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NAS KEY WEST  
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GROUNDWATER MONITORING REPORT FOR BOCA CHICA FLYING CLUB SITE  
UNDERGROUND STORAGE TANK SITE 9 FOR JANUARY 2001 WITH TRANSMITTAL  
LETTER NAS KEY WEST FL  
4/26/2001  
TETRA TECH NUS



TETRA TECH NUS, INC.

AIK-01-0125

April 26, 2001

Project Number HK 0395

*via Electronic Mail*

Byas Glover (Code 18410)  
Department of the Navy  
SOUTHDIV NAVFACENGCOM  
P.O. Box 190010  
North Charleston, South Carolina 29419-9010

Reference: CLEAN Contract No. N62467-94-D-0888  
Contract Task Order No. 110

Subject: Groundwater Monitoring Report for Flying Club Site, UST Site 9, January 2001, Rev. 1,  
Naval Air Station Key West, Florida

Dear Mr. Glover:

TtNUS is pleased to submit the enclosed PDF file for the final version of the Groundwater Monitoring Report for Flying Club Site, UST Site 9, January 2001, Rev. 1, Naval Air Station Key West, Florida. At your request, a copy of this report is being distributed to the Florida Department of Environmental Protection FDEP for their review and comment or concurrence. I anticipate receiving comments or concurrence on this document from FDEP within the next 30 days.

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

Sincerely,

C. M. Bryan  
Project Manager

CMB:spc

Enclosure

c: Ms. Debbie Wroblewski (Cover Letter Only)  
Mr. Joe Fugitt, FDEP  
File: 0395-7.3.2

Mr. R. Courtright, NAS Key West  
Mr. M. Perry/File

**GROUNDWATER MONITORING REPORT,  
JANUARY 2001**

**for**

**FLYING CLUB SITE  
UST SITE 9**

**Naval Air Station  
Key West, Florida**



**Southern Division  
Naval Facilities Engineering Command**

**Contract Number N62467-94-D-0888**

**Contract Task Order 110**

April 2001

*Revision 1*

**GROUNDWATER MONITORING REPORT**  
**JANUARY 2001**

**for**

**FLYING CLUB SITE**  
**UST SITE 9**

**NAVAL AIR STATION**  
**KEY WEST, FLORIDA**

**COMPREHENSIVE PERFORMANCE**  
**ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT**

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

**Submitted by:**  
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**CONTRACT NUMBER N62467-94-D-0888**  
**CONTRACT TASK ORDER 110**

**April 2001**

**PREPARED UNDER THE SUPERVISION OF:**

**APPROVED FOR SUBMITTAL BY:**

---

**CHUCK BRYAN**  
**TASK ORDER MANAGER**  
**TETRA TECH NUS**  
**AIKEN, SOUTH CAROLINA**



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## TABLE OF CONTENTS

<u>SECTION</u>	<u>PAGE</u>
<b>1.0 QUARTERLY REPORT</b> .....	<b>1-1</b>
1.1 SITE OVERVIEW .....	1-1
1.2 MONITORING OBJECTIVES .....	1-1
1.3 SECOND QUARTERLY MONITORING .....	1-1
1.4 CONCLUSIONS AND RECOMMENDATIONS .....	1-2
<b>REFERENCES</b> .....	<b>R-1</b>
<b>APPENDIX A        LABORATORY REPORT</b>	

## TABLES

<u>TABLE</u>	<u>PAGE</u>
1-1 Top of Casing Elevations, Water Table Elevations, and Total Depths .....	1-3
1-2 Groundwater Monitoring Well Analytical Summary .....	1-4

## FIGURES

<u>FIGURE</u>	<u>PAGE</u>
1-1 Groundwater Elevation Contour Map .....	1-5
1-2 Contaminant Concentrations, January 19, 2001 .....	1-6

## ACRONYMS

CLEAN	Comprehensive Long-Term Environmental Action, Navy
CTO	Contract Task Order
FDEP	Florida Department of Environmental Protection
GCTL	Groundwater Contaminant Target Levels
KAG	Kerosene Analytical Group
µg/l	micrograms per liter
RAP	Remedial Action Plan
TRPH	total recoverable petroleum hydrocarbons
TtNUS	Tetra Tech NUS, Inc.
UST	underground storage tank

## **1.0 QUARTERLY REPORT**

Tetra Tech NUS, Inc. (TtNUS) is pleased to submit the Groundwater Monitoring Report for the referenced Contract Task Order (CTO). This report has been prepared for the U.S. Navy Southern Division Naval Facilities Engineering Command under CTO-110, for the Comprehensive Long-Term Environmental Action, Navy (CLEAN) Contract Number N62467-94-D-0888.

### **1.1 SITE OVERVIEW**

A monitoring program presented in the Remedial Action Plan (RAP) for the Flying Club Site (Underground Storage Tank [UST] Site 9) at Naval Air Station, Key West, Florida (ABB-ES, 1997), was implemented in August 1999. As stated in the program, four of the Site's monitoring wells were sampled for the Kerosene Analytical Group (KAG) parameters for a period of one year. At the end of the program, only one monitoring well (KYW-A-127-MW-6) had concentrations that exceeded Florida Department of Environmental Protection (FDEP) Groundwater Cleanup Target Levels (GCTLs). Based on these results, TtNUS recommended that future monitoring at the Site include only the sampling of monitoring well KYW-A-127-MW-6 for an additional year (TtNUS, July 2000). In August 2000, FDEP approved the recommendation and requested that monitoring well KYW-A-127-MW-20 be added to the sampling program as a perimeter well (FDEP, 2000). The first quarterly monitoring event was conducted in October 2000.

### **1.2 MONITORING OBJECTIVES**

The objective of the quarterly monitoring program is to evaluate the contaminant plume stability until cleanup levels are achieved. The groundwater samples will be analyzed by the KAG, as listed in Chapter 62-770 of the Florida Administrative Code. The FDEP GCTLs for groundwater of low yield/poor quality, as prescribed by Chapter 62-770, are the appropriate GCTLs for the Site.

### **1.3 SECOND QUARTERLY MONITORING**

On January 19, 2001, TtNUS personnel collected groundwater samples from the two UST Site 9 monitoring wells, KYW-A-127-MW-6 and -MW-20. A duplicate groundwater sample was also collected for laboratory analysis. All sampling activities were conducted in accordance with TtNUS FDEP-approved CompQAP #980038. Immediately prior to collection of the groundwater samples, water-level and product measurements were recorded from each Site monitoring well. The water-level data was used to

determine purge volumes. Depth-to-water measurements, along with top of casing elevations, were also used to calculate groundwater elevations. Based on these elevations, groundwater was flowing primarily to the south-southeast at the time of the sampling. Figure 2, Attachment A, depicts the groundwater elevations recorded on January 19, 2001. Top of casing elevations, water table elevation data, and depth to water measurements are provided in Table 1-1. Figure 1-1 provides the groundwater elevation contour map.

Free phase petroleum product was not detected in any monitoring wells during this event. The water-level data was used to determine purge volumes.

Following collection of the groundwater samples, the sample bottles were packed on ice and shipped via overnight transport to Katahdin Analytical Services in Westbrook, Maine, where they were analyzed for the parameters listed in the KAG. Analytical results for the second quarterly groundwater sampling event are summarized in Table 1-2. Figure 1-2 depicts the contaminant concentrations as of January 19, 2001. A copy of the laboratory report is provided in Appendix A.

#### **1.4 CONCLUSIONS AND RECOMMENDATIONS**

Benzene, toluene, ethylbenzene, and total xylene concentrations were detected in monitoring well KYW-A-127-MW-6 at concentrations of 51 micrograms per liter ( $\mu\text{g/l}$ ), 18  $\mu\text{g/l}$ , 400  $\mu\text{g/l}$  and 93  $\mu\text{g/l}$ , respectively. Naphthalene was also detected at a concentration of 160  $\mu\text{g/l}$ , and Total Recoverable Petroleum Hydrocarbons (TRPH) were detected at a concentration of 1,900  $\mu\text{g/l}$ . Benzene and ethylbenzene concentrations were above their GTCLs in well KYW-A-127-MW-6. All petroleum hydrocarbon levels detected during the quarter were above concentrations detected during the previous quarter.

Ethylbenzene was the volatile organic compound detected in well KYW-A-127-MW-20 at a concentration of 12  $\mu\text{g/l}$ . Naphthalene was detected at 140  $\mu\text{g/l}$  and TRPH was detected at 2,500  $\mu\text{g/l}$ . Detected concentrations of TRPH did not exceed the the GCTLs for low yield/poor quality groundwater. All other detected constituents were also below their respective GTCLs; however, their levels during this quarter were higher than those detected during the previous quarter in well KYW-A-127-MW-20.

Results of second quarter monitoring indicate that hydrocarbon levels have increased in both wells KYW-A-127-MW-6 and -MW20. TtNUS will closely monitor these levels over subsequent quarters. A continuation of quarterly sampling for the KAG group is recommended for an additional six months.

**TABLE 1-1**

**TOP OF CASING ELEVATIONS, WATER TABLE ELEVATIONS, AND TOTAL DEPTHS  
FLYING CLUB UST SITE 9  
NAVAL AIR STATION  
KEY WEST, FLORIDA**

Well ID	Total Depth	Top of Casing Elevation <sup>(a)</sup>	January 19, 2001	
			Groundwater Level	Groundwater Elevation
KYW-A-127-MW-5	11.62	10.00	4.47	5.53
KYW-A-127-MW-6	14.88	9.07	3.71	5.36
KYW-A-127-MW-12	11.90	9.68	4.35	5.33
KYW-A-127-MW-21	14.71	8.96	3.81	5.15

a. TtNUS assigned an arbitrary 10-foot top of casing elevation for well KYW-A-127-MW-5 to provide a benchmark against which to establish top of casing elevations for the other wells listed in this table.

**TABLE 1-2**  
**GROUNDWATER MONITORING WELL ANALYTICAL SUMMARY**  
**UST SITE 9**  
**NAVAL AIR STATION**  
**KEY WEST, FLORIDA**

Sample		Benzene	Ethyl- benzene	Toluene	Total Xylenes	Naph- thalene	TRPH	Lead
Location	Date							
Cleanup Target Level <sup>(1)</sup>		10	300	400	200	200	50,000	150
KYW-A-127-MW-6	10/5/00	20	280	7	40	92.0	1500.0	7
	1/19/01	51	400	18	93	160	1900	<8.7
KYW-A-127-MW-20	10/5/00	<5	3*	<5	<5	11	<500	5.9
	1/19/01	<5	12	<5	<5	140	2500	15.9
FC-DUP-01 (MW-6)	10/5/00	21	250	7	44	110	1500.0	7.5
	1/19/01	55	460	19	99	160	1800	<8.6

**NOTES:**

- 1 Groundwater cleanup target levels as specified in Table VIII of Chapter 62-770, Florida Administrative Code.
- TRPH Total recoverable petroleum hydrocarbons.
- Denotes values less than the laboratory's Practical Quantitation Level.
- All contaminant concentrations measured in ppb (µg/l).





## REFERENCES

ABB-ES (Environmental Services, Inc.), 1997. Remedial Action Plan, Flying Club Site (UST Site 9), Naval Air Station, Key West, Florida, prepared for Southern Division Naval Facilities Engineering Command (SOUTHNAVFACENGCOM), Charleston, South Carolina, August.

FDEP (Florida Department of Environmental Protection), 2000. Re: Annual Groundwater Monitoring Report for Flying Club Site, Key West, Florida, August.

TtNUS (Tetra Tech NUS, Inc.), 2000. Annual Groundwater Monitoring Plan Report for Flying Club UST Site 9, Naval Air Station, Key West, Florida, prepared for Southern Division Naval Facilities Engineering Command (SOUTHNAVFACENGCOM), Charleston, South Carolina, July.

**APPENDIX A**  
**LABORATORY REPORT**

**NAS KEY WEST  
WATER DATA  
KAS  
SDG: NASKW15**

SAMPLE NUMBER:	FC-DUP-01	FCMW-20-2Q2	FCMW-6-2Q2	17MW7-10-PMP4
SAMPLE DATE:	01/19/01	01/19/01	01/19/01	01/22/01
LABORATORY ID:	WR0204-006	WR0204-005	WR0204-004	WR0215-004
QC_TYPE:	NORMAL	NORMAL	NORMAL	NORMAL
% SOLIDS:	0.0 %	0.0 %	0.0 %	0.0 %
UNITS:	UG/L	UG/L	UG/L	UG/L
FIELD DUPLICATE OF:	FCMW-6-2Q2			

	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
<b>INORGANICS</b>												
ALUMINUM										88.6	U	
ANTIMONY										11.0	U	
ARSENIC										7.8		
BARIUM										43.3		
BERYLLIUM										2.4	U	A
CADMIUM										0.72	U	
CALCIUM										387000		
CHROMIUM										4.4	U	A
COBALT										2.8	U	
COPPER										2.5	U	
IRON										1040		
LEAD	8.6	U	A	15.9			8.7	U	A	4.4	U	
MAGNESIUM										1180000		
MANGANESE										5.1	U	A
MERCURY										0.04		
NICKEL										2.7	U	A
POTASSIUM										526000		
SELENIUM										9.1	U	
SILVER										5.5		
SODIUM										9870000		
THALLIUM										14.2	U	
TIN										6.4	U	
VANADIUM										1.6	U	
ZINC										10.8	U	A

**NAS KEY WEST  
WATER DATA  
KAS  
SDG: NASKW15**

SAMPLE NUMBER:	FC-DUP-01	FCMW-20-2Q2	FCMW-6-2Q2	FCMW-6-2Q2-DS
SAMPLE DATE:	01/19/01	01/19/01	01/19/01	01/19/01
LABORATORY ID:	WR0204-6	WR0204-5	WR0204-4	WR0204-7
QC_TYPE:	NORMAL	NORMAL	NORMAL	NORMAL
% SOLIDS:	0.0 %	0.0 %	0.0 %	0.0 %
UNITS:	UG/L	UG/L	UG/L	UG/L
FIELD DUPLICATE OF:	FCMW-6-2Q2			

	RESULT	QUAL	CODE									
<b>VOLATILES</b>												
1,1,1,2-TETRACHLOROETHANE	5	U		5	U		5	U		5	U	
1,1,1-TRICHLOROETHANE	5	U		5	U		5	U		5	U	
1,1,2,2-TETRACHLOROETHANE	5	U		5	U		5	U		5	U	
1,1,2-TRICHLOROETHANE	5	U		5	U		5	U		5	U	
1,1-DICHLOROETHANE	5	U		5	U		5	U		5	U	
1,1-DICHLOROETHENE	5	U		5	U		5	U		5	U	
1,2,3-TRICHLOROPROPANE	5	U		5	U		5	U		5	U	
1,2-DIBROMO-3-CHLOROPROPANE	5	U		5	U		5	U		5	U	
1,2-DIBROMOETHANE	0.051	U										
1,2-DICHLOROETHANE	5	U		5	U		5	U		5	U	
1,2-DICHLOROPROPANE	5	U		5	U		5	U		5	U	
1,4-DIOXANE	100	UR	C									
2-BUTANONE	10	U										
2-CHLOROETHYL VINYL ETHER	5	U		5	U		5	U		5	U	
2-HEXANONE	10	U										
4-METHYL-2-PENTANONE	10	U										
ACETONE	10	U		10	U		10	U		8	J	P
ACETONITRILE	50	U										
ACROLEIN	50	U										
ACRYLONITRILE	10	U										
ALLYL CHLORIDE	10	U										
BENZENE	55			5	U		51			5	U	
BROMODICHLOROMETHANE	5	U		5	U		5	U		5	U	
BROMOFORM	5	U		5	U		5	U		5	U	
BROMOMETHANE	5	U		5	U		5	U		5	U	
CARBON DISULFIDE	5	U		5	U		5	U		5	U	
CARBON TETRACHLORIDE	5	U		5	U		5	U		5	U	
CHLOROBENZENE	5	U		5	U		5	U		5	U	
CHLOROETHANE	5	U		5	U		5	U		5	U	
CHLOROFORM	5	U		5	U		5	U		5	U	
CHLOROMETHANE	5	U		5	U		5	U		5	U	
CHLOROPRENE	10	U										
CIS-1,3-DICHLOROPROPENE	5	U		5	U		5	U		5	U	

**NAS KEY WEST  
WATER DATA  
KAS  
SDG: NASKW15**

SAMPLE NUMBER:	FC-DUP-01	FCMW-20-2Q2	FCMW-6-2Q2	FCMW-6-2Q2-DS
SAMPLE DATE:	01/19/01	01/19/01	01/19/01	01/19/01
LABORATORY ID:	WR0204-6	WR0204-5	WR0204-4	WR0204-7
QC_TYPE:	NORMAL	NORMAL	NORMAL	NORMAL
% SOLIDS:	0.0 %	0.0 %	0.0 %	0.0 %
UNITS:	UG/L	UG/L	UG/L	UG/L
FIELD DUPLICATE OF:	FCMW-6-2Q2			

	RESULT	QUAL	CODE									
<b>VOLATILES</b>												
DIBROMOCHLOROMETHANE	5	U		5	U		5	U		5	U	
DIBROMOMETHANE	5	U		5	U		5	U		5	U	
DICHLORODIFLUOROMETHANE	5	U		5	U		5	U		5	U	
ETHYL METHACRYLATE	10	U										
ETHYLBENZENE	460			12			400			6		
IODOMETHANE	10	U										
ISOBUTYL ALCOHOL	100	UR	C									
M+P-XYLENES	95			5	U		89			5	U	
METHYL METHACRYLATE	10	U										
METHYLACRYLONITRILE	50	U										
METHYLENE CHLORIDE	5	U		5	U		5	U		5	U	
O-XYLENE	4	J	P	5	U		4	J	P	5	U	
PENTACHLOROETHANE	10	U										
PROPIONITRILE	50	UR	C									
STYRENE	5	U		5	U		5	U		5	U	
TETRACHLOROETHENE	5	U		5	U		5	U		5	U	
TOLUENE	19			5	U		18			5	U	
TRANS-1,2-DICHLOROETHENE	5	U		5	U		5	U		5	U	
TRANS-1,3-DICHLOROPROPENE	5	U		5	U		5	U		5	U	
TRANS-1,4-DICHLORO-2-BUTENE	10	U										
TRICHLOROETHENE	5	U		5	U		5	U		5	U	
TRICHLOROFLUOROMETHANE	5	U		5	U		5	U		5	U	
VINYL ACETATE	5	U		5	U		5	U		5	U	
VINYL CHLORIDE	2	U		2	U		2	U		2	U	

**NAS KEY WEST  
WATER DATA  
KAS  
SDG: NASKW15**

SAMPLE NUMBER:	B189-MW-01-012101	B189-MW-02-012101	FC-DUP-01	FCMW-20-2Q2
SAMPLE DATE:	01/21/01	01/21/01	01/19/01	01/19/01
LABORATORY ID:	WR0215-1	WR0215-2	WR0204-6	WR0204-5
QC_TYPE:	NORMAL	NORMAL	NORMAL	NORMAL
% SOLIDS:	0.0 %	0.0 %	0.0 %	0.0 %
UNITS:	UG/L	UG/L	UG/L	UG/L
FIELD DUPLICATE OF:			FCMW-6-2Q2	

	RESULT	QUAL	CODE									
<b>POLYNUCLEAR AROMATIC HYDROCARBONS</b>												
2-METHYLNAPHTHALENE	0.2	U		0.2	U		27			140		
ACENAPHTHENE	0.2	U		0.2	U		0.2			0.7		
ACENAPHTHYLENE	0.2	U										
ANTHRACENE	0.2	U										
BENZO(A)ANTHRACENE	0.2	U										
BENZO(A)PYRENE	0.2	U										
BENZO(B)FLUORANTHENE	0.2	U										
BENZO(G,H,I)PERYLENE	0.2	U										
BENZO(K)FLUORANTHENE	0.2	U										
CHRYSENE	0.2	U										
DIBENZO(A,H)ANTHRACENE	0.2	U										
FLUORANTHENE	0.2	U		0.1	J	P	0.2	U		0.2	U	
FLUORENE	0.2	U		0.2	U		0.2	U		0.6		
INDENO(1,2,3-CD)PYRENE	0.2	U										
NAPHTHALENE	0.1	J	P	0.2	U		160			140		
PHENANTHRENE	0.2	U		0.2	U		0.2	U		0.2		
PYRENE	0.2	U		0.6			0.2	U		0.2	U	

**NAS KEY WEST  
WATER DATA  
KAS  
SDG: NASKW15**

SAMPLE NUMBER:	FCMW-6-2Q2		
SAMPLE DATE:	01/19/01	//	//
LABORATORY ID:	WR0204-4		//
QC_TYPE:	NORMAL		
% SOLIDS:	0.0 %	100.0 %	100.0 %
UNITS:	UG/L		
FIELD DUPLICATE OF:			

	RESULT	QUAL	CODE									
POLYNUCLEAR AROMATIC HYDROCARBONS												
2-METHYLNAPHTHALENE	27											
ACENAPHTHENE	0.2											
ACENAPHTHYLENE	0.2	U										
ANTHRACENE	0.2	U										
BENZO(A)ANTHRACENE	0.2	U										
BENZO(A)PYRENE	0.2	U										
BENZO(B)FLUORANTHENE	0.2	U										
BENZO(G,H,I)PERYLENE	0.2	U										
BENZO(K)FLUORANTHENE	0.2	U										
CHRYSENE	0.2	U										
DIBENZO(A,H)ANTHRACENE	0.2	U										
FLUORANTHENE	0.2	U										
FLUORENE	0.2	U										
INDENO(1,2,3-CD)PYRENE	0.2	U										
NAPHTHALENE	160											
PHENANTHRENE	0.2	U										
PYRENE	0.2	U										

NAS KEY WEST  
 WATER DATA  
 KAS  
 SDG: NASKW15

SAMPLE NUMBER:	FC-DUP-01	FCMW-20-2Q2	FCMW-6-2Q2	
SAMPLE DATE:	01/19/01	01/19/01	01/19/01	//
LABORATORY ID:	WR0204-6	WR0204-5	WR0204-4	
QC_TYPE:	NORMAL	NORMAL	NORMAL	
% SOLIDS:	0.0 %	0.0 %	0.0 %	100.0 %
UNITS:	UG/L	UG/L	UG/L	
FIELD DUPLICATE OF:	FCMW-6-2Q2			

	RESULT	QUAL	CODE									
PETROLEUM HYDROCARBONS												
TOTAL PETROLEUM HYDROCARBONS	1800			2500			1900					