SEDIMENT AND WATER SAMPLING REPORT

KEARNY MARSH
KEARNY, NEW JERSEY

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Newark Bay Study Area
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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.

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	1866-005	1866-004	1866-003	1866-002	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	0.000632 (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	8.16	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	6.98	5 69	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	14.65	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	1.6	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 Temp. (deg. C): 13.90 Spec. cond. (uS): 2820 ORP (mV): 117.10 Sal. (ppt): 1.40 DO (ppm): 10.30 Water depth (ft): ---	--- ---	0 of 0	0	Proposed core sample location, could not access with platform barge	---
W-2	pH (std. Units): 7.70 Temp. (deg. C): 12.50 Spec. cond. (uS): 2780 ORP (mV): 116.90 Sal. (ppt): 1.40 DO (ppm): 10.20 Water depth (ft): 3.20	40° 45' 22.86" 74° 07' 48.63"	4 of 6	0-1 1-2 2-4	Brown PEAT Gray CLAY, trace fine sand, trace silt (stiff) Brown PEAT	Pt CL Pt
W-3	pH (std. Units): 7.89 Temp. (deg. C): 17.00 Spec. cond. (uS): 4550 ORP (mV): 114.90 Sal. (ppt): 2.40 DO (ppm): 14.00 Water depth (ft): 5.00	40° 45' 26.76" 74° 07' 47.03"	5 of 6	0-4 4-5	Brown PEAT, some organic clay Gray CLAY, trace fine sand, trace silt (stiff)	Pt/CL CH
W-4	pH (std. Units): 8.00 Temp. (deg. C): 16.80 Spec. cond. (uS): 2700 ORP (mV): 117.40 Sal. (ppt): 1.50 DO (ppm): 15.00 Water depth (ft): 2.20	40° 45' 32.94" 74° 07' 50.48"	4 of 6	0-3.5 3.5-4	Brown PEAT Gray organic CLAY	Pt 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 Temp. (deg. C): 16.20 Spec. cond. (uS): 3360 ORP (mV): 117.10 Sal. (ppt): 1.70 DO (ppm): 14.30 Water depth (ft): ---	40° 45' 36.67" 74° 07' 52.33"	4 of 6	0-3 3-4	Brown PEAT, some clay and silt Brown organic CLAY/PEAT	Pt/CL Pt/CL
W-6	pH (std. Units): 8.07 Temp. (deg. C): 15.70 Spec. cond. (uS): 3470 ORP (mV): 116.80 Sal. (ppt): 1.80 DO (ppm): 14.00 Water depth (ft): 4.00	40° 45' 34.11" 74° 07' 55.55"	5.5 of 6	0-4.5 4.5-5.5	Brown PEAT Gray stiff CLAY, trace fine sand, trace silt	Pt CL
W-7	pH (std. Units): 7.50 Temp. (deg. C): 12.70 Spec. cond. (uS): 2370 ORP (mV): 117.20 Sal. (ppt): 1.20 DO (ppm): 10.00 Water depth (ft): 3.50	40° 45' 42.45" 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 Temp. (deg. C): 12.80 Spec. cond. (uS): 2008 ORP (mV): 114.80 Sal. (ppt): 1.00 DO (ppm): 13.00 Water depth (ft): 2.50	40° 45' 48.10" 74° 08' 03.86"	6 of 6	0-4 4-6	Brown PEAT Gray stiff CLAY, trace fine sand, trace silt	Pt 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 Temp. (deg. C): 12.70 Spec. cond. (uS): 163.60 ORP (mV): 117.70 Sal. (ppt): 0.80 DO (ppm): 8.88 Water depth (ft): 2.50	40° 45' 52.82" 74° 08' 00.40"	4 of 6	0-2 2-5	Black organic CLAY and SILT, trace fine sand and fine gravel. Brown PEAT, trace fine sand and fine gravel.	CH Pt
W-10	pH (std. Units): 8.17 Temp. (deg. C): 14.40 Spec. cond. (uS): 878.00 ORP (mV): 119.20 Sal. (ppt): 0.40 DO (ppm): 11.50 Water depth (ft): 3.00	40° 45' 45.97" 74° 07' 51.84"	0 of 0	0	No core sample collected	—
W-11	pH (std. Units): 8.14 Temp. (deg. C): 15.10 Spec. cond. (uS): 890.00 ORP (mV): 119.3 Sal. (ppt): 0.2 DO (ppm): 11.4 Water depth (ft): 2	40° 45' 50.57" 74° 07' 37.96"	0 of 0	0	No core sample collected	—
W-12	pH (std. Units): 8.18 Temp. (deg. C): 14.9 Spec. cond. (uS): 937.00 ORP (mV): 118.20 Sal. (ppt): 0.40 DO (ppm): 12.80 Water depth (ft): 4.00	40° 45' 44.12" 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 Temp. (deg. C): 15.10 Spec. cond. (uS): 801.00 ORP (mV): 119.30 Sal. (ppt): 0.40 DO (ppm): 10.20 Water depth (ft): 3.00	40° 45' 36.13" 74° 07' 44.49"	0 of 0	0	No core sample collected	---
W-14	pH (std. Units): 8.09 Temp. (deg. C): 15.60 Spec. cond. (uS): 1023 ORP (mV): 118.90 Sal. (ppt): 0.50 DO (ppm): 11.00 Water depth (ft): ---	40° 45' 48.15" 74° 07' 24.96"	0 of 0	0	No core sample collected	---
W-15	pH (std. Units): 8.25 Temp. (deg. C): 17.50 Spec. cond. (uS): 880.00 ORP (mV): 116.10 Sal. (ppt): 0.40 DO (ppm): 14.00 Water depth (ft): 3.60	40° 45' 44.96" 74° 07' 26.06"	4 of 6	0-4	Brown PEAT	Pt
W-16	pH (std. Units): 8.18 Temp. (deg. C): 16.70 Spec. cond. (uS): 851.00 ORP (mV): 112.90 Sal. (ppt): 0.40 DO (ppm): 18.00 Water depth (ft): —	40° 45' 32.09" 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 Temp. (deg. C): 11.10 Spec. cond. (uS): 1009 ORP (mV): 112.90 Sal. (ppt): 0.50 DO (ppm): 6.90 Water depth (ft): ---	--- ---	0 of 0	0	No core sample collected Stake not found could not confirm location.	---
W-18	pH (std. Units): 8.01 Temp. (deg. C): 18.50 Spec. cond. (uS): 1262 ORP (mV): 114.80 Sal. (ppt): 0.60 DO (ppm): 9.99 Water depth (ft): ---	40° 45' 42.31" 74° 07' 24.03"	0 of 0	0	No core sample collected	---
W-19	pH (std. Units): 8.12 Temp. (deg. C): 18.00 Spec. cond. (uS): 1135 ORP (mV): 113.90 Sal. (ppt): 0.60 DO (ppm): 12.00 Water depth (ft): 3.50	40° 45' 38.74" 74° 07' 27.04"	0 of 0	0	No core sample collected	---
W-20	pH (std. Units): 8.17 Temp. (deg. C): 18.40 Spec. cond. (uS): 1170 ORP (mV): 113.70 Sal. (ppt): 0.60 DO (ppm): 13.00 Water depth (ft): ---	40° 45' 46.51" 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 Temp. (deg. C): 19.30 Spec. cond. (uS): 1282 ORP (mV): 112.10 Sal. (ppt): 0.70 DO (ppm): 11.40 Water depth (ft): 3.50	40° 45' 35.26" 74° 07' 03.11"	3 of 6	0-3	Brown PEAT and ORGANIC CLAY	Pt/CL
W-22	pH (std. Units): 8.08 Temp. (deg. C): 18.90 Spec. cond. (uS): 1222 ORP (mV): 114.40 Sal. (ppt): 0.60 DO (ppm): 12.00 Water depth (ft): 2.00	40° 45' 25.10" 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 microsiemens (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.

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	1,460	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	6.14	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	8	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	6.74	0.747	9.58	16.2	3.49	0.804	2.83	34.7	8.67	5.8	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	15.6	16.2	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	6.66
Mercury	0.2	2	mg/kg	0.603	0.286	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	87.6	11.7	6.48	244	117	47	34.6
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	0.611	ND	ND	ND
Total Petroleum Hydrocarbons	—	—	mg/kg	650	267	52.6	107	483	187	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	4/29/98	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	0.02448	0.02058	0.02138	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	0.0166	ND	ND	ND	ND
Unknown alkane	—	—	mg/kg	ND	ND	ND	ND	0.6078	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	0.0806	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	0.68	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	1,460	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	0.988	0.258J	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-Ethylhexyl)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	6.48	ND	22.64	ND	5.02	76.24	257.21
Unknown aromatic	—	—	mg/kg	ND	ND	ND	ND	41.98	ND	0.7	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	0.0416	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	8	mg/kg	0.0166	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	3.84	28.3	8.64	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	0.8	10	mg/kg	26.2	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	31.8	130	ND	120
Lead	31	250	mg/kg	858	5.62	112	68.7	1070	414	62.6	70.1	339	ND	416
Mercury	0.2	2	mg/kg	152	0.141	20.5	1.06	20.5	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	580	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	720	668	524
Corrosivity as pH	—	—	S.U	8.9	7.62	7.43	7.08	8.51	7.87	7.43	7.4	7.55	7.66	7.66
Total Organic Carbons	—	—	mg/kg	38000	98000	58000	61000	46000	34000	84000	52000	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

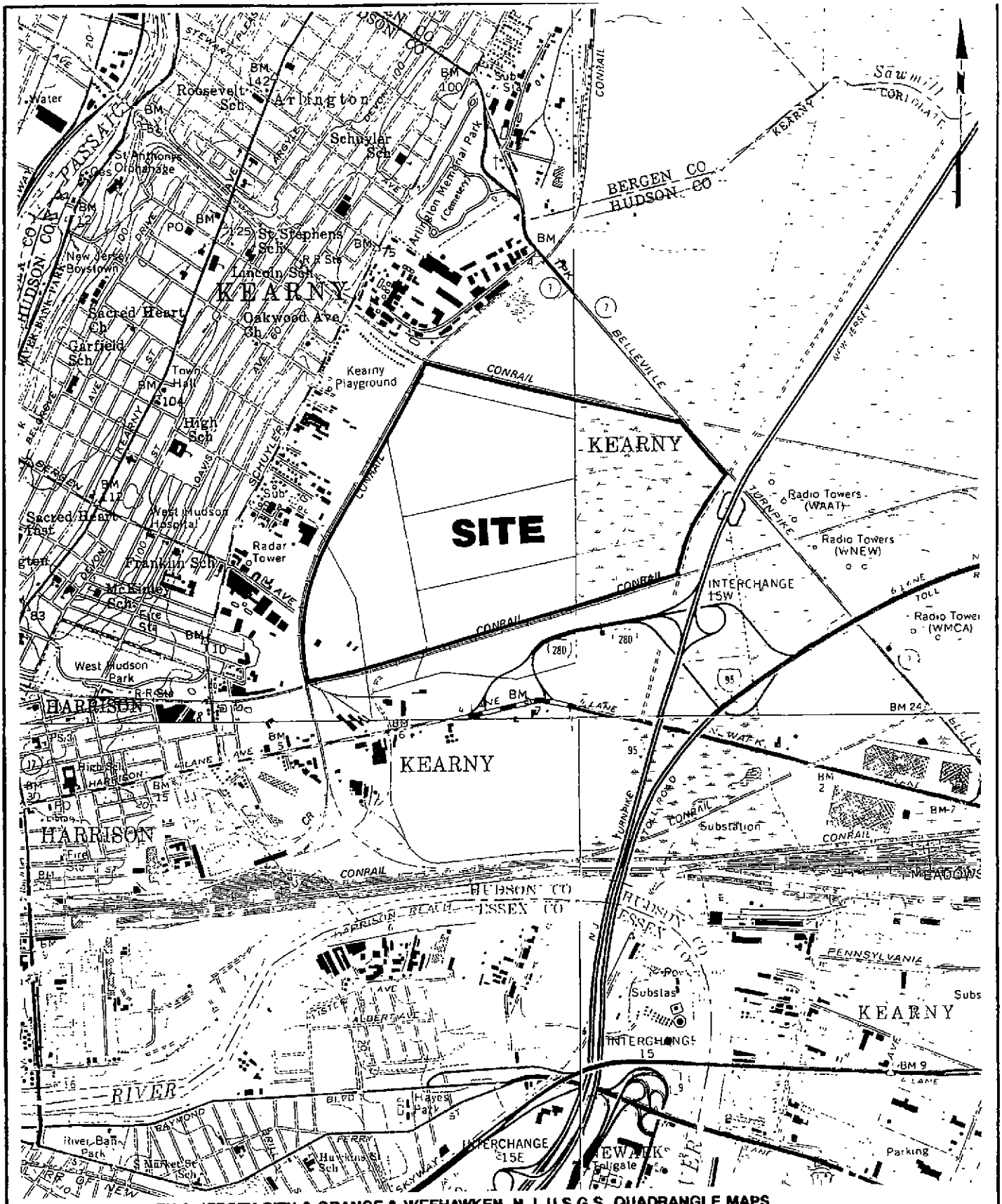
Sample ID				W13	W13A	DUPE 1	W13B	W13C	DUPE 2	W14	W15	W15A	W15B	W15C	W16
Langan Sample Number				087	058	061	059	060	062	083	076	055	056	057	066
Lab Sample Number	ONTARIO AQUATIC			2964-021	2421-028	2421-031	2421-029	2421-030	2421-032	2964-017	2964-010	2421-025	2421-026	2421-027	2964-020
Depth (feet)	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	6 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	88 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	20.6	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	8.6	ND	NA	NA
TOTAL PCBs	---	---	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA
PESTICIDES														
4,4'-DDD	0.008	8	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	5.88	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	6.15	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	7.8	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



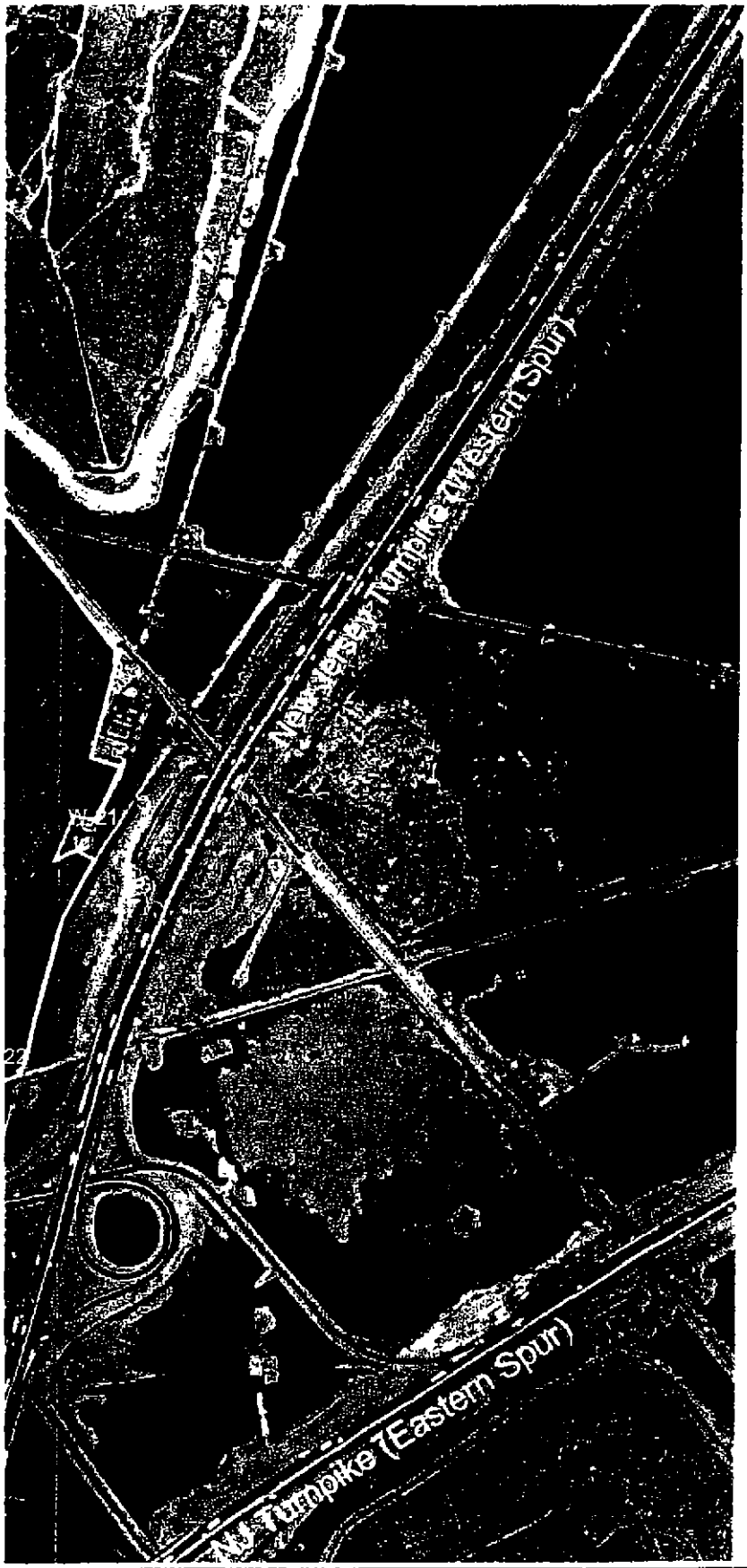
MAP REF: ELIZABETH & JERSEY CITY & ORANGE & WEEHAWKEN, N.J. U.S.G.S. QUADRANGLE MAPS

Langan Engineering and Environmental Services
(201) 794-6900 (215) 348-7101
Elmwood Park, NJ Doylestown, PA

Project **KEARNY MARSH**
SITE LOCATION MAP

KEARNY — NEW JERSEY

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



N

Legend

APPROXIMATE KEARNY MARSH BOUNDARY

● WATER SAMPLE LOCATION

▲ WATER AND SEDIMENT CORE SAMPLE LOCATION

Langan
Engineering and Environmental Services

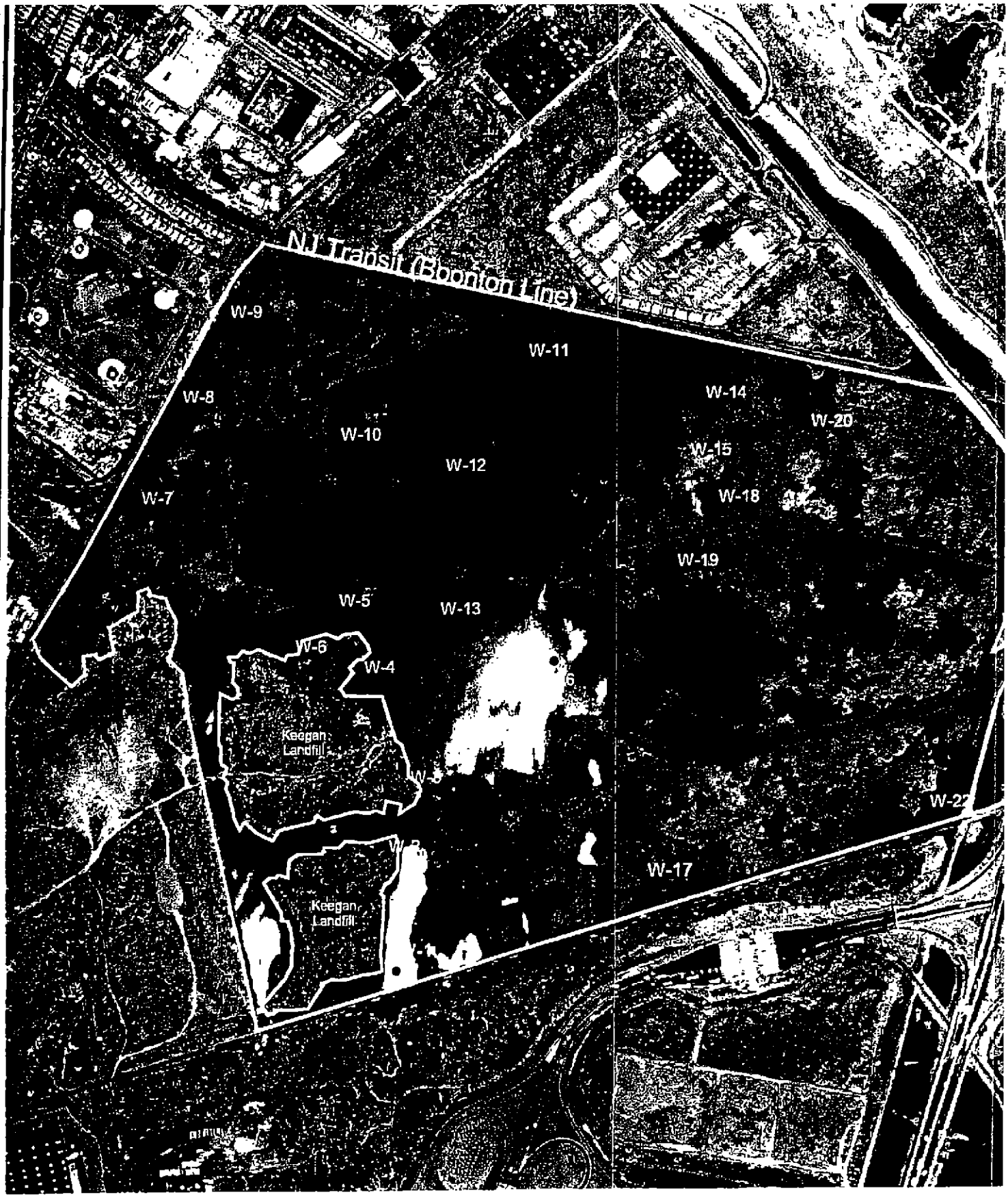
•Elmwood Park, NJ • New York, NY • Miami, FL • West Palm Beach, FL • Doylestown, PA

KEARNY MARSH

SAMPLE LOCATIONS

KEARNY NEW JERSEY

Project No.	Scale	Date	Figure No.
1567701	1"=700'	5/20/99	2



This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state authorized

APPENDIX A

HMDC SAMPLING PLAN

Sediment and Water Sampling Requirements for the Kearny Marsh

All sampling, analysis and reporting shall comply with the standards outlined in N.J.S.A. 7:26E – Technical Requirements for Site Remediation. A completed Chain-of-Custody Form must accompany all samples delivered to the laboratory.

List of Parameters – Water

- PP + 40
- total petroleum hydrocarbon (TPHC)
- water quality parameters
  - temperature
  - salinity
  - conductivity
  - dissolved oxygen
  - pH (lab)
  - chloride
  - total Kjeldahl N
  - surfactants
  - sulfates
  - BOD 5
  - COD
  - total organic carbon
  - turbidity
  - color
  - phosphate -P (total)
  - total suspended solids
  - fecal coliform
  - phenols

List of Parameters - Sediment

- PP + 40
- total petroleum hydrocarbon (TPHC)
- total organic carbon (TOC)
- pH
- particle size

Sample Locations

Approximately twenty (20) sampling locations will be identified for the assessment. All parameters are to be performed at each location, except for fecal coliform which may be performed on only half of the samples. Approximately ten (10) of the sample locations will be identified for core sediment samples to be taken from 0 to 36 inches. Analysis will be performed at 12, 24 [illegible] 36 inch depths.

APPENDIX B

LABORATORY DELIVERABLE PACKAGE – WATER

(previously submitted)

APPENDIX C

LABORATORY DELIVERABLE PACKAGE – SEDIMENT

(surficial sediment data only)
(sediment core data submitted previously)