TRPH IN GROUNDWATER
OPERABLE UNIT 2, SITE 5
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

CONTRACT NUMBER 7898

APPROVED BY — DATE —

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DRAWING NO. FIGURE 3-4 REV 0

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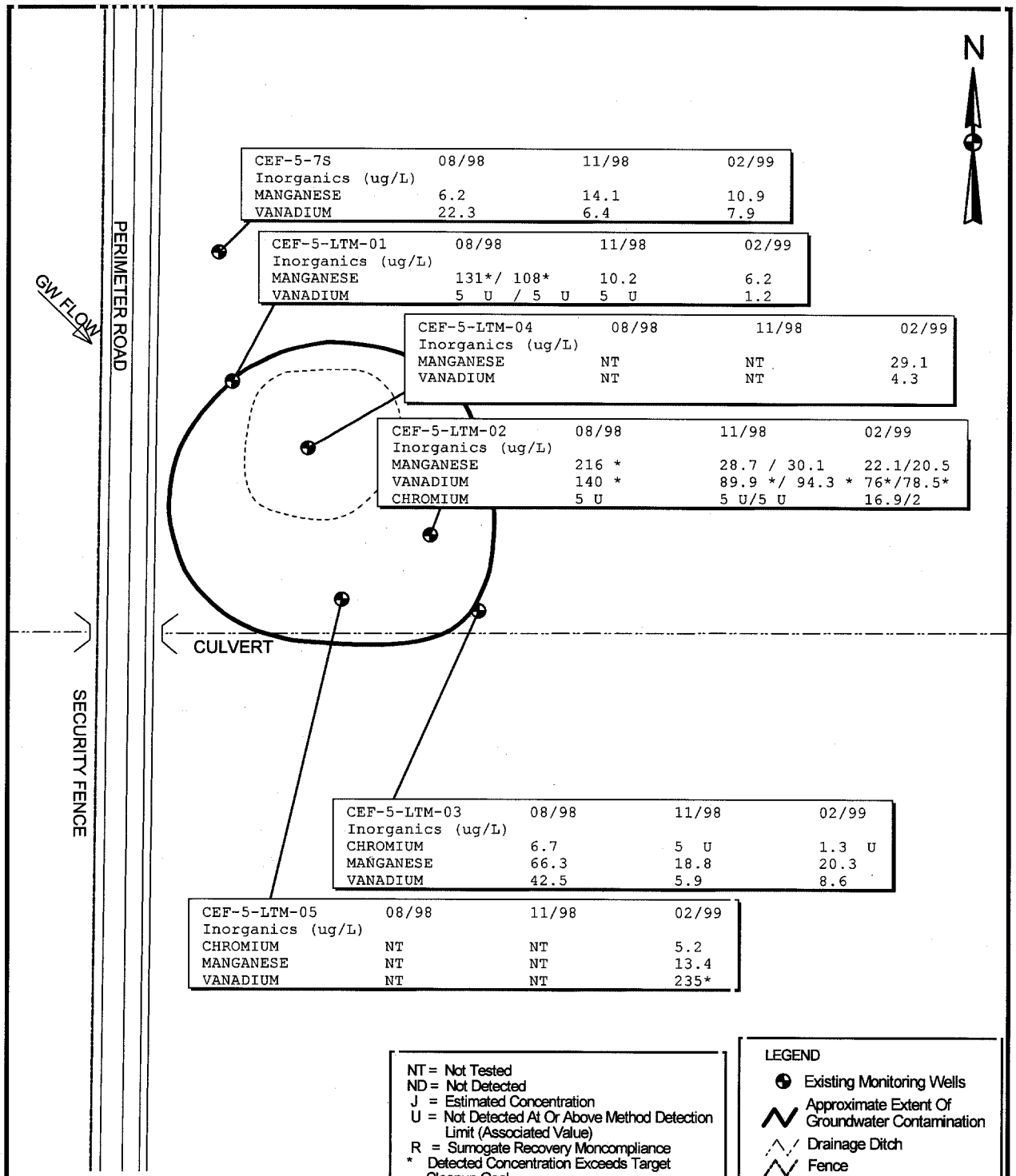
N
PERIMETER ROAD
GW FLOW
SECURITY FENCE
CULVERT
CEF-5-7S 08/98 11/98 02/99
Inorganics (ug/L)
MANGANESE 6.2 14.1 10.9
VANADIUM 22.3 6.4 7.9
CEF-5-LTM-01 08/98 11/98 02/99
Inorganics (ug/L)
MANGANESE 131*/ 108* 10.2 6.2
VANADIUM 5 U / 5 U 5 U 1.2
CEF-5-LTM-04 08/98 11/98 02/99
Inorganics (ug/L)
MANGANESE NT NT 29.1
VANADIUM NT NT 4.3
CEF-5-LTM-02 08/98 11/98 02/99
Inorganics (ug/L)
MANGANESE 216 * 28.7 / 30.1 22.1/20.5
VANADIUM 140 * 89.9 */ 94.3 * 76*/78.5*
CHROMIUM 5 U 5 U/5 U 16.9/2
CEF-5-LTM-03 08/98 11/98 02/99
Inorganics (ug/L)
CHROMIUM 6.7 5 U 1.3 U
MANGANESE 66.3 18.8 20.3
VANADIUM 42.5 5.9 8.6
CEF-5-LTM-05 08/98 11/98 02/99
Inorganics (ug/L)
CHROMIUM NT NT 5.2
MANGANESE NT NT 13.4
VANADIUM NT NT 235*
NT = Not Tested
ND = Not Detected
J = Estimated Concentration
U = Not Detected At Or Above Method Detection Limit (Associated Value)
R = Sumogate Recovery Moncompliance
* Detected Concentration Exceeds Target Cleanup Goal
LEGEND
Existing Monitoring Wells
Approximate Extent Of Groundwater Contamination
Drainage Ditch
Fence
Former Pit Area
100 0 100 Feet
DRAWN BY YLI
DATE 04/07/99
CHECKED BY BD
DATE 1/30/99
COST/SCHEDULE-AREA
SCALE AS NOTED
DEPARTMENT OF THE NAVY SOUTHERN DIV FACILITIES ENGINEERING COMD
INORGANICS IN GROUNDWATER
OPERABLE UNIT 2, SITE 5
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA
CONTRACT NUMBER 7898
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REV 0
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excess of surface water target cleanup goals included naphthalene in CEF-5-LTM-02 and CEF-5-LTM-05, BEHP in CEF-5-LTM-04, alpha-chlordane in CEF-5-LTM-02, and TRPH in CEF-5-LTM-02 and CEF-5-LTM-05.

3.2.1 VOCs

VOCs detected at concentrations greater than target cleanup goals during third quarter sampling included TCE, total xylenes, and benzene. TCE was detected in four of six wells sampled at concentrations ranging from 1.3 J to 33.7 µg/L. TCE concentrations exceeding the target cleanup goal of 3 µg/L were detected in CEF-5-LTM-01, CEF-5-LTM-04, and CEF-5-LTM-05. Total xylenes were detected in four of six wells sampled at concentrations ranging from 19.7 to 49 µg/L. Concentrations of xylenes in excess of the target cleanup goal of 20 µg/L were detected in CEF-5-LTM-02, CEF-5-LTM-04, and CEF-5-LTM-05. Benzene was detected in three of six wells sampled at concentrations ranging from 0.6 J to 2 µg/L. The benzene concentration in CEF-5-LTM-05 exceeded the target cleanup goal of 1 µg/L.

No VOCs were detected in wells CEF-5-7S or CEF-5-LTM-03. Wells CEF-5-LTM-04 and CEF-5-LTM-05 were installed in February 1999, and no previous data are available for comparison. Concentrations of acetone and benzene remained relatively constant in quarterly sampling to date. TCE concentrations decreased in CEF-5-LTM-01 and remained relatively constant in CEF-5-LTM-02 over the three quarterly sampling events. Concentrations of ethylbenzene and xylenes increased in both wells over the three quarters of sampling. Toluene concentrations increased in CEF-5-LTM-01 and CEF-5-LTM-02. Maximum detected concentrations of VOC COCs decreased significantly from the RI to third quarter sampling.

3.2.2 SVOCs

SVOCs detected above target cleanup goals during third quarter sampling included 4-methylphenol, naphthalene, and BEHP. 4-Methylphenol was detected in three of six wells at concentrations ranging from 1 J to 60 µg/L. Concentrations of 4-methylphenol exceeded its target cleanup goal of 4 µg/L in wells CEF-5-LTM-02 and CEF-5-LTM-05. Naphthalene was detected in four of six wells at concentrations ranging from 2 J to 82 µg/L. Concentrations of naphthalene were detected in excess of the target cleanup goal of 20 µg/L in CEF-5-LTM-02 and CEF-5-LTM-05. BEHP was detected in two of six wells sampled at concentrations ranging from 1 J to 8 µg/L. The concentration of BEHP detected in CEF-5-LTM-04 during third quarter sampling exceeded its target cleanup goal of 6 µg/L.

SVOCs were not detected in CEF-5-7S and CEF-5-LTM-03, and as stated previously, wells CEF-5-LTM-04 and CEF-5-LTM-05 were sampled for the first time during the third quarter event. Naphthalene concentrations were higher in third quarter samples than in previous sampling events. Concentrations of

other SVOCs remained relatively consistent with previous sampling results. Maximum detected concentrations of SVOC COCs decreased significantly from the RI to third quarter sampling.

SVOCs detected in groundwater at concentrations in excess of surface water target cleanup goals included naphthalene in CEF-5-LTM-02 and CEF-5-LTM-05 and BEHP in CEF-5-LTM-04.

3.2.3 Petroleum Hydrocarbons

TRPH concentrations in monitoring wells CEF-5-LTM-02 and CEF-5-LTM-05, 8.31 and 13 mg/L, respectively, exceeded the target cleanup goal of 5 mg/L. The maximum TRPH concentration decreased significantly at the site, from 160 mg/L in the RI to 13 mg/L during this sampling event. TRPH concentrations have increased in CEF-5-LTM-02 since the first quarter sampling event and have decreased in CEF-5-LTM-01 and CEF-5-LTM-03. Groundwater TRPH concentrations exceeded surface water target cleanup goals in groundwater from wells CEF-5-LTM-02 and CEF-5-LTM-05.

3.2.4 Inorganics

Inorganics detected during third quarter sampling included chromium, manganese, and vanadium. Chromium was detected in two of six wells sampled at concentrations of 5.2 and 16.9 µg/L. Manganese was detected in the six wells sampled at concentrations ranging from 6.2 to 29.1 µg/L. Vanadium was detected in the six wells at concentrations ranging from 1.2 to 235 µg/L. Concentrations of chromium and manganese detected during third quarter sampling did not exceed target cleanup goals. Vanadium concentrations in CEF-5-LTM-02 and CEF-5-LTM-05 during third quarter sampling exceeded its target cleanup goal of 49 µg/L. Concentrations of inorganics generally decreased from first to third quarter sampling, with maximum detected concentrations lower in quarterly monitoring compared to RI sample results.

3.2 NATURAL ATTENUATION PARAMETERS

Fixed-base laboratory analyses and field analytical tests were performed on samples of groundwater from monitoring wells for natural attenuation indicator parameters. The fixed-base laboratory parameters included alkalinity, biological oxygen demand (BOD), chemical oxygen demand (COD), chloride, dissolved iron, dissolved manganese, methane, ethane, ethene, nitrate, nitrite, orthophosphate, sulfate, dissolved sulfide, and total organic carbon (TOC). Field analytical tests included pH, specific conductivity, temperature, turbidity, oxidation-reduction potential (ORP), dissolved oxygen (DO), hydrogen sulfide (H_2S), sulfide (S^{-2}), dissolved carbon dioxide (CO_2), ferrous iron (Fe^{2+}), manganese, and alkalinity. This section presents the analytical results from the third quarter groundwater monitoring conducted in

February 1999. Natural attenuation data are provided in Table 3-4, and Figures 3-6 through 3-14 present tag maps of natural attenuation analytical results.

3.3.1 Dissolved Oxygen

DO acts as a primary substrate or co-substrate during the initial stages of microbial metabolism and is the most efficient electron acceptor involved in the biodegradation of natural or anthropogenic carbon. However, for chlorinated hydrocarbons, anaerobic pathways (e.g., reductive dechlorination) are more efficient than aerobic pathways. If DO concentrations are greater than 0.5 to 1.0 mg/L, anaerobic bacteria cannot exist and reductive dechlorination cannot occur. DO data for OU 2, Site 5 are presented in Figure 3-6.

The DO concentration in the upgradient well, CEF-5-7S, was 1.41 mg/L. DO concentrations in groundwater from wells within the plume (CEF-5-LTM-01, CEF-5-LTM-02, CEF-5-LTM-04, and CEF-5-LTM-05) were less than 0.5 mg/L, indicating an anaerobic environment in this area. In well CEF-5-LTM-03, downgradient of the plume, the DO concentration was 1.62 mg/L. These data, along with results from previous quarterly sampling events, indicate that mostly anaerobic conditions are present within the plume but that conditions appear to fluctuate between aerobic and anaerobic in well CEF-5-LTM-03. This is likely a result of the well being located along the downgradient edge of the plume.

3.3.2 Nitrate and Nitrite

After DO has been depleted through aerobic respiration, anaerobes may use nitrate (NO_3) as an electron receptor to degrade hydrocarbons (denitrification). This process generates nitrite (NO_2) as an intermediate compound, as well as carbon dioxide. However, because chlorinated hydrocarbons also are used as electron acceptors during reductive dechlorination, nitrate may compete as an electron acceptor if present at concentrations greater than 1.0 mg/L.

Nitrate was detected in the upgradient well, CEF-5-7S, at a concentration of 0.39 mg/L. Nitrate and nitrite were not detected in groundwater samples from wells within or downgradient of the plume and disposal site (see Figure 3-7). The presence of nitrate only in the upgradient well indicates that some level of denitrification is likely occurring at the site. However, due to the general lack of nitrate and/or nitrite throughout the groundwater system, it is unlikely that nitrate reduction is a significant microbial process at the site. These results are consistent with data from first and second quarter sampling.

TABLE 3-4

SUMMARY OF NATURAL ATTENUATION PARAMETERS IN GROUNDWATER
OPERABLE UNIT 2, SITE 5
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA
PAGE 1 OF 2

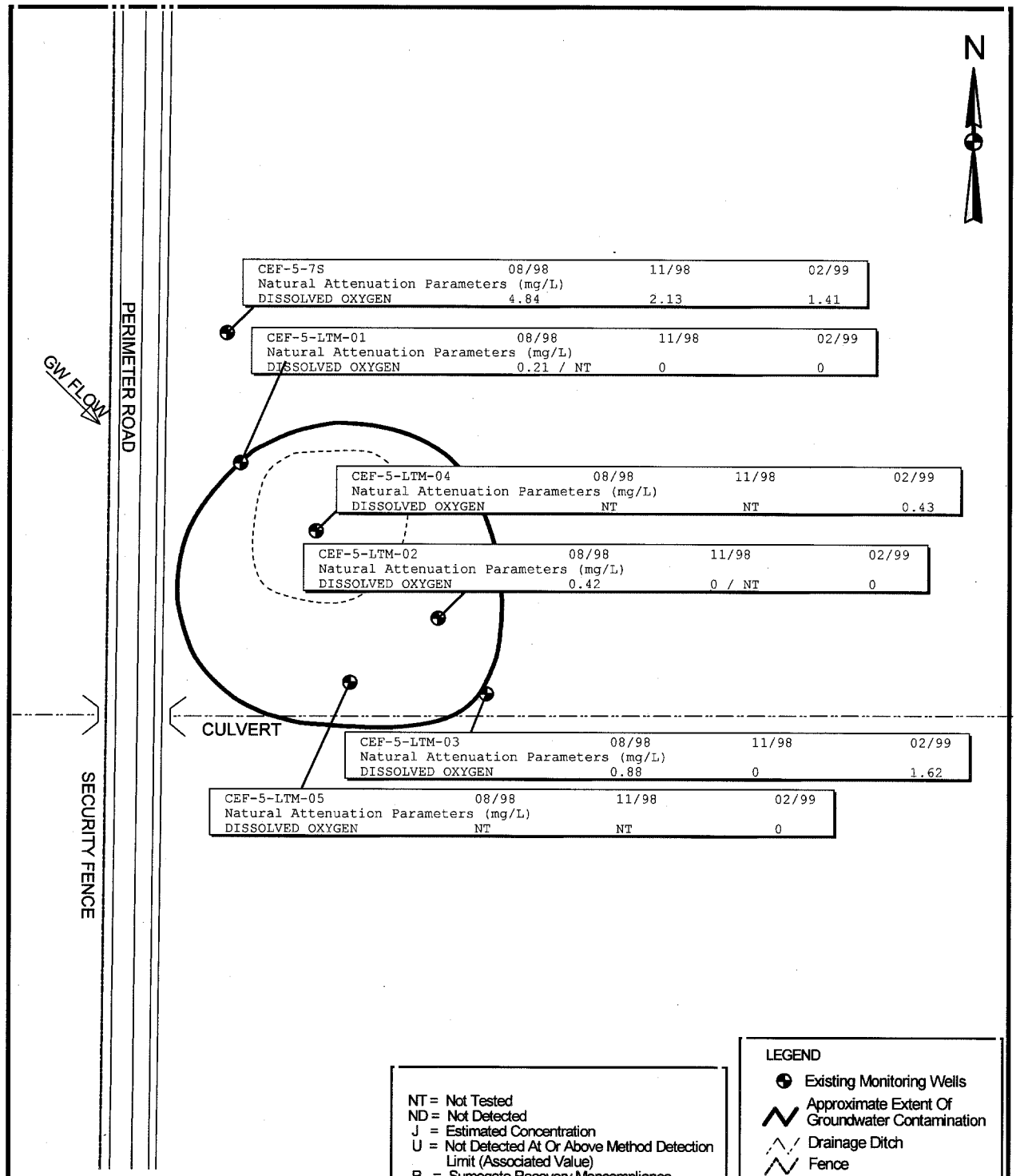
PARAMETER	UNITS	CEF-5-7S			CEF-05-LTM-01				CEF-05-LTM-02		
		Aug-98	Nov-98	Feb-99	Aug-98		Nov-98	Feb-99	Aug-98	Nov-98	
					Sample	Duplicate				Sample	Duplicate
ALKALINITY	mg/L	148	157	164	7.69	NT	1.0 UJ	1 U	11.5	7.77	5.18
ALKALINITY, FIELD	mg/L	119.5	298	161	4.7	NT	0	0	4.9	0	NT
BIOLOGICAL OXYGEN DEMAND	mg/L	3.6 J	2.0 U	2 U	2320 J	NT	2.0 U	2 U	3350 J	2.0 U	2.0 U
CARBON DIOXIDE	mg/L	63.2	166	140	103.6	NT	229	174	137	208	NT
CHEMICAL OXYGEN DEMAND	mg/L	55.6	28.6	23.8	16.7	22.2	23.4	21.4	66.7	80.5	80.5
CHLORIDE	mg/L	13.1	35.3 J	20	22.3	21.7	19.8 J	6.3	6.87	12.4 J	13.2 J
DISSOLVED OXYGEN	mg/L	4.84	2.13	1.41	0.21	NT	0	0	0.42	0	NT
ETHANE	ug/L	NT	6 U	5.8 U	NT	NT	6 U	5.8 U	NT	6 U	6 U
ETHENE	ug/L	NT	6 U	6.2 U	NT	NT	6 U	6.2 U	NT	6 U	6 U
FERROUS IRON	mg/L	0	0.01	0.03	3	NT	3.37	2.87	4	4.70	NT
IRON, FILTERED	ug/L	100 U	100 U	192	3020	2950	3510	2990	3580	5110	5540
HYDROGEN SULFIDE (H2S)	mg/L	0	0.0	0	0.5	NT	0.5	2	0.5	0.6	NT
SULFIDE (S-2)	mg/L	0	0.019	0.05	0	NT	0.719	0.8	0	0.719	NT
DISSOLVED SULFIDE	mg/L	NT	2.0 U	2 U	NT	NT	2.0 U	2 U	NT	2.0	2.0 U
SULFATE	mg/L	30.7	16.5 J	11	5.52	4.78	13.4 J	0.51	7.97	3.66 J	4.47 J
MANGANESE, FILTERED	ug/L	6	14.6	11.7	130	111	9.9	5.4	211	25.7	28.5
MANGANESE, FIELD	mg/L	NT	0	0.5	NT	0	NT	0.2	NT	0	NT
METHANE	ug/L	7.6	29	58.6	253	385.1	325	433.2	2293	1552	1654
NITRATE	mg/L	0.06	0.325 J	0.39	0.05 U	NT	0.1 UJ	0.1 U	2.61 J	0.1 UJ	0.1 UJ
NITRITE	mg/L	0.061	0.1 U	0.1 U	0.05 U	NT	0.1 U	0.1 U	0.05 U	0.1 U	0.1 U
ORTHOPHOSPHATE	mg/L	0.02 U	0.1 UJ	0.1 U	0.02 U	NT	0.1 UJ	0.1 U	0.06	0.1 UJ	0.1 UJ
pH	Standard units	6.73	6.12	6.84	4.8	NT	4.38	4.7	4.8	5.22	NT
ORP	mV	NT	0	55	0	NT	-148.0	-115	0	0	NT
SPECIFIC CONDUCTIVITY	mS/cm	0.41	0.437	0.397	0.118	NT	0.057	0.078	0.072	0.04	NT
TEMPERATURE	°C	29.9	22.5	15.4	27.1	NT	23.7	20.3	26.7	23.4	NT
TOTAL ORGANIC CARBON	mg/L	NT	8.51	753	NT	NT	3.69	4.41	NT	19.4	18.2
TURBIDITY	NTU	0	1	0	0	NT	0	0	0	0	NT

TABLE 3-4

SUMMARY OF NATURAL ATTENUATION PARAMETERS IN GROUNDWATER
OPERABLE UNIT 2, SITE 5
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA
PAGE 2 OF 2

PARAMETER	UNITS	CEF-05-LTM-02		CEF-05-LTM-03			CEF-05-LTM-04			CEF-05-LTM-05		
		Feb-99		Aug-98	Nov-98	Feb-99	Aug-98	Nov-98	Feb-99	Aug-98	Nov-98	Feb-99
		Sample	Duplicate									
ALKALINITY	mg/L	4.01	1.0	3.84	7.77	8	NT	NT	58.1	NT	NT	1 U
ALKALINITY, FIELD	mg/L	0	NT	10	0	7.5	NT	NT	56.8	NT	NT	17.3
BIOLOGICAL OXYGEN DEMAND	mg/L	2.33	2.03	198 J	2.0 U	2 U	NT	NT	4.03	NT	NT	2.03
CARBON DIOXIDE	mg/L	183	NT	58	93	54.2	NT	NT	211	NT	NT	296
CHEMICAL OXYGEN DEMAND	mg/L	85.7	83.3	11.1	18.2	14.3	NT	NT	28.6	NT	NT	145
CHLORIDE	mg/L	3.1	3.4	7.02	12.8 J	3.5	NT	NT	25	NT	NT	12
DISSOLVED OXYGEN	mg/L	0	NT	0.88	0	1.62	NT	NT	0.43	NT	NT	0
ETHANE	ug/L	5.8 U	5.8 U	NT	6 U	5.8 U	NT	NT	5.8 U	NT	NT	5.8 U
ETHENE	ug/L	6.2 U	6.2 U	NT	6 U	6.2 U	NT	NT	6.2 U	NT	NT	6.2 U
FERROUS IRON	mg/L	3.3	NT	1.6	0.56	0.43	NT	NT	1.63	NT	NT	2.58
IRON, FILTERED	ug/L	4160	4460	1010	616	614	NT	NT	1620	NT	NT	3040
HYDROGEN SULFIDE (H2S)	mg/L	0.7	NT	0.5	0.2	0.5	NT	NT	0.4	NT	NT	0.3
SULFIDE (S-2)	mg/L	0.8	NT	0	0.389	0.43	NT	NT	0.27	NT	NT	0.8
DISSOLVED SULFIDE	mg/L	2 U	2 U	NT	2.0 U	2 U	NT	NT	2 U	NT	NT	2 U
SULFATE	mg/L	3.3	3.4	0.709	1.27 J	0.73	NT	NT	2	NT	NT	0.67
MANGANESE, FILTERED	ug/L	19.8	21.6	62.6	18.0	21	NT	NT	25.5	NT	NT	13.1
MANGANESE, FIELD	mg/L	0	NT	NT	0.2	0	NT	NT	0.2	NT	NT	0.4
METHANE	ug/L	3380	2190	139.4	117	363.4	NT	NT	1339	NT	NT	6710
NITRATE	mg/L	0.1 UJ	0.1 UJ	0.05	0.1 UJ	0.1 U	NT	NT	0.1 U	NT	NT	0.1 U
NITRITE	mg/L	0.1 U	0.1 U	0.05 U	0.1 U	0.1 U	NT	NT	0.1 U	NT	NT	0.1 U
ORTHOPHOSPHATE	mg/L	0.1 UJ	0.1 UJ	0.02 U	0.1 UJ	0.1 U	NT	NT	0.1 U	NT	NT	0.1 U
pH	Standard units	4.93	NT	5.27	4.98	5.6	NT	NT	5.93	NT	NT	4.98
ORP	mV	-89	NT	0	0	-78	NT	NT	-59.3	NT	NT	-16.4
SPECIFIC CONDUCTIVITY	mS/cm	0.053	NT	0.049	0.029	0.052	NT	NT	0.197	NT	NT	0.063
TEMPERATURE	°C	20.3	NT	25.4	21.8	18.3	NT	NT	19.6	NT	NT	18.5
TOTAL ORGANIC CARBON	mg/L	22.2	24.8	NT	4.26	3.79	NT	NT	5.52	NT	NT	51.8
TURBIDITY	NTU	0	NT	468	11.0	0	NT	NT	182	NT	NT	302

NT = Not tested.
U = Not detected at or above method detection limit (associated value).
J = Estimated concentration.
ORP = Oxidation-reduction potential.



NT = Not Tested
ND = Not Detected
J = Estimated Concentration
U = Not Detected At Or Above Method Detection Limit (Associated Value)
R = Sumogate Recovery Moncompliance

LEGEND
- Existing Monitoring Wells
- Approximate Extent Of Groundwater Contamination
- Drainage Ditch
- Fence
- Former Pit Area

DRAWN BY	DATE
YLI	04/07/99
CHECKED BY	DATE
BD	1/30/99

COST/SCHEDULE-AREA

SCALE
AS NOTED

DISSOLVED OXYGEN IN GROUNDWATER
OPERABLE UNIT 2, SITE 5
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

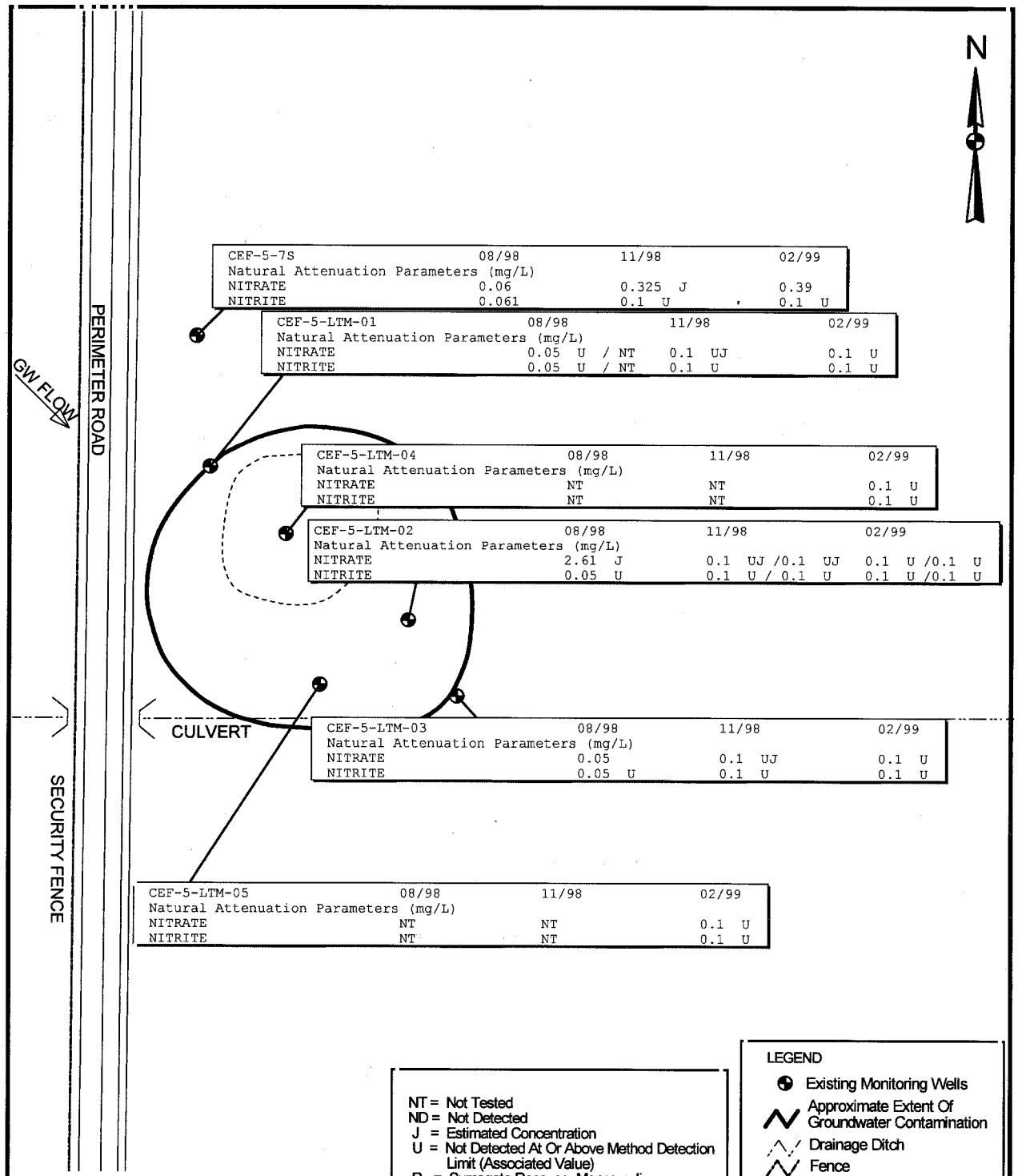
CONTRACT NUMBER 7898

APPROVED BY — DATE —

APPROVED BY — DATE —

DRAWING NO. FIGURE 3-6 REV 0

P:\GIS\CECIL\SITE5_GW.APR APRIL-07-99 YLI LAYOUT 3 R 06 DISSOLVED OXYGEN



NT = Not Tested
ND = Not Detected
J = Estimated Concentration
U = Not Detected At Or Above Method Detection Limit (Associated Value)
R = Sumogate Recovery Moncompliance

LEGEND
- Existing Monitoring Wells
- Approximate Extent Of Groundwater Contamination
- Drainage Ditch
- Fence
- Former Pit Area

DRAWN BY	DATE
YLI	04/07/99
CHECKED BY	DATE
BD	1/30/99

COST/SCHEDULE-AREA

SCALE
AS NOTED

NITRATE AND NITRITE IN GROUNDWATER
OPERABLE UNIT 2, SITE 5
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

CONTRACT NUMBER 7898

APPROVED BY — DATE —

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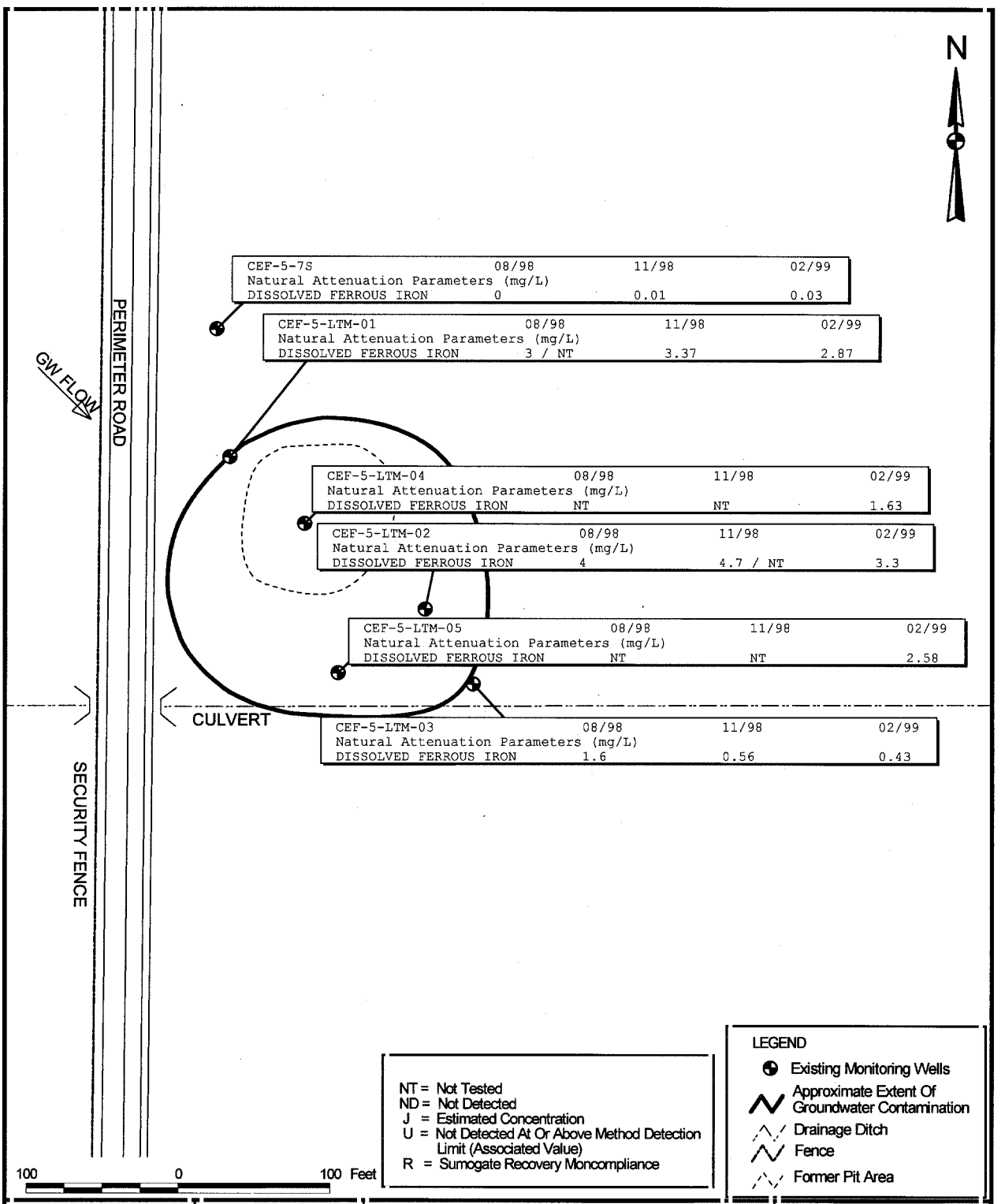
DRAWING NO. FIGURE 3-7 REV 0

P:\GIS\CECIL\SITE5_GW.APR APRIL-07-99 YLI LAYOUT 3 R 06 NITRATE

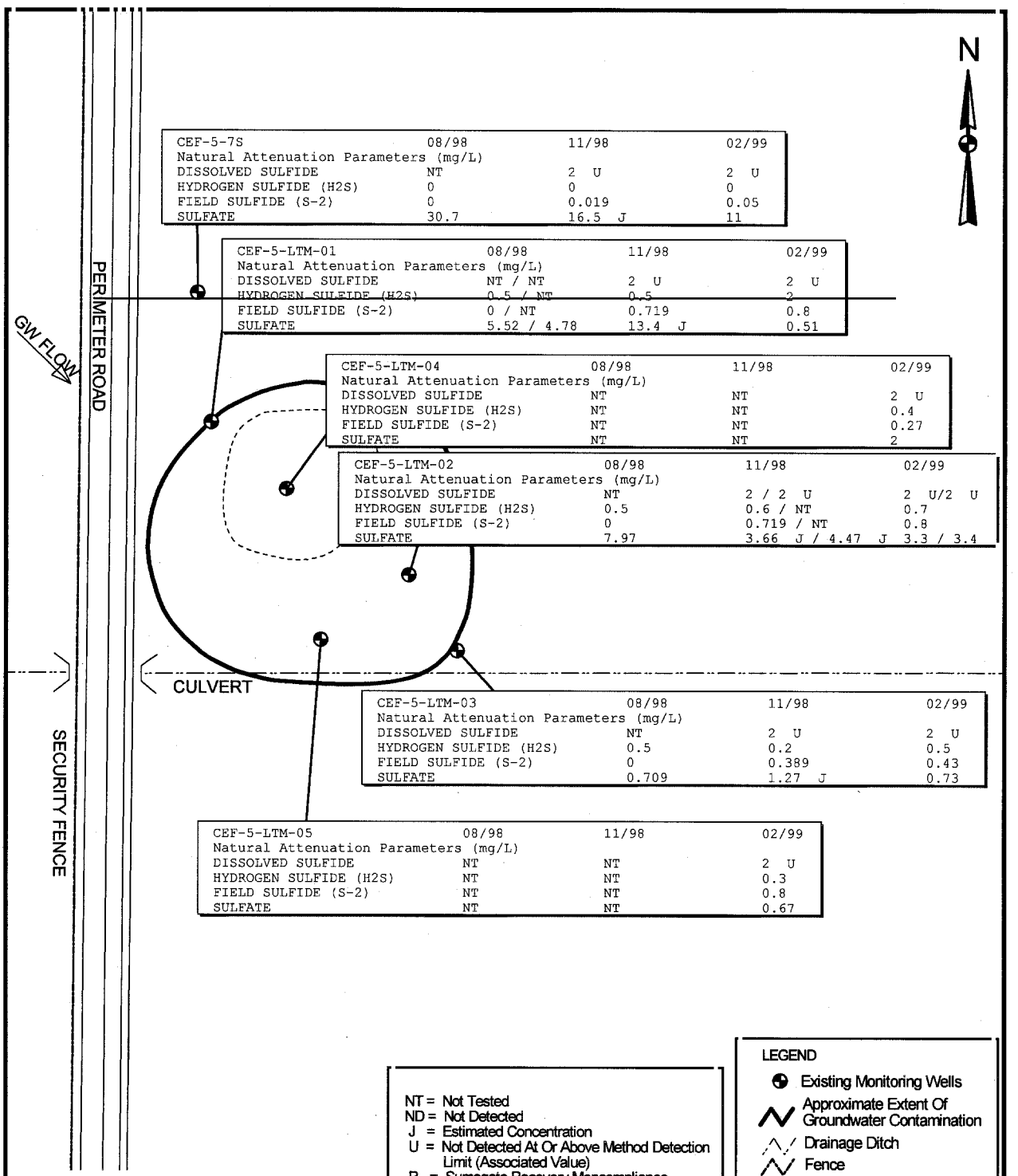


NT = Not Tested
ND = Not Detected
J = Estimated Concentration
U = Not Detected At Or Above Method Detection Limit (Associated Value)
R = Sumogate Recovery Moncompliance

LEGEND
- Existing Monitoring Wells
- Approximate Extent Of Groundwater Contamination
- Drainage Ditch
- Fence
- Former Pit Area

DRAWN BY YLI	DATE 04/07/99	FERROUS IRON IN GROUNDWATER OPERABLE UNIT 2, SITE 5 NAVAL AIR STATION CECIL FIELD JACKSONVILLE, FLORIDA	CONTRACT NUMBER 7898
CHECKED BY BD	DATE 1/30/99		APPROVED BY — DATE —
COST/SCHEDULE-AREA			APPROVED BY — DATE —
SCALE AS NOTED			DRAWING NO. FIGURE 3-8 REV 0

P:\GIS\CECIL\SITE5_GW.APR APRIL-07-99 YLI LAYOUT 3 R 07 FERROUS IRON



CEF-5-7S	08/98	11/98	02/99
Natural Attenuation Parameters (mg/L)			
DISSOLVED SULFIDE	NT	2 U	2 U
HYDROGEN SULFIDE (H2S)	0	0	0
FIELD SULFIDE (S-2)	0	0.019	0.05
SULFATE	30.7	16.5 J	11

CEF-5-LTM-01	08/98	11/98	02/99
Natural Attenuation Parameters (mg/L)			
DISSOLVED SULFIDE	NT / NT	2 U	2 U
HYDROGEN SULFIDE (H2S)	0.5 / NT	0.5	2
FIELD SULFIDE (S-2)	0 / NT	0.719	0.8
SULFATE	5.52 / 4.78	13.4 J	0.51

CEF-5-LTM-04	08/98	11/98	02/99
Natural Attenuation Parameters (mg/L)			
DISSOLVED SULFIDE	NT	NT	2 U
HYDROGEN SULFIDE (H2S)	NT	NT	0.4
FIELD SULFIDE (S-2)	NT	NT	0.27
SULFATE	NT	NT	2

CEF-5-LTM-02	08/98	11/98	02/99
Natural Attenuation Parameters (mg/L)			
DISSOLVED SULFIDE	NT	2 / 2 U	2 U/2 U
HYDROGEN SULFIDE (H2S)	0.5	0.6 / NT	0.7
FIELD SULFIDE (S-2)	0	0.719 / NT	0.8
SULFATE	7.97	3.66 J / 4.47 J	3.3 / 3.4

CEF-5-LTM-03	08/98	11/98	02/99
Natural Attenuation Parameters (mg/L)			
DISSOLVED SULFIDE	NT	2 U	2 U
HYDROGEN SULFIDE (H2S)	0.5	0.2	0.5
FIELD SULFIDE (S-2)	0	0.389	0.43
SULFATE	0.709	1.27 J	0.73

CEF-5-LTM-05	08/98	11/98	02/99
Natural Attenuation Parameters (mg/L)			
DISSOLVED SULFIDE	NT	NT	2 U
HYDROGEN SULFIDE (H2S)	NT	NT	0.3
FIELD SULFIDE (S-2)	NT	NT	0.8
SULFATE	NT	NT	0.67

NT = Not Tested
ND = Not Detected
J = Estimated Concentration
U = Not Detected At Or Above Method Detection Limit (Associated Value)
R = Sumogate Recovery Moncompliance

LEGEND
- Existing Monitoring Wells
- Approximate Extent Of Groundwater Contamination
- Drainage Ditch
- Fence
- Former Pit Area

DRAWN BY	DATE
YLI	04/07/99
CHECKED BY	DATE
BD	1/30/99

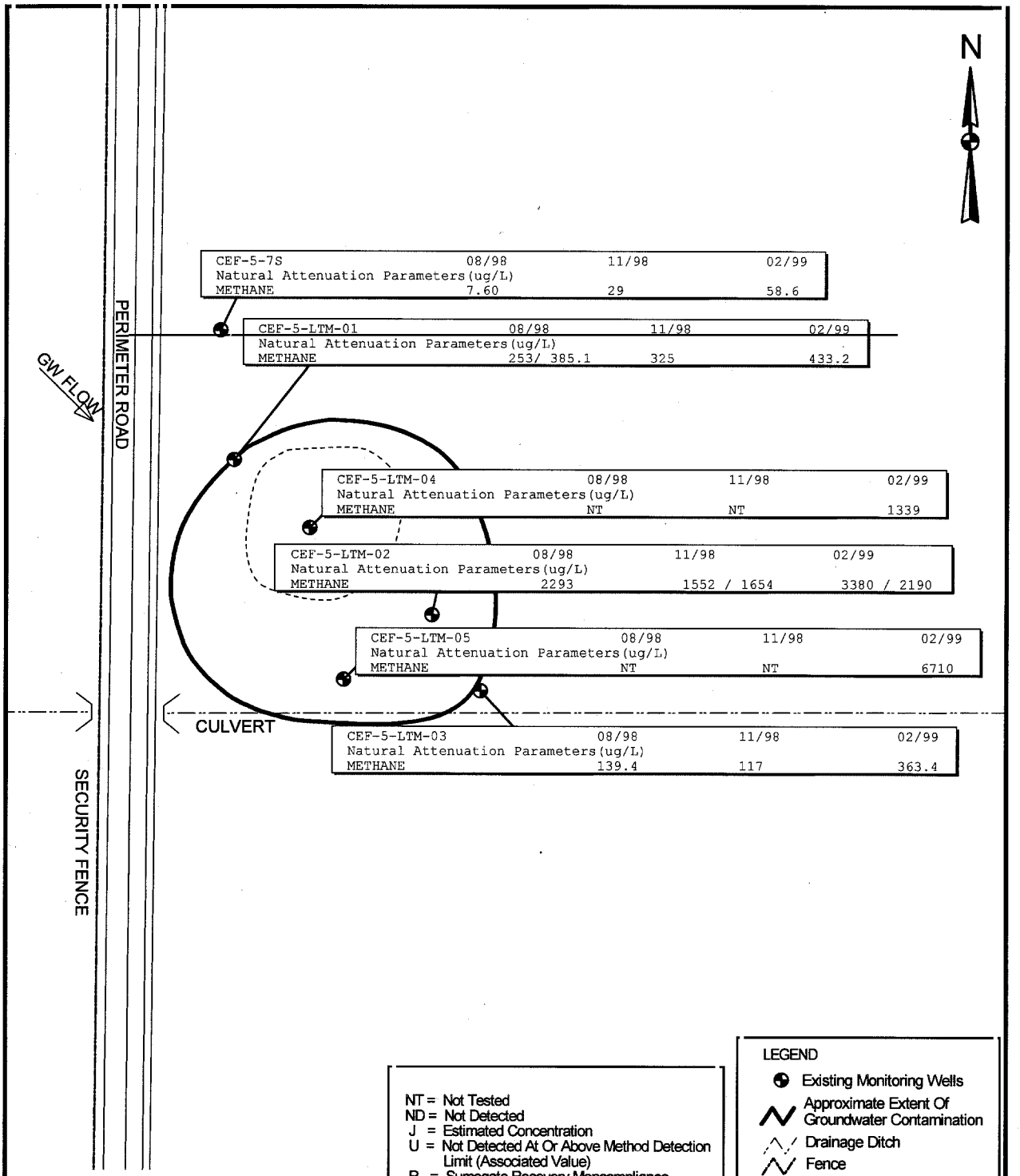
COST/SCHEDULE-AREA

SCALE
AS NOTED

SULFATE, SULFIDE, AND HYDROGEN SULFIDE IN GROUNDWATER
OPERABLE UNIT 2, SITE 5
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

CONTRACT NUMBER 7898
APPROVED BY — DATE —
APPROVED BY — DATE —
DRAWING NO. FIGURE 3-9 REV 0

P:\GIS\CECIL\SITE5_GW.APR APRIL-07-99 YLI LAYOUT 3 R 08 SULFATE



NT = Not Tested
ND = Not Detected
J = Estimated Concentration
U = Not Detected At Or Above Method Detection Limit (Associated Value)
R = Surrogate Recovery Noncompliance

LEGEND
- Existing Monitoring Wells
- Approximate Extent Of Groundwater Contamination
- Drainage Ditch
- Fence
- Former Pit Area

DRAWN BY	DATE
YLI	04/07/99
CHECKED BY	DATE
BD	1/30/99

COST/SCHEDULE-AREA

SCALE
AS NOTED

METHANE, ETHANE, AND ETHENE IN GROUNDWATER
OPERABLE UNIT 2, SITE 5
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

CONTRACT NUMBER 7898

APPROVED BY — DATE —

APPROVED BY — DATE —

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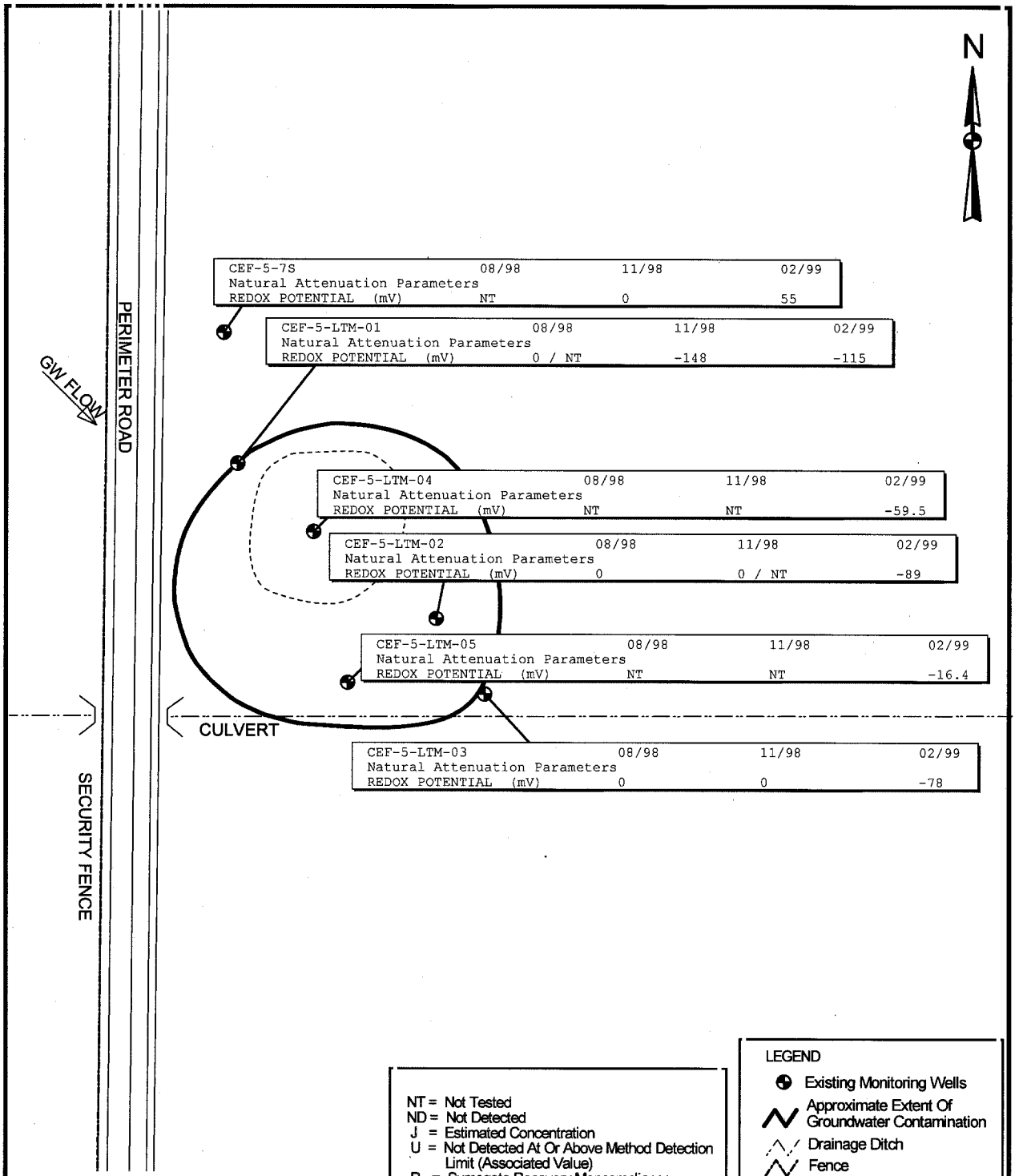
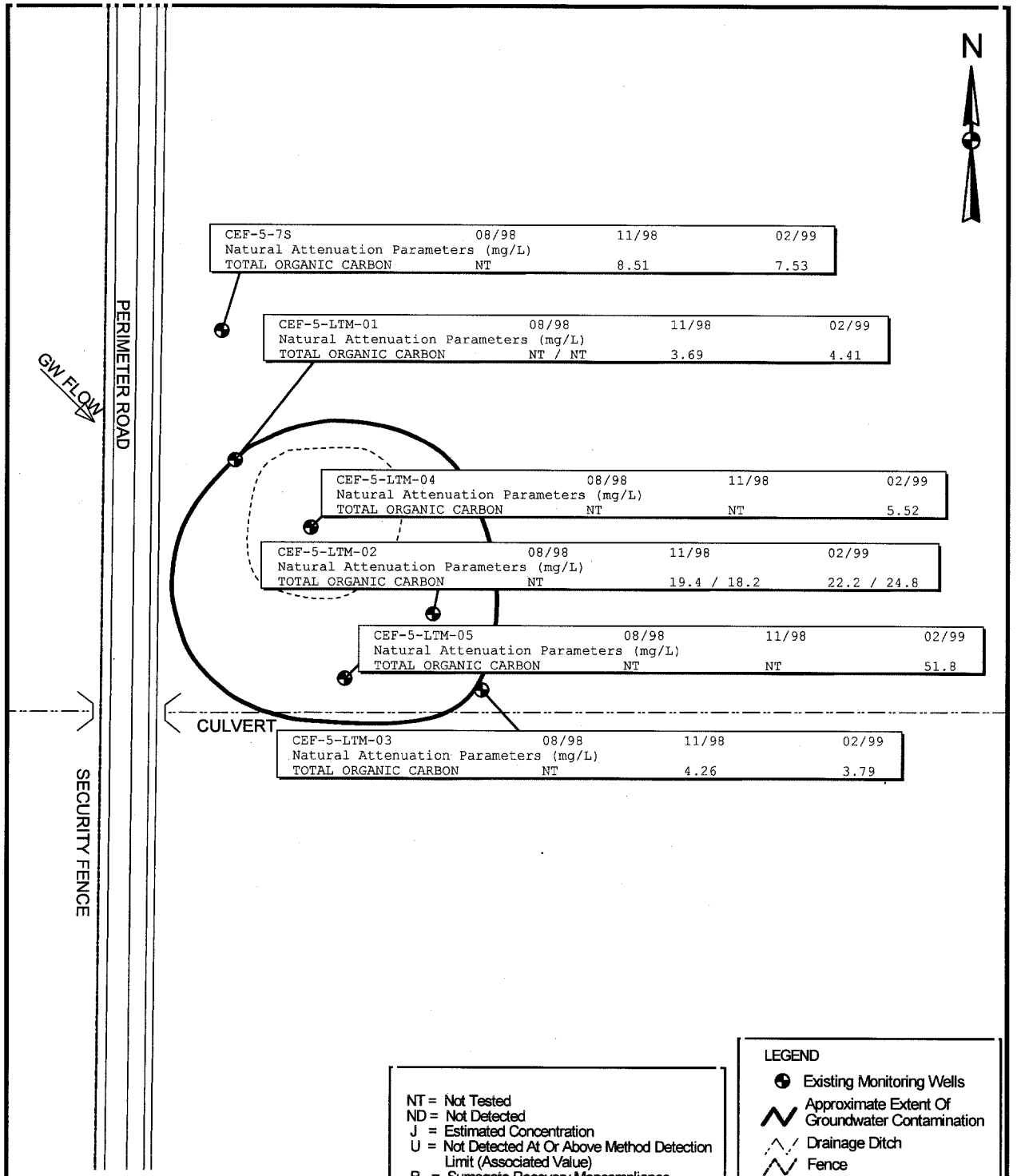
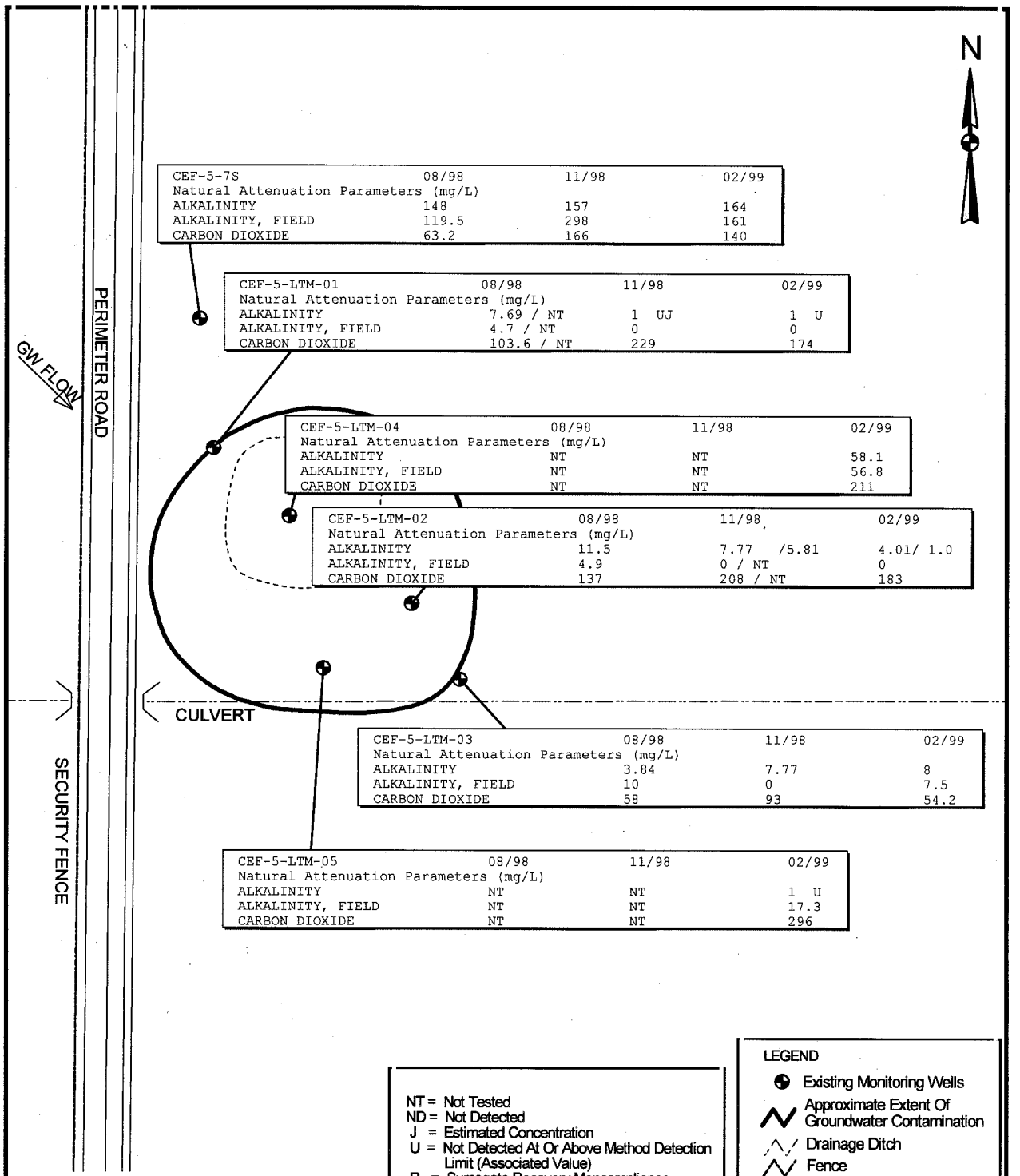

N
PERIMETER ROAD
GW FLOW
CEF-5-7S 08/98 11/98 02/99
Natural Attenuation Parameters
REDOX POTENTIAL (mV) NT 0 55
CEF-5-LTM-01 08/98 11/98 02/99
Natural Attenuation Parameters
REDOX POTENTIAL (mV) 0 / NT -148 -115
CEF-5-LTM-04 08/98 11/98 02/99
Natural Attenuation Parameters
REDOX POTENTIAL (mV) NT NT -59.5
CEF-5-LTM-02 08/98 11/98 02/99
Natural Attenuation Parameters
REDOX POTENTIAL (mV) 0 0 / NT -89
CEF-5-LTM-05 08/98 11/98 02/99
Natural Attenuation Parameters
REDOX POTENTIAL (mV) NT NT -16.4
CULVERT
CEF-5-LTM-03 08/98 11/98 02/99
Natural Attenuation Parameters
REDOX POTENTIAL (mV) 0 0 -78
SECURITY FENCE
NT = Not Tested
ND = Not Detected
J = Estimated Concentration
U = Not Detected At Or Above Method Detection Limit (Associated Value)
R = Surrogate Recovery Noncompliance
LEGEND
Existing Monitoring Wells
Approximate Extent Of Groundwater Contamination
Drainage Ditch
Fence
Former Pit Area
100 0 100 Feet
DRAWN BY YLI
DATE 04/07/99
CHECKED BY BD
DATE 1/30/99
COST/SCHEDULE-AREA
SCALE AS NOTED
GROUNDWATER OXIDATION-REDUCTION POTENTIAL
OPERABLE UNIT 2, SITE 5
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA
CONTRACT NUMBER 7898
APPROVED BY
DATE
APPROVED BY
DATE
DRAWING NO. FIGURE 3-11
REV 0
P:\GIS\CECIL\SITE5_GW.APR APRIL-07-99 YLI LAYOUT 3 R 11 ORP


N
CEF-5-7S 08/98 11/98 02/99
Natural Attenuation Parameters (mg/L)
TOTAL ORGANIC CARBON NT 8.51 7.53
CEF-5-LTM-01 08/98 11/98 02/99
Natural Attenuation Parameters (mg/L)
TOTAL ORGANIC CARBON NT / NT 3.69 4.41
CEF-5-LTM-04 08/98 11/98 02/99
Natural Attenuation Parameters (mg/L)
TOTAL ORGANIC CARBON NT NT 5.52
CEF-5-LTM-02 08/98 11/98 02/99
Natural Attenuation Parameters (mg/L)
TOTAL ORGANIC CARBON NT 19.4 / 18.2 22.2 / 24.8
CEF-5-LTM-05 08/98 11/98 02/99
Natural Attenuation Parameters (mg/L)
TOTAL ORGANIC CARBON NT NT 51.8
CEF-5-LTM-03 08/98 11/98 02/99
Natural Attenuation Parameters (mg/L)
TOTAL ORGANIC CARBON NT 4.26 3.79
GW FLOW
PERIMETER ROAD
CULVERT
SECURITY FENCE
100 0 100 Feet
NT = Not Tested
ND = Not Detected
J = Estimated Concentration
U = Not Detected At Or Above Method Detection Limit (Associated Value)
R = Surrogate Recovery Noncompliance
LEGEND
Existing Monitoring Wells
Approximate Extent Of Groundwater Contamination
Drainage Ditch
Fence
Former Pit Area
DRAWN BY YLI
DATE 04/07/99
CHECKED BY BD
DATE 1/30/99
COST/SCHEDULE-AREA
SCALE AS NOTED
DEPARTMENT OF THE NAVY SOUTHERN DIV FACILITIES ENGINEERING COMD
TOTAL ORGANIC CARBON IN GROUNDWATER
OPERABLE UNIT 2, SITE 5
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA
CONTRACT NUMBER 7898
APPROVED BY
DATE
APPROVED BY
DATE
DRAWING NO. FIGURE 3-12
REV 0
P:\GIS\CECIL\SITE5_GW\APR APRIL-07-99 YLI LAYOUT 3 R 11 TOC



DRAWN BY	DATE
YLJ	04/07/99
CHECKED BY	DATE
BD	1/30/99

COST/SCHEDULE-AREA

SCALE
AS NOTED

CARBON DIOXIDE AND ALKALINITY IN GROUNDWATER
OPERABLE UNIT 2, SITE 5
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

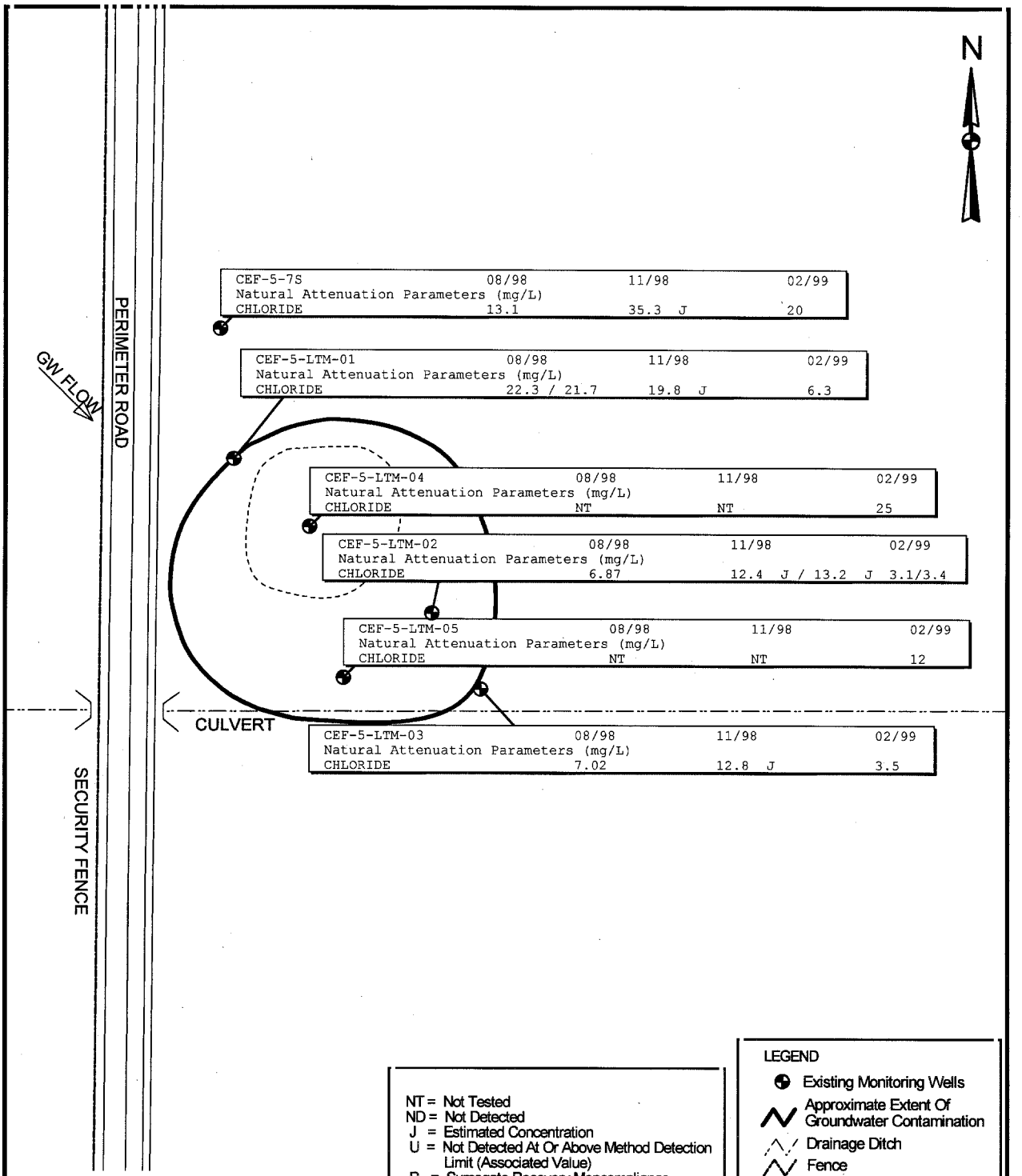
CONTRACT NUMBER 7898

APPROVED BY — DATE —

APPROVED BY — DATE —

DRAWING NO. FIGURE 3-13 REV 0

P:\GIS\CECIL\SITE5_GW.APR APRIL-07-99 YLJ LAYOUT 3 R 13 CO2



NT = Not Tested
ND = Not Detected
J = Estimated Concentration
U = Not Detected At Or Above Method Detection Limit (Associated Value)
R = Surrogate Recovery Noncompliance

LEGEND
- Existing Monitoring Wells
- Approximate Extent Of Groundwater Contamination
- Drainage Ditch
- Fence
- Former Pit Area

DRAWN BY	DATE
YLI	04/07/99
CHECKED BY	DATE
BD	1/30/99

COST/SCHEDULE-AREA

SCALE
AS NOTED

CHLORIDE IN GROUNDWATER
OPERABLE UNIT 2, SITE 5
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

CONTRACT NUMBER 7898

APPROVED BY — DATE —

APPROVED BY — DATE —

DRAWING NO. FIGURE 3-14 REV 0

P:\GIS\CECIL\SITE5_GW.APR APRIL-07-99 YLI LAYOUT 3 R 14 CHLORIDE

3.3.3 Field Manganese/Dissolved Manganese and Ferrous Iron/Dissolved Iron

After DO and nitrate have been depleted, anaerobic microbes may use manganese (Mn^{+4}) as an electron acceptor to anaerobically degrade hydrocarbons, generating manganese (Mn^{+2}) and carbon dioxide. Manganese measured in the field was detected in four of six wells at concentrations ranging from 0.2 to 0.5 mg/L. Filtered manganese (fixed-base analysis) was detected in the six wells sampled at concentrations ranging from 5.4 to 25.5 µg/L. These data indicate that a sufficient supply of manganese is available as a potential electron donor in groundwater at the site.

After DO, nitrate, and manganese have been utilized, anaerobic microbes may use ferric iron (Fe^{+3}) as an electron acceptor to degrade hydrocarbons via iron reduction, generating ferrous iron (Fe^{+2}) and carbon dioxide. Fixed-base analysis measures total ferric and ferrous iron concentrations. Only soluble ferrous iron is measured during the field analysis. Increasing concentrations of ferrous iron along the flow path indicate that biodegradation by iron reducing bacteria may be occurring. In addition, ferrous iron concentrations greater than 1 mg/L indicate an environment favorable to reductive dechlorination.

During this sampling event, the upgradient concentration of ferrous iron was 0.03 mg/L. Ferrous iron concentrations within the plume ranged from 1.63 to 3.3 mg/L, indicating iron reduction and an environment conducive to reductive dechlorination (see Figure 3-8). The ferrous iron concentration in downgradient well CEF-5-LTM-03 was 0.43 mg/L. A general trend of increasing concentrations in a downgradient direction is apparent within the plume, suggesting that ferric iron reduction is occurring in this area. A similar pattern was observed during first and second quarter sampling.

Total dissolved iron concentrations (fixed-base analysis) ranged from 192 µg/L in the upgradient well to 4,310 µg/L in CEF-5-LTM-02. These dissolved iron concentrations suggest that a sufficient supply of iron is available as a potential electron receptor.

3.3.4 Sulfate, Sulfide, and Hydrogen Sulfide

After DO, nitrate, manganese, and iron have been utilized, anaerobic microbes may use sulfate (SO_4) as an electron acceptor to degrade hydrocarbons. This process, sulfate reduction, generates sulfide and carbon dioxide. As with nitrate, sulfate may compete with chlorinated hydrocarbons as electron acceptors if present at concentrations greater than 20 mg/L. The results of the sulfate, dissolved sulfide, field sulfide, and hydrogen sulfide analyses are presented in Figure 3-9.

The sulfate concentration in the upgradient well was 11 mg/L. Sulfate concentrations within the plume ranged from 0.51 to 3.3 mg/L. The sulfate concentration in the downgradient well was 0.73 mg/L. Sulfate

concentrations generally decreased from first to third quarter sampling. Dissolved sulfide (fixed-base analysis) was not detected in samples collected during the third quarter. The field sulfide concentration in the upgradient well was 0.05 mg/L. Field sulfide concentrations within the plume ranged from 0.27 to 0.8 mg/L. In the downgradient well, field sulfide was detected at 0.43 mg/L. Concentrations of field sulfide generally increased from first to third quarter sampling. Hydrogen sulfide was not detected in the upgradient well. Concentrations of hydrogen sulfide within the plume ranged from 0.3 to 2.0 mg/L. Hydrogen sulfide was detected in the downgradient well at a concentration of 0.5 mg/L. In general, hydrogen sulfide concentrations increased from first to third quarter sampling.

A distinct trend of decreasing sulfate concentrations and increasing field sulfide/hydrogen sulfide concentrations in a downgradient direction was not observed during third quarter sampling. However, the overall decrease in sulfate concentrations and the associated increase in hydrogen sulfide/field sulfide concentrations over time within the plume provide an indication that sulfate reduction may be occurring in this area.

3.3.5 Orthophosphate

Phosphate reduction is a minor anaerobic degradation process whereby bacteria can use phosphate (PO_4) as an electron acceptor to degrade hydrocarbons. Orthophosphate concentrations were below detection limits during third quarter sampling. This is consistent with first and second quarter natural attenuation monitoring results. Due to the lack of phosphate as an electron acceptor in the groundwater system, it is unlikely that phosphate reduction is a significant portion of the total biodegradation capacity of the aquifer. In addition, phosphorous is one of several important nutrients for microbes, and its absence may limit the overall biodegradation capacity of the aquifer.

3.2.6 Methane, Ethane, and Ethene

Methanogenesis is the final anaerobic biodegradation pathway whereby bacteria utilize carbon dioxide as an electron acceptor and generate methane as a by-product. The presence of methane at levels greater than background concentrations in areas of contaminated groundwater is a key indicator of biodegradation of hydrocarbons. Methane in groundwater at concentrations greater than 500 µg/L is indicative of strong reducing conditions. Ethane and ethene are by-products of the reductive dechlorination of chlorinated ethenes. Their presence in areas of contaminated groundwater is a key indicator of biodegradation of chlorinated ethenes. The results of the methane, ethane, and ethene analyses are presented on Figure 3-10.

Methane was detected in the upgradient monitoring well at 58.6 µg/L. Methane concentrations within the plume ranged from 433.2 to 6,710 µg/L, and the concentration in the downgradient well was 363.4 µg/L.

Concentrations within and downgradient of the plume are significantly greater than the upgradient concentration, and three of the four wells within the plume have methane concentrations greater than 500 µg/L. Methane results from this sampling event are consistent with results from first quarter sampling and indicate that methanogenic conditions exist at the site, with methanogenesis being a predominant biodegradation mechanism, especially within the plume.

Ethane and ethene were not detected in samples collected during the third quarter monitoring event.

3.3.7 Oxidation-Reduction Potential

The ORP of groundwater is a measure of the relative tendency of the groundwater solution to accept or donate electrons and of the amount of energy released during electron transfers within the solution. ORP depends on and influences the rates and types of biodegradation processes that occur within a groundwater system. Because natural waters include mixed potentials, ORP can only be used as a qualitative indicator of the overall oxidation-reduction state of the groundwater. In general, ORP values less than 50 mV indicate that reductive dechlorination is possible, and ORP values less than -100 mV indicate that reductive dechlorination is likely.

ORP in the upgradient well was measured at 55 mV; ORP values within the plume ranged from -16.4 to -115 mV; and ORP in the downgradient well was measured at -78 mV (see Figure 3-11). These ORP values indicate a groundwater environment within and downgradient of the plume that is favorable to reductive dechlorination.

3.3.8 Total Organic Carbon

Because chlorinated hydrocarbons are used as electron acceptors during reductive dechlorination, a sufficient supply of organic carbon is needed as the primary substrate for microbial growth. This supply can come from native organic carbon in the aquifer or from anthropogenic sources such as petroleum hydrocarbon constituents (BTEX). Organic carbon concentrations greater than 20 mg/L in an aquifer indicate a sufficient supply of carbon to act as the primary substrate. TOC is a measure of the natural and anthropogenic carbon present in an aquifer. TOC analytical results are presented on Figure 3-12.

TOC was detected at 7.53 mg/L in the upgradient well, TOC concentrations ranged from 4.41 to 51.8 mg/L within the plume, and the downgradient TOC concentration was 3.79 mg/L. Data from the upgradient well suggest a minimal supply of native organic carbon to act as the primary substrate for reductive dechlorination. However, it appears that, within the plume, anthropogenic sources of carbon may be sufficient to effectively drive reductive dechlorination. These results are similar to those detected during first and second quarter sampling at the site.

3.3.9 Carbon Dioxide

Carbon dioxide is an end product of both aerobic and anaerobic biodegradation, and elevated concentrations (greater than twice background) are a strong indication that biodegradation is occurring. However, certain anaerobic bacteria utilize carbon dioxide during methanogenesis. Therefore, concentrations of carbon dioxide being generated through microbial respiration and/or reductive dechlorination may be underestimated because some of the carbon dioxide may be consumed during methanogenesis. The results of carbon dioxide analysis are presented on Figure 3-13.

The carbon dioxide concentration in the upgradient well was 140 mg/L. Carbon dioxide concentrations within the plume ranged from 174 to 296 mg/L. The downgradient carbon dioxide concentration was 54.2 mg/L. Carbon dioxide concentrations in wells within the plume were greater than the upgradient concentration, although only the carbon dioxide concentration in CEF-5-LTM-05 (296 mg/L) was greater than two times the upgradient concentration. A similar pattern was observed in previous sampling, with carbon dioxide concentrations within the plume somewhat greater than upgradient levels. It appears that carbon dioxide is being generated by anaerobic microbes and then being utilized by methanagens.

3.3.10 Alkalinity

Alkalinity concentrations give a general indication of the amount of carbon dioxide generated in a plume. As with carbon dixoide, alkalinity concentrations greater than two times background concentrations indicate that biodegration is occurring.

Alkalinity concentrations from laboratory testing ranged from not detected in two wells within the plume to 164 mg/L in the upgradient well, as shown on Figure 3-13. Field alkalinity concentrations ranged from 0 mg/L in two wells within the plume to 161 mg/L in the upgradient well. These results are consistent with previous sampling results in which the highest alkalinity concentrations were detected in the upgradient well.

3.3.11 Chloride

Chloride is released into groundwater during dechlorination; therefore, an increase in chloride ion concentrations in a downgradient direction (more than twice background) provides strong evidence that dechlorination is occurring. The results of chloride analysis are presented on Figure 3-14.

The chloride concentration in the upgradient well was 20 mg/L. Chloride concentrations within the plume ranged from 3.1 to 25 mg/L, and the downgradient chloride concentration was 3.5 mg/L. The chloride

concentration in CEF-5-LTM-04 (25 mg/L) was slightly higher than the upgradient concentration. A similar pattern, with chloride concentrations within and downgradient of the plume not significantly higher than background, was observed in previous sampling events.

3.3.12 Biochemical Oxygen Demand

BOD provides an indication of the amount of oxygen required to biologically and chemically stabilize organic matter. BOD was detected in three of six wells at concentrations ranging from 2.03 to 4.03 mg/L. Since the biodegradation of the hydrocarbons is occurring under anaerobic conditions, the results of this parameter provide little information.

3.3.13 Chemical Oxygen Demand

COD is generally defined as the amount of oxygen required to chemically degrade organic compounds, regardless of the biological degradation capacity. COD was detected in the six monitoring wells sampled at concentrations ranging from 14.3 to 145 mg/L in well CEF-5-LTM-02. Since the biodegradation of the hydrocarbons is occurring under anaerobic conditions, the results of this parameter provide little information.

3.3.14 pH

pH is a measurement of the hydrogen ion (H^+) concentration in terms of its negative logarithm and affects the presence and efficiency of bacterial populations in groundwater. pH values between 5 and 9 are considered optimal for reductive dechlorination. pH values ranged from 4.7 to 6.84 standard units during third quarter sampling. These pH values are within the tolerable range for biodegradation.

3.3.15 Specific Conductivity

Specific conductivity is a measure of the ability of a solution to carry an electrical current and is controlled by the types and quantities of ions in solution. Generally, conductivity increases as ion concentration increases, but values can fluctuate based on the geochemistry at a particular location. Conductivity is most frequently used as an indicator of a consistent groundwater source. Specific conductivity values ranged from 0.052 to 0.397 mS/cm at the site during third quarter sampling. This minor fluctuation indicates that all groundwater samples were from a consistent source.

3.3.16 Temperature

The temperature of groundwater affects the solubility of geochemical species as well as the metabolic activity rate of microbes. At temperatures greater than 20 ^{o}C, biochemical processes are accelerated.

Temperature values ranged from approximately 15.4 to 20.3 ^{o}C across the site during the February 1999 sampling event. These temperatures are within the range of values acceptable for bioremediation to take place.

3.4 SUMMARY OF ANALYSIS

The reductions in total VOC concentrations since the RI and the air sparging pilot-scale test are the strongest line of evidence that natural attenuation is occurring at OU 2, Site 5. VOC COCs detected at concentrations greater than target cleanup goals included TCE, benzene, and total xylenes. TCE and benzene concentrations remained relatively consistent over the three quarters of sampling, and, as stated previously, concentrations of total xylenes increased.

SVOC COCs detected above target cleanup goals during third quarter sampling included 4-methylphenol, naphthalene, and BEHP. BEHP was detected above its target cleanup goal in well CEF-5-LTM-04, sampled for the first time during this monitoring event. Concentrations of 4-methylphenol remained relatively consistent over the three sampling events, while concentrations of naphthalene increased. Maximum detected concentrations of SVOC COCs decreased significantly from levels detected during the RI.

TRPH concentrations exceeded the target cleanup goal in existing well CEF-5-LTM-02 and new well CEF-5-LTM-05. TRPH concentrations decreased in CEF-5-LTM-01 and CEF-5-LTM-03 over the three quarters of sampling. In CEF-5-LTM-02, TRPH concentrations increased from the first to second quarter and then decreased from the second to third quarter. Concentrations of TRPH in groundwater detected during the third quarter event were significantly lower than those detected during the RI.

Manganese was not detected in excess of its target cleanup goal during second or third quarter groundwater sampling. Vanadium was detected above its target cleanup goal in one existing well and one new well during third quarter sampling. Concentrations of vanadium have remained relatively consistent or decreased over the three sampling events at the site. Maximum detected concentrations of inorganic COCs were significantly lower in quarterly sampling than levels detected during the RI.

Because of the proximity of the drainage ditch in the southern portion of the site, surface water criteria also were used for comparison with groundwater data. Groundwater concentrations in excess of surface water target cleanup goals were detected in CEF-5-LTM-02 (naphthalene, alpha-chlordane, and TRPH), CEF-5-LTM-04 (BEHP), and CEF-5-LTM-05, the well located closest to the drainage ditch (naphthalene and TRPH).

Geochemical data suggest that natural attenuation is occurring at the site. The concentrations of by-product indicators of biodegradation (methane, ferrous iron, and sulfate/sulfide) suggest that active biodegradation is occurring in the area of the plume. The primary anaerobic biodegradation processes indicated by site geochemical data include iron reduction, sulfate reduction, and methanogenesis.

3.5 CONCLUSIONS AND RECOMMENDATIONS

Long-term monitoring of the well network will be performed in accordance with the Groundwater Remedial Design (TtNUS, 1998a), the Work Plan Addendum (TtNUS, 1998b), and the recommendations of the second quarter monitoring report for one more quarter. In addition, a temporary will point will be installed and sampled in the drainage ditch southeast of CEF-5-LTM-05 to determine whether contaminants are migrating to the ditch at concentrations in excess of groundwater and surface water target cleanup goals. This sampling program will be followed to determine whether significant changes are observed as a result of seasonal variation. Based on the analytical data obtained during the four sampling events, a comprehensive annual monitoring report will be prepared. This report will contain data interpretation regarding whether natural attenuation is occurring at the site and recommendations for future sampling.

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HLA, 1998. Site 5 Groundwater Remedial Design, NAS Cecil Field, Jacksonville, Florida. Prepared for Southern Division, Naval Facilities Engineering Command, North Charleston, South Carolina, May.

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APPENDIX A

SOIL BORING LOGS, WELL CONSTRUCTION DATA, AND WELL DEVELOPMENT FORMS

BORING LOG

PROJECT NAME: NAS - Cecil Field Site 5
PROJECT NUMBER: 7898
DRILLING COMPANY: Gulf Atlantic
DRILLING RIG: Deep Rock
BORING NUMBER: CEF-05-LTM04
DATE: 2/23/99
GEOLOGIST: Jason McCann
DRILLER: William Lindsey

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	ID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
						Dk. Brown	Fine-grained sand	SP	organic debris, small rocks, dry, chemical odor				
	2'	Hand Auger	–							1400	–	–	0.0
	4'	Hand Auger	–							1040	–	–	0.0
		3 / 10	6"		Loose sand				Moist, chemical odor				
	6'	5 / 8	6"						chemical odor, wet water table ~ 6 Ft.	120	–	–	0.0
		1 / 3	12"		very Loose Sand	Brown	Silty sand	SM					
	8'	12 / 14	6"		med. dense sand					155	–	–	0.0
		5 / 8	12"		Loose Sand								
	10'	12 / 12	12"		med. dense sand					0.0	–	–	0.0
		9 / 13	6"										
	12'	24 / 18	6"							0.0	–	–	0.0
		2 / 4	12"		very Loose sand								
	14'	4 / 5	12"							0.0	–	–	0.0
	15'												

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm): 0.0

Converted to Well: Yes X No ____ Well I.D. #: CEF-05-LTM04

BORING LOG

PROJECT NAME: NAS- Cecil Field Site 5
BORING NUMBER: CEF-05-LTM05
PROJECT NUMBER: 7898
DATE: 2/23/99
DRILLING COMPANY: Gulf Atlantic
GEOLOGIST: JASON McCann
DRILLING RIG: Deep Rock
DRILLER: William Lindsey

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistancy or Rock Hardness	Color	Material Classification	USCS*	Remarks	ID/FID Reading (ppm) Sample	Sampler BZ	Borehole**	Driller BZ**
						Dk. Brown	Fine-grained sand	SP	organic debris, dry, chemical odor				
	2'	Hand Auger	—							300	—	—	0.0
		1 1											
	4'	Hand Auger	—							1480	—	—	0.0
		17 17	12"		med. dense sand	Brown			Moist, chemical odor				
	6'	16 12	12"						chemical odor, wet, water table ~6 ft.	495	—	—	0.0
		1 6	3"		very loose sand		Silty sand	SM					
	8'	8 10	3"		loose sand					50	—	—	0.0
		4 11	12"										
	10'	12 10	12"							260	—	—	0.0
		2 3	12"		very loose sand								
	12'	10 9	12"		loose sand					1000	—	—	0.0
		5 7	12"										
	14'	6 8	12"							20	—	—	0.0
	15'												

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 0.0

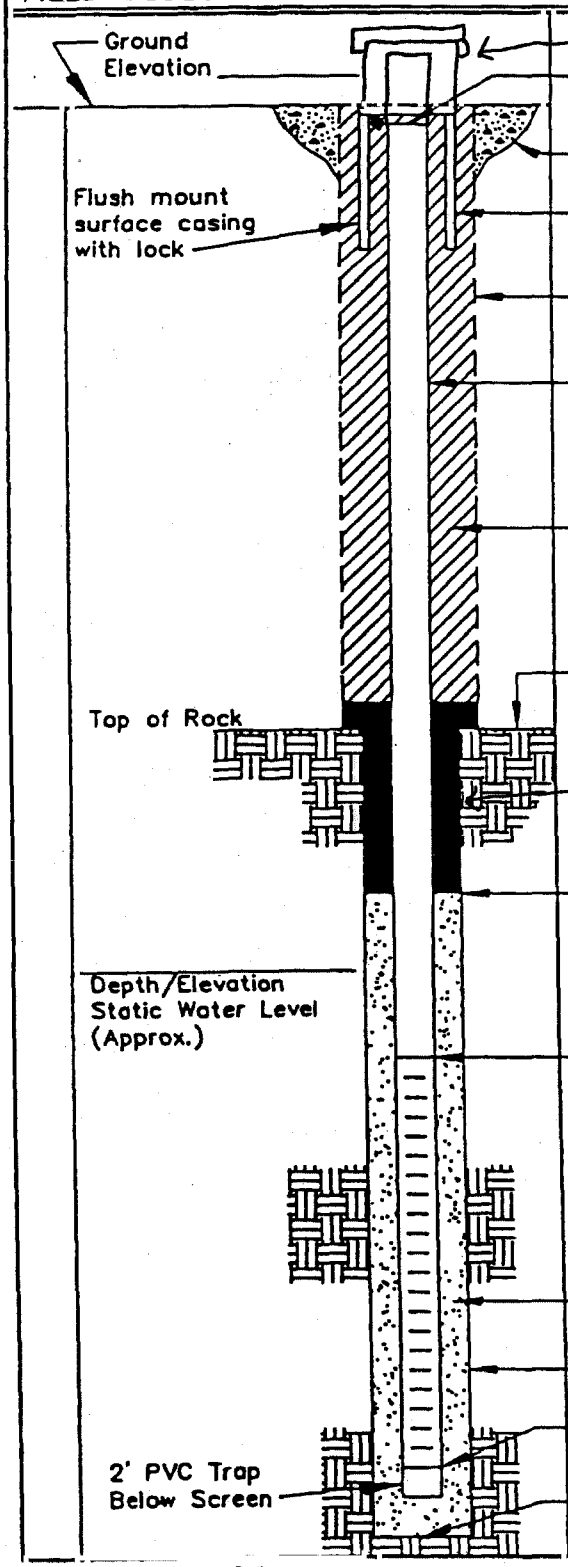
Remarks:

Converted to Well: Yes X No ____ Well I.D. #: CEF-05-LTM05

BORING NO.: CEF-05-LTM01

BEDROCK
MONITORING WELL SHEET
WELL INSTALLED IN BEDROCK

PROJECT: NAS - Cecil Field Site 5
LOCATION: Site 5
DRILLER: William Lindsey
PROJECT NO.: 7898
BORING: CEF-05-LTM04
DRILLING METHOD: Hollow-Stem Auger
ELEVATION: –
DATE: 2/23/99
DEVELOPMENT METHOD: pumping
FIELD GEOLOGIST: JASON McCann



3' Stick-up w/ Protective Casing

ELEVATION TOP OF RISER: _____

TYPE OF SURFACE SEAL: Concrete Pad

TYPE OF PROTECTIVE CASING: Steel

I.D. OF PROTECTIVE CASING: 4"

DIAMETER OF HOLE: 8.25"

TYPE OF RISER PIPE: 2" Schedule 40 PVC

RISER PIPE I.D.: 2"

TYPE OF BACKFILL/SEAL: Portland cement

DEPTH/ELEVATION TOP OF BEDROCK: 2' /

2' bentonite seal

DEPTH/ELEVATION TOP OF SAND: 4' /

DEPTH/ELEVATION TOP OF SCREEN: 5' /

TYPE OF SCREEN: 2" Rigid PVC Screen

SLOT SIZE x LENGTH: 0.010 Slotted : 10' Length (5'-15')

TYPE OF SAND PACK: 20/30 Silica Sand

DIAMETER OF HOLE IN BEDROCK: –

DEPTH/ELEVATION BOTTOM OF SCREEN: 15' /

DEPTH/ELEVATION BOTTOM OF SAND: 15.5' /

DEPTH/ELEVATION BOTTOM OF HOLE: 15.5' /

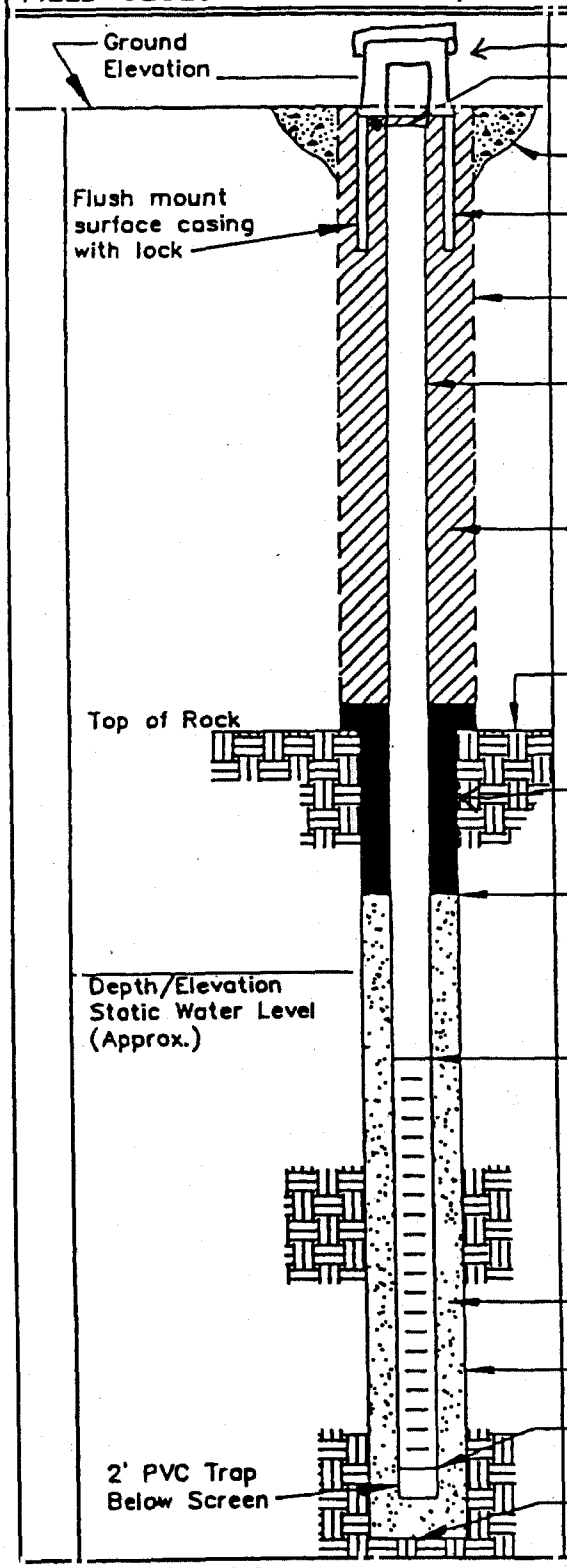
BACKFILL MATERIAL BELOW SAND: –

ACFILE: L670\GEOL\BEDR1.DWG

BORING NO.: CEF-05-LTM05

BEDROCK
MONITORING WELL SHEET
WELL INSTALLED IN BEDROCK

PROJECT: NAS - Cecil Field Site 5
LOCATION: Site 5
DRILLER: William Lindsey
PROJECT NO.: 7898
BORING: CEF-05-LTM05
DRILLING METHOD: Hollow-Stem Auger
ELEVATION: -
DATE: 2/23/99
DEVELOPMENT METHOD: pumping
FIELD GEOLOGIST: JASON McCann



3' stick-up w/ protective casing

ELEVATION TOP OF RISER: _____

TYPE OF SURFACE SEAL: concrete pad

TYPE OF PROTECTIVE CASING: steel

I.D. OF PROTECTIVE CASING: 4"

DIAMETER OF HOLE: 8.25"

TYPE OF RISER PIPE: 2" Schedule 40 PVC

RISER PIPE I.D.: 2"

TYPE OF BACKFILL/SEAL: Portland cement

DEPTH/ELEVATION TOP OF BEDROCK: 2' / _____

2' bentonite seal

DEPTH/ELEVATION TOP OF SAND: 4' / _____

DEPTH/ELEVATION TOP OF SCREEN: 5' / _____

TYPE OF SCREEN: 2" Rigid PVC Screen

SLOT SIZE x LENGTH: 0.010 slotted : 10' Length (5'-15')

TYPE OF SAND PACK: 20/30 silica sand

DIAMETER OF HOLE IN BEDROCK: —

DEPTH/ELEVATION BOTTOM OF SCREEN: 15' / _____

DEPTH/ELEVATION BOTTOM OF SAND: 15.5' / _____

DEPTH/ELEVATION BOTTOM OF HOLE: 15.5' / _____

BACKFILL MATERIAL BELOW SAND: —

ACFILE: L870\GEOL\BEDR1.DWG

MONITORING WELL DEVELOPMENT RECORD

Well: CEF-05-LTM04
Site: 5
Date Installed: 2/23/99
Date Developed: 2/24/99
Dev. Method: pumping
Pump Type: Submersible

Depth to Bottom (ft.): 15 ft.
Static Water Level Before (ft.): –
Static Water Level After (ft.): –
Screen Length (ft.): 10 ft. (5'-15')
Specific Capacity: 0.16 gal/ft.
Casing ID (in.): 2 in.

Responsible Personnel: JASON McCann
Drilling Co.: Gulf Atlantic
Project Name: NAS - Cecil Field Site 5
Project Number: 7898

Time	Estimated Sediment Thickness (Ft.)	Cumulative Water Volume (Gal.)	Water Level Readings (Ft. below TOC)	Temperature (Degrees C)	pH	Specific Conductance (Units ms/cm)	Turbidity (NTU)	Remarks (odor, color, etc.)
1020	–	–	–	–	–	–	–	Started developing
1025	–	–	–	20.3	5.93	.193	999	
1030	–	–	–	20.5	5.70	.126	999	
1035	–	–	–	20.6	5.60	.108	471	
1040	–	–	–	20.6	5.55	.099	208	
1045	–	–	–	20.6	5.49	.091	292	
1050	–	–	–	20.6	5.44	.086	242	
1055	–	–	–	20.8	5.22	.087	295	
1100	–	110 gal.	–	–	–	–	–	Finished developing.
								Water is cloudy, slight
								odor, slight sediment

MONITORING WELL DEVELOPMENT RECORD

Well: CPF-05-LTM05
Site: 5
Date Installed: 2/23/99
Date Developed: 2/24/99
Dev. Method: pumping
Pump Type: Submersible

Depth to Bottom (ft.): 15 Ft.
Static Water Level Before (ft.): –
Static Water Level After (ft.): –
Screen Length (ft.): 10 Ft. (5'-15')
Specific Capacity: 0.16 gal/Ft.
Casing ID (in.): 2 in.

Responsible Personnel: JASON McCann
Drilling Co.: GULF Atlantic
Project Name: NAS - Cecil Field Site 5
Project Number: 7898

Time	Estimated Sediment Thickness (Ft.)	Cumulative Water Volume (Gal.)	Water Level Readings (Ft. below TOC)	Temperature (Degrees C)	pH	Specific Conductance (Units ms/cm)	Turbidity (NTU)	Remarks (odor, color, etc.)
0905	–	–	–	–	–	–	–	Started developing
0910	–	–	–	18.7	5.10	.074	999	
0915	–	–	–	18.9	5.06	.073	999	
0920	–	–	–	19.2	5.04	.069	999	
0925	–	–	–	19.3	5.02	.066	999	
0930	–	–	–	19.3	5.00	.066	738	
0935	–	–	–	19.4	5.00	.063	904	
0940	–	–	–	19.3	4.99	.065	835	
0945	–	–	–	19.4	4.98	.062	545	
0950	–	–	–	19.4	4.94	.061	469	
0955	–	–	–	19.3	4.96	.061	816	
1000	–	–	–	19.6	4.95	.060	999	
1005	–	–	–	19.6	4.93	.061	999	
1010	–	55 gal.	–	–	–	–	–	Finished developing.
								Water is cloudy, slight odor,
								slight sediment.

APPENDIX B

ANALYTICAL LABORATORY RESULTS

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

PITT-03-9-213

TO: **MR. M. SPERANZA** **DATE: APRIL 5, 1999**

FROM: **JUSTIN ORBICH** **CC: DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION – VOA/SVOA/PEST/HERB/GAS/TPH**
CTO 066 – NAS CECIL FIELD
SDG 9902018

SAMPLES: 1/Leachate

CEF-05-DC-01

7/Aqueous

CEF-05-7S-03
CEF-05-LTM01-03
CEF-05-LTM03-03
CEF-05-LTM05-03
CEF-05-DUP1-03
CEF-05-LTM02-03
CEF-05-LTM04-03

OVERVIEW

The sample set for CTO 066, SDG 9902174, Naval Air Station (NAS) Cecil Field, Florida consists of one (1) leachate environmental sample and seven (7) aqueous environmental samples. The aqueous environmental samples were analyzed for selected volatile, semivolatile, pesticide, dissolved gas, and Total Petroleum Hydrocarbon (TPH) organic compounds. The leachate sample was analyzed for TCLP selected volatile, semivolatile, pesticide, and herbicide organic compounds. One (1) field duplicate pair (CEF-05-LTM02-03/CEF-05-DUP1-03) was included in this SDG.

The samples were collected by Tetra Tech, NUS on February 22nd, 24th, and 25th, 1999 and analyzed by GPL Laboratories. All analyses were performed in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria and analyzed according to SW 846 Methods 8260B, 8270C, 8081A, and 8151 and RSK SOP 147 & 175. The data in this SDG was validated with regard to the following parameters:

- Data Completeness
- * Holding Times
- Initial/continuing calibrations
- Laboratory method/field quality control blank results
- * Detection Limits
- Field Duplicate Precision

The symbol (*) indicates that all quality control criteria were met for this parameter. Problems affecting data quality are discussed below; documentation supporting these findings is presented in Appendix C. Qualified analytical results are presented in Appendix A.

MEMO TO: MR. M. SPERANZA
DATE: APRIL 5, 1999 – PAGE 2

VOLATILE FRACTION

The initial and continuing calibration Relative Response Factors (RRFs) were below the 0.05 quality control limits for acetone and 2-butanone. The positive and nondetected results were qualified as estimated (J) and rejected (UR), respectively.

It should be noted sample CEF-05-DC-01 reported elevated detection due to a ten-fold dilution.

Positive results reported at concentrations below the Contract Required Quantitation Limits (CRQL) were qualified as estimated (J).

SEMIVOLATILE FRACTION

It should be noted samples CEF-05-DUP1-03 and CEF-05-LTM05-03 reported elevated detection limits due to a five-fold dilution.

Positive results reported at concentrations below the Contract Required Quantitation Limits (CRQL) were qualified as estimated (J).

PESTICIDE FRACTION

All quality control parameters were met for this fraction.

HERBICIDE FRACTION

All quality control parameters were met for this fraction.

DISSOLVED GAS FRACTION

The following table summarizes the maximum concentrations of dissolved gas organic compounds found in the method blank.

Compound	Concentration	Aqueous Action
Methane	2.5µg/L	12.5µg/L

Blank Actions

- Value < Contract Required Quantitation Limit (CRQL); report CRQL followed by a U.
- Value > CRQL and < Action level; report value followed by a U.
- Value > CRQL and > Action level; report value unqualified.

Dilution factors and sample aliquots were taken into consideration during the application of all action levels. No action was warranted as a result of the elevated dilutions for methane.

Samples CEF-05-LTM02-03 and CEF-05-LTM05-03 were diluted 500X due to the presence of methane above the calibration range of the instrument. The results from the dilution were transposed over the undiluted sample results and used for validation purposes.

Samples CEF-05-DUP1-03 and CEF-05-LTM04-03 were diluted 100X due to the presence of methane above the calibration range of the instrument. The results from the dilution were transposed over the undiluted sample results and used for validation purposes.

Samples CEF-05-LTM01-03 and CEF-05-LTM03-03 were diluted 20X due to the presence of methane above the calibration range of the instrument. The results from the dilution were transposed over the undiluted sample results and used for validation purposes.

Sample CEF-05-7S-03 was diluted 5X due to the presence of methane above the calibration range of the instrument. The result from the dilution was transposed over the undiluted sample result and used for validation purposes.

TPH FRACTION

It should be noted sample CEF-05-LTM03-03 was labeled with the incorrect laboratory identification on the electronic data. The reviewer corrected the laboratory identification to 9902174-03.

EXECUTIVE SUMMARY

Laboratory performance: The initial and continuing calibration RRFs were below the 0.05 quality control limits for acetone and 2-butanone. Methane was detected as blank contaminant.

Other Factors Affecting Data Quality: Several dissolved gas compounds exceeded the calibration range of the instrument. Several of the samples were analyzed at a dilution in the volatile and semivolatile fractions

MEMO TO: MR. M. SPERANZA
DATE: APRIL 5, 1999 – PAGE 4

The data for these analyses were reviewed with reference to the EPA Functional Guidelines for Organic Data Validation (February, 1994), and the NFESC guidelines "Navy Installation Restoration Program Laboratory Quality Assurance Guide" (February, 1996). The text of this report has been formulated to address only those problems affecting data quality.

"I attest that the data referenced herein was validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

Justin Orbich

Chemist/Data Validator
Tetra Tech, NUS

Joseph A. Samchuck

Data Validation Quality Assurance Officer
Tetra Tech, NUS

Attachments:
1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF-050D.C.-01 DL

Lab Name: GPL LABORATORIES Contract: NUS_SOUT

Lab Code: GPLL Case No.: N/A SAS No.: N/A SDG No.: N/A

Matrix: (soil/water) WATER Lab Sample ID: 9902195-07A 10X

Sample wt/vol: 0.5 (g/ml) ML Lab File ID: A18452.D

Level: (low/med) LOW Date Received: 02/25/99

% Moisture: not dec. _____ Date Analyzed: 03/09/99

GC Column: RTXVOA ID: 0.53 (mm) Dilution Factor: 10.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
75-01-4	Vinyl Chloride	100	U
75-35-4	1,1-Dichloroethene	100	U
67-66-3	Chloroform	100	U
107-06-2	1,2-Dichloroethane	100	U
78-93-3	2-Butanone	100	U
56-23-5	Carbon Tetrachloride	100	U
79-01-6	Trichloroethene	100	U
71-43-2	Benzene	100	U
127-18-4	Tetrachloroethene	100	U
108-90-7	Chlorobenzene	100	U
95-50-1	1,4-Dichlorobenzene	100	U

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF-05-07S-03

Lab Name: GPLL LABORATORIES Contract: NUS_SOUTHD

Lab Code: GPLL Case No.: N/A SAS No.: N/A SDG No.: CF66-4

Matrix: (soil/water) WATER Lab Sample ID: 9902174-01B

Sample wt/vol: 25.000 (g/ml) ML Lab File ID: F15502.D

Level: (low/med) LOW Date Received: 02/23/99

% Moisture: not dec. _____ Date Analyzed: 03/05/99

GC Column: RTX_VO ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
67-64-1	Acetone	10.0	U
71-43-2	Benzene	1.0	U
79-01-6	Trichloroethene	3.0	U
108-88-3	Toluene	5.0	U
100-41-4	Ethylbenzene	5.0	U
108-38-3	m,p-xylene	5.0	U
95-47-6	o-xylene	5.0	U

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF-05-DUP1-03

Lab Name: GPLL LABORATORIES Contract: NUS_SOUTHD

Lab Code: GPLL Case No.: N/A SAS No.: N/A SDG No.: CF66-4

Matrix: (soil/water) WATER Lab Sample ID: 9902195-05A

Sample wt/vol: 25.000 (g/ml) ML Lab File ID: F15506.D

Level: (low/med) LOW Date Received: 02/25/99

% Moisture: not dec. Date Analyzed: 03/05/99

GC Column: RTX_VO ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
67-64-1	Acetone	6.4	J
71-43-2	Benzene	0.8	J
79-01-6	Trichloroethene	1.3	J
108-88-3	Toluene	5.2	
100-41-4	Ethylbenzene	3.5	J
108-38-3	m,p-xylene	15.5	
95-47-6	o-xylene	5.9	

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF-05-LTM01-03

Lab Name: GPLL LABORATORIES Contract: NUS_SOUTHD

Lab Code: GPLL Case No.: N/A SAS No.: N/A SDG No.: CF66-4

Matrix: (soil/water) WATER Lab Sample ID: 9902195-01A

Sample wt/vol: 25.000 (g/ml) ML Lab File ID: F15504.D

Level: (low/med) LOW Date Received: 02/25/99

% Moisture: not dec. Date Analyzed: 03/05/99

GC Column: RTX_VO ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
67-64-1	Acetone	10.0	U
71-43-2	Benzene	1.0	U
79-01-6	Trichloroethene	7.9	
108-88-3	Toluene	5.5	
100-41-4	Ethylbenzene	2.2	J
108-38-3	m,p-xylene	11.4	
95-47-6	o-xylene	8.3	

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF-05-LTM02-03

Lab Name: GPLL LABORATORIES Contract: NUS_SOUTHD

Lab Code: GPLL Case No.: N/A SAS No.: N/A SDG No.: CF66-4

Matrix: (soil/water) WATER Lab Sample ID: 9902195-03A

Sample wt/vol: 25.000 (g/ml) ML Lab File ID: F15505.D

Level: (low/med) LOW Date Received: 02/25/99

% Moisture: not dec. Date Analyzed: 03/05/99

GC Column: RTX_VO ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
67-64-1	Acetone	6.5	J
71-43-2	Benzene	0.8	J
79-01-6	Trichloroethene	1.4	J
108-88-3	Toluene	5.4	
100-41-4	Ethylbenzene	3.4	J
108-38-3	m,p-xylene	14.9	
95-47-6	o-xylene	5.4	

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF-05-LTM03-03

Lab Name: GPLL LABORATORIES Contract: NUS_SOUTHD

Lab Code: GPLL Case No.: N/A SAS No.: N/A SDG No.: CF66-4

Matrix: (soil/water) WATER Lab Sample ID: 9902174-03A

Sample wt/vol: 25.000 (g/ml) ML Lab File ID: F15485.D

Level: (low/med) LOW Date Received: 02/23/99

% Moisture: not dec. _____ Date Analyzed: 03/04/99

GC Column: RTX_VO ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
67-64-1	Acetone	10.0	U
71-43-2	Benzene	1.0	U
79-01-6	Trichloroethene	3.0	U
108-88-3	Toluene	5.0	U
100-41-4	Ethylbenzene	5.0	U
108-38-3	m,p-xylene	5.0	U
95-47-6	o-xylene	5.0	U

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF-05-LTM04-03

Lab Name: GPLL LABORATORIES Contract: NUS_SOUTHD

Lab Code: GPLL Case No.: N/A SAS No.: N/A SDG No.: CF66-4

Matrix: (soil/water) WATER Lab Sample ID: 9902200-03A

Sample wt/vol: 25.000 (g/ml) ML Lab File ID: F15508.D

Level: (low/med) LOW Date Received: 02/26/99

% Moisture: not dec. Date Analyzed: 03/05/99

GC Column: RTX_VO ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
67-64-1	Acetone	10.0	U
71-43-2	Benzene	0.6	J
79-01-6	Trichloroethene	33.7	
108-88-3	Toluene	10.2	
100-41-4	Ethylbenzene	6.7	
108-38-3	m,p-xylene	26.3	
95-47-6	o-xylene	11.5	

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF-05-LTM05-03

Lab Name: GPLL LABORATORIES Contract: NUS_SOUTHD

Lab Code: GPLL Case No.: N/A SAS No.: N/A SDG No.: CF66-4

Matrix: (soil/water) WATER Lab Sample ID: 9902200-01A

Sample wt/vol: 25.000 (g/ml) ML Lab File ID: F15507.D

Level: (low/med) LOW Date Received: 02/26/99

% Moisture: not dec. _____ Date Analyzed: 03/05/99

GC Column: RTX_VO ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
67-64-1	Acetone	9.9	J
71-43-2	Benzene	2.0	
79-01-6	Trichloroethene	11.5	
108-88-3	Toluene	28.1	
100-41-4	Ethylbenzene	10.1	
108-38-3	m,p-xylene	33.4	
95-47-6	o-xylene	15.6	

1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF05DC01

Lab Name: GPL_LABORATORIES Contract: NUS_SOUT

Lab Code: GPLL Case No.: N/A SAS No.: N/A SDG No.: CF66-4

Matrix: (soil/water) WATER Lab Sample ID: 9902195-07A

Sample wt/vol: 200 (g/ml) ML Lab File ID: D14986.D

Level: (low/med) LOW Date Received: 02/25/99

% Moisture: _____ decanted:(Y/N) N Date Extracted: 03/03/99

Concentrated Extract Volume: 1000 (uL) Date Analyzed: 03/11/99

Injection Volume: 1.0 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 5

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
110-86-1	Pyridine	50	U
106-46-7	1,4-Dichlorobenzene	50	U
95-48-7	2-Methylphenol	50	U
67-72-1	Hexachloroethane	50	U
106-44-5	3 & 4-Methylphenol	50	U
98-95-3	Nitrobenzene	50	U
87-68-3	Hexachlorobutadiene	50	U
88-06-2	2,4,6-Trichlorophenol	50	U
95-95-4	2,4,5-Trichlorophenol	50	U
121-14-2	2,4-Dinitrotoluene	50	U
118-74-1	Hexachlorobenzene	50	U
87-86-5	Pentachlorophenol	250	U

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF0507S03

Lab Name: GPL_LABORATORIES Contract: NUS_SOUT

Lab Code: GPLL Case No.: N/A SAS No.: N/A SDG No.: CF66-4

Matrix: (soil/water) WATER Lab Sample ID: 9902174-01C

Sample wt/vol: 960 (g/ml) ML Lab File ID: D14826.D

Level: (low/med) LOW Date Received: 02/23/99

% Moisture: _____ decanted:(Y/N) N Date Extracted: 02/26/99

Concentrated Extract Volume: 1000 (uL) Date Analyzed: 03/02/99

Injection Volume: 1.0 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
106-44-5	4-Methylphenol	4	U
105-67-9	2,4-Dimethylphenol	10	U
91-20-3	Naphthalene	6	U
117-81-7	bis(2-Ethylhexyl)phthalate	4	U

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF05DUP103DL

Lab Name: GPL_LABORATORIES Contract: NUS_SOUT

Lab Code: GPLL Case No.: N/A SAS No.: N/A SDG No.: CF66-4

Matrix: (soil/water) WATER Lab Sample ID: 9902195-05CDL

Sample wt/vol: 970 (g/ml) ML Lab File ID: D14832.D

Level: (low/med) LOW Date Received: 02/25/99

% Moisture: _____ decanted:(Y/N) N Date Extracted: 02/26/99

Concentrated Extract Volume: 1000 (uL) Date Analyzed: 03/02/99

Injection Volume: 1.0 (uL) Dilution Factor: 5.0

GPC Cleanup: (Y/N) N pH: 7

CONCENTRATION UNITS:

(ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
106-44-5	4-Methylphenol	13	JD
105-67-9	2,4-Dimethylphenol	9	JD
91-20-3	Naphthalene	49	D
117-81-7	bis(2-Ethylhexyl)phthalate	21	U

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF05LTM0103

Lab Name: GPL_LABORATORIES Contract: NUS_SOUT

Lab Code: GPLL Case No.: N/A SAS No.: N/A SDG No.: CF66-4

Matrix: (soil/water) WATER Lab Sample ID: 9902195-01C

Sample wt/vol: 990 (g/ml) ML Lab File ID: D14830.D

Level: (low/med) LOW Date Received: 02/25/99

% Moisture: _____ decanted:(Y/N) N Date Extracted: 02/26/99

Concentrated Extract Volume: 1000 (uL) Date Analyzed: 03/02/99

Injection Volume: 1.0 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
106-44-5	4-Methylphenol	4	U
105-67-9	2,4-Dimethylphenol	1	J
91-20-3	Naphthalene	15	
117-81-7	bis(2-Ethylhexyl)phthalate	1	J

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF05LTM0203

Lab Name: GPL_LABORATORIES Contract: NUS_SOUT

Lab Code: GPLL Case No.: N/A SAS No.: N/A SDG No.: CF66-4

Matrix: (soil/water) WATER Lab Sample ID: 9902195-03C

Sample wt/vol: 980 (g/ml) ML Lab File ID: D14831.D

Level: (low/med) LOW Date Received: 02/25/99

% Moisture: _____ decanted:(Y/N) N Date Extracted: 02/26/99

Concentrated Extract Volume: 1000 (uL) Date Analyzed: 03/02/99

Injection Volume: 1.0 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
106-44-5	4-Methylphenol	10	
105-67-9	2,4-Dimethylphenol	6	J
91-20-3	Naphthalene	36	
117-81-7	bis(2-Ethylhexyl)phthalate	4	U

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF05LTM0303

Lab Name: GPL_LABORATORIES Contract: NUS_SOUT

Lab Code: GPLL Case No.: N/A SAS No.: N/A SDG No.: CF66-4

Matrix: (soil/water) WATER Lab Sample ID: 9902174-03C

Sample wt/vol: 980 (g/ml) ML Lab File ID: D14829.D

Level: (low/med) LOW Date Received: 02/23/99

% Moisture: _____ decanted:(Y/N) N Date Extracted: 02/26/99

Concentrated Extract Volume: 1000 (uL) Date Analyzed: 03/02/99

Injection Volume: 1.0 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7

CONCENTRATION UNITS:

(ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
106-44-5	4-Methylphenol	4	U
105-67-9	2,4-Dimethylphenol	10	U
91-20-3	Naphthalene	6	U
117-81-7	bis(2-Ethylhexyl)phthalate	4	U

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF05LTM0403

Lab Name: GPL_LABORATORIES Contract: NUS_SOUTHD

Lab Code: GPLL Case No.: N/A SAS No.: N/A SDG No.: CF66-4

Matrix: (soil/water) WATER Lab Sample ID: 9902200-03C

Sample wt/vol: 970 (g/ml) ML Lab File ID: C20556.D

Level: (low/med) LOW Date Received: 02/26/99

% Moisture: _____ decanted:(Y/N) N Date Extracted: 03/03/99

Concentrated Extract Volume: 1000 (uL) Date Analyzed: 03/15/99

Injection Volume: 1.0 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
106-44-5	4-Methylphenol	1	J
105-67-9	2,4-Dimethylphenol	2	J
91-20-3	Naphthalene	2	J
117-81-7	bis(2-Ethylhexyl)phthalate	8	

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF05LTM0503DL

Lab Name: GPL_LABORATORIES Contract: NUS_SOUTHD

Lab Code: GPLL Case No.: N/A SAS No.: N/A SDG No.: CF66-4

Matrix: (soil/water) WATER Lab Sample ID: 9902200-01CDL

Sample wt/vol: 970 (g/ml) ML Lab File ID: C20557.D

Level: (low/med) LOW Date Received: 02/26/99

% Moisture: _____ decanted:(Y/N) N Date Extracted: 03/03/99

Concentrated Extract Volume: 1000 (uL) Date Analyzed: 03/15/99

Injection Volume: 1.0 (uL) Dilution Factor: 5.0

GPC Cleanup: (Y/N) N pH: 7

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
106-44-5	4-Methylphenol	60	D
105-67-9	2,4-Dimethylphenol	20	JD
91-20-3	Naphthalene	82	D
117-81-7	bis(2-Ethylhexyl)phthalate	21	U

1D

PESTICIDE ORGANICS ANALYSIS DATA SHEET

CLIENT ID

CEF-05-D.C.-01

Lab Name: GPL LABORTORIES Project: NUS_SOUTHD

Lab Code: GPLL WO No.: 9902195 SAS No.: N/A SDG No.: CF66-4

Matrix: (soil/water) WATER Lab Sample ID: 9902195-07A

Sample wt/vol: 200 (g/ml) ML Lab File ID: L06500P.D

% Moisture: decanted:(Y/N) N Date Received: 02/25/99

Extraction: (SepF/Cont/Sonc) SEPF Date Extracted: 03/03/99

Concentrated Extract Volume: 10000 (uL) Date Analyzed: 03/06/99

Injection Volume: 1.0 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: Sulfur Cleanup: (Y/N) N

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
58-89-9	gamma-BHC (Lindane)	0.20	U
76-44-8	Heptachlor	0.15	U
1024-57-3	Heptachlor Epoxide	4.2	U
72-20-8	Endrin	0.30	U
72-43-5	Methoxychlor	8.8	U
8001-35-2	Toxaphene	12	U
12789-03-6	Chlordane	0.70	U

1D
PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

07S-03

Lab Name: GPL LABORATORIES Contract: NUS_SOUTHD

Lab Code: GPLL Case No.: 9902174 SAS No.: N/A SDG No.: CF66-4

Matrix: (soil/water) WATER Lab Sample ID: 9902174-01E

Sample wt/vol: 980 (g/ml) ML Lab File ID: L06756P.D

% Moisture: _____ decanted:(Y/N) N Date Received: 02/23/99

Extraction: (SepF/Cont/Sonc) CONT Date Extracted: 02/26/99

Concentrated Extract Volume: 10000 (uL) Date Analyzed: 03/19/99

Injection Volume: 1.0 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: _____ Sulfur Cleanup: (Y/N) N

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
319-85-7	beta-BHC	0.020	U
5103-71-9	alpha-Chlordane	0.051	U

1D
PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

DUP1-03

Lab Name: GPL LABORATORIES Contract: NUS_SOUTHD

Lab Code: GPLL Case No.: 9902195 SAS No.: N/A SDG No.: CF66-4

Matrix: (soil/water) WATER Lab Sample ID: 9902195-05E

Sample wt/vol: 970 (g/ml) ML Lab File ID: L06765P.D

% Moisture: _____ decanted:(Y/N) N Date Received: 02/23/99

Extraction: (SepF/Cont/Sonc) CONT Date Extracted: 02/26/99

Concentrated Extract Volume: 10000 (uL) Date Analyzed: 03/19/99

Injection Volume: 1.0 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: _____ Sulfur Cleanup: (Y/N) N

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
319-85-7	beta-BHC	0.021	U
5103-71-9	alpha-Chlordane	0.14	

1D
PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

LTM01-03

Lab Name: GPL LABORATORIES Contract: NUS_SOUTHD

Lab Code: GPLL Case No.: 9902195 SAS No.: N/A SDG No.: CF66-4

Matrix: (soil/water) WATER Lab Sample ID: 9902195-01E

Sample wt/vol: 970 (g/ml) ML Lab File ID: L06763P.D

% Moisture: _____ decanted:(Y/N) N Date Received: 02/23/99

Extraction: (SepF/Cont/Sonc) CONT Date Extracted: 02/26/99

Concentrated Extract Volume: 10000 (uL) Date Analyzed: 03/19/99

Injection Volume: 1.0 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: _____ Sulfur Cleanup: (Y/N) N

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
319-85-7	beta-BHC	0.021	U
5103-71-9	alpha-Chlordane	0.052	U

1D
PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

LTM02-03

Lab Name: GPL LABORATORIES Contract: NUS_SOUTHD

Lab Code: GPLL Case No.: 9902195 SAS No.: N/A SDG No.: CF66-4

Matrix: (soil/water) WATER Lab Sample ID: 9902195-03E

Sample wt/vol: 960 (g/ml) ML Lab File ID: L06764P.D

% Moisture: _____ decanted:(Y/N) N Date Received: 02/23/99

Extraction: (SepF/Cont/Sonc) CONT Date Extracted: 02/26/99

Concentrated Extract Volume: 10000 (uL) Date Analyzed: 03/19/99

Injection Volume: 1.0 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: _____ Sulfur Cleanup: (Y/N) N

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
319-85-7	beta-BHC	0.021	U
5103-71-9	alpha-Chlordane	0.15	

1D
PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

LTM03-03

Lab Name: GPL LABORATORIES Contract: NUS_SOUTHD

Lab Code: GPLL Case No.: 9902174 SAS No.: N/A SDG No.: CF66-4

Matrix: (soil/water) WATER Lab Sample ID: 9902174-03E

Sample wt/vol: 990 (g/ml) ML Lab File ID: L06760P.D

% Moisture: _____ decanted:(Y/N) N Date Received: 02/23/99

Extraction: (SepF/Cont/Sonc) CONT Date Extracted: 02/26/99

Concentrated Extract Volume: 10000 (uL) Date Analyzed: 03/19/99

Injection Volume: 1.0 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: _____ Sulfur Cleanup: (Y/N) N

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
319-85-7	beta-BHC	0.020	U
5103-71-9	alpha-Chlordane	0.051	U

1D

PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

LTM04-03

Lab Name: GPL LABORATORIES Contract: NUS_SOUTHD

Lab Code: GPLL Case No.: 9902200 SAS No.: N/A SDG No.: CF66-4

Matrix: (soil/water) WATER Lab Sample ID: 9902200-03E

Sample wt/vol: 950 (g/ml) ML Lab File ID: L06717P.D

% Moisture: decanted:(Y/N) N Date Received: 02/26/99

Extraction: (SepF/Cont/Sonc) CONT Date Extracted: 03/03/99

Concentrated Extract Volume: 10000 (uL) Date Analyzed: 03/18/99

Injection Volume: 1.0 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: Sulfur Cleanup: (Y/N) N

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
319-85-7	beta-BHC	0.021	U
5103-71-9	alpha-Chlordane	0.053	U

1D
PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

LTM05-03

Lab Name: GPL LABORATORIES Contract: NUS_SOUTHD

Lab Code: GPLL Case No.: 9902200 SAS No.: N/A SDG No.: CF66-4

Matrix: (soil/water) WATER Lab Sample ID: 9902200-01E

Sample wt/vol: 980 (g/ml) ML Lab File ID: L06716P.D

% Moisture: _____ decanted:(Y/N) N Date Received: 02/26/99

Extraction: (SepF/Cont/Sonc) CONT Date Extracted: 03/03/99

Concentrated Extract Volume: 10000 (uL) Date Analyzed: 03/18/99

Injection Volume: 1.0 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: _____ Sulfur Cleanup: (Y/N) N

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
319-85-7	beta-BHC	0.020	U
5103-71-9	alpha-Chlordane	0.051	U

1D

PESTICIDE ORGANICS ANALYSIS DATA SHEET

CLIENT ID: CEF-05-D.C.-01

Lab Name: GPL LABORATORIES, LLLP Project: NUS_SOUT

Lab Code: GPL WO No.: 9902195 SAS No.: N/A SDG No.: N/A

Matrix: (soil/water) WATER Lab Sample ID: 9902195-07A

Sample wt/vol: 200 (g/ml) ML Lab File ID: IJ0741P.D

% Moisture: _____ decanted:(Y/N) N Date Received: 02/25/99

Extraction: (SepF/Cont/Sonc) SEPF Date Extracted: 03/03/99

Concentrated Extract Volume: 10000 (uL) Date Analyzed: 03/05/99

Injection Volume: 2.5 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: _____ Sulfur Cleanup: (Y/N) N

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
309-00-2	2,4-D	60	U
319-85-7	2,4,5-TP(Silvex)	8.5	U

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

Client ID.

CEF-05-07S-03

Lab Name: GPL Laboratories Contract: NUS_SOUT

Lab Code: GPL Case No.: _____ SAS No.: _____ SDG No.: CF66-4

Matrix: (soil/water) WATER Lab Sample ID: 9902174-01J

Sample wt/vol: 10 (g/ml) ML Lab File ID: N14745.D

Level: (low/med) LOW Date Received: 02/23/99

% Moisture: _____ decanted:(Y/N) N Date Extracted: _____

Concentrated Extract Volume: 1 (uL) Date Analyzed: 03/08/99

Injection Volume: 500. (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: _____

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
74-82-8	Methane	60.4	EB
~~74-82-8~~	~~Methane~~	~~83.1~~	~~EB~~
~~74-82-8~~	~~Methane~~	~~1.7~~	~~JB~~
74-84-0	Ethane	5.8	U
~~74-84-0~~	~~Ethane~~	~~5.8~~	~~U~~
74-85-1	Ethylene	6.2	U
~~74-85-1~~	~~Ethylene~~	~~6.2~~	~~U~~

Tmg
3/22/99

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

Client ID.

CEF-05-07S-03 DL

Lab Name: GPL Laboratories Contract: NUS_SOUT

Lab Code: GPL Case No.: _____ SAS No.: _____ SDG No.: CF66-4

Matrix: (soil/water) WATER Lab Sample ID: 9902174-01K 5X

Sample wt/vol: 10 (g/ml) ML Lab File ID: N14787.D

Level: (low/med) LOW Date Received: 02/23/99

% Moisture: _____ decanted:(Y/N) N Date Extracted: _____

Concentrated Extract Volume: 1 (uL) Date Analyzed: 03/10/99

Injection Volume: 500. (uL) Dilution Factor: 5.0

GPC Cleanup: (Y/N) N pH: _____

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
74-82-8	Methane	58.6	BD
74-84-0	Ethane	29.0	U
74-85-1	Ethylene	31.2	U

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

Client ID.

CEF-05-DUP1-03

Lab Name: GPL Laboratories Contract: NUS_SOUT

Lab Code: GPL Case No.: _____ SAS No.: _____ SDG No.: CF66-4

Matrix: (soil/water) WATER Lab Sample ID: 9902195-05K

Sample wt/vol: 10 (g/ml) ML Lab File ID: N14782.D

Level: (low/med) LOW Date Received: 02/25/99

% Moisture: _____ decanted:(Y/N) N Date Extracted: _____

Concentrated Extract Volume: 1 (uL) Date Analyzed: 03/10/99

Injection Volume: 500. (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: _____

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
74-82-8	Methane	2379.0	EB
74-84-0	Ethane	5.8	U
74-85-1	Ethylene	6.2	U

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

Client ID.

CEF-05-DUP1-03 DL

Lab Name: GPL Laboratories Contract: NUS_SOUT

Lab Code: GPL Case No.: _____ SAS No.: _____ SDG No.: CF66-4

Matrix: (soil/water) WATER Lab Sample ID: 9902195-05K 100X

Sample wt/vol: 10 (g/ml) ML Lab File ID: N14785.D

Level: (low/med) LOW Date Received: 02/25/99

% Moisture: _____ decanted:(Y/N) N Date Extracted: _____

Concentrated Extract Volume: 1 (uL) Date Analyzed: 03/10/99

Injection Volume: 500. (uL) Dilution Factor: 100.0

GPC Cleanup: (Y/N) N pH: _____

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
74-82-8	Methane	2190.0	BD
74-84-0	Ethane	580.0	U
74-85-1	Ethylene	624.0	U

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

Client ID.

CEF-05-LTM01-03

Lab Name: GPL Laboratories Contract: NUS_SOUT

Lab Code: GPL Case No.: _____ SAS No.: _____ SDG No.: CF66-4

Matrix: (soil/water) WATER Lab Sample ID: 9902195-01K

Sample wt/vol: 10 (g/ml) ML Lab File ID: N14778.D

Level: (low/med) LOW Date Received: 02/25/99

% Moisture: _____ decanted:(Y/N) N Date Extracted: _____

Concentrated Extract Volume: 1 (uL) Date Analyzed: 03/10/99

Injection Volume: 500. (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: _____

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
74-82-8	Methane	466.7	EB
74-84-0	Ethane	5.8	U
74-85-1	Ethylene	6.2	U

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

Client ID.

CEF-05-LTM01-03 DL

Lab Name: GPL Laboratories Contract: NUS_SOUT

Lab Code: GPL Case No.: _____ SAS No.: _____ SDG No.: CF66-4

Matrix: (soil/water) WATER Lab Sample ID: 9902195-01K 20X

Sample wt/vol: 10 (g/ml) ML Lab File ID: N14779.D

Level: (low/med) LOW Date Received: 02/25/99

% Moisture: _____ decanted:(Y/N) N Date Extracted: _____

Concentrated Extract Volume: 1 (uL) Date Analyzed: 03/10/99

Injection Volume: 500. (uL) Dilution Factor: 20.0

GPC Cleanup: (Y/N) N pH: _____

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
74-82-8	Methane	433.2	BD
74-84-0	Ethane	116.0	U
74-85-1	Ethylene	124.8	U

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

Client ID.

CEF-05-LTM02-03

Lab Name: GPL Laboratories Contract: NUS_SOUT

Lab Code: GPL Case No.: _____ SAS No.: _____ SDG No.: CF66-4

Matrix: (soil/water) WATER Lab Sample ID: 9902195-03K

Sample wt/vol: 10 (g/ml) ML Lab File ID: N14780.D

Level: (low/med) LOW Date Received: 02/25/99

% Moisture: _____ decanted:(Y/N) N Date Extracted: _____

Concentrated Extract Volume: 1 (uL) Date Analyzed: 03/10/99

Injection Volume: 500. (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: _____

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
74-82-8	Methane	2594.7	EB
74-84-0	Ethane	5.8	U
74-85-1	Ethylene	6.2	U

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

Client ID.

CEF-05-LTM02-03 DL

Lab Name: GPL Laboratories Contract: NUS_SOUT

Lab Code: GPL Case No.: _____ SAS No.: _____ SDG No.: CF66-4

Matrix: (soil/water) WATER Lab Sample ID: 9902195-03K 500X

Sample wt/vol: 10 (g/ml) ML Lab File ID: N14781.D

Level: (low/med) LOW Date Received: 02/25/99

% Moisture: _____ decanted:(Y/N) N Date Extracted: _____

Concentrated Extract Volume: 1 (uL) Date Analyzed: 03/10/99

Injection Volume: 500. (uL) Dilution Factor: 500.0

GPC Cleanup: (Y/N) N pH: _____

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
74-82-8	Methane	3380.0	BD
74-84-0	Ethane	2900.0	U
74-85-1	Ethylene	3120.0	U

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

Client ID.

CEF-05-LTM03-03

Lab Name: GPL Laboratories Contract: NUS_SOUT

Lab Code: GPL Case No.: SAS No.: SDG No.: CF66-4

Matrix: (soil/water) WATER Lab Sample ID: 9902174-03J

Sample wt/vol: 10 (g/ml) ML Lab File ID: N14746.D

Level: (low/med) LOW Date Received: 02/23/99

% Moisture: decanted:(Y/N) N Date Extracted:

Concentrated Extract Volume: 1 (uL) Date Analyzed: 03/08/99

Injection Volume: 500. (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH:

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
74-82-8	Methane	587.9	EB
~~74-82-8~~	~~Methane~~	~~808.9~~	~~EB~~
~~74-82-8~~	~~Methane~~	~~365.3~~	~~EB~~
~~74-84-0~~	~~Ethane~~	~~5.8~~	~~U~~
74-84-0	Ethane	5.8	U
~~74-85-1~~	~~Ethylene~~	~~6.2~~	~~U~~
74-85-1	Ethylene	6.2	U

TMK 3/22/99

1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

Client ID.

CEF-05-LTMO3-03 DL

Lab Name: GPL Laboratories Contract: NUS_SOUT

Lab Code: GPL Case No.: _____ SAS No.: _____ SDG No.: CF66-4

Matrix: (soil/water) WATER Lab Sample ID: 9902174 03J 20X

Sample wt/vol: 10 (g/ml) ML Lab File ID: N14749.D

Level: (low/med) LOW Date Received: 02/25/99

% Moisture: _____ decanted:(Y/N) N Date Extracted: _____

Concentrated Extract Volume: 1 (uL) Date Analyzed: 03/08/99

Injection Volume: 500. (uL) Dilution Factor: 20.0

GPC Cleanup: (Y/N) N pH: _____

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
74-82-8	Methane	363.4	BD
~~74-82-8~~	~~Methane~~	~~500.0~~	~~BD~~
74-84-0	Ethane	116.0	U
~~74-84-0~~	~~Ethane~~	~~116.0~~	~~U~~
74-85-1	Ethylene	124.8	U
~~74-85-1~~	~~Ethylene~~	~~237.6~~	~~D~~

TMR
3/22/99

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

Client ID.

CEF-05-LTM04-03

Lab Name: GPL Laboratories Contract: NUS_SOUT

Lab Code: GPL Case No.: _____ SAS No.: _____ SDG No.: CF66-4

Matrix: (soil/water) WATER Lab Sample ID: 9902200-03K

Sample wt/vol: 10 (g/ml) ML Lab File ID: N14776.D

Level: (low/med) LOW Date Received: 02/26/99

% Moisture: _____ decanted:(Y/N) N Date Extracted: _____

Concentrated Extract Volume: 1 (uL) Date Analyzed: 03/10/99

Injection Volume: 500. (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: _____

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
74-82-8	Methane	1538.0	EB
74-84-0	Ethane	5.8	U
74-85-1	Ethylene	6.2	U

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

Client ID.

CEF-05-LTM04-03 DL

Lab Name: GPL Laboratories Contract: NUS_SOUT

Lab Code: GPL Case No.: _____ SAS No.: _____ SDG No.: CF66-4

Matrix: (soil/water) WATER Lab Sample ID: 9902200-03K 100X

Sample wt/vol: 10 (g/ml) ML Lab File ID: N14777.D

Level: (low/med) LOW Date Received: 02/25/99

% Moisture: _____ decanted:(Y/N) N Date Extracted: _____

Concentrated Extract Volume: 1 (uL) Date Analyzed: 03/10/99

Injection Volume: 500. (uL) Dilution Factor: 100.0

GPC Cleanup: (Y/N) N pH: _____

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
74-82-8	Methane	1339.0	BD
74-84-0	Ethane	580.0	U
74-85-1	Ethylene	624.0	U

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

Client ID.

CEF-05-LTM05-03

Lab Name: GPL Laboratories Contract: NUS_SOUT

Lab Code: GPL Case No.: _____ SAS No.: _____ SDG No.: CF66-4

Matrix: (soil/water) WATER Lab Sample ID: 9902200-01K

Sample wt/vol: 10 (g/ml) ML Lab File ID: N14774.D

Level: (low/med) LOW Date Received: 02/26/99

% Moisture: _____ decanted:(Y/N) N Date Extracted: _____

Concentrated Extract Volume: 1 (uL) Date Analyzed: 03/10/99

Injection Volume: 500. (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: _____

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
74-82-8	Methane	3296.6	EB
74-84-0	Ethane	5.8	U
74-85-1	Ethylene	6.2	U

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

Client ID.

CEF-05-LTM05-03 DL

Lab Name: GPL Laboratories Contract: NUS_SOUT

Lab Code: GPL Case No.: _____ SAS No.: _____ SDG No.: CF66-4

Matrix: (soil/water) WATER Lab Sample ID: 9902200-01K 500X

Sample wt/vol: 10 (g/ml) ML Lab File ID: N14775.D

Level: (low/med) LOW Date Received: 02/25/99

% Moisture: _____ decanted:(Y/N) N Date Extracted: _____

Concentrated Extract Volume: 1 (uL) Date Analyzed: 03/10/99

Injection Volume: 500. (uL) Dilution Factor: 500.0

GPC Cleanup: (Y/N) N pH: _____

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
74-82-8	Methane	6710.0	BD
74-84-0	Ethane	2900.0	U
74-85-1	Ethylene	3120.0	U

ACCUTEST

Report of Analysis

Client Sample ID:	9902174-01H		
Lab Sample ID:	F3754-1	**Date Sampled:**	02/22/99
Matrix:	AQ - Ground Water	**Date Received:**	02/25/99
Method:	FLORIDA-PRO	**Percent Solids:**	n/a
Project:	9804148		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	P03359.D	1	02/26/99	SKW	02/26/99	OP703	GOP160
Run #2							

CAS No.	Compound	Result	RDL	Units	Q
	TPH (C8-C40)	ND	0.50	mg/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	86%		40-140%

ND = Not detected
RDL = Reported Detection Limit
E = Indicates value exceeds calibration range

J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

ACCUTEST

Report of Analysis

Client Sample ID:	CEF-05-DUP1-03		
Lab Sample ID:	F3768-3	**Date Sampled:**	02/24/99
Matrix:	AQ - Ground Water	**Date Received:**	02/27/99
Method:	FLORIDA-PRO	**Percent Solids:**	n/a
Project:	Nas Cecil Field Site 5 CTO66		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	P03430.D	5	03/03/99	SKW	03/03/99	OP703	GOP163
Run #2							

CAS No.	Compound	Result	RDL	Units	Q
	TPH (C8-C40)	8.36	2.5	mg/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	90%		40-140%

ND = Not detected
RDL = Reported Detection Limit
E = Indicates value exceeds calibration range

J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

ACCUTEST

Report of Analysis

Client Sample ID:	CEF-05-LTM01-03		
Lab Sample ID:	F3768-1	**Date Sampled:**	02/24/99
Matrix:	AQ - Ground Water	**Date Received:**	02/27/99
Method:	FLORIDA-PRO	**Percent Solids:**	n/a
Project:	Nas Cecil Field Site 5 CTO66		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	P03433.D	1	03/03/99	SKW	03/03/99	OP703	GOP163
Run #2							

CAS No.	Compound	Result	RDL	Units	Q
	TPH (C8-C40)	1.08	0.50	mg/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	95%		40-140%

ND = Not detected
RDL = Reported Detection Limit
E = Indicates value exceeds calibration range

J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

ACCUTEST

Report of Analysis

Client Sample ID:	CEF-05-LTM02-03		
Lab Sample ID:	F3768-2	**Date Sampled:**	02/24/99
Matrix:	AQ - Ground Water	**Date Received:**	02/27/99
Method:	FLORIDA-PRO	**Percent Solids:**	n/a
Project:	Nas Cecil Field Site 5 CTO66		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	P03429.D	5	03/03/99	SKW	03/03/99	OP703	GOP163
Run #2							

CAS No.	Compound	Result	RDL	Units	Q
	TPH (C8-C40)	8.26	2.5	mg/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	89%		40-140%

ND = Not detected
RDL = Reported Detection Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

ACCUTEST

Report of Analysis

Client Sample ID:	9902174-03H		
Lab Sample ID:	F3754-2	**Date Sampled:**	02/22/99
Matrix:	AQ - Ground Water	**Date Received:**	02/25/99
Method:	FLORIDA-PRO	**Percent Solids:**	n/a
Project:	9804148		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	P03360.D	1	02/26/99	SKW	02/26/99	OP703	GOP160
Run #2							

CAS No.	Compound	Result	RDL	Units	Q
	TPH (C8-C40)	ND	0.50	mg/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	90%		40-140%

ND = Not detected
RDL = Reported Detection Limit
E = Indicates value exceeds calibration range

J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

ACCUTEST

Report of Analysis

Client Sample ID:	CEF-05-LTM04-03		
Lab Sample ID:	F3779-2	**Date Sampled:**	02/25/99
Matrix:	AQ - Ground Water	**Date Received:**	03/02/99
Method:	FLORIDA-PRO	**Percent Solids:**	n/a
Project:	9902200		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	P03432.D	1	03/03/99	SKW	03/03/99	OP703	GOP163
Run #2							

CAS No.	Compound	Result	RDL	Units	Q
	TPH (C8-C40)	2.01	0.50	mg/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	98%		40-140%

ND = Not detected
RDL = Reported Detection Limit
E = Indicates value exceeds calibration range

J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

ACCUTEST

Report of Analysis

Client Sample ID:	CEF-05-LTM05-03		
Lab Sample ID:	F3779-1	**Date Sampled:**	02/25/99
Matrix:	AQ - Ground Water	**Date Received:**	03/02/99
Method:	FLORIDA-PRO	**Percent Solids:**	n/a
Project:	9902200		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	P03431.D	5	03/03/99	SKW	03/03/99	OP703	GOP163
Run #2							

CAS No.	Compound	Result	RDL	Units	Q
	TPH (C8-C40)	13.0	2.5	mg/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	88%		40-140%

ND = Not detected
RDL = Reported Detection Limit
E = Indicates value exceeds calibration range

J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

PITT-03-9-208

TO:	**M. SPERANZA**	**DATE:**	**MARCH 30, 1999**
FROM:	**GRETCHEN PHIPPS**	**COPIES:**	**DV FILE**

SUBJECT: **DATA VALIDATION – SELECT METALS, DISSOLVED IRON, DISSOLVED MANGANESE, ALKALINITY, BOD, COD, CHLORIDE, DISSOLVED SULFIDE, NITRATE, NITRITE, ORTHOPHOSPHATE, SULFATE AND TOC**
CTO 066 - NAS CECIL FIELD
SDG - 9902174

SAMPLES: 14/Aqueous/

CEF-05-7S-03	CEF-05-7S-03-F
CEF-05-DUP1-03	CEF-05-DUP1-03-F
CEF-05-LTM01-03	CEF-05-LTM01-03-F
CEF-05-LTM02-03	CEF-05-LTM02-03-F
CEF-05-LTM03-03	CEF-05-LTM03-03-F
CEF-05-LTM04-03	CEF-05-LTM04-03-F
CEF-05-LTM05-03	CEF-05-LTM05-03-F

1/TCLP Leachate/

CEF-05DC-01

Overview

The sample set for CTO 066, NAS Cecil Field, SDG 9902174, consists of fourteen (14) aqueous environmental samples and one (1) TCLP leachate sample. Two field duplicate pairs (CEF-05-LTM02-03 / CEF-05-DUP1-03 and CEF-05-LTM02-03-F / CEF-05-DUP1-03) were included within this SDG.

All aqueous samples, with exception to those designated –F, were analyzed for antimony, arsenic, beryllium, cadmium, chromium, manganese, vanadium, alkalinity, biological oxygen demand (BOD), chemical oxygen demand (COD), chloride, dissolved sulfide, nitrate, nitrite, orthophosphate, sulfate and total organic carbon (TOC). The samples designated with –F were analyzed for dissolved iron and dissolved manganese. The TCLP leachate samples was analyzed for toxicity characteristic leaching procedure (TCLP) arsenic, barium, cadmium, chromium, lead, mercury, selenium and silver. The samples were collected by Tetra Tech NUS on February 22, 24 and 25, 1999 and analyzed by GPL Laboratories under Naval Facilities Engineering Service Center (NFESC) Quality Assurance / Quality Control criteria. All metals analyses, with the exception of mercury, were conducted using SW-846 method 6010B. Mercury analyses were conducted using SW 846 method 7471A. Alkalinity analyses were conducted using MCAWW EPA method 310.1. Chloride, nitrate, nitrite, orthophosphate and sulfate analyses were conducted using EPA method 300. Dissolved sulfide analyses were conducted using MCAWW EPA method 376.1. BOD analyses were conducted using EPA method 405.1. COD

analyses were conducted using EPA method 410.1. TOC analyses were conducted using EOA method 415.1.

The data was evaluated based on the following parameters:

* • Data Completeness
* • Holding Times
• Calibration Verifications
• Laboratory Blank Analyses

* - All quality control criteria were met for this parameter.

The attached Table 1 summarizes the validation recommendations which were based on the following information:

Laboratory Blank Analyses

Affected samples: Aqueous samples

Analyte	Maximum Concentration	Action Level(aqueous)
Antimony[1]	3.417µg/L	17.085µg/L
Arsenic	4.3µg/L	21.5µg/L
Beryllium	1.2µg/L	6.0µg/L
Cadmium[1]	0.455µg/L	2.275µg/L
Chromium[1]	0.854µg/L	4.27µg/L
Iron[1]	28.041µg/L	140.205µg/L
Manganese	0.6µg/L	3.0µg/L

[1] Maximum concentration present in an aqueous preparation blank.

An action level of 5X the maximum concentration has been used to evaluate the sample data for blank contamination. Sample aliquot and dilution factors were taken into consideration when determining blank contamination. Positive results < the action level for antimony, arsenic, beryllium, cadmium and chromium were qualified as, "U", as a result of blank contamination. No action was taken for the remaining analytes since either the results were greater than the action level or were nondetects.

Affected samples: TCLP Leachate sample

Analyte	Maximum Concentration	Action Level(leachate)
Barium	76.2µg/L	381µg/L

An action level of 5X the maximum concentration has been used to evaluate the sample data for blank contamination. Sample aliquot and dilution factors were taken into consideration when determining blank contamination. Positive results < the action level barium were qualified as, "U", as a result of blank contamination.

Notes

The Initial and/or Continuing Calibration (ICV/CCV) Percent Recoveries (%Rs) for nitrate and orthophosphate were marginally <90% quality control limit. However, no validation action was taken based on this noncompliance.

Sample CEF-05-07S-03 was changed to CEF-05-7S-03.

A comparison of field duplicate pairs (CEF-05-LTM02-03 / CEF-05-DUP1-03 and CEF-05-LTM02-03-F / CEF-05-DUP1-03) is included in Appendix C.

Executive Summary

Laboratory Performance: Several analytes were present in the laboratory method / preparation blanks.

Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Review", February 1994 and the NFESC document entitles "Navy Installation Restoration Laboratory Quality Assurance Guide." (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

Gretchen A Phipps

Tetra Tech NUS
Gretchen A. Phipps

Tetra Tech NUS
Joseph A. Samchuck
Quality Control Officer

Attachments:

1. Appendix A - Qualified Analytical Data
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation

INORGANIC CLP

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

CEF-05-07S-03

ontract:

ab Code: GPL Case No.: SAS No.: SDG NO.: NUS02174

atrix (soil/water): WATER Lab Sample ID: 9902174-01

evel (low/med): LOW Date Received: 2/23/99

Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	3.8	B		P
7440-38-2	Arsenic	3.6	U		P
7440-41-7	Beryllium	0.10	U		P
7440-43-9	Cadmium	0.36	B		P
7440-47-3	Chromium	1.5	B		P
7439-96-5	Manganese	10.9	B		P
7440-62-2	Vanadium	7.9	B		P

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

INORGANIC CLP

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

CEF-05-07S-03 FILTERED

ontract:

Lab Code: GPL Case No.: SAS No.: SDG NO.: NUS02174

Matrix (soil/water): WATER Lab Sample ID: 9902174-02

Level (low/med): LOW Date Received: 2/23/99

Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7439-89-6	Iron	192			P
7439-96-5	Manganese	11.7	B		P

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

INORGANIC CLP

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

CEF-05-DUP1-03

ontract:

ab Code: GPL Case No.: SAS No.: SDG NO.: NUS02174

atrix (soil/water): WATER Lab Sample ID: 9902195-05

evel (low/med): LOW Date Received: 2/25/99

Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	2.6	U		P
7440-38-2	Arsenic	3.6	U		P
7440-41-7	Beryllium	0.11	B		P
7440-43-9	Cadmium	0.30	U		P
7440-47-3	Chromium	2.0	B		P
7439-96-5	Manganese	20.5			P
7440-62-2	Vanadium	78.5			P

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Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

INORGANIC CLP

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

CEF-05-DUP1-03 FILTERED

ontract:

ab Code: GPL Case No.: SAS No.: SDG NO.: NUS02174

atrix (soil/water): WATER Lab Sample ID: 9902195-06

evel (low/med): LOW Date Received: 2/25/99

Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7439-89-6	Iron	4460			P
7439-96-5	Manganese	21.6			P

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Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

INORGANIC CLP

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

CEF-05-LTM01-03

ontract:

ab Code: GPL Case No.: SAS No.: SDG NO.: NUS02174

atrix (soil/water): WATER Lab Sample ID: 9902195-01

evel (low/med): LOW Date Received: 2/25/99

Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	2.6	U		P
7440-38-2	Arsenic	3.6	U		P
7440-41-7	Beryllium	0.10	U		P
7440-43-9	Cadmium	0.30	U		P
7440-47-3	Chromium	0.73	B		P
7439-96-5	Manganese	6.2	B		P
7440-62-2	Vanadium	1.2	B		P

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

INORGANIC CLP

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

CEF-05-LTM01-03 FILTERED

Contract:

Lab Code: GPL Case No.: SAS No.: SDG NO.: NUS02174

Matrix (soil/water): WATER Lab Sample ID: 9902195-02

Level (low/med): LOW Date Received: 2/25/99

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7439-89-6	Iron	2990			P
7439-96-5	Manganese	5.4	B		P

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Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

INORGANIC CLP

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

CEF-05-LTM02-03

ontract:

ab Code: GPL Case No.: SAS No.: SDG NO.: NUS02174

atrix (soil/water): WATER Lab Sample ID: 9902195-03

evel (low/med): LOW Date Received: 2/25/99

Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	2.6	U		P
7440-38-2	Arsenic	3.6	U		P
7440-41-7	Beryllium	0.10	U		P
7440-43-9	Cadmium	0.30	U		P
7440-47-3	Chromium	16.9			P
7439-96-5	Manganese	22.1			P
7440-62-2	Vanadium	76.0			P

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

INORGANIC CLP

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

CEF-05-LTM02-03 FILTERED

ontract:

ab Code: GPL Case No.: SAS No.: SDG NO.: NUS02174

atrix (soil/water): WATER Lab Sample ID: 9902195-04

evel (low/med): LOW Date Received: 2/25/99

Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7439-89-6	Iron	4160			P
7439-96-5	Manganese	19.8			P

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Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

INORGANIC CLP

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

CEF-05-LTM03-03

ontract:

ab Code: GPL Case No.: SAS No.: SDG NO.: NUS02174

atrix (soil/water): WATER Lab Sample ID: 9902174-03

evel (low/med): LOW Date Received: 2/23/99

Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	2.6	U		P
7440-38-2	Arsenic	3.6	U		P
7440-41-7	Beryllium	0.10	U		P
7440-43-9	Cadmium	0.33	B		P
7440-47-3	Chromium	1.3	B		P
7439-96-5	Manganese	20.3			P
7440-62-2	Vanadium	8.6	B		P

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

INORGANIC CLP

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

CEF-05-LTM03-03 FILTERED

ontract:

ab Code: GPL Case No.: SAS No.: SDG NO.: NUS02174

atrix (soil/water): WATER Lab Sample ID: 9902174-04

evel (low/med): LOW Date Received: 2/23/99

Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7439-89-6	Iron	614			P
7439-96-5	Manganese	21.0			P

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Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

INORGANIC CLP

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

CEF-05-LTM04-03

Contract:

Lab Code: GPL Case No.: SAS No.: SDG NO.: NUS02174

Matrix (soil/water): WATER Lab Sample ID: 9902200-03

Level (low/med): LOW Date Received: 2/26/99

Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	2.6	U		P
7440-38-2	Arsenic	3.6	U		P
7440-41-7	Beryllium	0.10	U		P
7440-43-9	Cadmium	0.30	U		P
7440-47-3	Chromium	1.9	B		P
7439-96-5	Manganese	29.1		E	P
7440-62-2	Vanadium	4.3	B		P

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Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

INORGANIC CLP

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

CEF-05-LTM04-03 FILTERED

ontract:

ab Code: GPL Case No.: SAS No.: SDG NO.: NUS02174

atrix (soil/water): WATER Lab Sample ID: 9902200-04

evel (low/med): LOW Date Received: 2/26/99

Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7439-89-6	Iron	1620		N	P
7439-96-5	Manganese	25.5		E	P

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

INORGANIC CLP

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

CEF-05-LTM05-03

Contract:

Lab Code: GPL Case No.: SAS No.: SDG NO.: NUS02174

Matrix (soil/water): WATER Lab Sample ID: 9902200-01

Level (low/med): LOW Date Received: 2/26/99

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	2.6	U		P
7440-38-2	Arsenic	3.6	U		P
7440-41-7	Beryllium	0.10	U		P
7440-43-9	Cadmium	0.34	B		P
7440-47-3	Chromium	5.2	B		P
7439-96-5	Manganese	13.4	B	E	P
7440-62-2	Vanadium	235			P

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Comments:

INORGANIC CLP

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

CEF-05-LTM05-03 FILTERED

Contract:

Lab Code: GPL Case No.: SAS No.: SDG NO.: NUS02174

Matrix (soil/water): WATER Lab Sample ID: 9902200-02

Level (low/med): LOW Date Received: 2/26/99

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7439-89-6	Iron	3040		N	P
7439-96-5	Manganese	13.1	B	E	P

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

INORGANIC CLP

-1-

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

CEF-05-D.C.-01

Contract:

Lab Code: GPL Case No.: SAS No.: SDG NO.: NUS02195

Matrix (soil/water): TCLP Lab Sample ID: 9902195-07

Level (low/med): LOW Date Received: 2/25/99

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): µG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	50.0	U		P
7440-39-3	Barium	113	B		P
7440-43-9	Cadmium	30.0	U	N	P
7440-47-3	Chromium	50.0	U		P
7439-92-1	Lead	30.0	U	N	P
7439-97-6	Mercury	2.0	U		AV
7782-49-2	Selenium	50.0	U	N	P
7440-22-4	Silver	30.0	U	N	P

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Comments:

RUN SUMMARY SHEET
Alkalinity

TA FILE: ALK30299
STRUMENT FILE: INSTRUMENT: WET_LAB ANALYZED: 03/02/1999

q	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	MDL	Units	%Recovery	%RPD	%RSD
1	ICV	ICV	216		216	216	1.00	mg/L	102		
2	ICB	ICB	0		0.000	0.000	1.00	mg/L			
3	9902128-07	CEF-3-WP-02	154		154	154	1.00	mg/L			
4	9902131-01	D10-38	32.0		32.0	32.0	1.00	mg/L			
5	9902131-02	D10-39	4.01		4.01	4.01	1.00	mg/L			
6	9902131-03	D10-31S	6.01		6.01	6.01	1.00	mg/L			
7	9902131-04	D10-32D	2.00		2.00	2.00	1.00	mg/L			
8	9902148-01	D10-35S	0		0.000	0.000	1.00	mg/L			
9	9902148-02	D10-33S	28.0		28.0	28.0	1.00	mg/L			
0	9902148-02D	D10-33SD	30.0		30.0	30.0	1.00	mg/L		6.90	
1	9902148-03	D10-34D	88.1		88.1	88.1	1.00	mg/L			
2	9902161-01	CEF-3-13S-02	3.61		3.61	3.61	1.00	mg/L			
3	CCV1	CCV1	212		212	212	1.00	mg/L	100		
4	CCB1	CCB1	0		0.000	0.000	1.00	mg/L			
5	9902161-02	CEF-3-14I-02	3.60		3.60	3.60	1.00	mg/L			
6	9902161-03	CEF-3-7S-02	22.0		22.0	22.0	1.00	mg/L			
7	9902161-04	CEF-3-DUP1-02	26.0		26.0	26.0	1.00	mg/L			
8	9902161-05	CEF-3-28S-02	0		0.000	0.000	1.00	mg/L			
9	9902161-06	CEF-3-DUP2-02	0		0.000	0.000	1.00	mg/L			
0	9902166-01	RB1	0		0.000	0.000	1.00	mg/L			
1	9902166-01D	RB1D	0		0.000	0.000	1.00	mg/L		DIV BY	
2	9902174-01	CEF-05-07S-03	164		164	164	1.00	mg/L			
3	9902174-03	CEF-05-LTM03-03	8.00		8.00	8.00	1.00	mg/L			
4	9902195-01	CEF-05-LTM01-03	0		0.000	0.000	1.00	mg/L			
5	CCV2	CCV2	130		130	130	1.00	mg/L	103		
6	CCB2	CCB2	0		0.000	0.000	1.00	mg/L			
7	9902195-03	CEF-05-LTM02-03	4.01		4.01	4.01	1.00	mg/L			
8	9902195-05	CEF-05-DUP1-03	1.00		1.00	1.00	1.00	mg/L			
9	9902200-01	CEF-05-LTM05-03	0		0.000	0.000	1.00	mg/L			
0	9902200-03	CEF-05-LTM04-03	58.1		58.1	58.1	1.00	mg/L			
1	CCV3	CCV3	126		126	126	1.00	mg/L	100		
2	CCB3	CCB3	0		0.000	0.000	1.00	mg/L			

AS
Analyst / Date

Lab Supervisor / Date

91-W-067

BOD ANALYSIS LOGSHEET

Analyst: Shrub / [illegible] Client: CEF

Method: MCAWW 405.1 Date of Analysis: 2/24/99 / 3/1/99

Method Detection Limit: 2.0 mg/L 11:45am / 11:22am

Client ID	GP ID	Vol. ml.	Initial DO (D1) temp	DOi	Final DO (D2) temp	DOf	Change	Result mg/L	Ave. Result mg/L
ICV	O_2 Sat Air	—	19	9.30	19.5	9.20	—	—	—
ICB	Na_2SO_3	60	17.0	0.00	21.0	0.00	—	—	—
Unseed Blank		60	18.5	9.10	20.0	9.10	0	<2	<2
↓		↓	18.5	9.10	20.0	9.10	0	<2	<2
Seed Blank		0.40	18.0	9.10	20.0	9.10	0	<2	<2
↓	2/24/99	~~50~~ ↓	18.0	9.10	20.0	8.85	0.25	<2	<2
Seed Control		5.0	18.0	9.10	20.0	6.00	3.10		2.85
↓		↓	18.0	9.00	20.0	6.40	2.60		
9/9A		2.0	18.5	9.15	20.0	3.65	5.50	158.16 ~~5.27~~ 3/1/99	173.13
↓		↓	19.0	9.10	20.0	2.60	6.50	188.16	
41 89		2.5	18.5	9.10	20.0	7.95	1.15	22.13	23.93
↓		↓	18.5	9.10	20.0	7.80	1.30	25.73	
CCV 1	O_2 Sat Air	—	18.0	9.50	19.5	9.20	—	—	—
CCB2	Na_2SO_3	60	17.0	0.000	20.0	0.00	—	—	—
CEF-05-025-02	9902174-14	60	19.5	9.10	20.0	7.90	1.20	<2	<2
↓	↓	20	19.0	9.10	20.0	8.75	0.35		
↓	↓	6	19.5	9.20	20.0	8.85	0.35		
CEF-05 LTM03-03	32	60	20.0	9.30	20.0	8.50	0.80	<2	<2
↓	↓	20	19.0	9.20	20.0	8.80	0.40		
↓	↓	6	19.5	9.10	20.0	8.95	0.15		

pH 5.5 adjusted to 6.5

pH 5.0 adjusted to 6.5

Calculations:

$$BOD\ mg/L = \frac{(D_1 - D_2) - (B_1 - B_2)f}{P}$$

where:

D_1 = initial DO of sample

D_2 = final DO of sample

B_1 = initial DO of seed control

B_2 = final DO of seed control

f = 0.08; p = dilution factor

$(B_1 - B_2)f$ = 0.228

Reviewed by/Date: [illegible]

0136

49 10

GP-W-067

BOD ANALYSIS LOGSHEET

Analyst: Shruti / C.Bean

Client: CEF

Method: MCAWW405.1

Date of Analysis: 2/24/99 / 3/1/99
11:45am 11:22am

Method Detection Limit: 2.0 mg/L

Client ID	GP ID	Vol. ml.	Initial DO (D1) temp	Initial DO (D1) DOi	Final DO (D2) temp	Final DO (D2) DOf	Change	Result mg/L	Ave. Result mg/L
dup	dup	60	19.5	9.40	20.0	8.90	0.50	<2	<2
		20	19.0	9.30	20.0	8.90	0.40 ~~1.38~~		
		6	19.0	9.10	20.0	8.90	0.20		
CCV2	O_2 Sat Air	—	18.5	9.40	19.5	9.30	—	—	—
CCB2	Na_2SO_3	60	18.0	0.00	20.0	0.00	—	—	—
		SN							
	2/	24/	99						

Calculations:

$$\text{BOD mg/L} = \frac{(D_1 - D_2) - (B_1 - B_2)f}{p}$$

where:
D_1 = initial DO of sample
D_2 = final DO of sample
B_1 = initial DO of seed control
B_2 = final DO of seed control
f = 0.08; p = dilution factor
$(B_1 - B_2)f$ = _____

Reviewed by/Date: [illegible]

0199

49 11

RUN SUMMARY SHEET
Biological Oxygen Demand

TA FILE: BOD30399
STRUMENT FILE: INSTRUMENT: WET_LAB ANALYZED: 03/03/1999

q	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	MDL	Units	%Recovery	%RPD	%RSD
1	UNSEEDED BLAN	UBLK	0.20	0.50	0.350	0.350	2.00	mg/L			60.6
2	SEEDED BLANK	SBLK	0.60	0.85	0.725	0.725	2.00	mg/L			24.4
3	WC0231	G/GA	141.96	33.96	88.0	88.0	2.00	mg/L	44.0		86.8
4	4189	LCSW	24.7	24.7	24.7	24.7	2.00	mg/L	49.4		0.00
5	9902195-01	CEF-05-LTM01-03	1.63		1.63	1.63	2.00	mg/L			
6	9902195-03	CEF-05-LTM02-03	2.33		2.33	2.33	2.00	mg/L			
7	9902195-05	CEF-05-DUP1-03	2.03		2.03	2.03	2.00	mg/L			
8	9902195-05D	CEF-05-DUP1-03D	1.63		1.63	1.63	2.00	mg/L		21.9	
9	9902200-01	CEF-05-LTM05-03	2.03		2.03	2.03	2.00	mg/L			
0	9902200-03	CEF-05-LTM04-03	4.03		4.03	4.03	2.00	mg/L			
1	9902201-04	LCH-022599-MW	7.83		7.83	7.83	2.00	mg/L			

SN
Analyst / Date

Lab Supervisor / Date

RUN SUMMARY SHEET
Chemical Oxygen Demand

TA FILE: COD31599
STRUMENT FILE: INSTRUMENT: WET_LAB ANALYZED: 03/15/1999

q	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	MDL	Units	%Recovery	%RPD	%RSD
1	PB1	PB1	0		0.000	0.000	5.00	mg/L			
2	LCS1	LCS1	90.5		90.5	90.5	5.00	mg/L	108		
3	9902128-01	CEF-3-36S-02	14.3		14.3	14.3	5.00	mg/L			
4	9902128-02	CEF-3-37I-02	14.3		14.3	14.3	5.00	mg/L			
5	9902128-03	CEF-3-38S-02	38.1		38.1	38.1	5.00	mg/L			
6	9902128-04	CEF-3-39I-02	14.3		14.3	14.3	5.00	mg/L			
7	9902128-05	CEF-3-25S-02	14.3		14.3	14.3	5.00	mg/L			
8	9902128-06	CEF-3-31S-02	23.8		23.8	23.8	5.00	mg/L			
9	9902128-07	CEF-3-WP-02	40.5		40.5	40.5	5.00	mg/L			
0	9902161-01	CEF-3-13S-02	104.7		105	105	5.00	mg/L			
1	9902161-01D	CEF-3-13S-02D	104.7		105	105	5.00	mg/L		0.000	
2	9902161-01S	CEF-3-13S-02S	152.4		152	152	5.00	mg/L	95.4		
3	9902161-02	CEF-3-14I-02	14.37		14.4	14.4	5.00	mg/L			
4	9902161-03	CEF-3-7S-02	119.0		119	119	5.00	mg/L			
5	9902161-04	CEF-3-DUP1-02	119.0		119	119	5.00	mg/L			
6	9902161-05	CEF-3-28S-02	19.00		19.0	19.0	5.00	mg/L			
7	9902161-06	CEF-3-DUP2-02	14.30		14.3	14.3	5.00	mg/L			
8	9902174-01	CEF-05-07S-03	23.8		23.8	23.8	5.00	mg/L			
9	9902174-03	CEF-05-LTM03-03	14.3		14.3	14.3	5.00	mg/L			
0	PB2	PB2	0		0.000	0.000	5.00	mg/L			
1	LCS2	LCS2	80.9		80.9	80.9	5.00	mg/L	96.2		
2	9902195-01	CEF-05-LTM01-03	21.4		21.4	21.4	5.00	mg/L			
3	9902195-03	CEF-05-LTM02-03	85.7		85.7	85.7	5.00	mg/L			
4	9902195-05	CEF-05-DUP1-03	83.3		83.3	83.3	5.00	mg/L			
5	9902200-01	CEF-05-LTM05-03	145.2		145	145	5.00	mg/L			
6	9902200-03	CEF-05-LTM04-03	28.6		28.6	28.6	5.00	mg/L			
7	9902201-04	LCH-022599-MW	52.3		52.3	52.3	5.00	mg/L			
8	9902201-04D	LCH-022599-MWD	52.3		52.3	52.3	5.00	mg/L		0.000	
9	9902201-04S	LCH-022599-MWS	107.1		107	107	5.00	mg/L	110		
0	9903088-01	MC-2-4	61.9		61.9	61.9	5.00	mg/L			
1	9903067-01	2650-01-08	85.7		85.7	171	10.0	mg/L			
2	9903067-02	2650-02-09	95.2		95.2	190	10.0	mg/L			
3	9903067-03	2650-03-09	23.8		23.8	47.6	10.0	mg/L			
4	9903067-04	2650-04-09	38.1		38.1	76.2	10.0	mg/L			
5	PB3	PB3	0		0.000	0.000	5.00	mg/L			
6	LCS3	LCS3	90.5		90.5	90.5	5.00	mg/L	108		

SN 3/15/99

Analyst / Date

Lab Supervisor / Date

RUN SUMMARY SHEET
Chloride

.TA FILE: NUS664
ISTRUMENT FILE: I:NUS664.CSV INSTRUMENT: IC4000 ANALYZED: 02/23/1999

:q	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	CRDL	Units	%Recovery	%RPD	%RSD
1	ICV 4538/4539	ICV 4538/4539	3.61		3.61	3.6	0.10	mg/L	90.2		
2	ICB	ICB	0		0.000	0.000	0.10	mg/L			
3	9902174-01	CEF-05-07S-03	20.46		20.5	20	0.10	mg/L			
4	9902174-01D	CEF-05-07S-03D	19.85		19.8	20	0.10	mg/L		3.03	
5	9902174-01S	CEF-05-07S-03S	35.59		35.6	36	0.10	mg/L	75.7		
6	CCV1 4538/453	CCV1 4538/4539	3.65		3.65	3.6	0.10	mg/L	91.2		
7	CCB1	CCB1	0		0.000	0.000	0.10	mg/L			
8	9902174-03	CEF-05-LTM03-03	3.54		3.54	3.5	0.10	mg/L			
9	CCV2 4538/453	CCV2 4538/4539	3.60		3.60	3.6	0.10	mg/L	90.0		
10	CCB2	CCB2	0		0.000	0.000	0.10	mg/L			
11	ICV 4538/4539	ICV 4538/4539	3.92		3.92	3.9	0.10	mg/L	98.0		
12	ICB	ICB	0		0.000	0.000	0.10	mg/L			
13	9902195-05	CEF-05-DUP1-03	3.45		3.45	3.4	0.10	mg/L			
14	9902195-03	CEF-05-LTM02-03	3.07		3.07	3.1	0.10	mg/L			
15	9902195-01	CEF-05-LTM01-03	6.27		6.27	6.3	0.10	mg/L			
16	CCV1 4538/453	CCV1 4538/4539	3.86		3.86	3.9	0.10	mg/L	96.5		
17	CCB1	CCB1	0		0.000	0.000	0.10	mg/L			
18	ICV 4538/4539	ICV 4538/4539	3.93		3.93	3.9	0.10	mg/L	98.2		
19	ICB	ICB	0		0.000	0.000	0.10	mg/L			
20	9902200-03	CEF-05-LTM04-03	24.8		24.8	25	0.10	mg/L			
21	9902200-01	CEF-05-LTM05-03	12.35		12.4	12	0.10	mg/L			
22	CCV1 4538/453	CCV1 4538/4539	3.88		3.88	3.9	0.10	mg/L	97.0		
23	CCB1	CCB1	0		0.000	0.000	0.10	mg/L			

HH
Analyst / Date

3-23-99
Lab Supervisor / Date

47006

RUN SUMMARY SHEET
Sulfide

TA FILE: S2_22699
STRUMENT FILE: INSTRUMENT: WET_LAB ANALYZED: 02/26/1999

g	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	CRDL	Units	%Recovery	%RPD	%RSD
1	BLANK	ICB	0		0.000	0.000	2.00	mg/L			
2	3235	3235	10		10.0	10.0	2.00	mg/L	82.4		
3	9902174-01	CEF-05-07S-03	0		0.000	0.000	2.00	mg/L			
4	9902174-03	CEF-05-LTM03-03	0		0.000	0.000	2.00	mg/L			
5	9902195-01	CEF-05-LTM01-03	0		0.000	0.000	2.00	mg/L			
6	9902195-03	CEF-05-LTM02-03	0		0.000	0.000	2.00	mg/L			
7	9902195-05	CEF-05-DUP1-03	0		0.000	0.000	2.00	mg/L			
8	9902195-05D	CEF-05-DUP1-03D	0		0.000	0.000	2.00	mg/L		DIV BY	
9	BLANK	ICB	0		0.000	0.000	2.00	mg/L			
10	3235	3235	10		10.0	10.0	2.00	mg/L	82.4		

John V. Hatgi JH 2-26-99
Analyst / Date

Lab Supervisor / Date

RUN SUMMARY SHEET
Sulfide

ATA FILE: S2_30299
ISTRUMENT FILE: INSTRUMENT: WET_LAB ANALYZED: 03/02/1999

eq	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	CRDL	Units	%Recovery	%RPD	%RSD
1	BLANK 1	BLANK 1	0		0.000	0.000	2.00	mg/L			
2	LCS1 3235	LCS1 3235	9		9.00	9.00	2.00	mg/L	74.1		
3	9902200-01	CEF-05-LTM05-03	0		0.000	0.000	2.00	mg/L			
4	9902200-03	CEF-05-LTM04-03	0		0.000	0.000	2.00	mg/L			
5	9903005-01	10EGW05	0		0.000	0.000	2.00	mg/L			
6	9903005-02	10EGW06	0		0.000	0.000	2.00	mg/L			
7	9903005-03	10EGW07	0		0.000	0.000	2.00	mg/L			
8	9903005-04	10GW17	0		0.000	0.000	2.00	mg/L			
9	9903005-05	10GW18	0		0.000	0.000	2.00	mg/L			
10	9903005-06	10GW25	0		0.000	0.000	2.00	mg/L			
11	9903005-06D	10GW25D	0		0.000	0.000	2.00	mg/L		DIV BY	
12	9903005-07	10GW34	0		0.000	0.000	2.00	mg/L			
13	BLANK 2	BLANK 2	0		0.000	0.000	2.00	mg/L			
14	LCS2 3235	LCS2 3235	9		9.00	9.00	2.00	mg/L	74.1		
15	9903005-08	10GW35	1		1.00	1.00	2.00	mg/L			
16	9903005-09	10GW42	0		0.000	0.000	2.00	mg/L			
17	9903005-10	10GW48	0		0.000	0.000	2.00	mg/L			
18	9903005-11	10B	0		0.000	0.000	2.00	mg/L			

JH
Analyst / Date

JWardell 3/25/99
Lab Supervisor / Date

RUN SUMMARY SHEET
Nitrate

'A FILE: NUS664
;TRUMENT FILE: I:NUS664.CSV INSTRUMENT: IC4000 ANALYZED: 02/23/1999

ı	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	CRDL	Units	%Recovery	%RPD	%RSD
ı	ICV 4538/4539	ICV 4538/4539	1.72		1.72	1.7	0.10	mg/L	86.0		
?	ICB	ICB	0		0.000	0.000	0.10	mg/L			
;	9902174-01	CEF-05-07S-03	0.39		0.390	0.39	0.10	mg/L			
;	9902174-01D	CEF-05-07S-03D	0.38		0.380	0.38	0.10	mg/L		2.60	
;	9902174-01S	CEF-05-07S-03S	2.07		2.07	2.1	0.10	mg/L	84.0		
5	CCV1 4538/453	CCV1 4538/4539	1.76		1.76	1.8	0.10	mg/L	88.0		
7	CCB1	CCB1	0		0.000	0.000	0.10	mg/L			
3	9902174-03	CEF-05-LTM03-03	0		0.000	0.000	0.10	mg/L			
9	CCV2 4538/453	CCV2 4538/4539	1.78		1.78	1.8	0.10	mg/L	89.0		
0	CCB2	CCB2	0		0.000	0.000	0.10	mg/L			
1	ICV 4538/4539	ICV 4538/4539	1.77		1.77	1.8	0.10	mg/L	88.5		
2	ICB	ICB	0		0.000	0.000	0.10	mg/L			
3	9902195-05	CEF-05-DUP1-03	0		0.000	0.000	0.10	mg/L			
4	9902195-03	CEF-05-LTM02-03	0		0.000	0.000	0.10	mg/L			
5	9902195-01	CEF-05-LTM01-03	0		0.000	0.000	0.10	mg/L			
6	CCV1 4538/453	CCV1 4538/4539	1.73		1.73	1.7	0.10	mg/L	86.5		
7	CCB1	CCB1	0		0.000	0.000	0.10	mg/L			
8	ICV 4538/4539	ICV 4538/4539	1.76		1.76	1.8	0.10	mg/L	88.0		
9	ICB	ICB	0		0.000	0.000	0.10	mg/L			
0	9902200-03	CEF-05-LTM04-03	0.09		0.090	0.090	0.10	mg/L			
1	9902200-01	CEF-05-LTM05-03	0.06		0.060	0.060	0.10	mg/L			
2	CCV1 4538/453	CCV1 4538/4539	1.78		1.78	1.8	0.10	mg/L	89.0		
3	CCB1	CCB1	0		0.000	0.000	0.10	mg/L			

HH
Analyst / Date

3-23-99
Lab Supervisor / Date

47007

RUN SUMMARY SHEET
Nitrite

A FILE: NUS664
TRUMENT FILE: I:NUS664.CSV INSTRUMENT: IC4000 ANALYZED: 02/23/1999

	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	CRDL	Units	%Recovery	%RPD	%RSD
1	ICV 4538/4539	ICV 4538/4539	1.03		1.03	1.0	0.10	mg/L	103		
2	ICB	ICB	0		0.000	0.000	0.10	mg/L			
3	9902174-01	CEF-05-07S-03	0		0.000	0.000	0.10	mg/L			
4	9902174-01D	CEF-05-07S-03D	0		0.000	0.000	0.10	mg/L		DIV BY	
5	9902174-01S	CEF-05-07S-03S	5.46		5.46	5.5	0.10	mg/L	109		
6	CCV1 4538/453	CCV1 4538/4539	1.02		1.02	1.0	0.10	mg/L	102		
7	CCB1	CCB1	0		0.000	0.000	0.10	mg/L			
8	9902174-03	CEF-05-LTM03-03	0		0.000	0.000	0.10	mg/L			
9	CCV2 4538/453	CCV2 4538/4539	1.01		1.01	1.0	0.10	mg/L	101		
0	CCB2	CCB2	0		0.000	0.000	0.10	mg/L			
1	ICV 4538/4539	ICV 4538/4539	1.07		1.07	1.1	0.10	mg/L	107		
2	ICB	ICB	0		0.000	0.000	0.10	mg/L			
3	9902195-05	CEF-05-DUP1-03	0		0.000	0.000	0.10	mg/L			
4	9902195-03	CEF-05-LTM02-03	0		0.000	0.000	0.10	mg/L			
5	9902195-01	CEF-05-LTM01-03	0		0.000	0.000	0.10	mg/L			
6	CCV1 4538/453	CCV1 4538/4539	0.97		0.970	0.97	0.10	mg/L	97.0		
7	CCB1	CCB1	0		0.000	0.000	0.10	mg/L			
8	ICV 4538/4539	ICV 4538/4539	1.02		1.02	1.0	0.10	mg/L	102		
9	ICB	ICB	0		0.000	0.000	0.10	mg/L			
0	9902200-03	CEF-05-LTM04-03	0		0.000	0.000	0.10	mg/L			
1	9902200-01	CEF-05-LTM05-03	0		0.000	0.000	0.10	mg/L			
2	CCV1 4538/453	CCV1 4538/4539	0.96		0.960	0.96	0.10	mg/L	96.0		
3	CCB1	CCB1	0		0.000	0.000	0.10	mg/L			

HH
Analyst / Date

3-23-99
Lab Supervisor / Date

47008

RUN SUMMARY SHEET
O-Phosphate

.TA FILE: NUS664
STRUMENT FILE: I:NUS664.CSV INSTRUMENT: IC4000 ANALYZED: 02/23/1999

:q	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	CRDL	Units	%Recovery	%RPD	%RSD
1	ICV 4538/4539	ICV 4538/4539	1.90		1.90	1.9	0.10	mg/L	95.0		
2	ICB	ICB	0		0.000	0.000	0.10	mg/L			
3	9902174-01	CEF-05-07S-03	0		0.000	0.000	0.10	mg/L			
4	9902174-01D	CEF-05-07S-03D	0		0.000	0.000	0.10	mg/L		DIV BY	
5	9902174-01S	CEF-05-07S-03S	4.09		4.09	4.1	0.10	mg/L	81.8		
6	CCV1 4538/453	CCV1 4538/4539	1.83		1.83	1.8	0.10	mg/L	91.5		
7	CCB1	CCB1	0		0.000	0.000	0.10	mg/L			
8	9902174-03	CEF-05-LTM03-03	0		0.000	0.000	0.10	mg/L			
9	CCV2 4538/453	CCV2 4538/4539	1.84		1.84	1.8	0.10	mg/L	92.0		
10	CCB2	CCB2	0		0.000	0.000	0.10	mg/L			
11	ICV 4538/4539	ICV 4538/4539	1.70		1.70	1.7	0.10	mg/L	85.0		
12	ICB	ICB	0		0.000	0.000	0.10	mg/L			
13	9902195-05	CEF-05-DUP1-03	0		0.000	0.000	0.10	mg/L			
14	9902195-03	CEF-05-LTM02-03	0		0.000	0.000	0.10	mg/L			
15	9902195-01	CEF-05-LTM01-03	0		0.000	0.000	0.10	mg/L			
16	CCV1 4538/453	CCV1 4538/4539	1.88		1.88	1.9	0.10	mg/L	94.0		
17	CCB1	CCB1	0		0.000	0.000	0.10	mg/L			
18	ICV 4538/4539	ICV 4538/4539	1.90		1.90	1.9	0.10	mg/L	95.0		
19	ICB	ICB	0		0.000	0.000	0.10	mg/L			
20	9902200-03	CEF-05-LTM04-03	0		0.000	0.000	0.10	mg/L			
21	9902200-01	CEF-05-LTM05-03	0		0.000	0.000	0.10	mg/L			
22	CCV1 4538/453	CCV1 4538/4539	1.75		1.75	1.8	0.10	mg/L	87.5		
23	CCB1	CCB1	0		0.000	0.000	0.10	mg/L			

HH
Analyst / Date

3-23-99
Lab Supervisor / Date

47009

RUN SUMMARY SHEET
Sulfate

TA FILE: NUS664
STRUMENT FILE: I:NUS664.CSV INSTRUMENT: IC4000 ANALYZED: 02/23/1999

q	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	CRDL	Units	%Recovery	%RPD	%RSD
1	ICV 4538/4539	ICV 4538/4539	3.59		3.59	3.6	0.10	mg/L	89.8		
2	ICB	ICB	0		0.000	0.000	0.10	mg/L			
3	9902174-01	CEF-05-07S-03	10.90		10.9	11	0.10	mg/L			
4	9902174-01D	CEF-05-07S-03D	10.29		10.3	10	0.10	mg/L		5.76	
5	9902174-01S	CEF-05-07S-03S	30.70		30.7	31	0.10	mg/L	99.0		
6	CCV1 4538/453	CCV1 4538/4539	3.95		3.95	4.0	0.10	mg/L	98.8		
7	CCB1	CCB1	0		0.000	0.000	0.10	mg/L			
8	9902174-03	CEF-05-LTM03-03	0.73		0.730	0.73	0.10	mg/L			
9	CCV2 4538/453	CCV2 4538/4539	3.90		3.90	3.9	0.10	mg/L	97.5		
10	CCB2	CCB2	0		0.000	0.000	0.10	mg/L			
11	ICV 4538/4539	ICV 4538/4539	3.76		3.76	3.8	0.10	mg/L	94.0		
12	ICB	ICB	0		0.000	0.000	0.10	mg/L			
13	9902195-05	CEF-05-DUP1-03	3.41		3.41	3.4	0.10	mg/L			
14	9902195-03	CEF-05-LTM02-03	3.32		3.32	3.3	0.10	mg/L			
15	9902195-01	CEF-05-LTM01-03	0.51		0.510	0.51	0.10	mg/L			
16	CCV1 4538/453	CCV1 4538/4539	3.72		3.72	3.7	0.10	mg/L	93.0		
17	CCB1	CCB1	0		0.000	0.000	0.10	mg/L			
18	ICV 4538/4539	ICV 4538/4539	3.89		3.89	3.9	0.10	mg/L	97.2		
19	ICB	ICB	0		0.000	0.000	0.10	mg/L			
20	9902200-03	CEF-05-LTM04-03	1.95		1.95	2.0	0.10	mg/L			
21	9902200-01	CEF-05-LTM05-03	0.67		0.670	0.67	0.10	mg/L			
22	CCV1 4538/453	CCV1 4538/4539	3.79		3.79	3.8	0.10	mg/L	94.8		
23	CCB1	CCB1	0		0.000	0.000	0.10	mg/L			

HH
Analyst / Date

3-23-99
Lab Supervisor / Date

47010

RUN SUMMARY SHEET
Total Organic Carbon

TA FILE: TOC31299
STRUMENT FILE: INSTRUMENT: DOHRMAN ANALYZED: 03/12/1999

g	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	CRDL	Units	%Recovery	%RPD	%RSD
1	ICV	ICV	32.964		33.0	33.0	1.00	mg/L	99.9		
2	ICB	ICB	-0.106		-0.106	-0.106	1.00	mg/L			
3	9902126-01	CEF-16-32S-03	6.209		6.21	6.21	1.00	mg/L			
4	9902126-01D	CEF-16-32S-03D	6.208		6.21	6.21	1.00	mg/L		0.016	
5	9902126-01S	CEF-16-32S-03S	16.128		16.1	16.1	1.00	mg/L	99.2		
6	9902126-02	CEF-16-GW-45I-0	18.944		18.9	18.9	1.00	mg/L			
7	9902126-03	CEF-16-DUP2-03	22.402		22.4	22.4	1.00	mg/L			
8	9902127-01	CEF-3-8S-02	5.121		5.12	5.12	1.00	mg/L			
9	9902127-02	CEF-3-9I-02	1.329		1.33	1.33	1.00	mg/L			
10	9902128-01	CEF-3-36S-02	5.849		5.85	5.85	1.00	mg/L			
11	9902128-02	CEF-3-37I-02	2.791		2.79	2.79	1.00	mg/L			
12	9902128-03	CEF-3-38S-02	11.150		11.2	11.2	1.00	mg/L			
13	CCV1	CCV1	33.725		33.7	33.7	1.00	mg/L	102		
14	CCB1	CCB1	-0.056		-0.056	-0.056	1.00	mg/L			
15	9902128-04	CEF-3-39I-02	4.502		4.50	4.50	1.00	mg/L			
16	9902128-05	CEF-3-25S-02	2.150		2.15	2.15	1.00	mg/L			
17	9902128-06	CEF-3-31S-02	6.220		6.22	6.22	1.00	mg/L			
18	9902128-07	CEF-3-WP-02	13.479		13.5	13.5	1.00	mg/L			
19	9902161-01	CEF-3-13S-02	24.505		24.5	24.5	1.00	mg/L			
20	9902161-02	CEF-3-14I-02	1.967		1.97	1.97	1.00	mg/L			
21	9902161-03	CEF-3-7S-02	38.489		38.5	38.5	1.00	mg/L			
22	9902161-04	CEF-3-DUP1-02	39.368		39.4	39.4	1.00	mg/L			
23	9902161-05	CEF-3-28S-02	6.054		6.05	6.05	1.00	mg/L			
24	9902161-06	CEF-3-DUP2-02	3.830		3.83	3.83	1.00	mg/L			
25	CCV2	CCV2	33.677		33.7	33.7	1.00	mg/L	102		
26	CCB2	CCB2	-0.003		-0.003	-0.003	1.00	mg/L			
27	9902166-01	RB1	-0.014		-0.014	-0.014	1.00	mg/L			
28	9902166-01D	RB1D	0.021		0.021	0.021	1.00	mg/L		1000	
29	9902166-01S	RB1S	9.997		10.0	10.0	1.00	mg/L	100		
30	9902174-01	CEF-05-07S-03	7.531		7.53	7.53	1.00	mg/L			
31	9902174-03	CEF-05-LTM03-03	3.789		3.79	3.79	1.00	mg/L			
32	9902184-01	TF2-4	4.755		4.76	4.76	1.00	mg/L			
33	9902184-03	TF2-4D	3.481		3.48	3.48	1.00	mg/L			
34	9902184-05	TF2-5	4.201		4.20	4.20	1.00	mg/L			
35	9902195-01	CEF-05-LTM01-03	4.407		4.41	4.41	1.00	mg/L			
36	9902195-03	CEF-05-LTM02-03	22.247		22.2	22.2	1.00	mg/L			
37	CCV3	CCV3	33.630		33.6	33.6	1.00	mg/L	102		
38	CCB3	CCB3	0.040		0.040	0.040	1.00	mg/L			

DCB 3/12/99
Analyst / Date

Lab Supervisor / Date

RUN SUMMARY SHEET
Total Organic Carbon

ATA FILE: TOC31299
ISTRUMENT FILE: INSTRUMENT: DOHRMAN ANALYZED: 03/12/1999

eq	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	CRDL	Units	%Recovery	%RPD	%RSD
39	9902195-05	CEF-05-DUP1-03	24.778		24.8	24.8	1.00	mg/L			
40	9902197-08	E03-SD00-00-174	0.539		0.539	0.539	1.00	mg/L			
41	9902197-09	E03-SD00-00-175	-0.075		-0.075	-0.075	1.00	mg/L			
42	9902200-01	CEF-05-LTM05-03	51.808		51.8	51.8	1.00	mg/L			
43	9902200-03	CEF-05-LTM04-03	5.525		5.52	5.52	1.00	mg/L			
44	9903005-01	10EGW05	3.044		3.04	3.04	1.00	mg/L			
45	9903005-02	10EGW06	43.028		43.0	43.0	1.00	mg/L			
46	9903005-03	10EGW07	1.480		1.48	1.48	1.00	mg/L			
47	9903005-04	10GW17	3.063		3.06	3.06	1.00	mg/L			
48	9903005-05	10GW18	5.415		5.42	5.42	1.00	mg/L			
49	CCV4	CCV4	33.214		33.2	33.2	1.00	mg/L	101		
50	CCB4	CCB4	0.096		0.096	0.096	1.00	mg/L			
51	9903005-06	10GW25	0.291		0.291	0.291	1.00	mg/L			
52	9903005-06D	10GW25D	0.270		0.270	0.270	1.00	mg/L		7.49	
53	9903005-06S	10GW25S	10.841		10.8	10.8	1.00	mg/L	108		
54	9903005-07	10GW34	10.461		10.5	10.5	1.00	mg/L			
55	9903005-08	10GW35	3.164		3.16	3.16	1.00	mg/L			
56	9903005-09	10GW42	2.933		2.93	2.93	1.00	mg/L			
57	9903005-10	10GW48	2.333		2.33	2.33	1.00	mg/L			
58	9903005-11	10B	0.116		0.116	0.116	1.00	mg/L			
59	9903011-02	LWS	-0.161		-0.161	-0.161	1.00	mg/L			
60	9903088-01	MC-2-4	8.313		8.31	8.31	1.00	mg/L			
61	CCV5	CCV5	33.832		33.8	33.8	1.00	mg/L	103		
62	CCB5	CCB5	0.250		0.250	0.250	1.00	mg/L			

Chris Beam DCB 3/12/99
Analyst / Date

Lab Supervisor / Date