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NAS PENSACOLA
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DRAFT TECHNICAL MEMORANDUM FOR SOIL AND GROUNDWATER SAMPLING
RESULTS SITE 24 OPERABLE UNIT 13 WITH TRANSMITTAL NAS PENSACOLA FL
9/9/2002
CH2MHILL



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September 9, 2002
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Subject: Contract No. N62467-98-D-0095
Contract Task Order 0085 - Naval Air Station (NAS) Pensacola - Pensacola,
Florida
Draft Technical Memorandum, Results of Soil and Groundwater Sampling,
Operable Unit 13 - Site 24, Revision 00

Dear Mr. Hill:

CH2M HILL Constructors (CCI) is pleased to provide this electronic copy of the Draft Technical Memorandum, Results of Soil and Groundwater Sampling, Operable Unit 13 - Site 24, Revision 00.

Please contact me (850.939.8300, ext. 17) if you have any questions or comments regarding this material.

Sincerely,

CH2M HILL

A handwritten signature in black ink, appearing to read "Amy Twitty".

Amy Twitty, P.G.
Project Manager

cc: Gena Townsend/EPA
Tracie Vaught/FDEP
Terry Hansen/TtNUS
Greg Wilfley/CCI
Ron Joyner/NASP
Allison Harris/EnSafe
Brian Caldwell/EnSafe
Paul Stoddard/EnSafe
CCI Project File No. 171578

Results of Soil and Groundwater Sampling Operable Unit 13 – Site 24

PREPARED FOR: Bill Hill
Southern Division, Naval Facilities Engineering Command

PREPARED BY: Amy Twitty, P.G.

DATE: September 9, 2002

This memorandum presents analytical data obtained during sampling and analysis activities performed from August 14-15, 2002 at Naval Air Station (NAS) Pensacola, Florida. Soil sampling was conducted at Operable Unit (OU) 13, Site 24 in order to delineate contaminants for soil excavation. In addition to the scope outlined in the Sampling and Analysis Plan, CCI also collected one groundwater sample in each area of soil contamination to determine if the groundwater was impacted by soil conditions at the site.

Preliminary review of the data by the Quality Assurance Chemist indicates the data are acceptable, however, the final data validation is not complete. Therefore, this document will be considered draft until the laboratory result qualifiers have been received and reviewed.

Background and Objectives

Site 24 is located along the eastern side of John Towers Road, south of Taylor Road in the middle of the NAS Complex as shown in Figure 1. Site 24 is immediately north of Building 3561 near the northwest corner of the Barrancas National Cemetery. Nearly three quarters of the site is now part of the Barrancas National Cemetery and contains multiple gravesites. Only the southwestern corner of the site, now covered with grass, does not contain gravesites. A paved road transects the site from east to west, which leads to the circular drive surrounding the columbarium. Cemetery personnel have reported finding buried metal, rubber, and plastic aircraft parts during excavation along the eastern boundary of Site 24 (Ensafe, Inc. [EnSafe] 2000). Figure 2 presents the site layout.

From the early 1950s until the early 1960s, Site 24 was used to mix DDT with diesel fuel for mosquito control. DDT was reportedly spilled in the mixing area while being transferred from drums to spray tanks, potentially contaminating the soil and groundwater. DDT was aerially applied for at least 10 years to control mosquito outbreaks. In subsequent years, DDT was applied via a fogger machine. On the average, two or three mosquito outbreaks occurred each year during the spring and summer. Following each outbreak, DDT was generally applied for a 1-week period (EnSafe 2000). For each application, 500 gallons of 20 percent DDT solution was mixed with 300 gallons of diesel fuel. The fogger machine used 300 gallons of 20 percent DDT mixed with 300 gallons of diesel fuel. An estimated 20 gallons of the 20 percent solution may have been spilled during the approximate 10-year period of DDT mixing at the site (Naval Energy and Environmental Support Activity 1983).

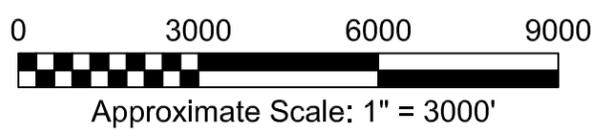
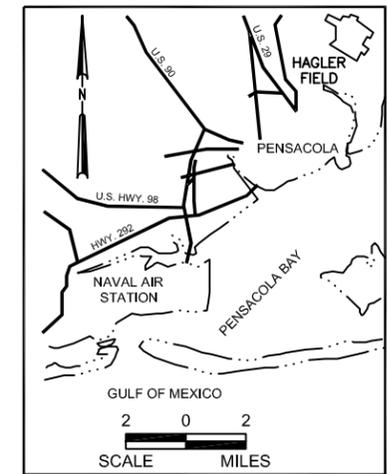
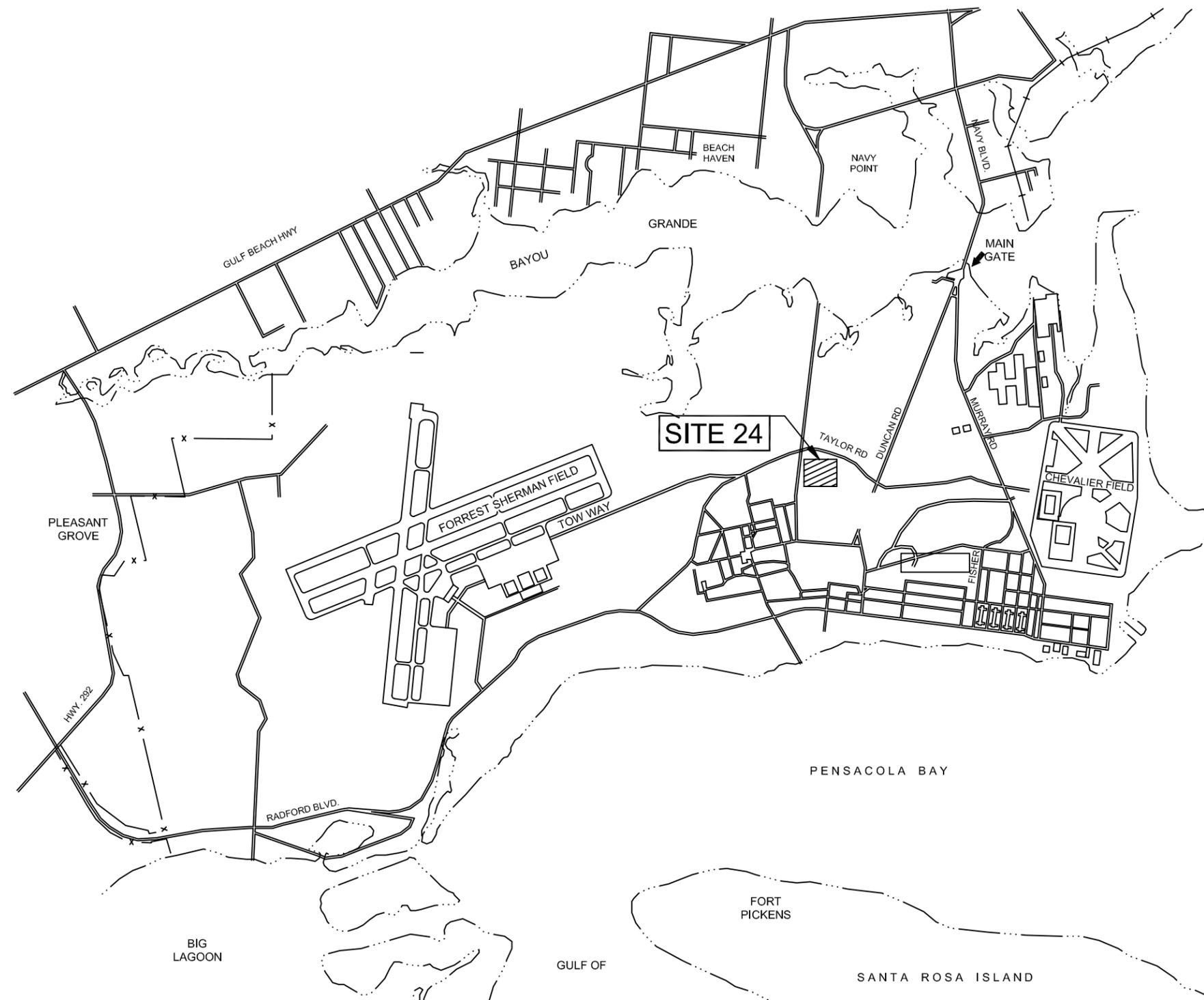


FIGURE 1
Site Location Map
Site 24, NAS Pensacola



LEGEND

Building



Fence



← Barrancas National Cemetery →

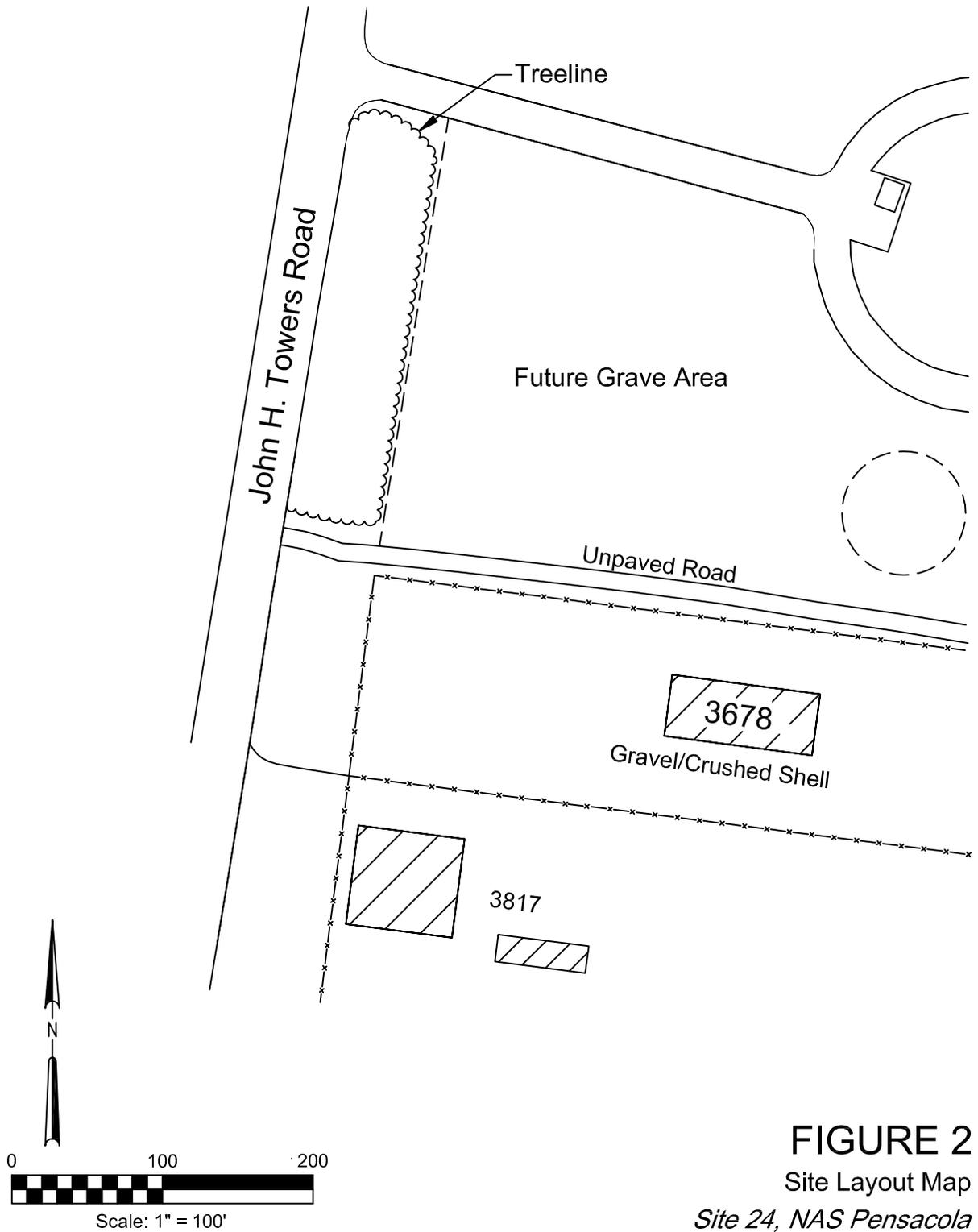


FIGURE 2
Site Layout Map
Site 24, NAS Pensacola

During Remedial Investigation (RI) activities in 1996, four soil contamination areas were identified at Site 24 in the vicinity of previous samples 24S01, 24S10, 24S11, and 24S12. With the change in remediation goals for dieldrin in subsurface soil, sample 24S01 no longer exceeds the soil cleanup target level (SCTL) of 0.004 mg/kg for dieldrin. Sample 24S10 exceeded the surface soil remediation goals for arsenic and benzo(a)pyrene, and the subsurface remediation goal for dieldrin; sample 24S11 exceeded the surface soil remediation goal for arsenic; and sample 24S12 exceeded the subsurface remediation goal for dieldrin.

The Preliminary Remediation Goals (PRGs) for subsurface soil at the site are 29 milligrams per kilogram (mg/kg), 8 mg/kg, and 0.004 mg/kg for arsenic, benzo(a)pyrene and dieldrin, respectively. However, EnSafe performed a statistical evaluation for these COCs in surface soil at Site 24. The evaluation was conducted in conjunction with FDEP's *Use of the 95 Percent Upper Confidence Level in Developing Exposure Point Concentrations of Contaminants in Soil* (May 11, 1999). Based on the statistical analysis of the 95 percent upper confidence level (UCL), the new surface soil cleanup goal for arsenic was established at 2.4 mg/kg, 0.3 mg/kg for benzo(a)pyrene, and 0.210 mg/kg for dieldrin.

Soil Investigation

From August 14-15, 2002, a total of 8 surface, 13 subsurface, and associated QA/QC samples were collected by CH2M HILL Constructors, Inc. (CCI) in the vicinity of former sample 24S10 for the source delineation of arsenic, benzo(a)pyrene, and dieldrin. Additionally, a total of 1 surface, 11 subsurface, and associated QA/QC samples were collected by CCI in the vicinity of former sample 24S12 for the source delineation of arsenic and dieldrin, respectively.

Surface soil samples were collected using decontaminated stainless steel hand augers. The deeper samples were collected using a drill rig equipped with 4-foot samplers lined with plastic sleeves. Soil was thoroughly mixed and placed in 4-ounce glass jars. All sampling was conducted in accordance with CCI's Basewide Work Plan for NAS Pensacola (CCI, 2000), Florida Department of Environmental Protection (FDEP) Standard Operating Procedures, and the U.S. Environmental Protection Agency (EPA), Region IV, Environmental Investigation Standard Operating Procedures and Quality Assurance Manual dated May 1996, revised 1997.

Delineation of the dieldrin subsurface soil contamination at former sample 24S10 was performed by taking four initial samples 25 feet to the north, south, east, and west of its location. To prevent the displacement of several large trees in the event of excavation, four additional samples were collected on 12.5-footcenters from the original sample (half the distance to the 25-foot samples). These samples were held at the laboratory pending the results of the 25-ft samples. Subsurface soil samples were collected from 5 to 7 feet bls. Deeper subsurface samples were collected at various depths depending on the depth to groundwater, which was found as high as 9 feet bls.

One sample was also collected south of former sample 24S11 in order to delineate the arsenic surface soil contamination.

Delineation for dieldrin contamination in the subsurface soil at the location of former sample 24S12 was performed by taking four initial samples 25 feet to the north, south, east, and west of its location. As with sampling at 24S10, secondary samples were also collected 12.5 feet from sample 24S12 in order to mitigate the potential disturbance to the tree line. These samples were held at the laboratory pending the results of the 25-ft samples. Subsurface soil samples were collected from 5 to 7 feet bls. The water table is located at approximately 8 feet bls, so the 10-12 feet bls samples were not collected. Figure 3 indicates the layout for each soil sample and location.

All samples were delivered to Kemron Environmental Services in Marietta, Ohio (a Navy-approved laboratory). Select samples were analyzed for arsenic using EPA Method 6010B, benzo(a)pyrene using EPA Method 8270C, and dieldrin using EPA Method 8081A on a 48-hour turnaround time.

Groundwater Investigation

A direct push drill rig was used to collect two groundwater samples and one duplicate sample. The purpose of the sampling was to determine whether the soil contamination had impacted groundwater. The groundwater samples were collected at the most downgradient locations to former samples 24S10 and 24S12 at locations 24S51 and 24S59, respectively. In collecting the samples, a 4-foot screen rod descended to the water table from approximately 12- 16 bls. Teflon tubing was then lowered into the screen interval until it was one foot above the bottom of the screen (approximately 15 feet bls). The tubing was attached to a peristaltic pump and the groundwater was pumped to the surface using low flow. To minimize turbidity, three gallons of water were purged prior to collection of the groundwater samples.

All groundwater samples were delivered to Kemron Environmental Services. Select samples were analyzed for arsenic using EPA Method 6010B, benzo(a)pyrene using EPA Method 8270C, and dieldrin using EPA Method 8081A on a 48-hour turnaround time.

The Horiba U-10 was used to check water quality. Table 1 presents the groundwater field parameter data.

TABLE 1
 Groundwater Field Parameter Data

Monitoring Well	Measurement Date	Water Temperature (°C)	pH	Specific Conductivity (mS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)
24S51	08/15/2002	25.2	6.33	0.537	6	8.53
24S59	08/14/2002	27.2	6.46	0.44	35	7.61

°C degrees Celsius
 mg/L milligrams per liter
 mS/cm micro Siemens per centimeter
 NTU nephelometric turbidity unit

LEGEND

- Building
- Fence
- New Soil Boring
- Previous Soil Boring
- Groundwater Sample Collected

← Barrancas National Cemetery →

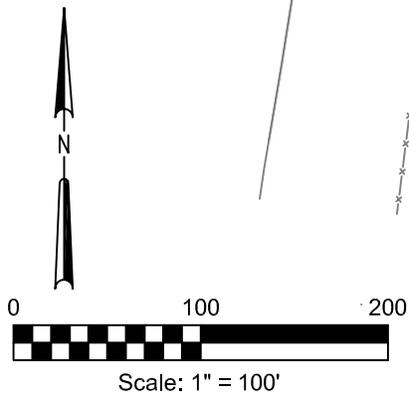
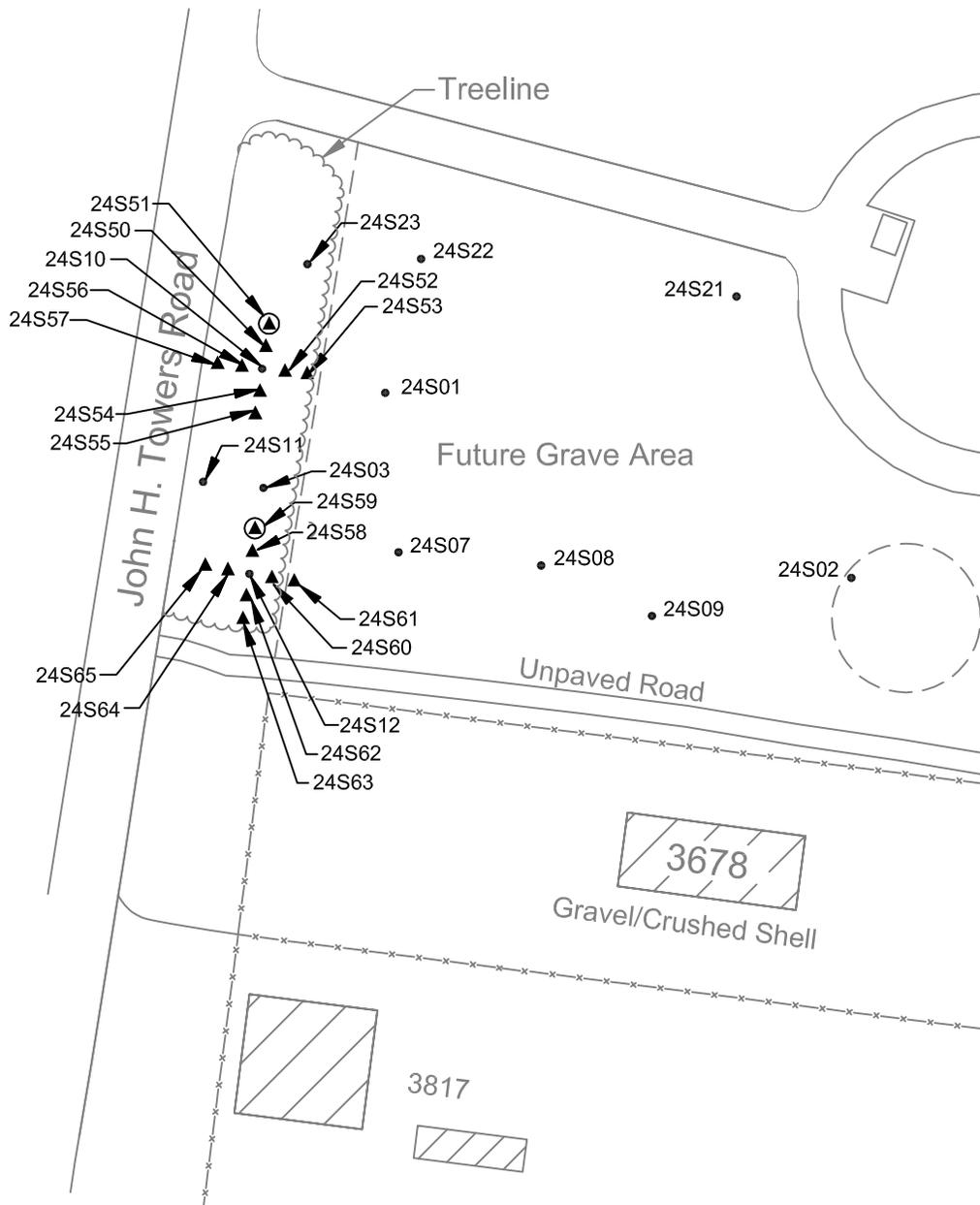


FIGURE 3
Soil Sample Location Map
Site 24, NAS Pensacola

Results

Soil

Analytical results for subsurface soil were compared to the PRGs established for the site taken from the FDEP soil cleanup target levels (SCTLs) found in Chapter 62-777, Florida Administration Code (FAC). As stated previously, the surface criterion for the COCs was established using the 95 percent UCL. Tables 2 and 3 present a summary of soil sample results from samples collected from the vicinity of 24S10 and 24S12, respectively. The analytical report is included in Attachment A. The Data Quality Evaluation (DQE) performed for the analytical results are presented in Attachment B.

TABLE 2
Surface Soil Sampling Results in Vicinity of Sample 24S10

Sample ID	Depth (feet bls)	Arsenic EPA Method 6010B (mg/kg)	Benzo(a)pyrene EPA Method 8270C (mg/kg)	Dieldrin EPA Method 8081A (mg/kg)
085-24-51-S-1	0-1	0.918	4.030	--
085-24-51-S-7	5-7	--	--	0.00344 U
085-24-51-S-11	9-11	--	--	0.0376/0.0329
085-24-53-S-1	0-1	0.74	0.741 J	--
085-24-53-S-7	5-7	--	--	0.00342 U
085-24-53-S-11	Groundwater encountered at 7.5 to 8 feet bls			
085-24-55-S-1	0-1	3.89	7.57	--
085-24-55-S-7	5-7	--	--	0.00346 U
085-24-55-S-11	9-11	--	--	0.0572 J
085-24-57-S-1	0-1	0.549 J	0.459 J	--
085-24-57-S-7	5-7	--	--	0.00688/0.00695
085-24-57-S-11	9-11	--	--	0.0478 J
95 % UCL Cleanup Goals for Surface Soil		2.4	0.3	--
Regulatory Guidance for Subsurface Soil (Chapter 62-777 FAC)		--	--	0.004

bls below land surface
mg/kg milligrams per kilogram
U undetected
-- not analyzed
Bold numbers indicate exceedance of cleanup criteria

Of the four initial surface samples collected and analyzed for arsenic and benzo(a)pyrene in the vicinity of sample 24S10, arsenic was found exceeding the 95 percent UCL in sample 24S55, while all four samples analyzed for benzo(a)pyrene exceeded the 95 percent UCL of 0.3 mg/kg.

Of the seven initial subsurface samples collected and analyzed for dieldrin near sample 24S10, samples 24S51, 24S55, and 24S57 exceeded the regulatory cleanup goal of 0.004

mg/kg for subsurface soil. Since each of the samples on 25-foot centers exceeded one or more of the cleanup goals, no other samples were analyzed closer to the original hot spot.

Sample 24S65, located south of original sample 24S11, was analyzed for surface arsenic in order to define the southern extent of surface arsenic contamination. Arsenic results were not above the PRG for this sample. This sample location was also used to delineate dieldrin in the subsurface.

TABLE 3
Soil Sampling Results in Vicinity of Former Sample 24S12

Sample ID	Depth (feet bls)	Arsenic EPA Method 6010B (mg/kg)	Dieldrin EPA Method 8081A (mg/kg)
085-24-58-S-7	5-7		0.00344 U
085-24-59-S-7	5-7		0.00355 U
085-24-66-S-7 (Duplicate of 085-24-59-S-7)	5-7		0.00112 J
085-24-60-S-7	5-7		0.0275 J / 0.0191 J
085-24-61-S-7	5-7		0.00102 J
085-24-62-S-7	5-7		0.00344 U
085-24-63-S-7	5-7		0.00394/0.00305 J
085-24-64-S-7	5-7		0.00343 U
085-24-65-S-1	0-1	0.697	--
085-24-65-S-7	5-7		0.00108 J
085-24-66-S-7	5-7		0.00112 J
95 % UCL Cleanup Goals for Subsurface Soil		2.4	
Regulatory Guidance for Subsurface Soil (Chapter 62-777 FAC)		--	0.004

bls below land surface
mg/kg milligrams per kilogram
U undetected
-- not analyzed
Bold numbers indicate exceedance of cleanup criteria

Of the four initial samples collected from 5-7 feet bls on 25-foot centers and analyzed for dieldrin in the vicinity of sample 24S12, none of the samples exceeded the regulatory cleanup goal. Therefore, the second set of samples collected on 12.5-foot centers from the original sample was also analyzed. Sample 24S60, collected 12.5 feet east of original sample 24S12 exceeded the regulatory cleanup goal of 0.004 mg/kg for subsurface soil. Figure 4 presents the results for soil samples.

Groundwater

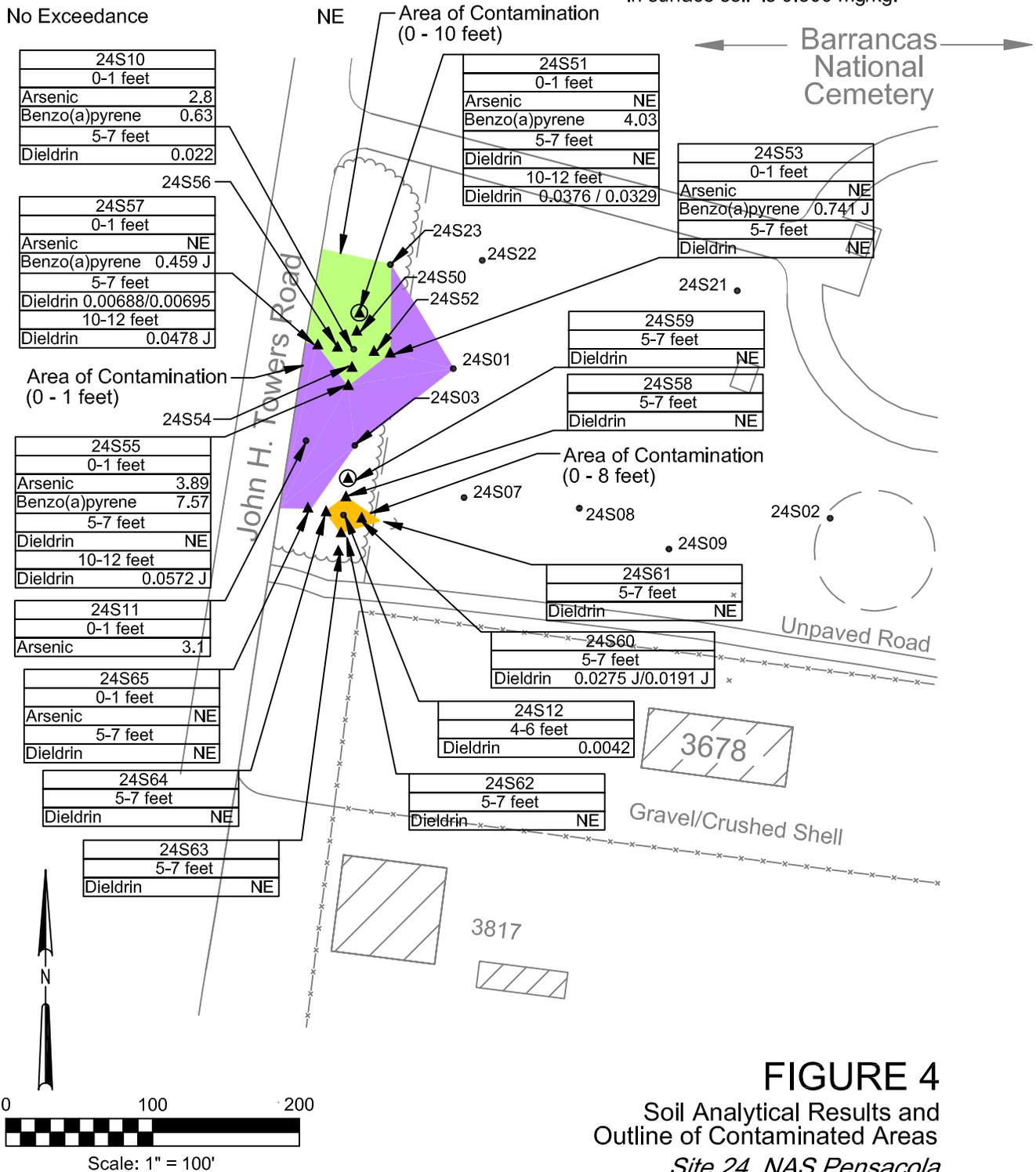
Groundwater sample results indicate arsenic, benzo(a)pyrene, and dieldrin were not detected in groundwater above the groundwater cleanup target levels (GCTLs, Chapter 62-777). The Method Detection Limit for dieldrin is 0.025 µg/L (above the associated GCTL). Refer to Table 4 for a summary of groundwater results. Based on the groundwater results,

LEGEND

Building	
Fence	
New Soil Boring	
Previous Soil Boring	
Groundwater Sample Collected	
Estimated Value	J
No Exceedance	NE

Notes:

1. Soil analytical results are shown in mg/kg.
2. The applicable subsurface soil criterion for dieldrin is 0.004 mg/kg.
3. The 95% UCL for arsenic in surface soil is 2.4 mg/kg.
4. The 95% UCL for benzo(a)pyrene in surface soil is 0.300 mg/kg.



there does not appear to be an impact to groundwater in the vicinity of the soil contamination, although the dieldrin results are not definitive.

TABLE 4
Groundwater Sampling Results

Sample ID	Arsenic EPA Method 6010B (µg/L)	Benzo(a)pyrene EPA Method 8270C (µg/L)	Dieldrin EPA Method 8081A (µg/L)
085-24-51-GW-16	31.2	0.1 U	0.025 U
085-24-59-GW-16	32.1	--	0.025 U
085-24-FD1-GW-16 (Duplicate of 085-24-59-GW-16)	27.3	--	0.025 U
Groundwater Cleanup Target Level	50.0 ^a	0.2 ^a	0.005 ^b

^a primary standard as provided from 62-550 FAC
^b minimum criteria practical quantitation limit as provided from 62-777 FAC
 bls below land surface
 µg/L micrograms per Liter
 U undetected
 -- not analyzed

Conclusions and Recommendations

Dieldrin in subsurface soil in the vicinity of sample 24S12 has been delineated. A volume of 281 cubic yards measuring 8 feet deep exceeds the leachability criteria for dieldrin. One large oak tree and at least two medium-sized pine trees are located in the affected areas.

Approximately 19,550 square feet (724 cubic yards) of arsenic in surface soil (0 to 1 foot bls) exceeds the established 95 percent UCL cleanup goal in the vicinity of 24S10 and 24S11. At least a dozen large trees are located within this area.

Benzo(a)pyrene in surface soil and dieldrin in subsurface soil exceed the cleanup criteria in the vicinity of sample 24S10. Since benzo(a)pyrene was not delineated to the east during this sampling event, former sample 24S01 would serve as the easternmost extent of contamination. Neither benzo(a)pyrene or dieldrin were delineated to the north of 24S10, therefore former sample 24S23 would serve as the northernmost extent. Similarly, benzo(a)pyrene and dieldrin were not delineated to the west. John Towers Road would serve as the westernmost boundary. One area of contamination exists to 10 feet bls and consist of approximately 5,140 cubic yards. Another area consists of benzo(a)pyrene surface contamination and is approximately 180 cubic yards in size.

The entire area encompassed by both surface and subsurface contamination is over 5,300 square feet. This area includes over a dozen large trees including pines, oaks and two large cherry laurel trees planted along the road by the cemetery. The area east of sample 24S53 will be used by the cemetery for grave sites. The area between the graves and the road will remain as a buffer between the cemetery and John Towers Road.

Since groundwater has not been impacted in the area after more than 50 years of operation at the site, soil removal is not necessary to protect groundwater. A greater impact to the

environment would be realized by destroying over a dozen trees in the area. However, surface soil exposure exists due to arsenic and benzo(a)pyrene over a larger area.

CCI suggests remedial action by one of the two following scenarios:

1. Excavate the area of contamination extending into the future grave area (Figures 3 and 4) to 1 foot bls. Place a one-foot thick soil cap over the remainder of the affected surface soil areas to prevent direct exposure. This cap would be permeable soil to allow rainfall infiltration to the surrounding tree roots. No action would be taken to remediate subsurface soil contamination. Land use controls would exist on the subsurface soil at the site under this scenario.
2. Excavate the area of contamination extending into the future grave area (Figures 3 and 4) to 1 foot bls. Use phytoremediation to remediate the surface soil contamination in the remainder of the affected surface soil areas. Phytoremediation has been proven useful against both arsenic and benzo(a)pyrene. Land use controls would exist on the subsurface soil at the site under this scenario.

Once the partnering team decides which remedial action alternative is best, CCI will prepare a remedial action work plan outlining the proposed work.

Works Cited

CH2M HILL Constructors, Inc. Basewide Work Plan Naval Air Station Pensacola, Pensacola, Florida. June 2000.

EnSafe. *Focused Feasibility Study Report, Operable Unit 13, Sites 8 and 24, Naval Air Station, Pensacola, Florida.* May 2000.

EnSafe. *95 Percent Upper Confidence Level Calculations for Operable Unit 13.* April 2002.

Naval Energy and Environmental Support Activity. *Initial Assessment Study of Naval Air Station Pensacola, Pensacola, Florida.* 1983.

ATTACHMENT A
ANALYTICAL REPORTS

ATTACHMENT B
DATA QUALITY EVALUATION
