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TECHNICAL MEMORANDUM ON RECOMMENDATION FOR ADDITIONAL SEDIMENT SAMPLING AT SITE 41 WETLANDS 10 AND 48 NAS PENSACOLA FL

4/23/2007

ENSAFE

Technical Memorandum
Naval Air Station — Pensacola, Florida

To: Naval Air Station Pensacola Partnering Team
From: EnSafe Inc.
Date: April 23, 2007
Subject: Recommendation for Additional Sediment Sampling, Site 41 — Wetlands 10 and 48

The Naval Air Station (NAS) Pensacola Site 41 Remedial Investigation (RI) Report (EnSafe Inc., 2005) identified data gaps at Wetlands 10 and 48. This memorandum proposes a sampling plan to collect additional data to fill those gaps, thereby reducing or eliminating uncertainty at Wetlands 10 and 48. This document summarizes the sampling rationale, locations, and techniques for collecting additional data.

WETLAND 10

Wetland 10 Site History

Parsons and Pruitt of USEPA (1991) originally described Wetland 10 as a palustrine emergent system. The wetland is a man-made drainage ditch along the southern edge of OU 10 and receives storm water runoff from the former Chevalier Field area. The wetland is bound by maintained grass and a few scattered pine trees. The open water portion of Wetland 10 ranges from 1 to 5 feet in depth and 12 to 20 feet in width. The wetland was described in the 2005 RI report as stagnant, containing a monoculture of duckweed *(Lemna).* Wetland 10 is dissected by a service road with a culvert, which allows the wetland to drain by percolation to Pensacola Bay. The eastern end of the wetland is silted in and appeared to keep the area from being tidally influenced. However, recent visual observations of Wetland 10 indicate that the wetland is connected to Pensacola Bay during high tide or high water events.

Seven sediment samples were previously collected and analyzed for metals, pesticides, polychlorinated biphenyls (PCBs), semivolatile organic compounds (SVOCs), and volatile organic compounds (VOCs) during Phase II of the RI. Of the seven sample locations in Wetland 10, sample location 033M0004 had the greatest number of constituents (four) that exceeded their refinement values. Cadmium (34.6 milligrams per kilogram [mg/kg]), chromium (1,180 mg/kg), lead (161 mg/kg) and nickel (52.1 mg/kg) exceeded their refinement values of 4.21 mg/kg, 160 mg/kg, 112 mg/kg, and 42.8 mg/kg, respectively. The mean effects-range median (ERM) quotient category was 3. Depending upon the resampling results, the RI proposed a feasibility study (FS) for Wetland 10.

The sampling proposed in this memorandum will address both the issue of extent and the potential for risk in the easternmost downgradient section of Wetland 10. The results of the analytical testing will be added to the RI Report in an addendum to more adequately evaluate risk.

Wetland 10 Sampling Rationale

The sampling proposed in this memorandum will assess the sediment chemistry in and around sample location 033M0004. Four sediment samples will be collected and analyzed for Target Analyte List (TAL) metals. One sample will be collected at location 033M0004. Two sediment samples will be collected upstream to the west from sample location 033M0004 at 100-foot and 200-foot intervals. Depending on the proximity of location 033M0004 to the current shoreline of Pensacola Bay, one sample will be collected to the east of 033M0004 in an attempt to sample the most downgradient portion of Wetland 10. All samples will be submitted for analysis at Level 2 data quality. In addition, the sediment samples will be analyzed for total organic carbon and grain size. Figure 1 shows the location of proposed sediment samples at Wetland 10.

Wetland 10 Toxicological Tests

Toxicity tests will be conducted concurrent with the chemistry analyses at the locations in Wetland 10. Bioassay organisms will be selected based on their sensitivity to the contaminants suspected and based on the salinity of the wetland. As a group, benthic macroinvertebrates are often the optimal assessment tool in determination of sediment toxicity. Their intimate contact with bottom sediments and interstitial and overlying waters for extended periods of their life cycle increases the likelihood for adverse effects occurring in the presence of contaminated sediments. Benthic macroinvertebrates fill a multitude of ecological niches: functioning as prey, predators, herbivores, omnivores, collectors, gatherers, shredders, and filter feeders, thus interacting with multiple trophic levels which control energy/nutrient/organic matter cycling dynamics in many ecosystems. Therefore, the health of the benthic community will be used as an assessment endpoint for evaluating the sediments collected from Wetland 10.

Unacceptable ecological impacts will be identified by any sediment location that yields a statistically significant reduction in lethal and sublethal effects linked to an exposure gradient when compared to a reference ditch/wetland area at NAS Pensacola.

If the salinity readings indicate Wetland 10 is a palustrine wetland, the benthic amphipod *Hyalella azteca* will be the toxicity test organism. *Hyalella azteca* is widely distributed and common in unpolluted lotic and lentic systems. *Hyalella azteca* is the primary food source for many juvenile fish and is a voracious feeder of animal, plant, and detrital material. The life cycle of *Hyalella azteca* can be divided into three stages: (1) immature (includes instars 1 to 5); (2)

juvenile (includes instars 6 and 7); and (3) adult. *Hyalella azteca* has been used frequently in sediment testing due to its many desirable characteristics.

These include a short generation time; its ease at being cultured in the laboratory; and its survival, growth, and development — all of which can be obtained from toxicity tests. Table 1 summarizes the test conditions recommended for conducting a 10-day sediment exposure using *Hyalella azteca*.

If the salinity readings indicate Wetland 10 is estuarine, then the 10-day toxicity test using the amphipod, *Leptocheirus Plumulosus,* will be conducted. Table 2 summarizes the test conditions recommended for conducting a 10-day sediment exposure using *Leptocheirus Plumulosus.*

WETLAND 48

Wetland 48 Site History

Wetland 48 is in a mostly undeveloped portion of NAS Pensacola, north of Radford Boulevard and south of the Pensacola Fuel Farm. One sediment sample (041M480101) was collected and analyzed for metals, pesticides, PCBs, SVOCs, and VOCs in January 1996. The sample location 041M4801 was centrally located within Wetland 48 and adjacent to Fuel Farm Road. Wetland specific and OU-wide evaluations in the RI Report determined that pesticide levels are a potential risk and need further assessment before the FS. The pesticides, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, and total DDT, had concentrations that exceeded the typical basewide sediment values. Wetland 48 had the highest concentration of total DDT (3,460 micrograms per kilogram [µg/kg]) for the miscellaneous wetlands during the RI. The Mean ERM quotient evaluation classified the sample as a Category 3.

The total DDT sediment concentration generated a maximum No-Observed-Adverse-Effect Level (NOAEL) hazard quotient (HQ) concentration of 14 during the Food Chain Model evaluation for the piscivorous bird community and a maximum NOAEL HQ concentration of 1.34 for the piscivorous mammal community.

The sampling proposed in this memorandum will evaluate the extent and potential excess risk for pesticides at Wetland 48.

Table 1
Recommended Test Conditions for
Conducting 10-day Sediment Exposures using *Hyalella azteca*.

Test Condition	*Hyalella azteca*
Temperature (C°)	23 ± 1
Light Intensity	50-100 foot-candles
Photo Period	16:8 (L:D)
Vessel Size	300 ml
Sediment Volume	100 ml
Water Volume	175 ml
Organisms/vessel	10
Replicates/concentration	8
Organisms/concentration	80
Aeration	only if DO < 2.5 mg/L
Dilution Water	Reconstituted Freshwater
Hardness	Moderately Hard
Test Duration	10 Days
Size/age at Test Initiation	7-14 Days
Renewal	2 volume additions daily
Feeding	yeast, Cerophyll, and trout chow
Endpoints	Survival, growth (by weight)

Notes:

ml = milligrams

mg/L = milligrams per liter

Reference: USEPA. (2000). *Methods for Measuring the Toxicity and Bioaccumulation of Sediment-Associated Contaminants with Freshwater Invertebrates*. (EPA/6OO/R-99/064).

Table 2
Test Conditions for Conducting a 10 Day Sediment Toxicity Test with the Amphipod, *Leptocheirus Plumulosus*

1. Test type:	Whole sediment toxicity test, static.
2. Temperature:	25° C
3. Salinity:	20 ppt (± 2 ppt of the selected test salinity)
4. Light quality:	Wide-spectrum fluorescent lights
5. Illuminance:	500 - 1000 lux
6. Photoperiod:	24L:0D
7. Test chamber:	1-L glass beaker or jar with - 10 cm I.D.
8. Sediment volume:	175 ml (2 cm)
9. Overlying water volume:	800 ml
10. Renewal of overlying water:	None
11. Size and life stage of amphipods:	2 - 4 mm (no mature males or females).
12. No. of organisms/chamber:	20 per test chamber.
13. No. of replicate chambers/treatment:	Depends on objective of test. At a minimum, four replicates must be used.
14. Source of food:	GORP - US EPA recipe.
15. Feeding:	Twice during test duration; day 2 and day 6.
16. Aeration:	Water in each test chamber should be aerated overnight before start of test, and throughout the test; aeration at rate that maintains 90% saturation of dissolved oxygen concentration.
17. Overlying water:	Clean sea water, natural or reconstituted water.
18. Overlying water quality:	Temperature daily. pH, ammonia, salinity, and DO of overlying water at least at test start and end. Salinity, ammonia, and pH of pore water.
19. Test duration:	10 days
20. Endpoints:	Survival and growth.
21. Test acceptability criteria:	Minimum mean control survival of 90% in the control exposure. Growth endpoint will be determined by subsampling the population at test initiation to establish a baseline weight. Organism weight at test termination will be compared to the control exposures and calculated using a T-test.

Reference: Modified from (USEPA 1994). Methods for assessing the toxicity of sediment-associated contaminants with estuarine and marine amphipods. EPA/600/R-94/025.

Wetland 48 Sampling Rationale

The sampling proposed in this memorandum will assess the current sediment chemistry in and around sample location 041M4801. A total of nine sediment samples will be collected and analyzed for pesticides. One sample will be collected at location 041M4801. Two sediment samples will be collected to the north, south, east, and west at 100-foot and 200-foot intervals in each direction from sample location 041M4801. All samples will be submitted for analysis at Level 2 data quality. In addition, the sediment samples will be analyzed for total organic carbon and grain size. Figure 2 shows the location of the proposed sediment samples.

SAMPLING METHODS

All samples will be collected, handled, preserved and documented in accordance with the Final *Comprehensive Sampling and Analysis Plan* (CSAP) (E/A&H, July 8, 1994) and U.S. Environmental Protection Agency (USEPA) Region 4 Environmental Investigations Standard Operating Procedures Quality Assurance Manual (2001). Sampling will be conducted using stainless steel sampling equipment including; hand augers, collection bowls, and mixing spoons. Stainless steel sampling equipment will be decontaminated using methods described in Section 11 of the CSAP.

Table 3 summarizes the analytical methods and sediment sample aliquots for the proposed sampling. These requirements may change, depending on the needs of the contracted laboratory.

Table 3
Sample Analysis

Analysis	Method	Sample Container / Aliquot
Wetland 10		
TAL Metals	SW-846 6010	9 oz. Glass Jar
Grain Size	ASTM D2434	50 ml glass or plastic
Total Organic Carbon	SW-846 9060	4 oz glass jar
Hyallela Azteca Toxicity depending on salinity	EPA/6OO/R-99/064	Two 1-Liter Plastic Containers
Leptocheirus Plumulosus Toxicity depending on salinity	EPA/600/R-94/025	Two 1-Liter Plastic Containers
Wetland 48		
Pesticides	SW-846 8081	9 oz. Glass Jar
Grain Size	ASTM D2434	50 ml glass or plastic

Total Organic Carbon	SW-846 9060	4 oz glass jar

Notes:

oz = ounce

All sediment samples will be collected from 0 to 6 inches depth. Sediments will be thoroughly homogenized, aliquots of which will be collected from the homogenate and transferred to laboratory-ready glass containers with Teflon lids and thermally preserved to 4° C for chemical and toxicity analysis.

LABORATORY ANALYSES

The analytical methods are summarized in Table 3. Detection limits or quantitation limits for metals and extractable organics will be requested to be below the lower of the USEPA Region 4's ecological screening values or Florida Department of Environmental Protection's threshold effects levels. Screening and refinement values are provided in Attachment A.

REPORTING

Upon receipt of the sample results from the analytical laboratory, the data will be compared with the Site 41 screening and refinement values. Toxicity data received from the laboratory will be reviewed, and effects will be determined and correlated to the health of sediments in Wetland 10. The data will be summarized and provided in an addendum to the Site 41 RI Report.

REFERENCES

EnSafe Inc. (2005). *Site 41 Remedial Investigation (RI) Report for Naval Air Station Pensacola, Pensacola, Florida.* Memphis, Tennessee.

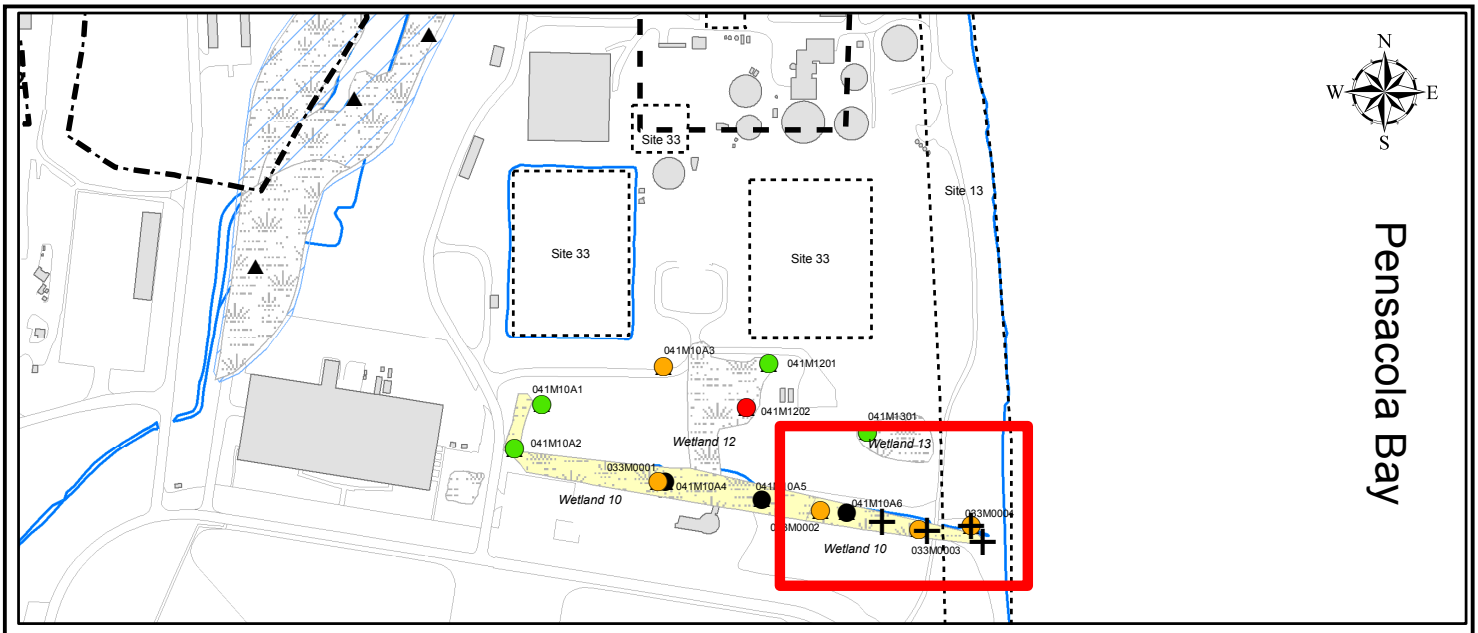
EnSafe/Allen and Hoshall. (1994). *Final Comprehensive Sampling and Analysis Plan for Naval Air Station Pensacola, Pensacola, Florida.* Memphis, Tennessee.

Parsons, M. and Pruitt, B.A. (1991). *Pensacola Naval Air Station Advanced Wetlands Identification.* U.S. Environmental Protection Agency, Environmental Services Division, Athens, Georgia.

U.S. Environmental Protection Agency (USEPA). (1994) Methods for assessing the toxicity of sediment-associated contaminants with estuarine and marine amphipods. (EPA/600/R-94/025).

USEPA. (2000). Methods for Measuring the Toxicity and Bioaccumulation of Sediment-Associated Contaminants with Freshwater Invertebrates. (EPA/600/R-99/064).

USEPA Region 4. (2001). *Environmental Investigations Standard Operating Procedures Quality Assurance Manual*. Environmental Services Division, Athens, Georgia.



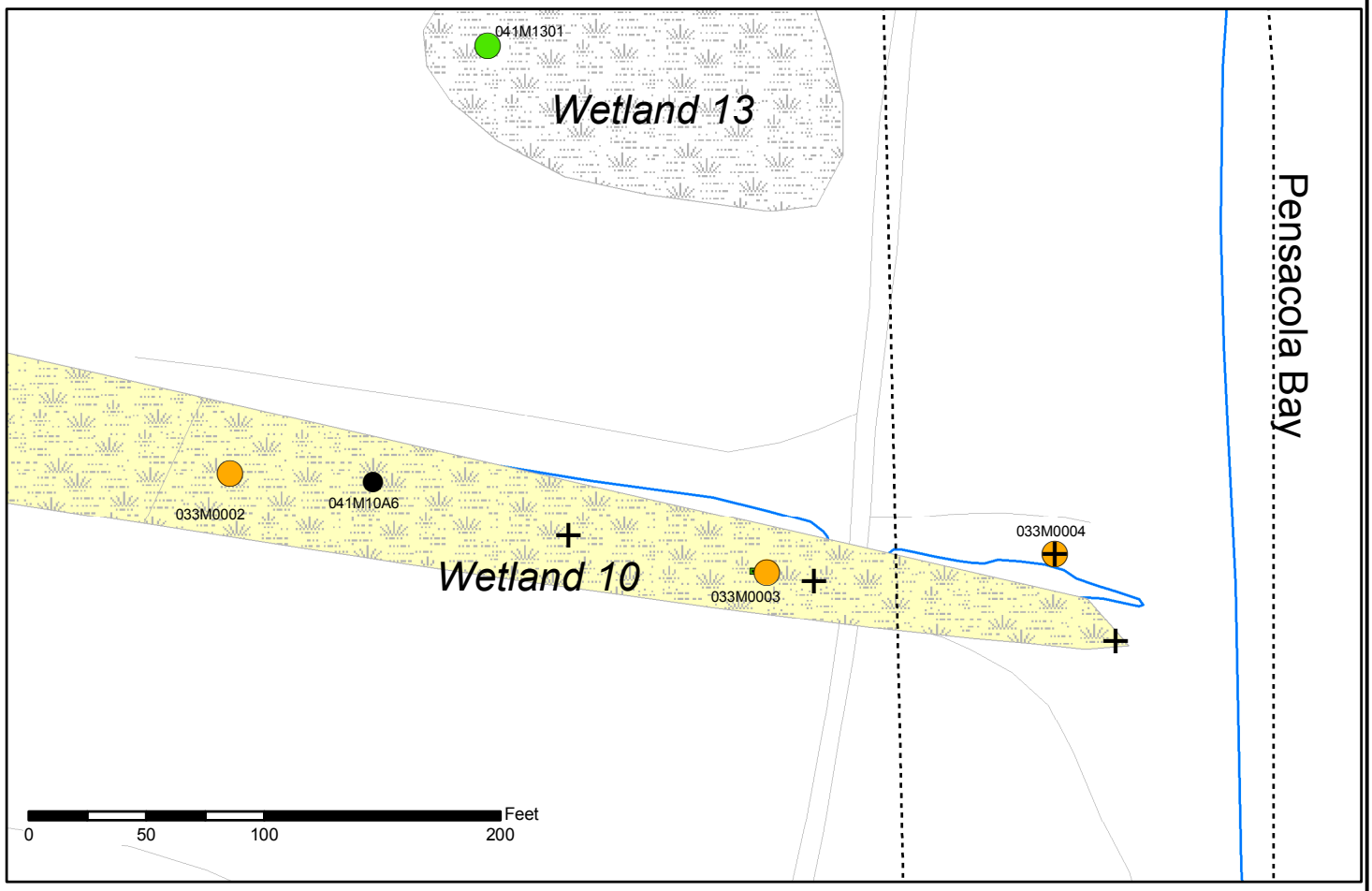


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Figure 1
Wetland 10
Proposed Sediment Sample Locations

Site 41 Sample Analysis Plan for Additional Sediment Sampling
NAS Pensacola, FL

Date: 3/29/2007 | **Drwn by: CT**

Legend

- Proposed Sediment ReSample
- **OU 10 Sediment Sample with ERM Category**
- **Phase II Mean ERM Quotient Category**
  - 1
  - 2
  - 3
- Site 41 RI Sediment associated to another OU
- Sediment Sample collected for grain size only
- Operable Unit (OU)
- Site
- Wetland 10
- Wetland- Approximate
- Consolidated Wetland 64
- Building
- Shoreline
- Road

File: K:/GIS/Navy-Pensacola/Tetratech_Wetland10_48_SAP_0888802584/wetland10_resample.mxd

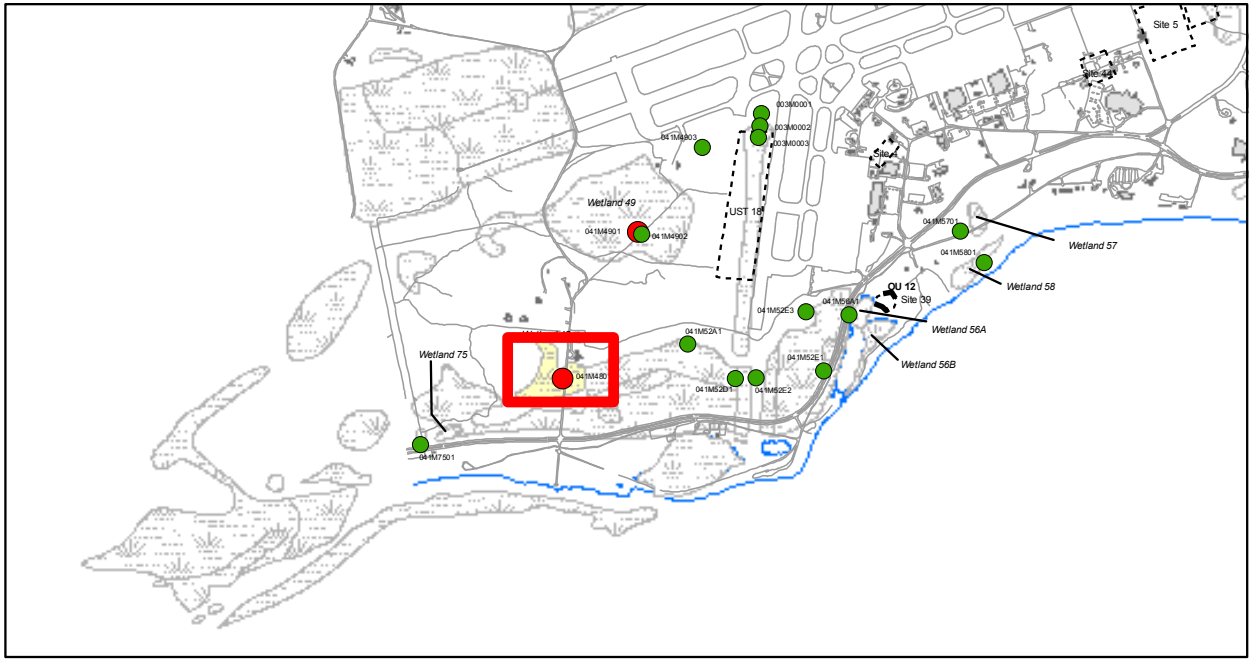
Legend

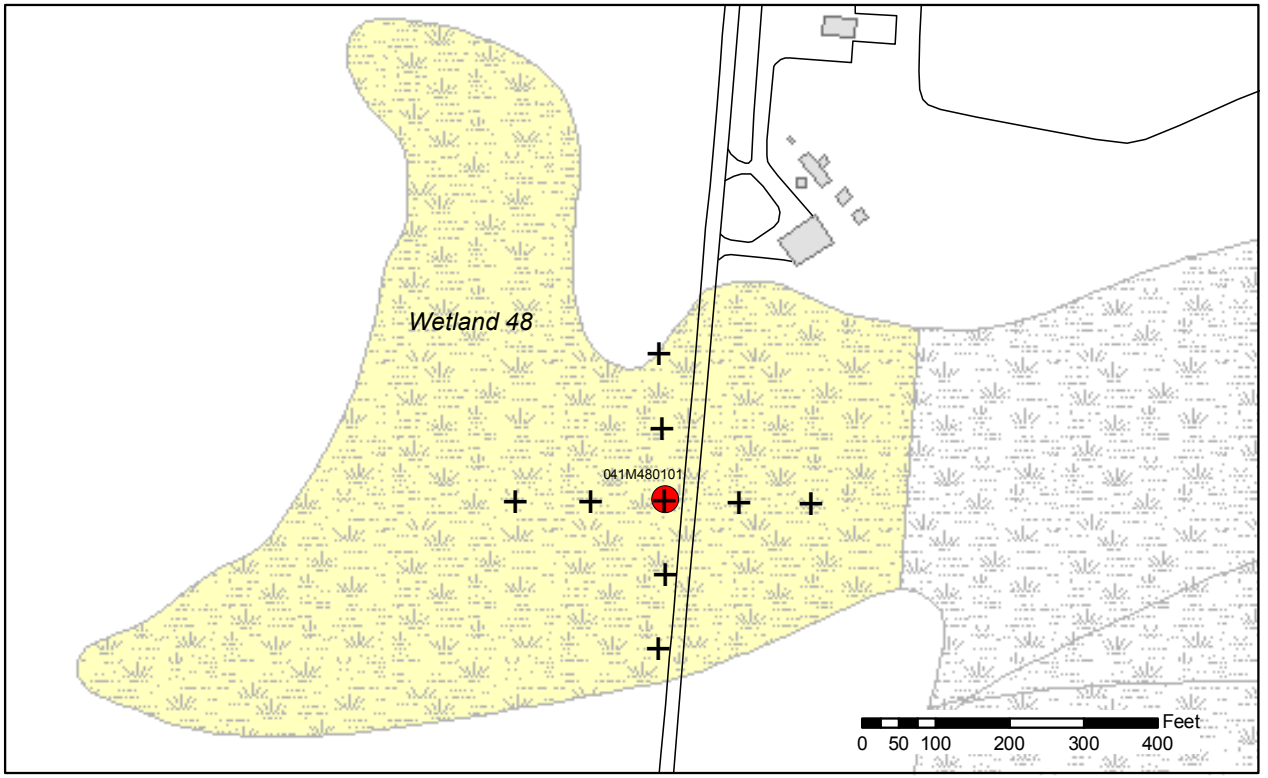
- Proposed Sediment ReSample

Site 41 RI Sediment Sample

Phase II Total DDT

- 0.285 - 109.99
- 110.00(BL) - 3460.00
- Road
- Shoreline
- Wetland 48
- Wetland-Approximate
- Operable Unit (OU)
- Site
- Building





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Note:
BL is the total DDT basewide level.
Results units are ug/kg.
Only the miscellaneous wetlands have labels.

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Figure 2
Wetland 48
Proposed Sediment Sample Locations

Site 41 Sample Analysis Plan for Additional Sediment Sampling
NAS Pensacola, FL

Date: 4/18/07		Drwn by: CT

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Attachment A
Sediment Screening and Refinement Values

Table A-1
Site 41
Sediment Screening/Refinement Values and Reference Concentrations

Parameter	Screening Value (SV) Value	Screening Value (SV) Source	Refinement Value (RV) Value	Refinement Value (RV) Source	Freshwater Reference Concentration	Saltwater Reference Concentration	Units
Metals (mg/kg)							
Aluminum	N/S	N/A	N/R	N/A	13,610	4,274	mg/kg
Antimony	12	1	N/R	N/A	4.43	0.26	mg/kg
Arsenic	7.24	1, 2	41.6	PEL	6.62	2.14	mg/kg
Barium	N/S	N/A	N/R	N/A	14	3.84	mg/kg
Beryllium	N/S	N/A	N/R	N/A	0.84	0.13	mg/kg
Cadmium	0.68	2	4.21	PEL	1.8	0.39	mg/kg
Calcium	N/S	N/A	N/R	N/A	10,756.67	1,978.80	mg/kg
Chromium	52.3	1, 2	160	PEL	39.37	13.1	mg/kg
Cobalt	N/S	N/A	N/R	N/A	2.8	0.91	mg/kg
Copper	18.7	1, 2	108	PEL	19.5	8.44	mg/kg
Cyanide (CN)	N/S	N/A	N/R	N/A	5.22	1.29	mg/kg
Iron	N/S	N/A	N/R	N/A	11,911.67	2,684.40	mg/kg
Lead	30.2	1, 2	112	PEL	82.47	21.04	mg/kg
Magnesium	N/S	N/A	N/R	N/A	7,513.33	2,943.60	mg/kg
Manganese	N/S	N/A	N/R	N/A	37.97	9.81	mg/kg
Mercury	0.13	1, 2	0.696	PEL	0.55	0.11	mg/kg
Nickel	15.9	1, 2	42.8	PEL	9.28	3.69	mg/kg
Potassium	N/S	N/A	N/R	N/A	1,628.67	899.72	mg/kg
Selenium	N/S	N/A	N/R	N/A	3.45	0.66	mg/kg
Silver	0.73	2	1.77	PEL	2.1	0.52	mg/kg
Sodium	N/S	N/A	N/R	N/A	18,993.33	11,439.60	mg/kg
Thallium	N/S	N/A	N/R	N/A	1.57	0.39	mg/kg
Vanadium	N/S	N/A	N/R	N/A	28.67	8.59	mg/kg
Zinc	124	1, 2	271	PEL	36.73	14.36	mg/kg
Pesticides and PCBs (µg/kg)							
Aldrin	N/S	N/A	N/R	N/A	N/A	N/A	N/A
Dieldrin	0.715	2	4.3	PEL	N/A	N/A	µg/kg
Endosulfan I	N/S	N/A	N/R	N/A	N/A	N/A	N/A
Endosulfan II	N/S	N/A	N/R	N/A	N/A	N/A	N/A
Endosulfan sulfate	N/S	N/A	N/R	N/A	N/A	N/A	N/A
Heptachlor	N/S	N/A	N/R	N/A	N/A	N/A	N/A
Heptachlor epoxide	N/S	N/A	N/R	N/A	N/A	N/A	N/A
Methoxychlor	N/S	N/A	N/R	N/A	N/A	N/A	N/A
Toxaphene	N/S	N/A	N/R	N/A	N/A	N/A	N/A
alpha-BHC	0.32	2	0.99	PEL	N/A	N/A	µg/kg
beta-BHC	0.32	2	0.99	PEL	N/A	N/A	µg/kg
delta-BHC	0.32	2	0.99	PEL	N/A	N/A	µg/kg
gamma-BHC (Lindane)	0.32	2	0.99	PEL	N/A	N/A	µg/kg
Total BHCs	0.32	2	0.99	PEL	N/A	N/A	µg/kg
alpha-Chlordane	1.7	1	4.79	PEL	N/A	N/A	µg/kg
gamma-Chlordane	1.7	1	4.79	PEL	N/A	N/A	µg/kg
Total Chlordanes	1.7	1	4.79	PEL	N/A	N/A	µg/kg
4,4'-DDD	1.22	2	7.81	PEL	50*	50*	µg/kg
4,4'-DDE	2.07	2	374	PEL	40*	40*	µg/kg
4,4'-DDT	1.19	2	4.77	PEL	20*	20*	µg/kg
Total 4,4'-DDx	3.3	1	51.7	PEL	110*	110*	µg/kg
Endrin	3.3	1	N/R	N/A	N/A	N/A	µg/kg
Endrin aldehyde	3.3	1	N/R	N/A	N/A	N/A	µg/kg
Endrin ketone	3.3	1	N/R	N/A	N/A	N/A	µg/kg
Total Endrins	3.3	1	N/R	N/A	N/A	N/A	µg/kg
Aroclor-1016	21.6	2	189	PEL	N/A	N/A	µg/kg
Aroclor-1221	67	1	189	PEL	N/A	N/A	µg/kg
Aroclor-1232	21.6	2	189	PEL	N/A	N/A	µg/kg
Aroclor-1242	21.6	2	189	PEL	N/A	N/A	µg/kg
Aroclor-1248	21.6	2	189	PEL	N/A	N/A	µg/kg
Aroclor-1254	21.6	2	189	PEL	N/A	N/A	µg/kg
Aroclor-1260	21.6	2	189	PEL	N/A	N/A	µg/kg
Total PCBs	21.6	2	189	PEL	N/A	N/A	µg/kg

Table A-1
Site 41
Sediment Screening/Refinement Values and Reference Concentrations

Parameter	Screening Value (SV) Value	Screening Value (SV) Source	Refinement Value (RV) Value	Refinement Value (RV) Source	Freshwater Reference Concentration	Saltwater Reference Concentration	Units
SVOCs (µg/kg)							
1,2,4-Trichlorobenzene	N/S	N/A	N/R	N/A	N/A	N/A	N/A
1,2-Dichlorobenzene	N/S	N/A	N/R	N/A	N/A	N/A	N/A
1,3-Dichlorobenzene	N/S	N/A	N/R	N/A	N/A	N/A	N/A
1,4-Dichlorobenzene	N/S	N/A	N/R	N/A	N/A	N/A	N/A
2,2'-oxybis(1-Chloropropane)/bis(2-chlor)	N/S	N/A	N/R	N/A	N/A	N/A	N/A
2,4,5-Trichlorophenol	N/S	N/A	N/R	N/A	N/A	N/A	N/A
2,4,6-Trichlorophenol	N/S	N/A	N/R	N/A	N/A	N/A	N/A
2,4-Dichlorophenol	N/S	N/A	N/R	N/A	N/A	N/A	N/A
2,4-Dimethylphenol	N/S	N/A	N/R	N/A	N/A	N/A	N/A
2,4-Dinitrophenol	N/S	N/A	N/R	N/A	N/A	N/A	N/A
2,4-Dinitrotoluene	N/S	N/A	N/R	N/A	N/A	N/A	N/A
2,6-Dinitrotoluene	N/S	N/A	N/R	N/A	N/A	N/A	N/A
2-Chloronaphthalene	N/S	N/A	N/R	N/A	N/A	N/A	N/A
2-Chlorophenol	N/S	N/A	N/R	N/A	N/A	N/A	N/A
2-Methyl-4,6-Dinitrophenol	N/S	N/A	N/R	N/A	N/A	N/A	N/A
2-Methylphenol (o-Cresol)	N/S	N/A	N/R	N/A	N/A	N/A	N/A
2-Nitroaniline	N/S	N/A	N/R	N/A	N/A	N/A	N/A
2-Nitrophenol	N/S	N/A	N/R	N/A	N/A	N/A	N/A
3,3'-Dichlorobenzidine	N/S	N/A	N/R	N/A	N/A	N/A	N/A
3-Nitroaniline	N/S	N/A	N/R	N/A	N/A	N/A	N/A
4-Bromophenyl-phenylether	N/S	N/A	N/R	N/A	N/A	N/A	N/A
4-Chloro-3-methylphenol	N/S	N/A	N/R	N/A	N/A	N/A	N/A
4-Chloroaniline	N/S	N/A	N/R	N/A	N/A	N/A	N/A
4-Chlorophenylphenyl ether	N/S	N/A	N/R	N/A	N/A	N/A	N/A
4-Methylphenol (p-Cresol)	N/S	N/A	N/R	N/A	N/A	N/A	N/A
4-Nitroaniline	N/S	N/A	N/R	N/A	N/A	N/A	N/A
4-Nitrophenol	N/S	N/A	N/R	N/A	N/A	N/A	N/A
Benzo(b)fluoranthene	N/S	N/A	N/R	N/A	N/A	N/A	N/A
Benzo(g,h,i)perylene	N/S	N/A	N/R	N/A	N/A	N/A	N/A
Benzo(k)fluoranthene	N/S	N/A	N/R	N/A	N/A	N/A	N/A
bis(2-Chloroethoxy)methane	N/S	N/A	N/R	N/A	N/A	N/A	N/A
bis(2-Chloroethyl)ether	N/S	N/A	N/R	N/A	N/A	N/A	N/A
bis(2-Ethylhexyl)phthalate (BEHP)	182	1, 2	2,647	PEL	N/A	N/A	µg/kg
Butylbenzylphthalate	182	3	2,647	PEL	N/A	N/A	µg/kg
Carbazole	N/S	N/A	N/R	N/A	N/A	N/A	N/A
Dibenzofuran	N/S	N/A	N/R	N/A	N/A	N/A	N/A
Diethylphthalate	182	3	2,647	PEL	N/A	N/A	µg/kg
Dimethylphthalate	182	3	2,647	PEL	N/A	N/A	µg/kg
Di-n-butylphthalate	182	3	2,647	PEL	N/A	N/A	µg/kg
Di-n-octylphthalate	182	3	2,647	PEL	N/A	N/A	µg/kg
Hexachlorobenzene	N/S	N/A	N/R	N/A	N/A	N/A	N/A
Hexachlorobutadiene	N/S	N/A	N/R	N/A	N/A	N/A	N/A
Hexachlorocyclopentadiene	N/S	N/A	N/R	N/A	N/A	N/A	N/A
Hexachloroethane	N/S	N/A	N/R	N/A	N/A	N/A	N/A
Indeno(1,2,3-cd)pyrene	N/S	N/A	N/R	N/A	N/A	N/A	N/A
Isophorone	N/S	N/A	N/R	N/A	N/A	N/A	N/A
Nitrobenzene	N/S	N/A	N/R	N/A	N/A	N/A	N/A
N-Nitroso-di-n-propylamine	N/S	N/A	N/R	N/A	N/A	N/A	N/A
N-Nitrosodiphenylamine	N/S	N/A	N/R	N/A	N/A	N/A	N/A
Pentachlorophenol	N/S	N/A	N/R	N/A	N/A	N/A	N/A
Phenol	N/S	N/A	N/R	N/A	N/A	N/A	N/A
2-Methylnaphthalene	20.2	2	201	PEL	N/A	N/A	µg/kg
Acenaphthene	6.71	2	88.9	PEL	N/A	N/A	µg/kg
Acenaphthylene	5.87	2	128	PEL	N/A	N/A	µg/kg
Anthracene	46.9	2	245	PEL	N/A	N/A	µg/kg
Benzo(a)anthracene	74.8	2	693	PEL	N/A	N/A	µg/kg
Benzo(a)pyrene	88.8	2	763	PEL	N/A	N/A	µg/kg
Chrysene	108	2	846	PEL	N/A	N/A	µg/kg
Dibenz(a,h)anthracene	6.22	2	135	PEL	N/A	N/A	µg/kg
Fluoranthene	113	2	1,494	PEL	N/A	N/A	µg/kg
Fluorene	21.2	2	144	PEL	N/A	N/A	µg/kg
Naphthalene	34.6	2	391	PEL	N/A	N/A	µg/kg
Phenanthrene	86.7	2	544	PEL	N/A	N/A	µg/kg
Pyrene	153	2	1,398	PEL	N/A	N/A	µg/kg
Total PAHs	1684	2	16,770	PEL	N/A	N/A	µg/kg
TOC Normalized PAHs	290	5	1,800	MEC	N/A	N/A	mg/kg-oc

Table A-1
Site 41
Sediment Screening/Refinement Values and Reference Concentrations

Parameter	Screening Value (SV) Value	Screening Value (SV) Source	Refinement Value (RV) Value	Refinement Value (RV) Source	Freshwater Reference Concentration	Saltwater Reference Concentration	Units
VOCs (µg/kg)							
1,1,1-Trichloroethane	N/S	N/A	N/R	N/A	N/A	N/A	N/A
1,1,2,2-Tetrachloroethane	N/S	N/A	N/R	N/A	N/A	N/A	N/A
1,1,2-Trichloroethane	N/S	N/A	N/R	N/A	N/A	N/A	N/A
1,1-Dichloroethane	N/S	N/A	N/R	N/A	N/A	N/A	N/A
1,1-Dichloroethene	N/S	N/A	N/R	N/A	N/A	N/A	N/A
1,2-Dichloroethane	N/S	N/A	N/R	N/A	N/A	N/A	N/A
1,2-Dichloroethene (total)	N/S	N/A	N/R	N/A	N/A	N/A	N/A
1,2-Dichloropropane	N/S	N/A	N/R	N/A	N/A	N/A	N/A
2-Butanone (MEK)	N/S	N/A	N/R	N/A	N/A	N/A	N/A
2-Hexanone	N/S	N/A	N/R	N/A	N/A	N/A	N/A
4-Methyl-2-Pentanone (MIBK)	N/S	N/A	N/R	N/A	N/A	N/A	N/A
Acetone	N/S	N/A	N/R	N/A	N/A	N/A	N/A
Benzene	N/S	N/A	N/R	N/A	N/A	N/A	N/A
Bromodichloromethane	N/S	N/A	N/R	N/A	N/A	N/A	N/A
Bromoform	N/S	N/A	N/R	N/A	N/A	N/A	N/A
Bromomethane	N/S	N/A	N/R	N/A	N/A	N/A	N/A
Carbon disulfide	N/S	N/A	N/R	N/A	N/A	N/A	N/A
Carbon tetrachloride	N/S	N/A	N/R	N/A	N/A	N/A	N/A
Chlorobenzene	N/S	N/A	N/R	N/A	N/A	N/A	N/A
Chloroethane	N/S	N/A	N/R	N/A	N/A	N/A	N/A
Chloroform	N/S	N/A	N/R	N/A	N/A	N/A	N/A
Chloromethane	N/S	N/A	N/R	N/A	N/A	N/A	N/A
cis-1,3-Dichloropropene	N/S	N/A	N/R	N/A	N/A	N/A	N/A
Dibromochloromethane	N/S	N/A	N/R	N/A	N/A	N/A	N/A
Ethylbenzene	N/S	N/A	N/R	N/A	N/A	N/A	N/A
Methylene chloride	N/S	N/A	N/R	N/A	N/A	N/A	N/A
Styrene	N/S	N/A	N/R	N/A	N/A	N/A	N/A
Tetrachloroethene	N/S	N/A	N/R	N/A	N/A	N/A	N/A
Toluene	N/S	N/A	N/R	N/A	N/A	N/A	N/A
trans-1,3-Dichloropropene	N/S	N/A	N/R	N/A	N/A	N/A	N/A
Trichloroethene	N/S	N/A	N/R	N/A	N/A	N/A	N/A
Vinyl chloride	N/S	N/A	N/R	N/A	N/A	N/A	N/A
Xylene (Total)	N/S	N/A	N/R	N/A	N/A	N/A	N/A

Notes:

1 = USEPA value.

2 = FDEP value.

1,2 = USEPA/FDEP values.

3 = 182 ug/kg EPA/FDEP value for BEHP used as a surrogate, per decision from the July 15-16, 2002 Eco Subgroup meeting.

4 = Swartz Threshold effects concentration (TEC).

* = Typical Base-wide Concentrations developed for NAS Pensacola