# SEDIMENT AND WATER SAMPLING REPORT

## KEARNY MARSH
## KEARNY, NEW JERSEY

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TABLE OF CONTENTS



LIST OF TABLES



LIST OF FIGURES



LIST OF APPENDICES

## 1.0 INTRODUCTION

Langan Engineering and Environmental Services, Inc. (Langan) has completed sediment and water sampling at the Kearny Marsh site located in Kearny, New Jersey (Figure 1). The sampling was conducted in accordance with the sampling plan provided to Langan (Appendix A), and developed by the Hackensack Meadowlands Development Commission (HMDC). Langan personnel completed surface water sampling on 7 and 8 April 1999. Core sediment sampling was completed on 29 April 1999 by Aqua Survey, Inc. of Flemington, New Jersey under the supervision of Langan personnel. Surface sediment sampling was completed on 26 May 1999 by Langan personnel.

This report details sediment and water sampling methodologies and provides a summary of analytical results.

## 2.0 SITE DESCRIPTION

The Kearny Marsh site encompasses approximately three hundred acres of impounded fresh water marsh (Figure 2). The site is bounded by the New Jersey Turnpike to the east, the NJ Transit Erie Lackawanna line to the north, and abandoned Conrail Erie Lackawanna lines to the south and west. Water depth in the Marsh ranges from approximately 2.5 to 4 feet. Dense *Phragmites* growth is present at various locations throughout the site.

## 3.0 SAMPLING METHODOLOGY

The following sections describe the sampling methodologies for collection of the water and sediment samples.

### 3.1 Surface Water Sampling

Surface water samples were collected at 22 locations (W-1 to W-22) in the marsh on 7 and 8 April 1999. The sample locations are shown in Figure 2. Each location was accessed using a 12-foot boat and samples were collected with a grab sampler and transferred directly into the laboratory provided bottles. The sampling device was decontaminated between samples using successive rinses of a laboratory grade phosphate-free soap solution, tap water and deionized water. Field parameter measurements were obtained at each sampling location using portable meters. The

field parameter measurements included: pH, dissolved oxygen (DO), temperature, specific conductance, oxidation-reduction potential (ORP) and salinity. All samples were placed into a cooler and stored at a temperature of approximately 4° C until they were delivered to the laboratory. The samples were submitted to Integrated Analytical Laboratories, LLC, (IAL) of Randolph, New Jersey, a NJDEP certified laboratory. All sampling, analysis, and reporting complies with the standards outlined in N.J.S.A. 7:26E – Technical Requirements for Site Remediation.

All water samples were analyzed for Priority Pollutants with a library search (PP+40), total petroleum hydrocarbon (TPH), chloride, total Kjeldahl nitrogen, surfactants, total sulfate, biochemical oxygen demand (BOD), chemical oxygen demand (COD), total organic carbon (TOC), pH, turbidity, color, total phosphate, total suspended solids (TSS), fecal coliform, and phenols. Quality assurance and quality control (QA/QC) measures, including the preparation of field blanks, trip blanks, and the collection of duplicate samples, were completed as required by NJDEP sampling protocols. The field and trip blank were analyzed for PP+40 and priority pollutant volatile organic compounds (PP-VO+15) respectively.

### 3.2 Sediment Sampling

Surficial sediment samples (0 – 0.5 feet) were collected by Langan at all twenty-two (W-1 to W-22) of the water sample locations on 26 May 1999. The sample locations are shown in Figure 2. Each location was accessed via boat and samples were collected with a hand corer that was inserted 0.5 feet into the sediment. When the corer was retrieved a grab sample was collected and transferred directly into the laboratory provided bottles. The sampling device was decontaminated between samples using successive rinses of a laboratory grade phosphate-free soap solution, tap water and deionized water. The sediment samples were analyzed for PP+40, TPH, TOC, pH, and particle size.

Sediment core samples were collected at eleven (W-2 to W-9, W-13, W-15, and W-21) of the 22 water sample locations on 29 April 1999 by Aqua Survey, Inc. of Flemington, New Jersey under the supervision of Langan personnel. Location W-1 was targeted for both water and sediment sampling but could not be accessed with the platform barge and was replaced by W-13.

The sediment core samples were collected using the Vibracore method from a platform barge. The Vibracore method involves vibrating a 6-foot, 4-inch diameter aluminum core barrel to the target depth of three feet. The Vibracore core barrel is equipped with a sediment catcher at the end of the barrel, which holds the sample in the barrel. The

core barrel was lined with dedicated 10-millimeter polyethylene liners. Once the core sample was retrieved from the water, the liner was removed from the core barrel, cut open and a discrete sample was transferred into the laboratory provided bottles from depths of 12, 24, and 36 inches below surface. The soil core was described using the Unified Soil Classification System (USCS). The sediment samples were analyzed for PP+40, TPH, TOC, pH and particle size. Sample locations are shown on Figure 2.

## 4.0 RESULTS

### 4.1 Surface Water

According to the NJDEP's Surface Water Quality Standards (SWQS; N.J.A.C. 7:9B), the site is classified as FW2. FW2 refers to all nontidal and tidal waters generally having salinity, due to natural sources, of less than or equal to 3.5 parts per thousand (ppt) at mean high tide. This is a general surface water classification applied to those fresh waters that are not designated as FW1 (maintained in their natural state of quality and not subjected to any man-made wastewater discharges or increases in runoff from anthropogenic activities) or Pinelands Waters.

Surface water sampling results are summarized in Table 1. Field parameter measurements and other field data are summarized in Table 2. The complete laboratory analytical package is provided in Appendix B. The water analytical data demonstrates that fecal coliform exceeded the SWQS at location W-9. In addition, the SWQS for lead was exceeded at all locations. The lead results ranged from 7.26 ug/l at location W-17 to 20.6 ug/l at location W-19. The average lead concentration detected was 10.52 ug/l.

The SWQS for 4-4'-DDD was exceeded at location W-22, which had a concentration of 0.0353 ug/l. Pesticides were not detected at any other sampling location. Total suspended solids exceeded SWQS at sampling locations W-19 and W-20, with concentrations of 49 mg/l and 58 mg/l respectively. The chloride SWQS has three categories including: i) a chronic aquatic life protection criteria, ii) an organoleptic effect-based criteria, and iii) an acute aquatic life protection criteria. The criteria in (i) and (ii) were exceeded at all sampling locations. The total chloride concentration ranged from 400 mg/l at sampling location W-9 to 740 mg/l at sampling location W-21. The average chloride concentration detected was 637 mg/l.

Trace concentrations of volatile organic compounds were detected at sampling locations W-9, W-15, W-16, and W-19. Trace concentrations of semivolatile

compounds were detected at sampling locations W-3, W-4, W-5, W-6, W-10, and W-14.

## 4.2 Surficial Sediment

Sediment throughout the wetlands consists of a brown peat and/or black organic clay in the upper three feet. Below the upper layer is gray clay of undetermined thickness with various amounts of silt, sand, and gravel. Field observations documenting sediment conditions are summarized in Table 2. Sediment sampling analytical results are summarized in Table 3. For surficial sediment samples, the following exceedances of Ontario Aquatic Sediment Quality Lower Effect Levels (LEL) were detected.

- Marginal exceedances of base neutral compounds at locations W-7 and W-9;
- marginal exceedances of 4,4'-DDD at locations W-1, W-6, W-7, W-8, W-16, and W-20;
- marginal exceedances of 4,4'-DDE and Aldrin at W-9;
- marginal exceedances of 4,4'-DDT at W-22;
- elevated TPH concentrates at locations W-6, W-7, W-8, and W-9; and
- exceedances for metals were detected at the following locations:
  - arsenic at all locations;
  - cadmium at W-1, W-7, W-8, W-9, W-10, W-15, and W-18;
  - chromium at W-1, W-2, W-5 through W-10, W-12 through W15, and W-17 through W-20;
  - copper at W-1 through W-10, W-12 through W-15, and W-17 through W-22;
  - lead at W-1 through W-10, and W-12 through W-22;
  - mercury at W-1 through W-10, and W-12 through W-22;
  - nickel at W-1 through W-10, and W-12 through W-20; and
  - zinc at W-1 through W-10, and W-12 through W-21.

## 4.3 Sediment Cores

Sediment core sample results revealed the following exceedances of the Ontario LEL.

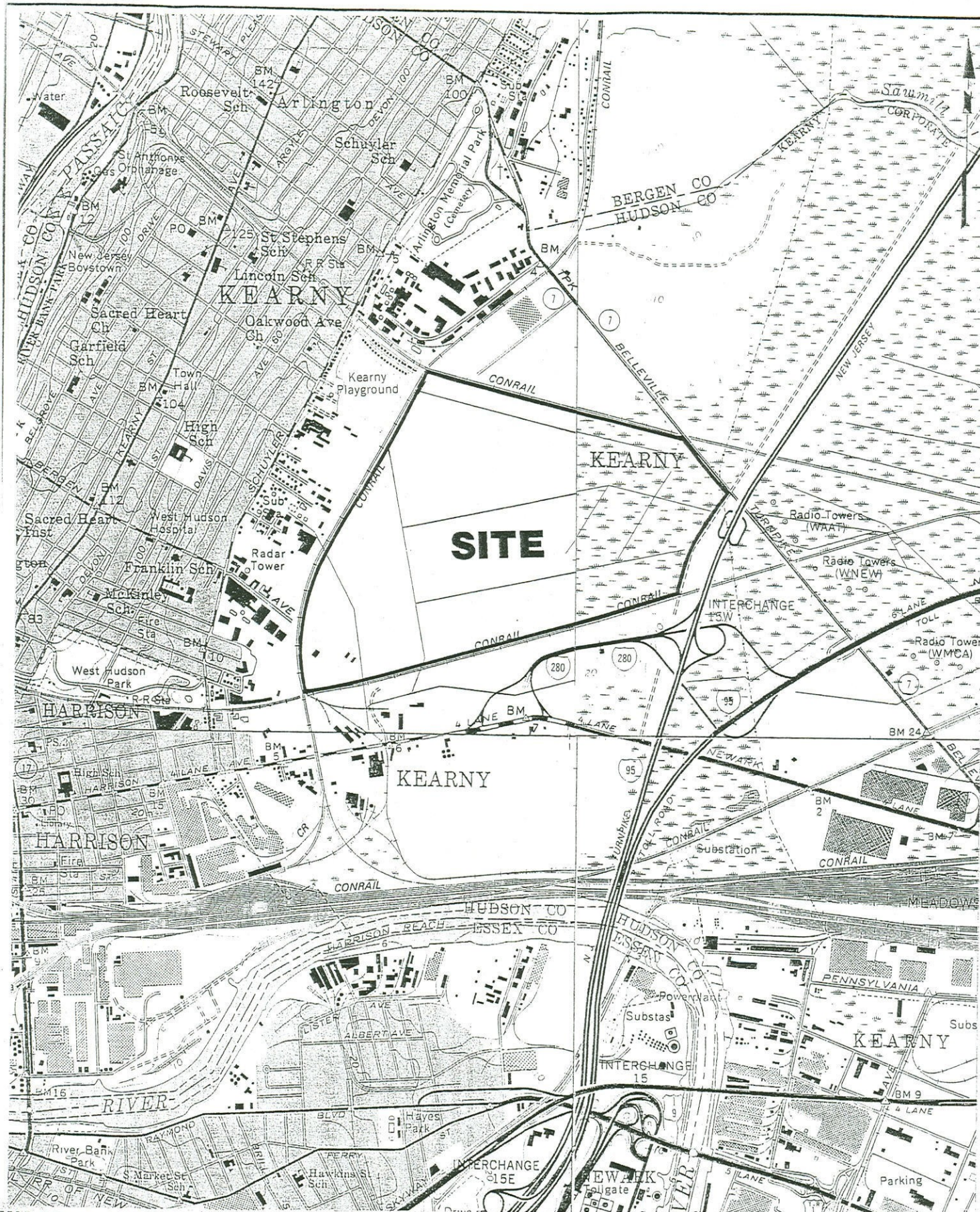
- Marginal exceedances of base neutral compounds at location W-9A;
- marginal exceedances of 4,4'-DDD at locations W-7A, and W-9A;
- elevated TPH concentrations at W-4C, W-7C, and W-9B;
- exceedances of metals were detected at the following locations:

- arsenic at W-2B, W-2C, W-4A, W-5C, W-7(A,B,&C), W-9A, and W-13A;
- cadmium at W-4A, W-7(A,B,&C), W-8B, W-8C, W-9A, and W-9B;
- chromium at W-2B, W-7(A,B,&C), W-8B, W-8C, and W-9(A,B,&C);
- copper W-2(A,B,&C), W-3C, W-4(A,B,&C), W-5A, W-5C, W-6A, W-7(A,B,&C), W-8B, W-8C, W-9(A,B,&C), W-13A, DUPE1, W-13B, W-15A, W-15C, W-21B and W-21C;
- lead at W-2B, W-2C, W-4A, W-5A, W-7(A,B,&C), W-8B, W-8C, W-9(A,B,&C), and W-15A;
- mercury at W-2B, W-2C, W-4A, W-7(A,B,&C), W-8B, W-8C, and W-9(A,B,&C);
- nickel at W-2C, W-7(A,B,&C), W-8B, W-9A, and W-9B; and
- zinc at W-2B, W-2C, W-6A, W-7(A,B,&C), W-8B, and W-9(A,B,&C).

## 5.0 CONCLUSIONS

Analytical results for water and sediment sampling reveal that contaminants including lead and 4,4'-DDD (exceeded SWQS at only one location) are present in surface water, and low levels of base neutral compounds and pesticides, and elevated concentrations of metals (As, Cd, Cr, Cu, Pb, Hg, Ni, and Zn) are present in sediment within the Kearny Marsh. Potential sources of these contaminants observed during completion of sampling include landfill runoff, stormwater runoff via pipe flow and overland flow, and discharges from adjoining automotive scrap yards and industrial facilities.

For the purposes of this investigation and as requested by HMDC, all sediment results were compared to Ontario Sediment Quality Criteria. The criteria were not adjusted to account for elevated total organic carbon (TOC) values measured at all sampling locations. Site specific guidelines which address issues such as contaminant leachability and mobility, potential for direct contact and/or ingestion by organisms, and background concentrations of metals must be developed to accurately assess the impact of detected contamination. Such work is beyond the scope of this investigation.




MAP REF: ELIZABETH & JERSEY CITY & ORANGE & WEEHAWKEN, N.J. U.S.G.S. QUADRANGLE MAPS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Project
KEARNY MARSH
SITE LOCATION MAP

KEARNY NEW JERSEY

| Job No. | Date | Scale | Dwg. No. |
|---|---|---|---|
| 1567701 | 5/18/99 | 1"=2000' | |

APPENDIX A APPENDIX B APPENDIX C

TABLE 3
SUMMARY OF SEDIMENT ANALYTICAL RESULTS
APRIL 1999 SAMPLING EVENT
KEARNY MARSH
KEARNY, NEW JERSEY
PROJECT 1567701

| Sample ID | | | | W1 | W2 | W2A | W2B | W2C | W3A | W3B | W3C | W4 | W4A | W4B | W4C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Langan Sample Number | | | | 081 | 080 | 049 | 050 | 051 | 052 | 053 | 054 | 078 | 046 | 047 | 048 |
| Lab Sample Number | ONTARIO AQUATIC | | | 2964-015 | 2964-014 | 2421-019 | 2421-020 | 2421-021 | 2421-022 | 2421-023 | 2421-024 | 2964-012 | 2421-016 | 2421-017 | 2421-018 |
| Depth (feet) | SEDIMENT QUALITY | | | 0 - 0.5 | 0 - 0.5 | 0.5 - 1 | 1.5 - 2 | 2.5 - 3 | 0.5 - 1 | 1.5 - 2 | 2.5 - 3 | 0 - 0.5 | 0.5 - 1 | 1.5 - 2 | 2.5 - 3 |
| Sampling Date | LEL | SEL | Units | 5/26/99 | 5/26/99 | 4/29/99 | 4/29/99 | 4/29/99 | 4/29/99 | 4/29/99 | 4/29/99 | 5/26/99 | 4/29/99 | 4/29/99 | 4/29/99 |
| **VOLATILE ORGANIC COMPOUNDS** | | | | | | | | | | | | | | | |
| Methylene Chloride | --- | --- | mg/kg | ND | ND | 0.0103B | 0.0322B | 0.021B | 0.0345B | 0.0231B | 0.0206B | ND | 0.0159B | 0.0248B | 0.5233B |
| Total Xylenes | --- | --- | mg/kg | 0.0296J | ND | ND | 0.00241J | ND | ND | ND | ND | ND | ND | ND | ND |
| **VOLATILE ORGANICS TICs** | | | | | | | | | | | | | | | |
| Unknown alkane | --- | --- | mg/kg | 0.1818 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Unknown aliphatic | --- | --- | mg/kg | ND | ND | ND | ND | ND | ND | ND | 0.0135 | ND | ND | ND | ND |
| **SEMIVOLATILE ORGANIC COMPOUNDS** | | | | | | | | | | | | | | | |
| Di-n-butyl phthalate | --- | --- | mg/kg | ND | 0.311J | ND | ND | ND | ND | ND | ND | 1.27J | ND | ND | ND |
| Fluoranthene | 0.75 | 1,020 | mg/kg | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Pyrene | 0.49 | 850 | mg/kg | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Benzo[a]anthracene | 0.32 | 1,480 | mg/kg | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Chrysene | 0.34 | 460 | mg/kg | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Benzo[b]fluoranthene | --- | --- | mg/kg | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Benzo[k]fluoranthene | 0.24 | 1,340 | mg/kg | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Benzo[a]pyrene | 0.37 | 1,440 | mg/kg | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Indeno[1,2,3-cd]pyrene | 0.2 | 320 | mg/kg | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| bis(2-Ethylhexyl)phthalate | --- | --- | mg/kg | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Di-n-octylphthalate | --- | --- | mg/kg | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Benzo[g,h,i]perylene | 0.17 | 320 | mg/kg | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| **SEMIVOLATILE ORGANICS TICs** | | | | | | | | | | | | | | | |
| Unknown aromatic | --- | --- | mg/kg | 13.3 | 26.56 | ND | 23.32 | 18.39 | 10.65 | 2.62 | ND | ND | ND | 12.59 | 3.41 |
| Unknown | --- | --- | mg/kg | ND | | ND | 3.95 | 3.09 | 6.31 | 96.92 | ND | 13 | ND | 227.92 | 24.31 |
| Unknown alkane | --- | --- | mg/kg | 237.28 | 7.34 | ND | ND | 8.14 | 51.8 | ND | ND | 179.94 | ND | 6.71 | ND |
| Vitamin E | --- | --- | mg/kg | ND | ND | ND | ND | ND | 2.31 | ND | ND | ND | ND | ND | ND |
| **TOTAL PCBs** | --- | --- | mg/kg | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| **PESTICIDES** | | | | | | | | | | | | | | | |
| 4,4'-DDD | 0.008 | 6 | mg/kg | 0.0128 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| **METALS** | | | | | | | | | | | | | | | |
| Antimony | --- | --- | mg/kg | ND | ND | ND | ND | ND | ND | ND | ND | ND | 5.55 | ND | ND |
| Arsenic | 6 | 33 | mg/kg | 58.4 | 8.74 | 0.747 | 9.58 | 16.2 | 3.49 | 0.804 | 2.83 | 34.7 | 8.67 | 5.6 | 4.02 |
| Cadmium | 0.6 | 10 | mg/kg | 6.1 | ND | ND | ND | 2.18 | ND | ND | ND | ND | 0.915 | ND | ND |
| Chromium | 26 | 110 | mg/kg | 47.3 | 35 | 12.4 | 28.5 | 13.4 | 2.48 | 1.46 | 8.38 | 20.5 | 20.4 | 3.28 | 3.18 |
| Copper | 16 | 110 | mg/kg | 61.6 | 31.8 | 16.3 | 70.2 | 55.3 | 15.8 | 15.2 | 20.6 | 32.2 | 61.1 | 24.6 | 25.3 |
| Lead | 31 | 250 | mg/kg | 95.7 | 72.2 | 8.29 | 112 | 32.4 | 8.83 | ND | 6.31 | 107 | 168 | 16.7 | 8.66 |
| Mercury | 0.2 | 2 | mg/kg | 0.603 | 0.226 | 0.034 | 0.603 | 0.671 | 0.058 | 0.039 | 0.049 | 0.229 | 0.255 | 0.072 | ND |
| Nickel | 16 | 75 | mg/kg | 38.1 | 9.65 | ND | ND | 24.9 | 5.22 | 3.44 | 6.31 | 22.6 | 13.4 | ND | ND |
| Selenium | --- | --- | mg/kg | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Silver | --- | --- | mg/kg | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Zinc | 120 | 820 | mg/kg | 515 | 127 | 19.4 | 307 | 423 | 67.6 | 11.7 | 8.46 | 244 | 117 | 47 | 34.8 |
| **WET CHEMISTRY** | | | | | | | | | | | | | | | |
| Cyanide | --- | --- | mg/kg | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Phenol | --- | --- | mg/kg | ND | ND | ND | ND | ND | ND | ND | ND | 0.811 | ND | ND | ND |
| Total Petroleum Hydrocarbons | --- | --- | mg/kg | 650 | 287 | 52.6 | 107 | 483 | 167 | 265 | 118 | 380 | 66.7 | 337 | 1120 |
| Corrosivity as pH | --- | --- | S.U | 7.52 | 7.52 | 7.33 | 7.28 | 7.11 | 7.4 | 7.21 | 7.09 | 7.49 | 7.23 | 7.06 | 6.94 |
| Total Organic Carbons | --- | --- | mg/kg | 53000 | 26000 | 15000 | 73000 | 58000 | 54000 | 37000 | 44000 | 45000 | 30000 | 50000 | 56000 |

Notes: Lowest Effect Levels (LEL) do not require any further calculations, however, Severe Effect Levels (SEL) must be multiplied by individual TOC sample/location
ND indicates that the sample was analyzed for the compound, but the compound was not detected
J indicates that the concentration was detected at a value below the minimum detection limits
B indicates the compound was detected in the blank and the sample

TABLE 3 CONTINUED
SUMMARY OF SEDIMENT ANALYTICAL RESULTS
APRIL 1999 SAMPLING EVENT
KEARNY MARSH
KEARNY, NEW JERSEY
PROJECT 1567701

| Sample ID | | | | W8 | W8A | W8B | W8C | W9 | W9A | W9B | W9C | W10 | W11 | W12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Langan Sample Number | | | | 038 | 034 | 035 | 036 | 039 | 031 | 032 | 033 | 072 | 073 | 077 |
| Lab Sample Number | ONTARIO AQUATIC | | | 2421-008 | 2421-004 | 2421-005 | 2421-006 | 2421-009 | 2421-001 | 2421-002 | 2421-003 | 2964-006 | 2964-007 | 2964-011 |
| Depth (feet) | SEDIMENT QUALITY | | | 0 - 0.5 | 0.5 - 1 | 1.5 - 2 | 2.5 - 3 | 0 - 0.5 | 0.5 - 1 | 1.5 - 2 | 2.5 - 3 | 0 - 0.5" | 0 - 0.5" | 0 - 0.5" |
| Sampling Date | LEL | SEL | Units | 5/26/99 | 4/29/99 | 4/29/99 | 4/29/99 | 5/26/99 | 4/29/99 | 4/29/99 | 4/29/99 | 5/26/99 | 5/26/99 | 5/26/99 |
| VOLATILE ORGANIC COMPOUNDS | | | | | | | | | | | | | | |
| Methylene Chloride | --- | --- | mg/kg | ND | 0.0244B | 0.0205B | 0.0213B | ND | 0.0189B | 0.0319B | 0.0411B | ND | ND | ND |
| Total Xylenes | --- | --- | mg/kg | ND | ND | ND | ND | 0.00572J | ND | ND | ND | ND | ND | ND |
| VOLATILE ORGANICS TICs | | | | | | | | | | | | | | |
| Substituted benzene | --- | --- | mg/kg | ND | ND | ND | ND | 0.0399 | 0.0108 | 0.0186 | ND | ND | ND | ND |
| Unknown alkane | --- | --- | mg/kg | ND | ND | ND | ND | 0.5079 | 0.012 | ND | ND | ND | ND | ND |
| Unknown | --- | --- | mg/kg | ND | ND | ND | ND | 0.0642 | 0.0106 | ND | ND | ND | ND | ND |
| Unknown aliphatic | --- | --- | mg/kg | ND | ND | ND | ND | 0.0808 | ND | ND | ND | ND | ND | ND |
| Unknown cyclic hydrocarbon | --- | --- | mg/kg | ND | ND | ND | ND | 0.1934 | ND | ND | ND | ND | ND | ND |
| Unknown hydrocarbon | --- | --- | mg/kg | ND | ND | ND | ND | 0.1122 | ND | ND | ND | ND | ND | ND |
| Unknown aromatic | --- | --- | mg/kg | ND | ND | ND | ND | 0.382 | ND | ND | ND | ND | ND | ND |
| SEMIVOLATILE ORGANIC COMPOUNDS | | | | | | | | | | | | | | |
| Di-n-butyl phthalate | --- | --- | mg/kg | 0.751J | ND | ND | ND | ND | 0.273J | ND | ND | 0.794J | 1.47 | ND |
| Phenanthrene | 0.56 | 950 | mg/kg | ND | ND | ND | ND | 1.12 | ND | ND | ND | ND | ND | ND |
| Fluoranthene | 0.75 | 1,020 | mg/kg | ND | ND | ND | ND | 1.97 | 0.405 | ND | ND | ND | ND | ND |
| Pyrene | 0.49 | 850 | mg/kg | ND | ND | ND | ND | 2.42 | 0.364J | ND | ND | ND | ND | ND |
| Benzo[a]anthracene | 0.32 | 1,480 | mg/kg | ND | ND | ND | ND | 1.37 | 0.4 | ND | ND | ND | ND | ND |
| Chrysene | 0.34 | 460 | mg/kg | ND | ND | ND | ND | 1.93 | 0.344J | ND | ND | ND | ND | ND |
| Benzo[b]fluoranthene | --- | --- | mg/kg | ND | ND | ND | ND | 2.25 | 0.585 | ND | ND | ND | ND | ND |
| Benzo[k]fluoranthene | 0.24 | 1,340 | mg/kg | ND | ND | ND | ND | 0.986 | 0.256J | ND | ND | ND | ND | ND |
| Benzo[a]pyrene | 0.37 | 1,440 | mg/kg | ND | ND | ND | ND | 2.24 | 0.556 | ND | ND | ND | ND | ND |
| Indeno[1,2,3-cd]pyrene | 0.2 | 320 | mg/kg | ND | ND | ND | ND | 1.22 | 0.407 | ND | ND | ND | ND | ND |
| Dibenz[a,h]anthracene | 0.06 | 130 | mg/kg | ND | ND | ND | ND | 0.476J | ND | ND | ND | ND | ND | ND |
| bis(2-Ethylhexyt)phthalate | --- | --- | mg/kg | 0.86J | ND | ND | ND | 4.94 | ND | ND | ND | ND | ND | ND |
| Benzo[g,h,i]perylene | 0.17 | 320 | mg/kg | ND | ND | ND | ND | 1.54 | 0.499 | ND | ND | ND | ND | ND |
| SEMIVOLATILE ORGANICS TICs | | | | | | | | | | | | | | |
| Unknown | --- | --- | mg/kg | ND | ND | ND | ND | ND | 4.7 | ND | ND | ND | ND | ND |
| Unknown alkane | --- | --- | mg/kg | ND | ND | ND | ND | 8.48 | ND | 22.64 | ND | 5.02 | 78.24 | 257.21 |
| Unknown aromatic | --- | --- | mg/kg | ND | ND | ND | ND | 41.98 | ND | 6.7 | ND | 52.36 | 6.2 | ND |
| TOTAL PCBs | --- | --- | mg/kg | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| PESTICIDES | | | | | | | | | | | | | | |
| alpha-Chlordane | --- | --- | mg/kg | ND | ND | ND | ND | 0.0415 | 0.00645 | ND | ND | ND | ND | ND |
| gamma-Chlordane | --- | --- | mg/kg | ND | ND | ND | ND | 0.0495 | 0.0071 | ND | ND | ND | ND | ND |
| 4,4'-DDD | 0.008 | 6 | mg/kg | 0.0186 | ND | ND | ND | ND | 0.00968 | ND | ND | ND | ND | ND |
| Aldrin | 0.002 | 8 | mg/kg | ND | ND | ND | ND | 1.29 | ND | ND | ND | ND | ND | ND |
| 4,4'-DDE | 0.005 | 19 | mg/kg | ND | ND | ND | ND | 0.011 | ND | ND | ND | ND | ND | ND |
| Endrin Ketone | --- | --- | mg/kg | ND | ND | ND | ND | 0.0183 | ND | ND | ND | ND | ND | ND |
| METALS | | | | | | | | | | | | | | |
| Arsenic | 6 | 33 | mg/kg | 42.5 | 2.55 | 5.78 | 3.64 | 28.3 | 6.64 | 5.49 | 4.27 | 43.1 | 14.8 | 32.1 |
| Beryllium | --- | --- | mg/kg | ND | ND | ND | ND | 0.873 | ND | ND | ND | ND | ND | ND |
| Cadmium | 0.6 | 10 | mg/kg | 28.2 | ND | 1.35 | 0.558 | 15 | 6.79 | 1.54 | ND | 5.03 | ND | ND |
| Chromium | 26 | 110 | mg/kg | 674 | 4.74 | 69.3 | 38 | 5950 | 91.5 | 174 | 30.7 | 70.9 | ND | 57.4 |
| Copper | 16 | 110 | mg/kg | 456 | 11.3 | 56.5 | 36.5 | 478 | 167 | 67 | 31.6 | 130 | ND | 120 |
| Lead | 31 | 250 | mg/kg | 859 | 8.62 | 112 | 68.7 | 1070 | 414 | 62.6 | 70.1 | 339 | ND | 418 |
| Mercury | 0.2 | 2 | mg/kg | 152 | 0.141 | 20.63 | 1.06 | 20.57 | 158 | 7 | 0.43 | 0.57 | ND | 1.34 |
| Nickel | 16 | 75 | mg/kg | 106 | 4.28 | 17 | 9.66 | 114 | 39.8 | 17.5 | 11.8 | 37.8 | ND | 31.2 |
| Silver | --- | --- | mg/kg | ND | ND | ND | ND | 1.62 | 1.16 | ND | ND | ND | ND | ND |
| Thallium | --- | --- | mg/kg | ND | ND | ND | ND | 0.421 | ND | ND | ND | ND | ND | ND |
| Zinc | 120 | 820 | mg/kg | 3,660 | 84.3 | 219 | 110 | 2090 | 1660 | 750 | 235 | 560 | 39 | 244 |
| WET CHEMISTRY | | | | | | | | | | | | | | |
| Cyanide | --- | --- | mg/kg | ND | ND | ND | ND | 5.37 | ND | ND | ND | ND | ND | ND |
| Phenol | --- | --- | mg/kg | ND | ND | ND | ND | ND | ND | ND | ND | 3.52 | ND | 0.937 |
| Total Petroleum Hydrocarbons | --- | --- | mg/kg | 1640 | 69.6 | 183 | 74.8 | 2110 | 757 | 1070 | 759 | 729 | 688 | 524 |
| Corrosivity as pH | --- | --- | S.U | 6.9 | 7.62 | 7.43 | 7.08 | 6.51 | 7.57 | 7.43 | 7.4 | 7.55 | 7.66 | 7.66 |
| Total Organic Carbons | --- | --- | mg/kg | 38000 | 98000 | 58000 | 61000 | 46000 | 34000 | 64000 | 82000 | 46000 | 32000 | 53000 |

PPM

Notes: Lowest Effect Levels (LEL) do not require any further calculations, however, Severe Effect Levels (SEL) must be multiplied by individual TOC sample/location
ND indicates that the sample was analyzed for the compound, but the compound was not detected
J indicates that the concentration was detected at a value below the minimum detection limits
B indicates the compound was detected in the blank and the sample

TABLE 3 CONTINUED
SUMMARY OF SEDIMENT ANALYTICAL RESULTS
APRIL 1999 SAMPLING EVENT
KEARNY MARSH
KEARNY, NEW JERSEY
PROJECT 1567701

| Sample ID | | | | W13 | W13A | DUPE 1 | W13B | W13C | DUPE 2 | W14 | W15 | W15A | W15B | W15C | W16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Langan Sample Number | | | | 087 | 058 | 061 | 059 | 060 | 062 | 083 | 076 | 055 | 056 | 057 | 086 |
| Lab Sample Number | ONTARIO AQUATIC | | | 2964-021 | 2421-028 | 2421-031 | 2421-029 | 2421-030 | 2421-032 | 2964-017 | 2964-010 | 2421-025 | 2421-026 | 2421-027 | 2964-020 |
| Depth (feet) | SEDIMENT QUALITY | | | 0 - 0.5" | 0.5 - 1 | 0.5 - 1 | 1.5 - 2 | 2.5 - 3 | 2.5 - 3 | 0 - 0.5" | 0 - 0.5" | 0.5 - 1 | 1.5 - 2 | 2.5 - 3 | 0 - 0.5" |
| Sampling Date | LEL | SEL | Units | 5/26/99 | 4/29/99 | 4/29/99 | 4/29/99 | 4/29/99 | 4/29/99 | 5/26/99 | 5/26/99 | 4/29/99 | 4/29/99 | 4/29/99 | 5/26/99 |
| VOLATILE ORGANIC COMPOUNDS | | | | | | | | | | | | | | | |
| Methylene Chloride | --- | --- | mg/kg | ND | 0.0724B | 0.0179B | 0.0312B | 0.0181B | 0.0159B | ND | ND | 0.0221B | 0.0409B | 0.0244B | ND |
| VOLATILE ORGANICS TICs | | | | | | | | | | | | | | | |
| Unknown alkane | --- | --- | mg/kg | 0.182 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SEMIVOLATILE ORGANIC COMPOUNDS | | | | | | | | | | | | | | | |
| Di-n-butyl phthalate | --- | --- | mg/kg | 0.486J | ND | ND | ND | ND | ND | 0.631J | ND | ND | ND | ND | ND |
| SEMIVOLATILE ORGANICS TICs | | | | | | | | | | | | | | | |
| Unknown | --- | --- | mg/kg | ND | 3.73 | 5.74 | 116.6 | 4.72 | 2.64 | ND | ND | ND | ND | 2.26 | ND |
| Unknown alkane | --- | --- | mg/kg | 4.77 | 5.46 | ND | 1.37 | ND | ND | 41.22 | 192 | ND | 7.19 | ND | ND |
| Unknown aromatic | --- | --- | mg/kg | 8.34 | 2.22 | ND | 3.23 | ND | ND | 17.77 | 104.75 | ND | ND | ND | ND |
| TOTAL PCBs | --- | --- | mg/kg | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| PESTICIDES | | | | | | | | | | | | | | | |
| 4,4'-DDD | 0.008 | 6 | mg/kg | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.0106 |
| METALS | | | | | | | | | | | | | | | |
| Arsenic | 6 | 33 | mg/kg | 34.4 | 7.39 | 3.91 | 4.47 | 2.23 | 2.35 | 53.2 | 48.2 | 5.41 | 3.17 | 3.03 | 50.2 |
| Cadmium | 0.6 | 10 | mg/kg | ND | ND | ND | ND | ND | ND | ND | 3.3 | ND | ND | ND | ND |
| Chromium | 26 | 110 | mg/kg | 66.7 | 8.28 | 3.81 | 5.36 | 3.6 | 4.01 | 59.6 | 44.6 | 7.69 | 7.3 | 7.04 | 13 |
| Copper | 16 | 110 | mg/kg | 66.4 | 20 | 18.9 | 20.3 | 12.9 | 15.1 | 109 | 86.9 | 30.4 | 11.1 | 16.6 | 10.6 |
| Lead | 31 | 250 | mg/kg | 251 | 20 | 8.89 | 11.5 | 11.9 | 13.2 | 365 | 295 | 42.5 | 13.1 | 25.9 | 61.2 |
| Mercury | 0.2 | 2 | mg/kg | 0.391 | 0.064 | ND | ND | 0.033 | 0.04 | 0.404 | 0.962 | 0.089 | 0.046 | 0.035 | 0.36 |
| Nickel | 16 | 75 | mg/kg | 20.8 | 10.9 | 6.14 | 7.42 | 4.27 | 4.44 | 44.8 | 32.4 | 10.6 | 12.4 | 8.85 | 17.5 |
| Zinc | 120 | 820 | mg/kg | 163 | 83.7 | 65.4 | 97.6 | 15 | 18.6 | 410 | 433 | 72.5 | 37.2 | 30.6 | 244 |
| WET CHEMISTRY | | | | | | | | | | | | | | | |
| Cyanide | --- | --- | mg/kg | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Phenol | --- | --- | mg/kg | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Total Petroleum Hydrocarbons | --- | --- | mg/kg | 190 | 265 | 75.5 | 118 | 316 | 56.2 | 532 | 121 | 316 | 483 | 167 | 507 |
| Corrosivity as pH | --- | --- | S.U | 7.38 | 7.21 | 6.93 | 7.09 | 7.02 | 6.78 | 7.28 | 6.68 | 7.02 | 7.11 | 7.4 | 7.59 |
| Total Organic Carbons | --- | --- | mg/kg | 48000 | 46000 | 50000 | 48000 | 30000 | 37000 | 52000 | 48000 | 25000 | 40000 | 46000 | 51000 |

Notes: Lowest Effect Levels (LEL) do not require any further calculations, however, Severe Effect Levels (SEL) must be multiplied by individual TOC sample/location
ND indicates that the sample was analyzed for the compound, but the compound was not detected
J indicates that the concentration was detected at a value below the minimum detection limits
B indicates the compound was detected in the blank and the sample

TABLE 3 CONTINUED
SUMMARY OF SURFACE SEDIMENT ANALYTICAL RESULTS
MAY 1999 SAMPLING EVENT
KEARNY MARSH
KEARNY, NEW JERSEY
PROJECT 1567701

| Sample ID | | | | W17 | W18 | W19 | W20 | W21 | W21A | W21B | W21C | W22 | FB | FB |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Langan Sample Number | | | | 082 | 075 | 085 | 074 | 084 | 064 | 065 | 066 | 088 | 089 | 063 |
| Lab Sample Number | ONTARIO AQUATIC | | | 2964-016 | 2964-009 | 2964-019 | 2964-008 | 2964-018 | 2421-034 | 2421-035 | 2421-036 | 2964-022 | 2964-023 | 2421-033 |
| Sampling Depth | SEDIMENT QUALITY | | | 0 - 0.5" | 0 - 0.5 | 0 - 0.5 | 0 - 0.5 | 0 - 0.5 | 0.5 - 1 | 1.5 - 2 | 2.5 - 3 | 0 - 0.5 | | |
| Sampling Date | LEL | SEL | Units | 5/26/99 | 5/26/99 | 5/26/99 | 5/26/99 | 5/26/99 | 4/29/99 | 4/29/99 | 4/29/99 | 5/26/99 | 5/26/99 | 4/29/99 |
| TOTAL VOLATILE ORGANICS | | | | | | | | | | | | | | |
| Methylene Chloride | --- | --- | mg/kg | ND | ND | ND | ND | ND | 0.0345B | 0.0422B | 0.0657B | ND | ND | ND |
| TOTAL VOLATILE ORGANICS TICs | --- | --- | mg/kg | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SEMIVOLATILE ORGANIC COMPOUNDS | | | | | | | | | | | | | | |
| Di-n-butylphthalate | --- | --- | mg/kg | ND | ND | ND | 2.59J | 0.783J | ND | ND | ND | 0.438J | NA | NA |
| Phenol | --- | --- | mg/kg | ND | ND | ND | ND | 1.3 | ND | ND | ND | ND | NA | NA |
| SEMIVOLATILE ORGANICS TICs | | | | | | | | | | | | | | |
| Unknown aromatic | --- | --- | mg/kg | 9.06 | 276.14 | 104.54 | 88.4 | 3.8 | 16.99 | 15.87 | 32.75 | 6.65 | NA | NA |
| Unknown | --- | --- | mg/kg | ND | 24.2 | ND | ND | ND | ND | 12.1 | 15.8 | ND | NA | NA |
| Unknown alkane | --- | --- | mg/kg | 20.48 | 226.92 | 311.41 | 373.2 | 187.07 | ND | 8.07 | 90.7 | 10.29 | NA | NA |
| Vitamin E | --- | --- | mg/kg | ND | ND | ND | ND | ND | ND | ND | 6.6 | ND | NA | NA |
| TOTAL PCBs | --- | --- | mg/kg | ND | ND | ND | ND | ND | ND | ND | ND | ND | NA | NA |
| PESTICIDES | | | | | | | | | | | | | | |
| 4,4'-DDD | 0.008 | 6 | mg/kg | ND | ND | ND | 0.0378 | ND | ND | ND | ND | ND | NA | NA |
| 4,4'-DDT | 0.008 | 71 | mg/kg | ND | ND | ND | ND | ND | ND | ND | ND | 0.0097 | NA | NA |
| METALS | | | | | | | | | | | | | | |
| Arsenic | 6 | 33 | mg/kg | 22.2 | 106 | 21 | 40.2 | 37.2 | ND | 5.01 | 4.04 | 17.6 | NA | NA |
| Cadmium | 0.6 | 10 | mg/kg | ND | 4.22 | ND | ND | ND | ND | ND | ND | ND | NA | NA |
| Chromium | 26 | 110 | mg/kg | 61.5 | 210 | 26.2 | 50.4 | 20.3 | ND | 5.68 | 3.86 | 15.1 | NA | NA |
| Copper | 16 | 110 | mg/kg | 71.8 | 577 | 33.8 | 42.7 | 17.5 | ND | 20.2 | 29.5 | 23 | NA | NA |
| Lead | 31 | 250 | mg/kg | 224 | 2030 | 125 | 154 | 84.9 | ND | 18.7 | 8.68 | 80.4 | NA | NA |
| Mercury | 0.2 | 2 | mg/kg | 0.584 | 1.84 | 0.431 | 0.42 | 0.292 | ND | 0.049 | ND | 0.206 | NA | NA |
| Nickel | 16 | 75 | mg/kg | 24.2 | 118 | 14.5 | 22 | 14.5 | ND | 5.15 | 6.53 | 11.5 | NA | NA |
| Thallium | --- | --- | mg/kg | 0.212 | 2.12 | ND | ND | ND | ND | ND | ND | ND | NA | NA |
| Zinc | 120 | 820 | mg/kg | 208 | 1300 | 146 | 181 | 206 | ND | 62 | 57.7 | 115 | NA | NA |
| WET CHEMISTRY | | | | | | | | | | | | | | |
| Cyanide | --- | --- | mg/kg | ND | ND | ND | ND | ND | ND | ND | ND | ND | NA | NA |
| Phenol | --- | --- | mg/kg | ND | ND | ND | ND | ND | ND | ND | ND | ND | NA | NA |
| Total Petroleum Hydrocarbons | --- | --- | mg/kg | 216 | 595 | 285 | 792 | 687 | 605 | 222 | 328 | 286 | NA | NA |
| Corrosivity as pH | --- | --- | S.U | 7.7 | 7.52 | 7.69 | 7.34 | 7.6 | 7 | 7.05 | 7.15 | 7.59 | NA | NA |
| Total Organic Carbons | --- | --- | mg/kg | 65000 | 46000 | 46000 | 27000 | 49000 | 23000 | 43000 | 43000 | 60000 | NA | NA |

Notes: Lowest Effect Levels (LEL) do not require any further calculations, however, Severe Effect Levels (SEL) must be multiplied by Individual TOC sample/location
ND indicates that the sample was analyzed for the compound, but the compound was not detected
J indicates that the concentration was detected at a value below the minimum detection limits
NA indicates that the sample was not analyzed for the compound

# TABLE 1
## SUMMARY OF WATER ANALYTICAL RESULTS: 7 AND 8 APRIL 1999
## KEARNY MARSH - KEARNY, NJ
## PROJECT 1567701

| Sample ID | | | W1 | W2 | W3 | W4 | W5 | W6 | W7 | W8 | W9 | DUPE | W10 | W11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Langan Sample Number | | | 005 | 004 | 010 | 009 | 008 | 007 | 003 | 002 | 001 | 030 | 016 | 017 |
| Lab Sample Number | NJDEP | | 1866-005 | 1866-004 | 1886-005 | 1886-004 | 1886-003 | 1886-002 | 1866-003 | 1866-002 | 1866-001 | 1918-012 | 1897-001 | 1897-002 |
| Sampling Date | SWQS | Units | 4/7/99 | 4/7/99 | 4/7/99 | 4/7/99 | 4/7/99 | 4/7/99 | 4/7/99 | 4/7/99 | 4/7/99 | 4/8/99 | 4/8/99 | 4/8/99 |
| VOLATILE ORGANIC COMPOUNDS | | | | | | | | | | | | | | |
| Toluene | 7,440 (h) | ug/l | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Chloroform | 5.67 (hc) | ug/l | ND | ND | ND | ND | ND | ND | ND | ND | 0.441 | ND | ND | ND |
| SEMIVOLATILE ORGANIC COMPOUNDS | | | | | | | | | | | | | | |
| Di-n-butyl phthalate | 3,530 (h) | ug/l | ND | ND | 1.62 J | 1.48 J | 1.95 J | 2.07 J | NA | 40 | NA | ND | 1.55 J | ND |
| Diethylphthalate | 21,200 (h) | ug/l | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| bis(2-Ethylhexyl)phthalate | 1.76 (hc) | ug/l | ND | ND | ND | ND | ND | ND | NA | ND | NA | ND | ND | ND |
| SEMIVOLATILE ORGANICS TICs | | | | | | | | | | | | | | |
| Eicosane | --- | ug/l | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Hexacosane | --- | ug/l | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Heptacosane | --- | ug/l | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Octacosane | --- | ug/l | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Unknown alkanes | --- | ug/l | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| TOTAL PCBS | --- | ug/l | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| PESTICIDES | | | | | | | | | | | | | | |
| 4,4'-DDD | 0.000832 (hc) | ug/l | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| METALS | | | | | | | | | | | | | | |
| Cadmium | 10 (h) | ug/l | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Lead | 5 (h) | ug/l | 7.73 | 9.45 | 8.14 | 7.52 | 8.18 | 14.5 | 11.6 | 9.47 | 7.33 | 8.18 | 8.8 | 10.2 |
| Silver | 164 (h) | ug/l | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Zinc | --- | ug/l | ND | ND | ND | ND | ND | ND | 47 | 30 | 47 | 24 | 30 | ND |
| WET CHEMISTRY | | | | | | | | | | | | | | |
| Cyanide | 5.2 ( c) | ug/l | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | 22 (a) | ug/l | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | 768 (h) | ug/l | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Phenol | 20,900 (h) | ug/l | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Total Petroleum Hydrocarbons | --- | mg/l | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Corrosivity as pH | 6.5-8.5 | S.U | 7.84 | 7.76 | 7.93 | 7.88 | 7.98 | 7.97 | 7.8 | 7.77 | 7.53 | 7.8 | 7.79 | 7.81 |
| Total Suspended Solids | 40 | mg/l | 17 | 15 | 14 | 16 | 11 | 21 | 15 | 17 | 18 | 25 | 16 | 20 |
| Chemical Oxygen Demand | --- | mg/l | 65 | 59 | 55 | 50 | 52 | 61 | 59 | 50 | 52 | 37 | 65 | 50 |
| Biochemical Oxygen Demand | --- | mg/l | 2.74 | 0.92 | 20.3 | 12.5 | 9.95 | 12.3 | 2.14 | 8.98 | 5.89 | 11.5 | 8.75 | 12.1 |
| Total Organic Carbon | --- | mg/l | 18.05 | 16.25 | 14.75 | 14.67 | 14.93 | 15.16 | 14.8 | 14.1 | 12.96 | 11.27 | 15.13 | 15.05 |
| Total Kjeldahl Nitrogen - TKN | --- | mg/l | 2.4 | 2 | 1 | 1.2 | 0.9 | 1.1 | 1.3 | 1.3 | 1.7 | 1.8 | 1.3 | 1.4 |
| Total Phosphate | --- | mg/l | 0.11 | 0.11 | 0.13 | 0.11 | 0.11 | 0.12 | 0.11 | 0.13 | 0.16 | 0.16 | 0.11 | 0.19 |
| Chloride | 230,000 (c) | ug/l | 610000 | 600000 | 660000 | 670000 | 670000 | 620000 | 570000 | 500000 | 400000 | 460000 | 670000 | 670000 |
| | 250,000 (ol) | ug/l | 610000 | 600000 | 660000 | 670000 | 670000 | 620000 | 570000 | 500000 | 400000 | 460000 | 670000 | 670000 |
| | 860,000 (a) | ug/l | 610000 | 600000 | 660000 | 670000 | 670000 | 620000 | 570000 | 500000 | 400000 | 460000 | 670000 | 670000 |
| Sulfate | 250 | mg/l | 49 | 49 | 55 | 52 | 54 | 51 | 49 | 44 | 39 | 41 | 55 | 52 |
| Color | --- | Pt. Co. | 50 | 50 | 50 | 50 | 45 | 45 | 50 | 40 | 35 | 35 | 50 | 50 |
| Surfactants | --- | mg/l | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Turbidity | 50 | N.T.U. | 11 | 14 | 9 | 9 | 8.5 | 10 | 9 | 11 | 12 | 11 | 8 | 11 |
| Fecal Coliform | 200 | MPN/100 ml | 30 | 50 | 13 | 11 | 4 | 11 | 50 | 30 | 3000 | NA * | 8 | 7 |

# TABLE 1
## SUMMARY OF WATER ANALYTICAL RESULTS: 7 AND 8 APRIL 1999
## KEARNY MARSH - KEARNY, NJ
## PROJECT 1567701

| Sample ID | | | W12 | W13 | W14 | W15 | W16 | W17 | W18 | W19 | W20 | W21 | W22 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Langan Sample Number | | | 018 | 019 | 020 | 022 | 021 | 028 | 024 | 025 | 023 | 027 | 026 |
| Lab Sample Number | NJDEP | | 1897-003 | 1918-001 | 1918-002 | 1918-004 | 1918-003 | 1918-010 | 1918-006 | 1918-007 | 1918-005 | 1918-009 | 1918-008 |
| Sampling Date | SWQS | Units | 4/8/99 | 4/8/99 | 4/8/99 | 4/8/99 | 4/8/99 | 4/8/99 | 4/8/99 | 4/8/99 | 4/8/99 | 4/8/99 | 4/8/99 |
| **VOLATILE ORGANIC COMPOUNDS** | | | | | | | | | | | | | |
| Toluene | 7,440 (h) | ug/l | ND | ND | ND | 0.438 | 0.435 | ND | ND | 0.724 | ND | ND | ND |
| Chloroform | 5.67 (hc) | ug/l | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| **SEMIVOLATILE ORGANIC COMPOUNDS** | | | | | | | | | | | | | |
| Di-n-butyl phthalate | 3,530 (h) | ug/l | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Diethylphthalate | 21,200 (h) | ug/l | ND | ND | 1.24J | ND | ND | ND | ND | ND | ND | ND | ND |
| bis(2-Ethylhexyl)phthalate | 1.76 (hc) | ug/l | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| **SEMIVOLATILE ORGANICS TICs** | | | | | | | | | | | | | |
| Eicosane | --- | ug/l | ND | ND | 14.6 | ND | ND | ND | ND | ND | ND | ND | ND |
| Hexacosane | --- | ug/l | ND | ND | 26.8 | ND | ND | ND | ND | ND | ND | ND | ND |
| Heptacosane | --- | ug/l | ND | ND | 36.8 | ND | ND | ND | ND | ND | ND | ND | ND |
| Octacosane | --- | ug/l | ND | ND | 42.4 | ND | ND | ND | ND | ND | ND | ND | ND |
| Unknown alkanes | --- | ug/l | ND | ND | 62.8 | ND | ND | ND | ND | ND | ND | ND | ND |
| **TOTAL PCBS** | --- | ug/l | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| **PESTICIDES** | | | | | | | | | | | | | |
| 4,4'-DDD | 0.000832 (hc) | ug/l | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.0353 |
| **METALS** | | | | | | | | | | | | | |
| Cadmium | 10 (h) | ug/l | ND | ND | ND | ND | ND | 3.58 | ND | ND | ND | ND | ND |
| Lead | 5 (h) | ug/l | 12.2 | 12.9 | 9.6 | 10.6 | 11 | 7.26 | 12.4 | 20.6 | 7.99 | 10.5 | 15.7 |
| Silver | 164 (h) | ug/l | ND | 9.7 | ND | ND | 1.24 | 38.1 | ND | ND | ND | ND | ND |
| Zinc | --- | ug/l | ND | ND | 45 | 23 | 30 | ND | 34 | 24 | 60 | ND | 25 |
| **WET CHEMISTRY** | | | | | | | | | | | | | |
| Cyanide | 5.2 ( c) | ug/l | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | 22 (a) | ug/l | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | 768 (h) | ug/l | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Phenol | 20,900 (h) | ug/l | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Total Petroleum Hydrocarbons | --- | mg/l | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Corrosivity as pH | 6.5-8.5 | S.U | 7.8 | 7.73 | 7.63 | 7.87 | 7.6 | 7.38 | 7.78 | 7.79 | 7.64 | 7.8 | 7.74 |
| Total Suspended Solids | 40 | mg/l | 20 | 15 | 23 | 22 | 21 | 16 | 22 | 49 | 58 | 29 | 32 |
| Chemical Oxygen Demand | --- | mg/l | 57 | 87 | 48 | 35 | 65 | 59 | 57 | 52 | 57 | 40 | 59 |
| Biochemical Oxygen Demand | --- | mg/l | 10.1 | 10.8 | 9.8 | 10.9 | 11.7 | 8.9 | 6.85 | 3.97 | 7.42 | 9.2 | 10.3 |
| Total Organic Carbon | --- | mg/l | 15.03 | 15.26 | 15.3 | 15.39 | 15.49 | 16.23 | 14.85 | 14.95 | 14.74 | 15.32 | 16.27 |
| Total Kjeldahl Nitrogen - TKN | --- | mg/l | 0.7 | 1.7 | 1 | 1.7 | 1.2 | 1.4 | 1.8 | 2.4 | 0.8 | 1.6 | 2.4 |
| Total Phosphate as P | --- | mg/l | 0.13 | 0.15 | 0.12 | 0.11 | 0.14 | 0.1 | 0.15 | 0.18 | 0.11 | 0.12 | 0.14 |
| Chloride | 230,000 (c) | ug/l | 670000 | 660000 | 660000 | 660000 | 660000 | 690000 | 700000 | 690000 | 690000 | 740000 | 730000 |
| | 250,000 (ol) | ug/l | 670000 | 660000 | 660000 | 660000 | 660000 | 690000 | 700000 | 690000 | 690000 | 740000 | 730000 |
| | 860,000 (a) | ug/l | 670000 | 660000 | 660000 | 660000 | 660000 | 690000 | 700000 | 690000 | 690000 | 740000 | 730000 |
| Sulfate | 250 | mg/l | 56 | 55 | 57 | 57 | 57 | 49 | 59 | 58 | 58 | 63 | 58 |
| Color | --- | Pt. Co. | NA * | 50 | 50 | 45 | 50 | 65 | 50 | 50 | 50 | 50 | 55 |
| Surfactants | --- | mg/l | NA * | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Turbidity | 50 | N.T.U. | NA * | 11 | 9.5 | 10 | 12 | 6 | 7 | 26 | 9 | 11 | 18 |
| Fecal Coliform | 200 | MPN/100 ml | NA | 50 | NA | NA | NA | NA | NA | NA | NA | NA | NA |

TABLE 1
SUMMARY OF WATER ANALYTICAL RESULTS: 7 AND 8 APRIL 1999
KEARNY MARSH - KEARNY, NJ
PROJECT 1567701

| Sample ID | | | FB | TB | TB |
|---|---|---|---|---|---|
| Langan Sample Number | | | 006 | 011 | 029 |
| Lab Sample Number | NJDEP | | 1886-001 | 1886-006 | 1918-011 |
| Sampling Date | SWQS | Units | 4/7/99 | 4/7/99 | 4/7/99 |
| VOLATILE ORGANIC COMPOUNDS | --- | ug/l | ND | ND | ND |
| SEMIVOLATILE ORGANIC COMPOUNDS | | | | | |
| Di-n-butyl phthalate | 3,530 (h) | ug/l | 1.4 J | 5.3 | ND |
| bis(2-Ethylhexyl)phthalate | 1.76 (hc) | ug/l | 5.08 | ND | ND |
| SEMIVOLATILE ORGANICS TICs | --- | ug/l | ND | ND | ND |
| TOTAL PCBS | --- | ug/l | ND | ND | ND |
| TOTAL PESTICIDES | --- | ug/l | ND | ND | ND |
| TOTAL METALS | --- | ug/l | ND | ND | ND |
| WET CHEMISTRY | | | | | |
| Cyanide | 5.2 ( c) | ug/l | ND | NA | NA |
| | 22 (a) | ug/l | ND | NA | NA |
| | 768 (h) | ug/l | ND | NA | NA |
| Phenol | 20,900 (h) | ug/l | ND | NA | NA |
| Total Petroleum Hydrocarbons | --- | mg/l | ND | NA | NA |
| Corrosivity as pH | 6.5-8.5 | S.U | NA | NA | NA |
| Total Suspended Solids | 40 | mg/l | NA | NA | NA |
| Chemical Oxygen Demand | --- | mg/l | NA | NA | NA |
| Biochemical Oxygen Demand | --- | mg/l | NA | NA | NA |
| Total Organic Carbon | --- | mg/l | NA | NA | NA |
| Total Kjeldahl Nitrogen - TKN | --- | mg/l | NA | NA | NA |
| Total Phosphate as P | --- | mg/l | NA | NA | NA |
| Chloride | 230,000 (c) | ug/l | NA | NA | NA |
| | 250,000 (ol) | ug/l | NA | NA | NA |
| | 860,000 (a) | ug/l | NA | NA | NA |
| Sulfate | 250 | mg/l | NA | NA | NA |
| Color | --- | Pt. Co. | NA | NA | NA |
| Surfactants | --- | mg/l | NA | NA | NA |
| Turbidity | 50 | N.T.U. | NA | NA | NA |
| Fecal Coliform | 200 | MPN/100 ml | NA | NA | NA |

Notes: * indicates holding times were exceeded by laboratory
NA indicates that the sample was not analyzed for the compound
ND indicates that the sample was analyzed for the compound, but the compound was not detected
J indicates that the concentration was detected at a value below the minimum detection limits
(a) represents acute aquatic life protection criteria as a one-hour average
(ol) represents organoleptic effect-based criteria and are maximum concentrations
(c) represents chronic aquatic life protection criteria as a four-day average
(h) represents noncarcinogenic effect-based human health criteria as a 30-day average
(hc) represents carcinogenic effect-based human health criteria as a 70-year average
Duplicate sample was taken at W9

**bold** - boxed values indicate exceedance of SWQS

TABLE 2
Field Parameter Measurements and Observations
Water Sampling 7 & 8 April 1999 / Sediment Sampling 29 April 1999
Kearny Marsh - Kearny, NJ

| Sample Location | Field Parameters | Loc Lat./Long. | Core Rec (ft) | Core Int. (ft) | Sediment Description | USCS Symbol |
|---|---|---|---|---|---|---|
| W-1 | pH (std. Units): 7.70<br>Temp. (deg. C): 13.90<br>Spec. cond. (uS): 2820<br>ORP (mV): 117.10<br>Sal. (ppt): 1.40<br>DO (ppm): 10.30<br>Water depth (ft): --- | ---<br>--- | 0 of 0 | 0 | Proposed core sample location, could not access with platform barge | --- |
| W-2 | pH (std. Units): 7.70<br>Temp. (deg. C): 12.50<br>Spec. cond. (uS): 2780<br>ORP (mV): 116.90<br>Sal. (ppt): 1.40<br>DO (ppm): 10.20<br>Water depth (ft): 3.20 | 40° 45' 22.86"<br>74° 07' 48.63" | 4 of 6 | 0-1<br>1-2<br>2-4 | Brown PEAT<br>Gray CLAY, trace fine sand, trace silt (stiff)<br>Brown PEAT | Pt<br>CL<br>Pt |
| W-3 | pH (std. Units): 7.89<br>Temp. (deg. C): 17.00<br>Spec. cond. (uS): 4550<br>ORP (mV): 114.90<br>Sal. (ppt): 2.40<br>DO (ppm): 14.00<br>Water depth (ft): 5.00 | 40° 45' 26.76"<br>74° 07' 47.03" | 5 of 6 | 0-4<br>4-5 | Brown PEAT, some organic clay<br>Gray CLAY, trace fine sand, trace silt (stiff) | Pt/CL<br>CH |
| W-4 | pH (std. Units): 8.00<br>Temp. (deg. C): 16.80<br>Spec. cond. (uS): 2700<br>ORP (mV): 117.40<br>Sal. (ppt): 1.50<br>DO (ppm): 15.00<br>Water depth (ft): 2.20 | 40° 45' 32.94"<br>74° 07' 50.48" | 4 of 6 | 0-3.5<br>3.5-4 | Brown PEAT<br>Gray organic CLAY | Pt<br>OH/CH |

TABLE 2 (Continued)
Field Parameter Measurements and Observations
Water Sampling 7 & 8 April 1999 / Sediment Sampling 29 April 1999
Kearny Marsh - Kearny, NJ

| Sample Location | Field Parameters | Loc Lat./Long. | Core Rec (ft) | Core Int. (ft) | Sediment Description | USCS Symbol |
|---|---|---|---|---|---|---|
| W-5 | pH (std. Units): 8.13<br>Temp. (deg. C): 16.20<br>Spec. cond. (uS): 3360<br>ORP (mV): 117.10<br>Sal. (ppt): 1.70<br>DO (ppm): 14.30<br>Water depth (ft): --- | 40° 45' 36.67"<br>74° 07' 52.33" | 4 of 6 | 0-3<br>3-4 | Brown PEAT, some clay and silt<br>Brown organic CLAY/PEAT | Pt/CL<br>Pt/CL |
| W-6 | pH (std. Units): 8.07<br>Temp. (deg. C): 15.70<br>Spec. cond. (uS): 3470<br>ORP (mV): 116.80<br>Sal. (ppt): 1.80<br>DO (ppm): 14.00<br>Water depth (ft): 4.00 | 40° 45' 34.11"<br>74° 07' 55.55" | 5.5 of 6 | 0-4.5<br>4.5-5.5 | Brown PEAT<br>Gray stiff CLAY, trace fine sand, trace silt | Pt<br>CL |
| W-7 | pH (std. Units): 7.50<br>Temp. (deg. C): 12.70<br>Spec. cond. (uS): 2370<br>ORP (mV): 117.20<br>Sal. (ppt): 1.20<br>DO (ppm): 10.00<br>Water depth (ft): 3.50 | 40° 45' 42.45"<br>74° 08' 06.92" | 3 of 6 | 0-3 | Black organic CLAY and SILT, with leaves, roots, branches | OH |
| W-8 | pH (std. Units): 7.65<br>Temp. (deg. C): 12.80<br>Spec. cond. (uS): 2008<br>ORP (mV): 114.80<br>Sal. (ppt): 1.00<br>DO (ppm): 13.00<br>Water depth (ft): 2.50 | 40° 45' 48.10"<br>74° 08' 03.86" | 6 of 6 | 0-4<br>4-6 | Brown PEAT<br>Gray stiff CLAY, trace fine sand, trace silt | Pt<br>CL |

TABLE 2 (Continued)
Field Parameter Measurements and Observations
Water Sampling 7 & 8 April 1999 / Sediment Sampling 29 April 1999
Kearny Marsh - Kearny, NJ

| Sample Location | Field Parameters | Loc Lat./Long. | Core Rec (ft) | Core Int. (ft) | Sediment Description | USCS Symbol |
|---|---|---|---|---|---|---|
| W-9 | pH (std. Units): 7.00<br>Temp. (deg. C): 12.70<br>Spec. cond. (uS): 163.60<br>ORP (mV): 117.70<br>Sal. (ppt): 0.80<br>DO (ppm): 8.88<br>Water depth (ft): 2.50 | 40° 45' 52.82"<br>74° 08' 00.40" | 4 of 6 | 0-2<br>2-5 | Black organic CLAY and SILT, trace fine sand and fine gravel.<br>Brown PEAT, trace fine sand and fine gravel. | CH<br>Pt |
| W-10 | pH (std. Units): 8.17<br>Temp. (deg. C): 14.40<br>Spec. cond. (uS): 878.00<br>ORP (mV): 119.20<br>Sal. (ppt): 0.40<br>DO (ppm): 11.50<br>Water depth (ft): 3.00 | 40° 45' 45.97"<br>74° 07' 51.84" | 0 of 0 | 0 | No core sample collected | --- |
| W-11 | pH (std. Units): 8.14<br>Temp. (deg. C): 15.10<br>Spec. cond. (uS): 890.00<br>ORP (mV): 119.3<br>Sal. (ppt): 0.2<br>DO (ppm): 11.4<br>Water depth (ft): 2 | 40° 45' 50.57"<br>74° 07' 37.96" | 0 of 0 | 0 | No core sample collected | --- |
| W-12 | pH (std. Units): 8.18<br>Temp. (deg. C): 14.9<br>Spec. cond. (uS): 937.00<br>ORP (mV): 118.20<br>Sal. (ppt): 0.40<br>DO (ppm): 12.80<br>Water depth (ft): 4.00 | 40° 45' 44.12"<br>74° 07' 44.17" | 0 of 0 | 0 | No core sample collected | --- |

TABLE 2 (Continued)
Field Parameter Measurements and Observations
Water Sampling 7 & 8 April 1999 / Sediment Sampling 29 April 1999
Kearny Marsh - Kearny, NJ

| Sample Location | Field Parameters | Loc Lat./Long. | Core Rec (ft) | Core Int. (ft) | Sediment Description | USCS Symbol |
|---|---|---|---|---|---|---|
| W-13 | pH (std. Units): 8.13<br>Temp. (deg. C): 15.10<br>Spec. cond. (uS): 801.00<br>ORP (mV): 119.30<br>Sal. (ppt): 0.40<br>DO (ppm): 10.20<br>Water depth (ft): 3.00 | 40° 45' 36.13"<br>74° 07' 44.49" | 0 of 0 | 0 | No core sample collected | --- |
| W-14 | pH (std. Units): 8.09<br>Temp. (deg. C): 15.60<br>Spec. cond. (uS): 1023<br>ORP (mV): 118.90<br>Sal. (ppt): 0.50<br>DO (ppm): 11.00<br>Water depth (ft): --- | 40° 45' 48.15"<br>74° 07' 24.96" | 0 of 0 | 0 | No core sample collected | --- |
| W-15 | pH (std. Units): 8.25<br>Temp. (deg. C): 17.50<br>Spec. cond. (uS): 880.00<br>ORP (mV): 116.10<br>Sal. (ppt): 0.40<br>DO (ppm): 14.00<br>Water depth (ft): 3.60 | 40° 45' 44.96"<br>74° 07' 26.06" | 4 of 6 | 0-4 | Brown PEAT | Pt |
| W-16 | pH (std. Units): 8.18<br>Temp. (deg. C): 16.70<br>Spec. cond. (uS): 851.00<br>ORP (mV): 112.90<br>Sal. (ppt): 0.40<br>DO (ppm): 18.00<br>Water depth (ft): --- | 40° 45' 32.09"<br>74° 07' 37.56" | 0 of 0 | 0 | No core sample collected | --- |

TABLE 2 (Continued)
Field Parameter Measurements and Observations
Water Sampling 7 & 8 April 1999 / Sediment Sampling 29 April 1999
Kearny Marsh - Kearny, NJ

| Sample Location | Field Parameters | Loc Lat./Long. | Core Rec (ft) | Core Int. (ft) | Sediment Description | USCS Symbol |
|---|---|---|---|---|---|---|
| W-17 | pH (std. Units): 7.56<br>Temp. (deg. C): 11.10<br>Spec. cond. (uS): 1009<br>ORP (mV): 112.90<br>Sal. (ppt): 0.50<br>DO (ppm): 6.90<br>Water depth (ft): --- | ---<br>--- | 0 of 0 | 0 | No core sample collected<br>Stake not found could not confirm location. | --- |
| W-18 | pH (std. Units): 8.01<br>Temp. (deg. C): 18.50<br>Spec. cond. (uS): 1262<br>ORP (mV): 114.80<br>Sal. (ppt): 0.60<br>DO (ppm): 9.99<br>Water depth (ft): --- | 40° 45' 42.31"<br>74° 07' 24.03" | 0 of 0 | 0 | No core sample collected | --- |
| W-19 | pH (std. Units): 8.12<br>Temp. (deg. C): 18.00<br>Spec. cond. (uS): 1135<br>ORP (mV): 113.90<br>Sal. (ppt): 0.60<br>DO (ppm): 12.00<br>Water depth (ft): 3.50 | 40° 45' 38.74"<br>74° 07' 27.04" | 0 of 0 | 0 | No core sample collected | --- |
| W-20 | pH (std. Units): 8.17<br>Temp. (deg. C): 18.40<br>Spec. cond. (uS): 1170<br>ORP (mV): 113.70<br>Sal. (ppt): 0.60<br>DO (ppm): 13.00<br>Water depth (ft): --- | 40° 45' 46.51"<br>74° 07' 17.25" | 0 of 0 | 0 | No core sample collected | --- |

TABLE 2 (Continued)
Field Parameter Measurements and Observations
Water Sampling 7 & 8 April 1999 / Sediment Sampling 29 April 1999
Kearny Marsh - Kearny, NJ

| Sample Location | Field Parameters | Location (Lat./Long.) | Core Rec (ft) | Core Int. (ft) | Sediment Description | USCS Symbol |
|---|---|---|---|---|---|---|
| W-21 | pH (std. Units): 8.15<br>Temp. (deg. C): 19.30<br>Spec. cond. (uS): 1282<br>ORP (mV): 112.10<br>Sal. (ppt): 0.70<br>DO (ppm): 11.40<br>Water depth (ft): 3.50 | 40° 45' 35.26"<br>74° 07' 03.11" | 3 of 6 | 0-3 | Brown PEAT and ORGANIC CLAY | Pt/CL |
| W-22 | pH (std. Units): 8.08<br>Temp. (deg. C): 18.90<br>Spec. cond. (uS): 1222<br>ORP (mV): 114.40<br>Sal. (ppt): 0.60<br>DO (ppm): 12.00<br>Water depth (ft): 2.00 | 40° 45' 25.10"<br>74° 07' 08.52" | 0 of 0 | 0 | No core sample collected | --- |

**Notes:**

1. Location determined by Aqua Survey, Inc. using Global Positioning System (GPS).
2. " --- " = data not collected or not applicable.
3. Cor Rec = length of core recovery of a maximum 6 feet.
4. Cor Int. = specific core interval.
5. Spec. cond. = specific conductance measured in micosiemens (uS).
6. ORP = oxidation-reductoin potential measured in millivolts (mV).
7. Sal. = salinity measured in parts per thousand (ppt).
8. DO = dissolved oxygen measured in parts per million (ppm).
9. USCS =Unified Soil Classification System.