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LETTER REGARDING SUBMITTAL OF TECHNICAL MEMORANDUM ON SOIL SAMPLING AT STUDY AREA 36 NTC ORLANDO FL
1/17/2002
TETRA TECH

TETRA TECH NUS, INC.
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0102-E018

January 17, 2002

Commander, Southern Division
Naval Facilities Engineering Command
Attn: Ms. Barbara Nwokike, Code ES333
P.O. Box 190010
2155 Eagle Drive
North Charleston, SC 29419-9010

Reference: CLEAN Contract No. N62467-94-D-0888
Contract Task Order No. 0024

Subject: Soil Sampling at Study Area 36
Former Naval Training Center, Orlando, Florida

Dear Ms. Nwokike:

Enclosed is a technical memorandum describing the results of soil sampling at SA 36. A second copy has been mailed to your attention at Southern Division's Orlando office. Please contact me at (865) 220-4730 if you have any comments or questions regarding the memorandum.

Sincerely,

Steven B. McCoy, P.E.
Task Order Manager

SBM:tko

Enclosure

c: Ms. Barbara Nwokike, Southern Division (Orlando Office)
Mr. David Grabka, FDEP
Mr. Gregory Fraley, USEPA Region 4
Mr. Steve Tsangaris, CH2M Hill
Mr. Mark Salvetti, Harding ESE
Mr. Michael Campbell, Tetra Tech NUS
Ms. Janice Johnson, Tetra Tech NUS
File/db

Subject: **Soil Investigation Summary, Study Area 36, NTC Orlando**

Prepared for: Barbara Nwokike, SouthDiv

Prepared by: Janice Johnson, TtNUS

Copies: Steve McCoy, TtNUS
Mike Campbell, TtNUS
Allan Jenkins, TtNUS

Date: January 16, 2002

Purpose

The results of the soil investigation at Study Area (SA) 36 are presented in this Technical Memorandum. This discussion will be included in the Site Investigation Report that will be issued when the groundwater investigation has been completed.

Site Screening Investigation

During the initial site screening activities in 1997 (HLA, 1999)[1], investigators conducted a passive soil gas survey at SA 36 over the storage areas, drainage swale, and the western portion of the Public Work Yard using passive collectors at 2-ft depths and at grid nodes spaced 50 ft apart. A total of 56 collectors were analyzed for volatile organic constituents (USEPA 8260). Tetrachloroethene (PCE) was detected at 3.59 µg/L (PQL = 2.50 µg/L) in one soil vapor sample (36V00901) in the North Storage Area.

Based on the soil gas survey, soil samples were collected during installation of monitoring wells at the storage areas in October of 1997. Composite surface soil samples were collected in the 0-2 foot below ground surface (bgs) interval. Subsurface soil was collected from the 6-8 foot bgs interval, immediately above groundwater elevation. All soil samples were analyzed for full suite CLP target analyte list (TAL), target compound list (TCL), pesticides/PCBs, and total recoverable petroleum hydrocarbons (TRPH) at Level 4 data quality objectives (DQOs). Samples with elevated metals concentrations in soils were noted throughout the site (Figure 1). A summary of positive detections is provided in Table 1. Exceedances of Background Screening Values (BGSVs), Soil Cleanup Target Levels (SCTLs), and U.S. Environmental Protection Agency (USEPA) Region III Risk-Based Concentrations (RBCs) were observed for the following:

[1] Harding, Lawson & Associates, 1999. *Base Realignment and Closure Environmental Site Screening Report, Study Area 36,* Naval Training Center, Orlando, Florida, Unit Identification Code N00207, Contract No. N62467-89-D-0317/107, July.

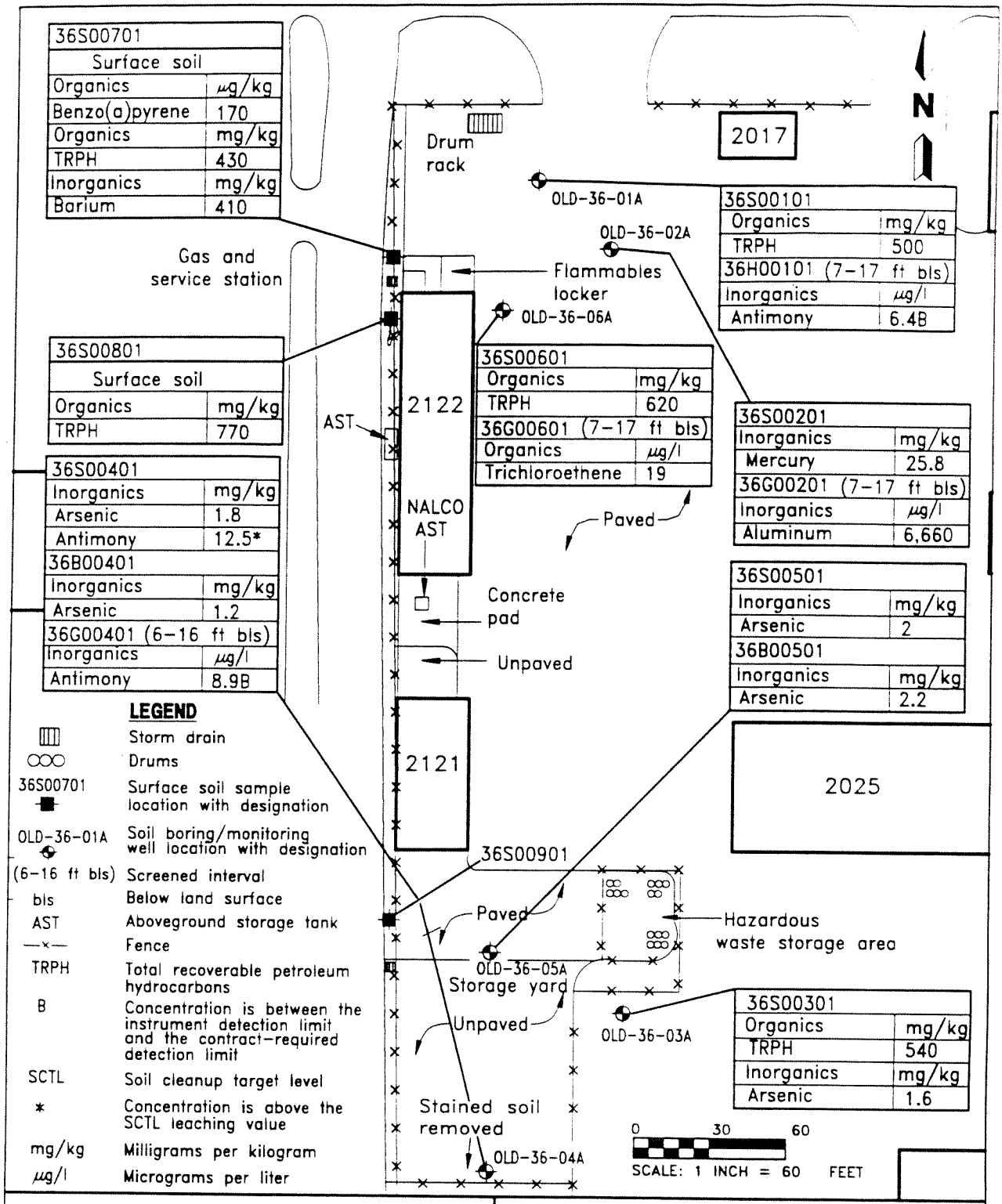

FIGURE 1

SURFACE SOIL, SOIL BORING, AND MONITORING WELL LOCATIONS BUILDINGS 2121 AND 2122, PUBLIC WORKS AREA

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BASE REALIGNMENT AND CLOSURE ENVIRONMENTAL SITE SCREENING REPORT, STUDY AREA 36

NAVAL TRAINING CENTER ORLANDO, FLORIDA

NTC-ESSR.S36
FGW.07.99

TABLE 1

Summary of Positive Detections in Surface Soil Analytical Results, Initial Screening

Study Area 36

Naval Training Center, Orlando

Orlando, FL

Sample ID	Background	SCTL	RBC for Residential Soil	RBC for Industrial Soil	36S00101	36S00201	36S00301	36S00401	36S00501
Sampling Date					30-Oct-97	30-Oct-97	30-Oct-97	30-Oct-97	30-Oct-97
Volatile Organics, ug/kg									
Tetrachloroethene		10,000	12,000 c	110,000 c					
Semivolatile Organics, ug/kg									
Acenaphthylene		1,100,000	2,300,000 n	61,000,000 n		24 J			
Anthracene		19,000,000	23000000 n	610000000 n		11 J			
Benzo(a)anthracene		1,400	880 c	7,800 c		17 J			9 J
Benzo(a)pyrene		100	88 c	780 c		40 J			13 J
Benzo(b)fluoranthene		1,400	880 c	7,800 c	12 J	40 J			16 J
Benzo(g,h,i)perylene		2,300,000	2300000 n	61,000,000 n		35 J			5 J
Benzo(k)fluoranthene		15,000	8,800 c	78,000 c		26 J			15 J
bis(2-Ethylhexyl)phthalate		75,000	46,000 c	410,000 c					
Butylbenzylphthalate		220,000	16000000 n	410,000,000 n					50 J
Chrysene		140,000	88,000 c	780,000 c		38 J			17 J
Dibenz(a,h)anthracene		100	88 c	780 c		12 J			
Fluoranthene		2,800,000	3,100,000 n	82,000,000 n	6 J	19 J	12 J	5 J	23 J
Indeno(1,2,3-cd)pyrene		1,500	880 c	7,800 c		34 J			10 J
Phenanthrene		1,900,000	2,300,000 n	61,000,000 n		9 J	13 J		8 J
Pyrene		2,200,000	2,300,000 n	61,000,000 n	14 J	25 J	21 J		21 J
Pesticides/PCBs, ug/kg									
4,4'-DDD		4,500	2,700 c	24,000 c	3.4 J			1.7 J	
4,4'-DDE		3,200	1,900 c	17,000 c	10	2.8 J	0.62 J	8.3	1.1 J
4,4'-DDT		3,200	1,900 c	17,000 c	0.48 J	0.72 J	0.44 J	22	1.9 J
alpha-Chlordane		3,000	490 c	4,400 c	0.46 J	0.07 J		0.25 J	
Aroclor-1260		600	ND	ND					
beta-BHC		600	350 c	3,200 c			0.2 J		
delta-BHC		22,000	350 c	3,200 c				0.22 J	0.16 J
Dieldrin		70	40 c	360 c		0.48 J	0.09 J		
Endrin		21,000	23,000 n	610,000 n					
Endrin ketone		ND	ND	ND			1.4 J		0.78 J
gamma-BHC (Lindane)		700	490 c	4,400 c				0.13 J	
gamma-Chlordane		3,000	490 c	4,400 c	0.86 J	0.24 J	0.33 J	0.3 J	
Heptachlor epoxide		100	70 c	630 c					

TABLE 1

Summary of Positive Detections in Surface Soil Analytical Results, Initial Screening
Study Area 36

Naval Training Center, Orlando
Orlando, FL

Sample ID	Background		SCTL		RBC for Residential Soil		RBC for Industrial Soil		36S00101		36S00201		36S00301		36S00401		36S00501	
Sampling Date									30-Oct-97		30-Oct-97		30-Oct-97		30-Oct-97		30-Oct-97	
Methoxychlor			380,000		390,000	n	10,000,000	n			1.7	J	3.2	J				
Inorganics, mg/kg																		
Aluminum	2088		72,000		78,000	n	1,000,000	n	576	J	100	J	741	J	591	J	590	J
Antimony	ND		26		31	n	820	n							12.5			
Arsenic	1.0		0.8		0.43 /23	c/n	3.8 c/610	c/n			1	J	1.6	J	1.8	J	2	J
Barium	8.7		105		5,500	n	140,000	n							7.4	J	5.1	J
Beryllium	ND		120		0.15	c	1	c										
Cadmium	0.98		75		39	n	1,000	n							0.19	J		
Calcium	25295		ND		1000000		1000000		105000		90300		60700		34900		29500	
Chromium	5		290		390	n	10,000	n	2.6		2.5		2.8		5.4		2.4	
Cobalt	ND		4,700		4,700	n	120,000	n	0.22	J	0.29	J			1.5	J	0.86	J
Copper	4.1		105		270,000	n	1,000,000	n										
Iron	712		23,000		23,000	n	610,000	n	129	J			237	J	862	J	135	J
Lead	14.5		500		400		400		1.5	J			4.2	J	29.2	J	2	J
Magnesium	328		ND		460,468		460,468										1180	
Manganese	8.1		1,600		1,800	n	47,000	n	15.2		8.7		14.4		8.7		5.2	
Mercury	0.07		3.7		23	n	610	n			25.8		0.05	J			0.02	J
Nickel	4.4		1500		1,600	n	41,000	n										
Selenium	1.1		390		390	n	10,000	n	0.84	J			0.96	J	1	J		
Silver	ND		390		390	n	10,000	n							0.94	J	0.95	J
Thallium	2		ND		ND		ND						1.6	J	0.99	J		
Vanadium	3.1		15		550	n	14,000	n	2.3	J	1.8	J	4.7	J	1.1	J	0.9	J
Zinc	17.2		23,000		23,000	n	610,000	n							156	J		
General Chemistry																		
TRPH	ND		350		ND		ND		500		260		540		13		10	

TABLE 1

Summary of Positive Detections in Surface Soil Analytical Results, Initial Screening
Study Area 36

Naval Training Center, Orlando
Orlando, FL

Sample ID	Background		SCTL		RBC for Residential Soil		RBC for Industrial Soil		36S00601		36S00701		36S00701D		36S00801		36S00901	
Sampling Date									30-Oct-97		10-Nov-97		10-Nov-97		10-Nov-97		10-Nov-97	
Volatile Organics, ug/kg																		
Tetrachloroethene			10,000		12,000	c	110,000	c							3	J		
Semivolatile Organics, ug/kg																		
Acenaphthylene			1,100,000		2,300,000	n	61,000,000	n							7	J		
Anthracene			19,000,000		23000000	n	610000000	n			15	J			8	J		
Benzo(a)anthracene			1,400		880	c	7,800	c			120	J	88	J	32	J		
Benzo(a)pyrene			100		88	c	780	c			170	J	140	J	60	J		
Benzo(b)fluoranthene			1,400		880	c	7,800	c			240	J	190	J	65	J		
Benzo(g,h,i)perylene			2,300,000		2300000	n	61,000,000	n			82	J						
Benzo(k)fluoranthene			15,000		8,800	c	78,000	c			170	J	150	J	56	J		
bis(2-Ethylhexyl)phthalate			75,000		46,000	c	410,000	c	66	J			390					
Butylbenzylphthalate			220,000		16000000	n	410,000,000	n										
Chrysene			140,000		88,000	c	780,000	c			230	J	180	J	64	J		
Dibenz(a,h)anthracene			100		88	c	780	c										
Fluoranthene			2,800,000		3,100,000	n	82,000,000	n	6	J	350	J	190	J	62	J		
Indeno(1,2,3-cd)pyrene			1,500		880	c	7,800	c			130	J	82	J	48	J		
Phenanthrene			1,900,000		2,300,000	n	61,000,000	n	7	J	120	J	54	J	27	J		
Pyrene			2,200,000		2,300,000	n	61,000,000	n	7	J	240	J	150	J	55	J		
Pesticides/PCBs, ug/kg																		
4,4'-DDD			4,500		2,700	c	24,000	c	15		1	J	1.3	J	6	J	0.35	J
4,4'-DDE			3,200		1,900	c	17,000	c	9.7		5.5	J	5.6		4.2		8.3	
4,4'-DDT			3,200		1,900	c	17,000	c			12	J	13	J	15	J	12	J
alpha-Chlordane			3,000		490	c	4,400	c	1.7	J	11		11		13		2	J
Aroclor-1260			600		ND		ND				85		67		97		29	J
beta-BHC			600		350	c	3,200	c			1.4	J	2.5	J	0.54	J	0.91	J
delta-BHC			22,000		350	c	3,200	c	0.15	J								
Dieldrin			70		40	c	360	c					1.3	J	7.4	J		
Endrin			21,000		23,000	n	610,000	n									0.53	J
Endrin ketone			ND		ND		ND		1.5	J								
gamma-BHC (Lindane)			700		490	c	4,400	c			0.72	J	1.2	J	0.27	J		
gamma-Chlordane			3,000		490	c	4,400	c	2.5		12		12		16		2.4	J
Heptachlor epoxide			100		70	c	630	c			0.3	J	0.46	J	1.2	J		

TABLE 1

Summary of Positive Detections in Surface Soil Analytical Results, Initial Screening
Study Area 36

Naval Training Center, Orlando
Orlando, FL

Sample ID	Background	SCTL	RBC for Residential Soil		RBC for Industrial Soil		36S00601		36S00701		36S00701D		36S00801		36S00901	
Sampling Date							30-Oct-97		10-Nov-97		10-Nov-97		10-Nov-97		10-Nov-97	
Methoxychlor		380,000	390,000	n	10,000,000	n	7.9	J			6.8	J	9.3	J	5.6	J
Inorganics, mg/kg																
Aluminum	2088	72,000	78,000	n	1,000,000	n	489	J	1560		1880		3270		732	
Antimony	ND	26	31	n	820	n										
Arsenic	1.0	0.8	0.43 /23	c/n	3.8 c/610	c/n							1	J		
Barium	8.7	105	5,500	n	140,000	n	13.1	J	410		499		38.3	J		
Beryllium	ND	120	0.15	c	1	c			0.19	J	0.25	J	0.17	J		
Cadmium	0.98	75	39	n	1,000	n			1.9		1.9		0.35	J	0.19	J
Calcium	25295	ND	1000000		1000000		69700		49200		41300		22200			
Chromium	5	290	390	n	10,000	n	2.1	J	15.5	J	27	J	8.5		2.9	
Cobalt	ND	4,700	4,700	n	120,000	n			1.1	J	1	J				
Copper	4.1	105	270,000	n	1,000,000	n			21.6		22					
Iron	712	23,000	23,000	n	610,000	n	156	J	1130		1240		327		386	
Lead	14.5	500	400		400		11.9	J	188		259		51.1		49.1	
Magnesium	328	ND	460,468		460,468				983	J	1290					
Manganese	8.1	1,600	1,800	n	47,000	n	11.8		60.1		68.5		33.2		8.9	
Mercury	0.07	3.7	23	n	610	n	0.04	J	0.23	J	1.9	J	0.14			
Nickel	4.4	1500	1,600	n	41,000	n			3.7	J	4.1	J	1.4	J	1.2	J
Selenium	1.1	390	390	n	10,000	n										
Silver	ND	390	390	n	10,000	n										
Thallium	2	ND	ND		ND											
Vanadium	3.1	15	550	n	14,000	n	1	J	5.6	J	6.4	J	2.1	J	1.1	J
Zinc	17.2	23,000	23,000	n	610,000	n			224		217		85.1			
General Chemistry																
TRPH	ND	350	ND		ND		620		430				770		55	

TABLE 1

Notes for Summary of Positive Detections in
Surface Soil Analytical Results, Initial Screening
Study Area 36

Naval Training Center, Orlando
Orlando, FL

NOTES:

The background screening value is twice the average of detected concentrations for inorganic analytes.

SCTL = Florida Department of Environmental Protection, Soil Cleanup Target Levels, Chapter 62-785 FAC, April 30, 1998.
Values indicated are for direct exposure scenario. Value for chromium is for chromium (IV).
Value for mercury is for inorganic mercury.

RBC = Risk-Based Concentration Table, USEPA Region III, May 1996, R.L. Smith. RBC for chromium is based on chromium VI. RBC for lead is not available; value is Interim Guidance on Establishing Soil Lead Cleanup Levels at Superfund Sites (OSWER directive 9355-4-12). For essential nutrients (calcium, magnesium, sodium, potassium) screening values were derived based on recommended daily allowances.
RBC for benzo(g,h,i)perylene and phenanthrene are not available, value is based on pyrene.

n = noncarcinogenic pathway
c = carcinogenic pathway
ND = Not determined.
bls = below land surface
PCB = polychlorinated biphenyl.
OSWER = Office of Solid Waste and Emergency Response.
USEPA = U.S. Environmental Protection Agency.
DDD = Dichlorodiphenyldichloroethane
DDE = Dichlorodiphenyldichloroethene
DDT = Dichlorodiphenyltrichloroethane
D = Indicates value was determined during a diluted reanalysis.
J = Reported concentration is an estimated quantity.
mg/kg = milligrams per kilogram.
ug/kg = micrograms per kilogram.

All inorganics results expressed in milligrams per kilogram (mg/kg) soil dry weight; organics in micrograms per kilogram (ug/kg) soil dry weight.
Bold/shaded values indicate exceedance of regulatory guidance and background.

- TRPH at the surface beneath the pavement in the North Storage Area (36S00101) and adjacent to the flammable storage cabinet (36S00601); in the drainage swale north and south of the storm drain next to the Paint Shop (36S00701, 36S00801); and at the surface in the South Storage Area (36S00301).

- Mercury in surface soil in the North Storage Area (36S00201).

- Arsenic in the South Storage Area at both surface and subsurface intervals near the edge of the pavement (36S00501) and south of the yard (36S00401) in the lime rock paved area.

- Benzo(a)pyrene and barium in surface soil in the drainage swale (36S00701) north of the storm drain next to the Paint Shop (Building 2122).

- Antimony in the South Storage Area at the surface at the southern fence line (36S00401).

Additional Soil Sampling

In April 2000, Tetra Tech NUS, Inc. (TtNUS) collected 28 additional surface soil samples to confirm and define the horizontal extent of mercury, barium, arsenic, antimony, and TRPH contamination at "hot spots" in surface soil exceeding background or regulatory guidance at SA 36 to assess the possible need for soil removal actions (Figure 2). Sample analytes were selected in each area according to the exceedances reported in the initial investigation. Samples were collected in the North Storage Area near well OLD-36-02A and analyzed for mercury. In the drainage swale, north of the storm drain adjacent to the Pint Shop (Building 2122), samples were collected and analyzed for barium. In the South Storage Area, samples were collected near former wells OLD-36-03A, -04A, and –05A and throughout the area and analyzed for arsenic and antimony. Samples were analyzed for TRPH from the North Storage Area and the South Storage Area where previous samples exceeded screening criteria to characterize impacts since overlying asphalt was assumed to be the source. Results of the soil samples are presented in Table 2 and the Florida Residential SCTLs are shown in the table for comparison. The leachability SCTLs for these analytes based on groundwater criteria are less restrictive (higher values) than the residential SCTLs.

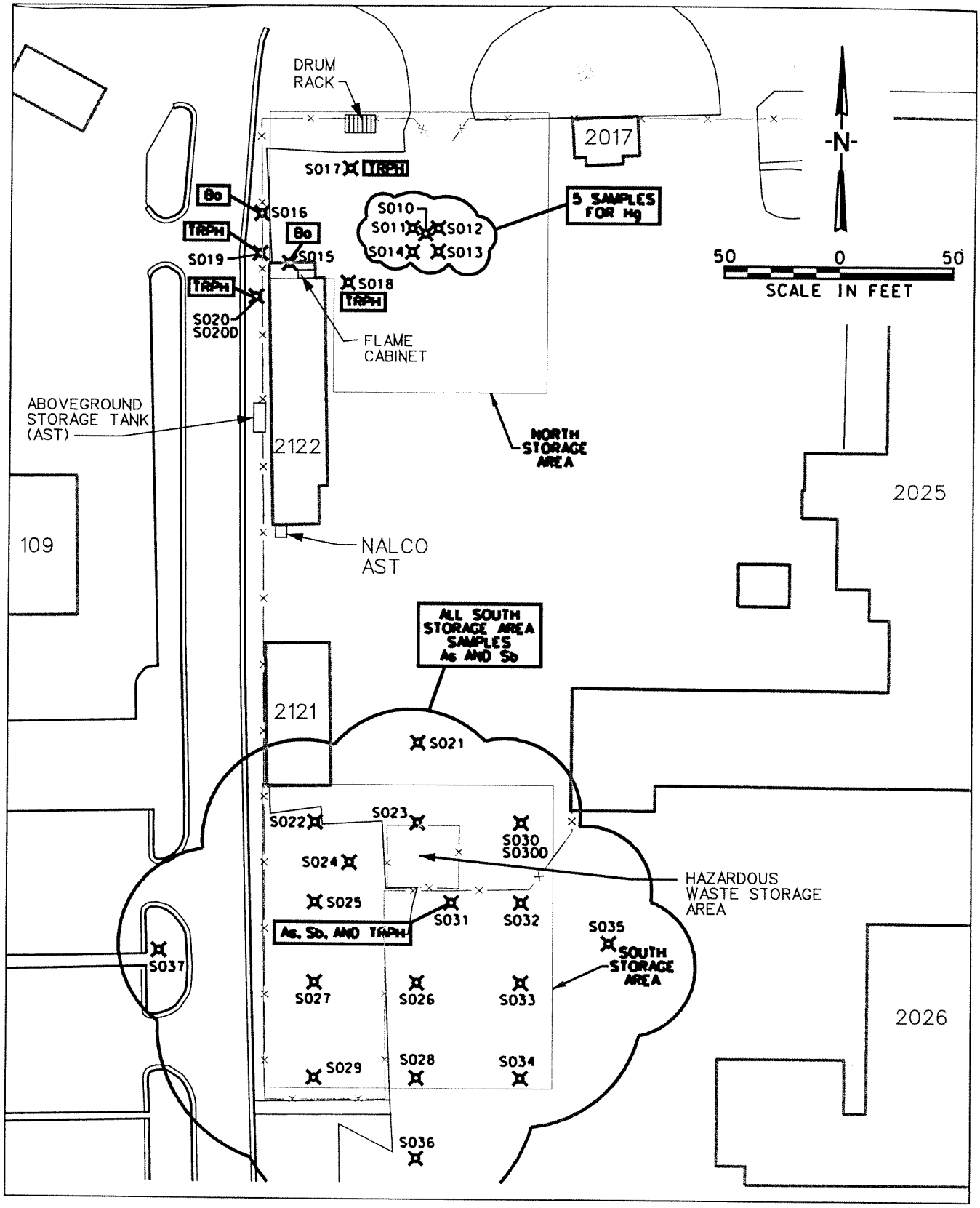

Figure 2. Confirmation Soil Sample Locations

TABLE 2

ANALYTES DETECTED IN SURFACE SOILS IN CONFIRMATION SAMPLING AT STUDY AREA 36

FORMER NAVAL TRAINING CENTER ORLANDO, FLORIDA

Sampling Location	Sampling Date	Antimony mg/kg	Arsenic mg/kg	Barium mg/kg	Mercury mg/kg	TRPH mg/kg
Florida SCTL[1]		26	0.8	110	3.4	340
Surface BGSV[2]			1.0	8.7	0.1	
S010	04/16/00				0.018U	
S011	04/16/00				0.015U	
S012	04/16/00				0.014U	
S013	04/16/00				0.015U	
S014	04/16/00				0.007U	
S015	04/16/00			18.20		
S016	04/16/00			109.00		
S017	04/16/00					35J
S018	04/16/00					13J
S019	04/16/00					140J
S020	04/16/00					130J
S020D	04/16/00					180J
S021	04/16/00	0.17U	0.55			
S022	04/16/00	0.17U	0.26U			
S023	04/16/00	0.17U	0.26U			
S024	04/16/00	0.16U	0.26U			
S025	04/16/00	0.16U	0.39			
S026	04/16/00	0.17U	0.27			
S027	04/16/00	0.17U	0.26U			
S028	04/16/00	0.17U	0.81			
S029	04/16/00	0.17U	0.76			
S030	04/16/00	0.17U	O.26U			
S030D	04/17/00	0.16U	0.26U			
S031	04/17/00	0.17U	0.67			170J
S032	04/17/00	0.17U	0.31			
S033	04/17/00	0.17U	0.26U			
S034	04/17/00	0.17U	0.27U			
S035	04/17/00	0.16U	0.26U			
S036	04/17/00	0.22	0.46			
S037	04/17/00	0.21	0.25U			

[1] FDEP Residential Soil Cleanup Target Level
[2] Background screening value. The background screening value is twice the average of detected concentrations for inorganic analytes.
U The analyte was analyzed for but not detected above the reported sample quantitation limit. The number preceding the U qualifier is the reported sample quantitation limit.
J The analyte was positively identified and the associated numerical value is an estimated concentration.

The analyses of the soil samples revealed some elevated concentrations of inorganics, but not at concentrations that constitute exceedances of residential SCTLs. The arsenic concentration at soil sample location S028 (0.81 mg/kg) slightly exceeded its SCTL of 0.8 mg/kg, but was below the BGSV of 1.0 mg/kg. Barium concentrations at sampling locations S015 (18.20 mg/kg) and S016 (109.00 mg/kg) exceeded the BGSV of 8.7 mg/kg, but were below the SCTL of 110 mg/kg. Antimony, mercury, and TRPH concentrations were below their respective SCTLs and BGSVs.

Conclusions and Recommendations

The Site Screening Investigation identified exceedances of Florida SCTLs, but the subsequent sampling indicated that no exceedances were present. As a result, the Orlando Partnering Team (OPT) decided that no further investigation of soil was required. It is recommended that the soil at SA 36 be considered suitable for transfer under a residential reuse scenario.