APPENDIX G:
WATER RESOURCES

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Appendix G.1
Bathymetry & Water Quality Figures

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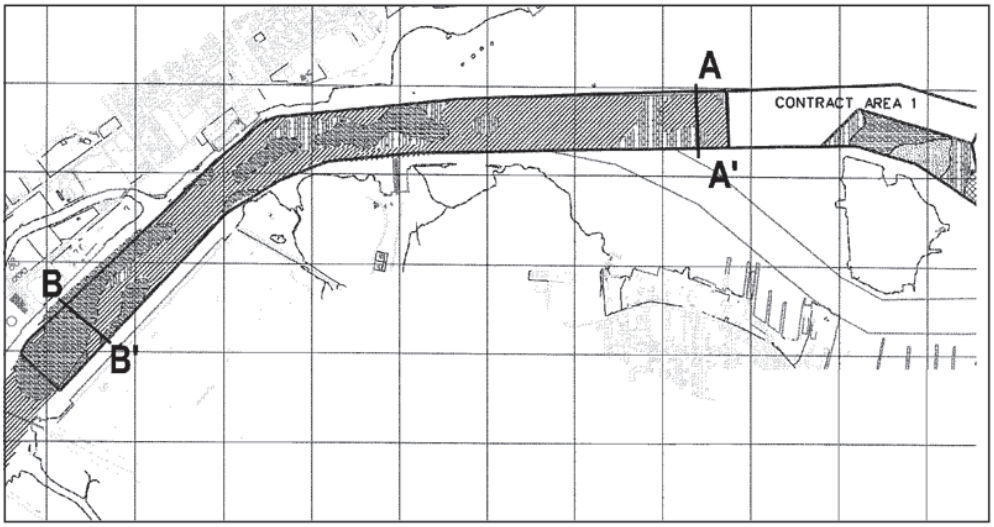
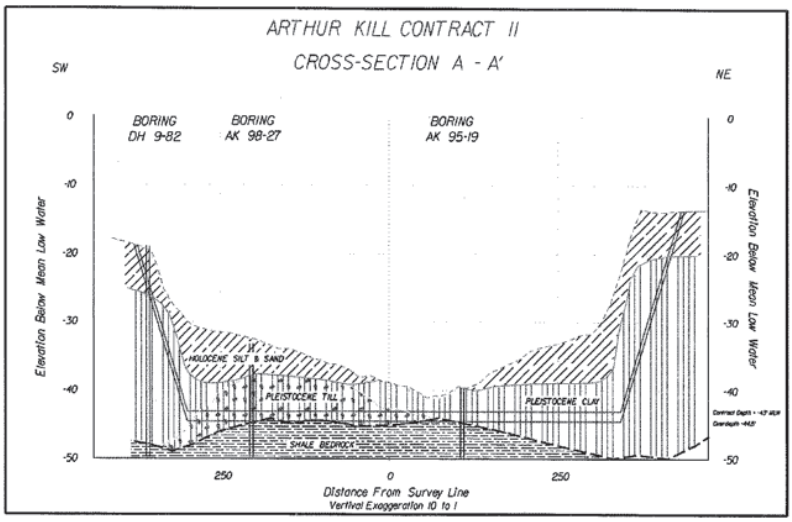
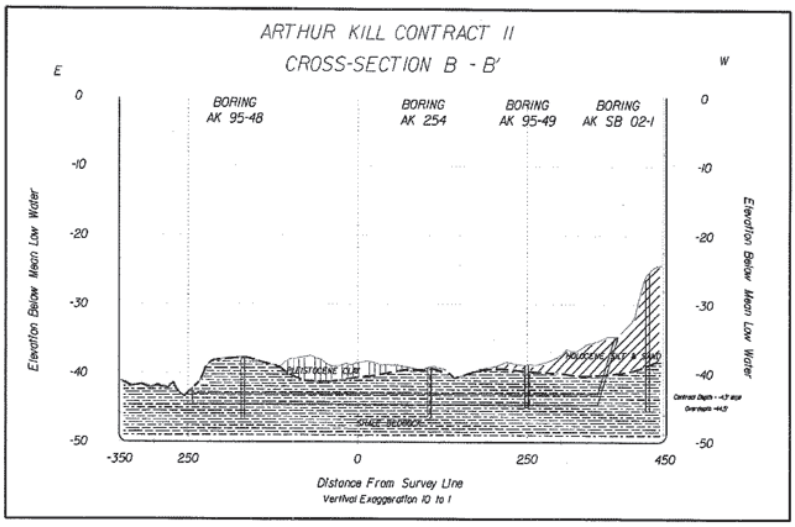




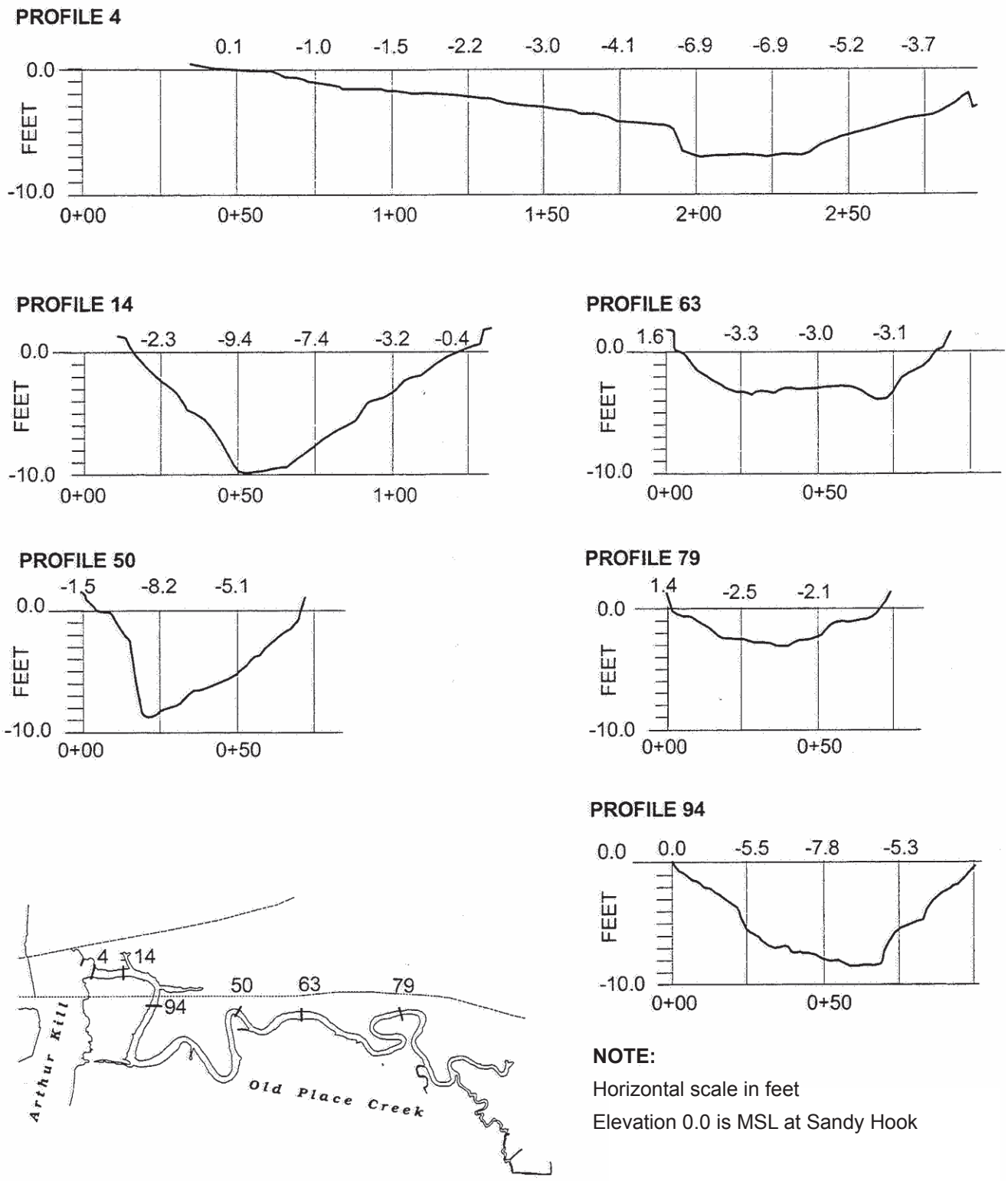


Goethals Bridge Replacement EIS

FIGURE 1

Cross Sections of Arthur Kill Channel

United States Coast Guard



NOTE:

Horizontal scale in feet

Elevation 0.0 is MSL at Sandy Hook

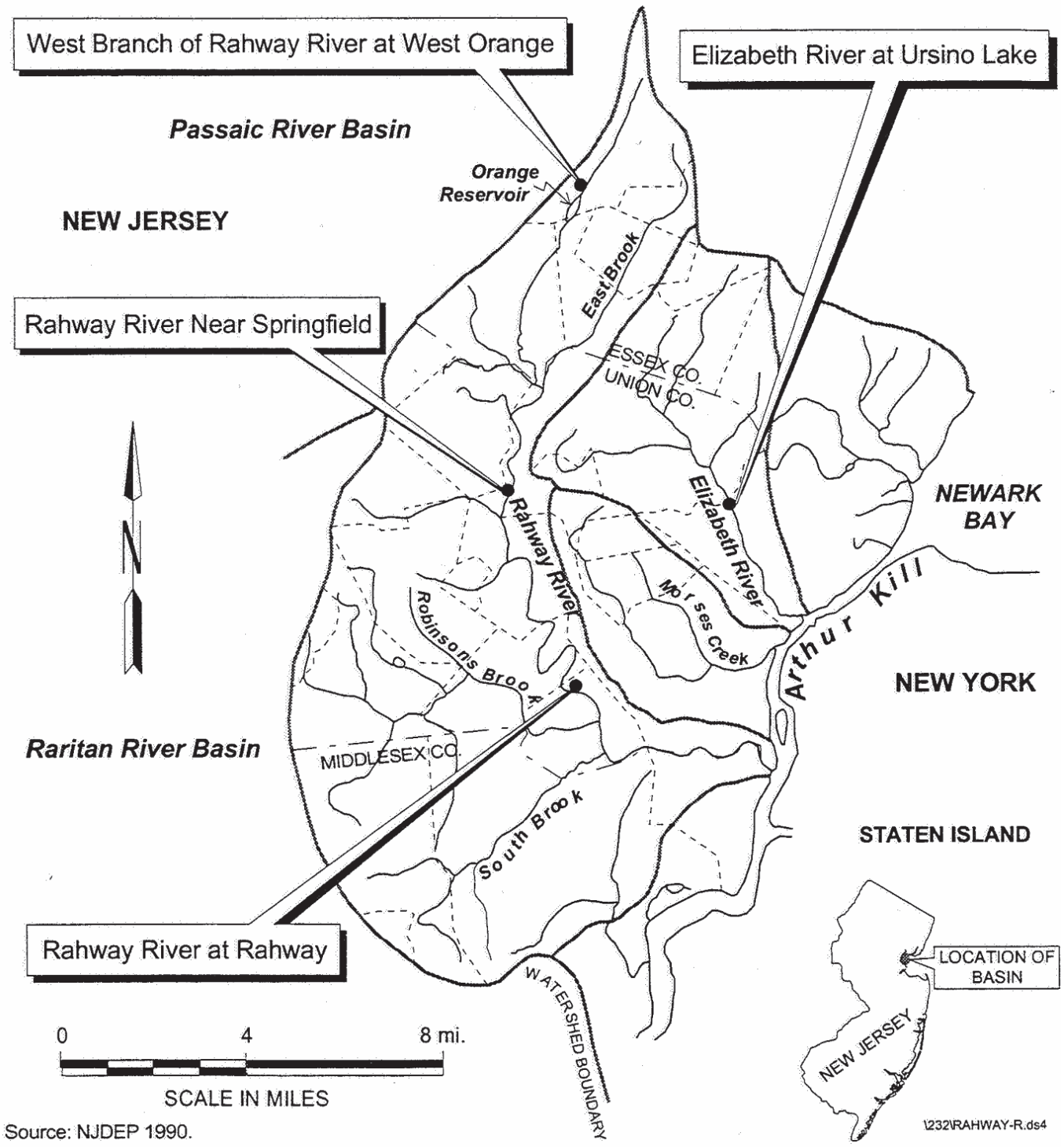
Source: PA 1993.

Goethals Bridge Replacement EIS

FIGURE 2

Bathymetric Profiles of Old Place Creek

United States Coast Guard



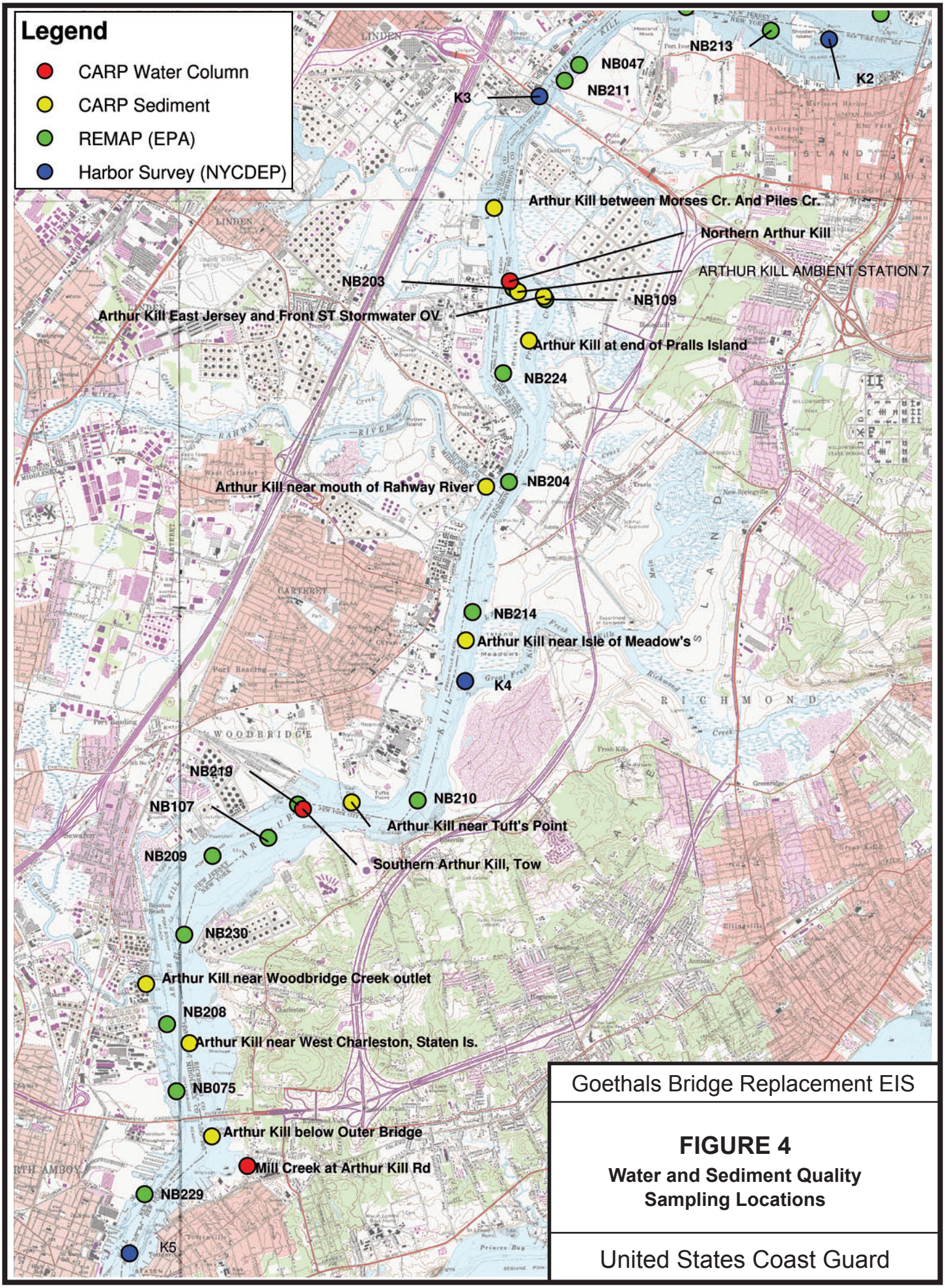
Source: NJDEP 1990.

Goethals Bridge Replacement EIS

FIGURE 3

Water Quality and Flow Monitoring Stations Located in the Rahway and Elizabeth River Watersheds

United States Coast Guard

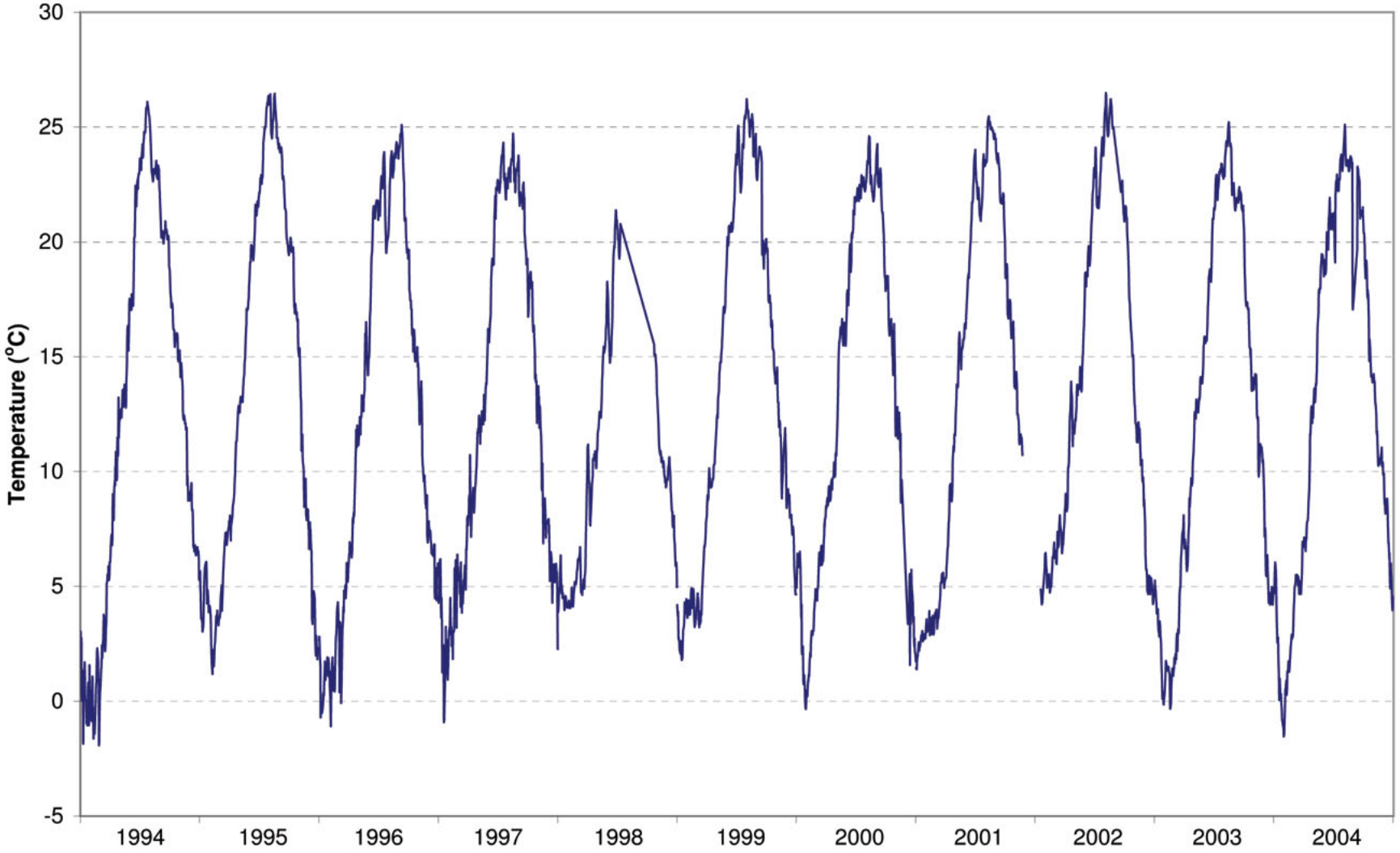


Goethals Bridge Replacement EIS

FIGURE 4

Water and Sediment Quality Sampling Locations

United States Coast Guard



Goethals Bridge Replacement EIS

FIGURE 5

Daily Average Surface Water Temperature from 1994 to 2004 NOAA Station: Bergen Point West Reach, NY (#8519483)

United States Coast Guard

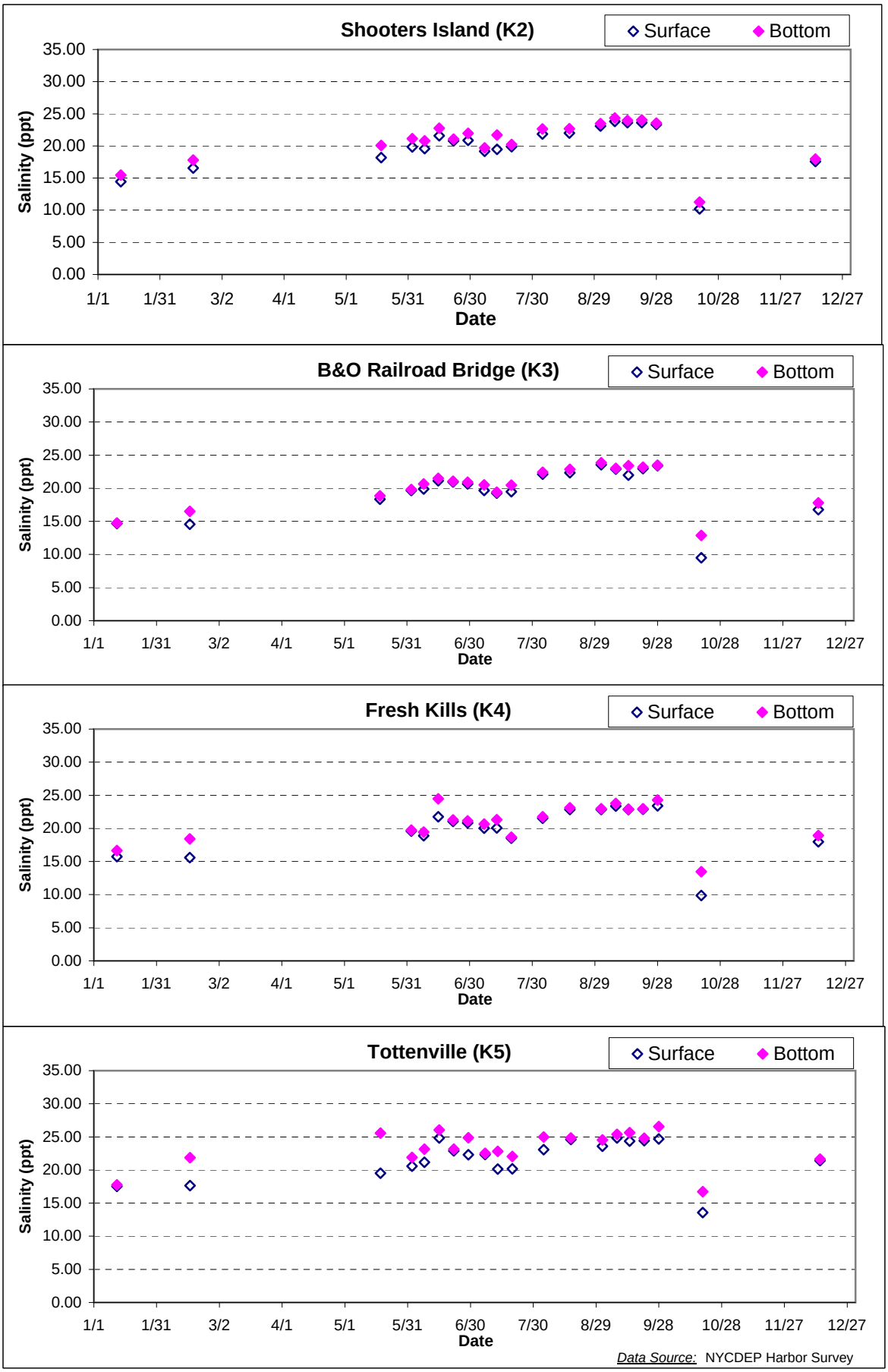


FIGURE 6
2005 Surface and Bottom Salinity in the Arthur Kill

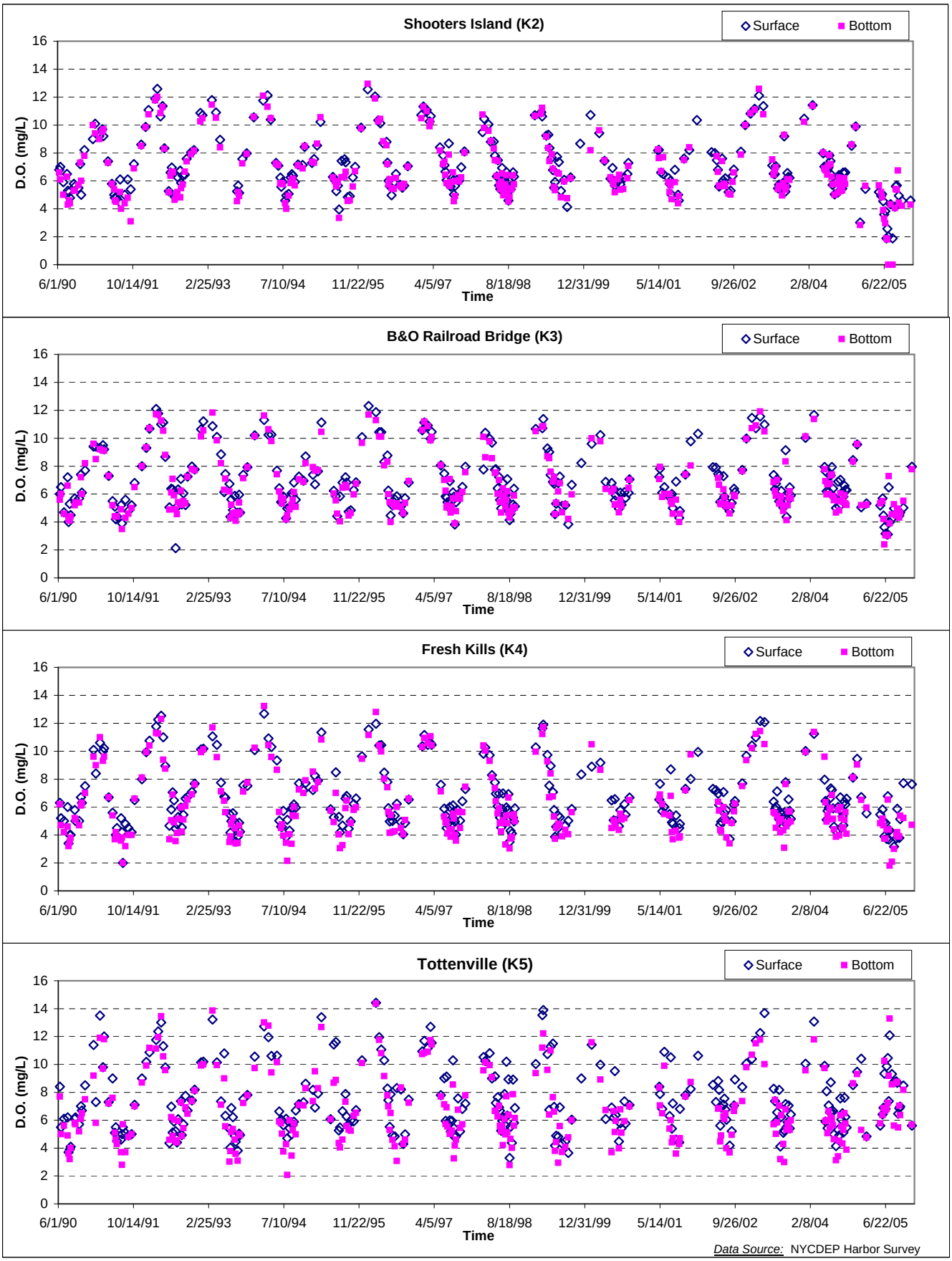
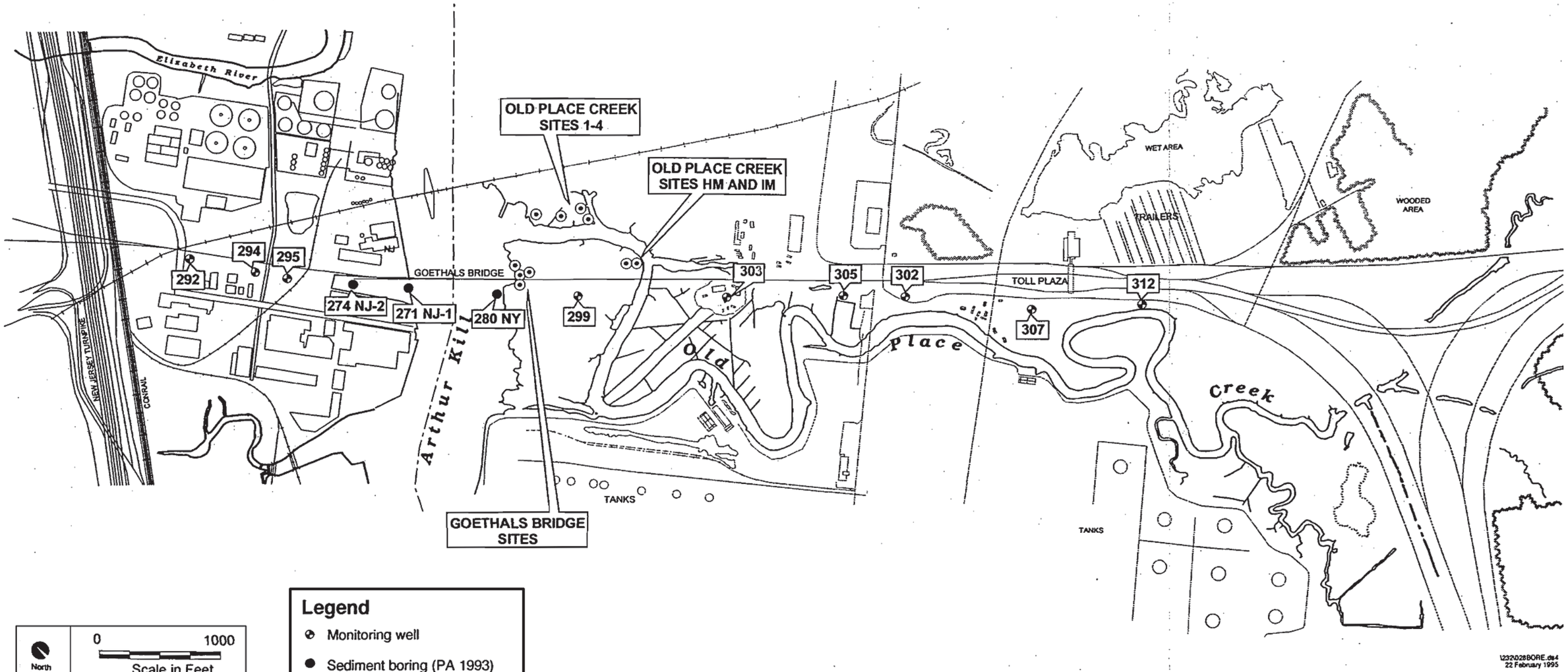


FIGURE 7
1990-2005 Surface and Bottom Dissolved Oxygen in the Arthur Kill



Map source: Base map developed from aerial photographs

Goethals Bridge Replacement EIS

FIGURE 8

Approximate Monitoring Well and Sediment Boring Locations

United States Coast Guard

Appendix G.2
Water Quality Tables

- Table 1: Selected Surface Water Quality Standards and Criteria, Micrograms Per Liter (ug/L)
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TABLE 1
SELECTED SURFACE WATER QUALITY STANDARDS AND CRITERIA, MICROGRAMS PER LITER (µG/L)

Parameter	NYSDEC-SD	Criteria Basis	NJDEP-SE3	Criteria Basis	EPA - Saltwater	Criteria Basis
Aldrin	–	–	1.3(0.000050)	AA(H)	1.3(0.000049)0.000050	CMC(HCW)HCO
Aldrin & Dieldrin	0.001	H(FC)	–	–	–	–
Arsenic	120[b]	A(A)	69[ds](36[ds])0.061[d]	AA(AC)HC	69(36)0.018(0.14)	CMC(CCC)HCW(HCO)
Benzene	10	H(FC)	3.3	HC	2.2(51)	HCW(HCO)
Benzo(a)pyrene	–	–	0.018	HC	0.0038(0.018)	HCW(HCO)
alpha-BHC	–	–	0.0049	HC	0.0026(0.0049)	HCW(HCO)
beta-BHC	–	–	0.017	HC	0.0091(0.017)	HCW(HCO)
gamma-BHC	–	–	0.16(1.8)	AA(H)	0.98(1.8)	HCW(HCO)
Cadmium	21	A(A)	40[ds](8.8[ds])16[d]	AA(AC)H	40(8.8)	CMC(CCC)
Chlordane	0.00002	H(FC)	0.09 (0.004)0.00011	AA(AC)HC	0.09 (0.004)8x10^{-4}(0.00081)	CMC(CCC)HCW(HCO)
Chlorobenzene	400	H(FC)	2,500	H	130(1,600)	HCW(HCO)
Chromium	–	–	750[d]	H	–	–
Chromium, hexavalent	1,200[c]	A(A)	1,100[ds](50[ds])	AA(AC)	1,100(50)	CMC(CCC)
Copper	7.9 ug/L[****]	A(A)	7.9(5.6)	AA(AC)	4.8(3.1)1,300	CMC(CCC)HCW
Cyanide	1	A(A)	1.0[fc](1.0[fc])140	AA(AC)H	1(1)140(140)	CMC(CCC)HCW(HCO)
DDE	1.1 x 10^{-5}	W	0.00022	HC	0.00022(0.00022)	HCW(HCO)
DDT	1.1 x 10^{-5}	W	0.13(0.0010)0.00022	AA(AC)HC	0.13(0.001)0.00022(0.00022)	CMC(CCC)HCW(HCO)
Dieldrin	6 x10^{-7}	H(FC)	0.71(0.0019)0.000054	AA(AC)HC	0.71(0.0019)5.2x10^{-5}(5.5x10^{-5})	CMC(CCC)HCW(HCO)
Dioxin/Furan[g]	3.1x10^{-9}	W	(5.1x10^{-9})	HC	5.0x10^{-9}(5.1x10^{-9})	HCW(HCO)
Endosulfans (alpha and beta)	0.034(A)	A	0.034(0.0087)89	AA(AC)H	0.034(0.0087)62(89)	CMC(CCC)HCW(HCO)
Endrin	0.002	H(FC)	0.037 (0.0023)0.060	AA(AC)H	0.037(0.0023)0.059(0.060)	CMC(CCC)HCW(HCO)

TABLE 1 (CONTINUED)
SELECTED SURFACE WATER QUALITY STANDARDS AND CRITERIA, MICROGRAMS PER LITER (µG/L)

Parameter	NYSDEC-SD	Criteria Basis	NJDEP-SE3	Criteria Basis	EPA - Saltwater	Criteria Basis
Endrin aldehyde	–	–	0.060	H	0.29(0.30)	HCW(HCO)
Heptachlor	2.0×10^{-4}	H(FC)	0.053(0.0036)0.000079	AA(AC)HC	0.053(0.0036)7.9×10^{-5}(7.9×10^{-5})	CMC(CCC)HCW(HCO)
Heptachlor epoxide	3.0×10^{-4}	H(FC)	0.053(0.0036)0.000039	AA(AC)HC	0.053(0.0036)3.9×10^{-5}(3.9×10^{-5})	CMC(CCC)HCW(HCO)
Hexachlorobenzene	3.0×10^{-5}	H(FC)	0.00029	HC	0.00028(0.00029)	CMC(CCC)
Lead	204 [b]	A(A)	210[ds](24[ds])	AA(AC)	210(8.1)	CMC(CCC)
Mercury	0.0026[b]	W	1.8[ds](0.94[ds])0.051[d]	AA(AC)H	1.8(0.94)0.3mg/kg	CMC(CCC)HCO
Methoxychlor	–	–	0.03	AC	0.03(100)	CCC(HCW)
Mirex	1.0×10^{-6}	H(FC)	0.001	AC	0.001	CCC
Nickel	74 [b]	A(A)	64[ds](22[ds])1,700[d]	AA(AC)H	74(8.2)610(4,600)	CMC(CCC)HCW(HCO)
Polychlorinated- biphenyls	0.00012	W	0.030(0.000064)	AC(HC)	0.03(0.000064)0.000064	CCC(HCW)HCO
Silver	2.3[c]	A(A)	1.9[ds](40,000[d])	AA(H)	1.9	CMC
Zinc	95[b]	A(A)	90[ds](81[ds])26,000[d]	AA(AC)H	90(81)7,400(26,000)	CMC(CCC)HCW(HCO)
Chlorine, total residual	13	A(A)	13 (7.5)	AA(AC)	13(7.5)	CMC(CCC)
Dissolved oxygen (mg/l)	Shall not be less than 3.0 mg/L at any time.	A(A)	Not less than 3.0	–	–	–
Fecal coliforms (No./ml)	–	–	Fecal coliform levels shall not exceed a geometric mean of 1500/100ml.	–	–	–
Floating oils and grease	No residue attributable to sewage, industrial wastes or other wastes, nor visible oil film nor globules of grease.		None noticeable and none which would render the waters unsuitable for the designated uses	–	–	–

TABLE 1 (CONTINUED)
SELECTED SURFACE WATER QUALITY STANDARDS AND CRITERIA, MICROGRAMS PER LITER (µG/L)

Parameter	NYSDEC-SD	Criteria Basis	NJDEP-SE3	Criteria Basis	EPA - Saltwater	Criteria Basis
pH (SU)	The normal range shall not be extended by more than one-tenth (0.1) of a pH unit.		6.5-8.5	–	6.5-8.5(5-9)	CCC(HCW)
Solids, dissolved	250,000		None which would render the waters unsuitable for the designated uses –	–	250,000	–
Solids, suspended	None from sewage, industrial wastes or other wastes that will cause deposition or impair the waters for their best usages.		None which would render the waters unsuitable for the designated uses.	–	–	–
Turbidity (NTU)	No increase that will cause a substantial visible contrast to natural conditions.		Maximum 30-day average of 15 NTU, a maximum of 50 NTU at any time	–	–	–

Notes:
A(A) – NYSDEC acute aquatic life protection criterion.
AA – NJDEP acute aquatic life protection criterion.
AC – NJDEP chronic aquatic life protection criterion.
H – NJDEP noncarcinogenic effect-based human health criterion.
H(FC) – NYSDEC health (fish consumption)-based standard.
HC – NJDEP carcinogenic effect-based human health criterion.
W – NYSDEC wildlife based standard.
CMC – Criteria Maximum Concentration
CCC – Criteria Continuous Concentration
HCW – Human Health for the Consumption of Water + Organism
HCO – Human Health for the Consumption of Organism Only
[a] – Guidance values.
[b] – Aquatic standards apply to dissolved form.
[c] – Aquatic standards apply to acid-soluble form.
[d] – Standards apply to total recoverable.
[e] – Standard applies to free cyanide.
[f] – Standard applies to 1,2,4-trichlorobenzene.
[g] – Applies only to 2,3,7,8-TCDD
**** – Standard is 4.8 ug/L except in New York/New Jersey harbor where it is 7.9 ug/L
Sources: NJAC 7:9B-1.14 (June 2008), NYSDEC CRR Title 6 10:703 (Aug. 1999 revised Jan. 2008), and 2002 National Recommended Water Quality Criteria: 2002 table (EPA-822-R-02-047) and 2003 Revised Human Health Water Quality Criteria (EPA-822-F-03-012).

TABLE 2
PCB CONCENTRATIONS (µG/L) IN WATER COLUMN AT STATIONS IN ARTHUR KILL

Homologues Group	Northern Arthur Kill			Southern Arthur Kill, Tow			Mill Creek at Arthur Kill Rd		
	Dissolved	Solids	Total	Dissolved	Solids	Total	Dissolved	Solids	Total
Mono	4.77E-06	8.13E-06	1.29E-05	7.62E-06	6.24E-06	1.39E-05	1.80E-05	6.04E-06	2.41E-05
Di	5.80E-05	4.35E-05	1.02E-04	2.66E-05	3.62E-05	6.28E-05	4.50E-05	2.93E-05	7.43E-05
Tri	1.00E-04	8.40E-05	1.84E-04	3.36E-05	6.03E-05	9.39E-05	4.95E-05	7.77E-05	1.27E-04
Tetra	9.24E-05	1.05E-04	1.97E-04	2.77E-05	7.98E-05	1.07E-04	3.65E-05	1.89E-04	2.25E-04
Penta	3.41E-05	1.01E-04	1.35E-04	8.67E-06	5.62E-05	6.49E-05	1.43E-05	1.65E-04	1.79E-04
Hexa	1.51E-05	8.35E-05	9.86E-05	2.64E-06	3.35E-05	3.61E-05	5.86E-06	1.02E-04	1.08E-04
Hepta	5.78E-06	8.33E-05	8.91E-05	7.28E-07	1.87E-05	1.95E-05	3.58E-06	7.80E-05	8.16E-05
Octa	2.10E-06	4.47E-05	4.68E-05	4.83E-07	1.09E-05	1.13E-05	1.68E-06	3.73E-05	3.90E-05
Nona	0.00E+00	2.60E-05	2.60E-05	0.00E+00	1.21E-05	1.21E-05	0.00E+00	2.71E-05	2.71E-05
Deca	0.00E+00	4.65E-05	4.65E-05	0.00E+00	1.95E-05	1.95E-05	0.00E+00	3.79E-05	3.79E-05
SUM	3.12E-04	6.26E-04	9.38E-04	1.08E-04	3.33E-04	4.41E-04	1.75E-04	7.49E-04	9.23E-04

Source: CARP, 2003.

TABLE 3
PESTICIDES IN WATER COLUMN AT STATIONS IN ARTHUR KILL

Parameter	Sampling Location:	Mill Creek at Arthur Kill Rd	Northern Arthur Kill	Northern Arthur Kill	Northern Arthur Kill	Northern Arthur Kill	Southern Arthur Kill
	Day of Measurement:	4/26/2001	11/17/1998	2/17/1999	4/18/2000	7/8/1999	2/22/2003
2,4'-DDD	DISS	1.45E-04	2.00E-03	8.03E-04	1.08E-03	1.61E-03	2.31E-04
2,4'-DDD	SOLIDS	7.84E-04	1.52E-03	1.22E-03	9.22E-04	5.22E-04	5.33E-04
2,4'-DDE	DISS		3.60E-04	1.24E-04	1.24E-04	5.80E-04	3.10E-05
2,4'-DDE	SOLIDS	2.07E-04	8.64E-04	3.49E-04	1.49E-04	6.75E-04	2.08E-04
2,4'-DDT	DISS		3.63E-04	4.34E-04		6.87E-05	9.35E-06
2,4'-DDT	SOLIDS	1.43E-04	3.61E-04	7.06E-04	7.13E-05	8.68E-05	2.23E-05
4,4'-DDD	DISS	3.82E-04	5.18E-03	2.14E-03	2.12E-03	3.83E-03	6.60E-04
4,4'-DDD	SOLIDS	1.88E-03	5.03E-03	3.07E-03	2.50E-03	1.50E-03	1.65E-03
4,4'-DDE	DISS		7.27E-04	2.85E-04	2.81E-04	1.08E-03	1.16E-04
4,4'-DDE	SOLIDS	7.99E-04	1.99E-03	1.05E-03	5.73E-04	1.72E-03	5.03E-04
4,4'-DDT	DISS		3.50E-04	5.30E-04		1.01E-04	1.83E-05
4,4'-DDT	SOLIDS	2.26E-04	1.42E-03	2.13E-03	4.15E-04	6.77E-04	2.55E-04
Aldrin	SOLIDS		1.52E-06	2.81E-06		2.26E-06	1.14E-06
BHC, alpha	DISS	3.38E-04	7.42E-04	6.59E-04	3.87E-04	5.43E-04	2.81E-04
BHC, alpha	SOLIDS		4.84E-06	3.45E-06		4.19E-06	3.55E-06
BHC, beta	DISS	9.45E-05	1.60E-04	1.19E-04		3.32E-04	5.94E-05
BHC, beta	SOLIDS		3.61E-06	2.75E-06		2.29E-06	2.29E-06
BHC, gamma	DISS	2.42E-04	1.07E-03	6.34E-04		7.01E-04	1.75E-03
BHC, gamma	SOLIDS		3.80E-06	3.03E-06		2.31E-06	1.78E-05
Chlordane,alpha (cis)	DISS	7.14E-05	2.06E-04	2.24E-04	2.67E-04	2.54E-04	7.47E-05
Chlordane,alpha (cis)	SOLIDS	2.32E-04	8.93E-05	2.14E-04	1.04E-04	7.61E-05	1.33E-04
Chlordane,gamma (trans)	DISS	4.49E-05	1.48E-04	1.84E-04	2.48E-04	1.92E-04	4.86E-05
Chlordane,gamma (trans)	SOLIDS	2.15E-04	9.50E-05	2.19E-04	1.41E-04	7.68E-05	1.13E-04
Chlordane,oxy-	DISS	1.80E-05		2.38E-05	2.43E-04	2.02E-05	3.55E-05
Chlordane,oxy-	SOLIDS			4.86E-06		3.24E-06	1.07E-05
Dieldrin	DISS	1.58E-04	3.54E-04	2.66E-04	4.25E-04	4.27E-04	1.85E-04
Dieldrin	SOLIDS	6.97E-05	2.85E-05	4.19E-05	4.67E-05	3.44E-05	7.00E-05

TABLE 3 (CONTINUED)
PESTICIDES IN WATER COLUMN AT STATIONS IN ARTHUR KILL

Parameter	Sampling Location:	Mill Creek at Arthur Kill Rd	Northern Arthur Kill	Northern Arthur Kill	Northern Arthur Kill	Northern Arthur Kill	Southern Arthur Kill
	Day of Measurement:	4/26/2001	11/17/1998	2/17/1999	4/18/2000	7/8/1999	2/22/2003
Endosulfan sulfate	DISS	9.60E-05	5.30E-05	6.16E-05	1.90E-04	7.94E-05	
Endosulfan sulfate	SOLIDS		1.80E-06	2.48E-06		1.55E-06	
Endosulfan, alpha	SOLIDS			6.99E-06			
Endosulfan, beta	DISS			1.80E-05			
Endosulfan, beta	SOLIDS						
Endrin	SOLIDS		1.52E-06	1.18E-06			
Endrin aldehyde	SOLIDS						
Endrin ketone	DISS	3.13E-05	5.71E-06	2.27E-05		9.68E-06	1.98E-05
Endrin ketone	SOLIDS		1.14E-07	1.21E-06		6.81E-07	
Heptachlor	DISS	9.28E-06	1.99E-05	3.63E-05		2.19E-06	1.28E-06
Heptachlor	SOLIDS		2.09E-06	6.83E-06		6.97E-07	2.84E-06
Heptachlor epoxide	DISS	1.06E-04	8.50E-05	1.74E-04	1.38E-04	9.63E-05	7.95E-05
Heptachlor epoxide	SOLIDS	2.09E-05	2.75E-06	1.55E-05		5.15E-06	1.41E-05
Hexachlorobenzene	DISS	4.41E-05	9.12E-05	6.87E-05		1.94E-04	3.07E-05
Hexachlorobenzene	SOLIDS	4.41E-05	4.46E-05	2.97E-05		5.24E-05	2.31E-05
Methoxychlor	DISS		6.52E-05	4.29E-05		4.49E-05	1.52E-05
Methoxychlor	SOLIDS		5.41E-05	1.71E-05		4.88E-05	
Mirex	DISS		1.73E-06			2.36E-07	
Mirex	SOLIDS	3.04E-06	1.23E-06	1.52E-06		1.92E-06	2.52E-06

Source: CARP, 2003.

TABLE 4
ERL AND ERM LIMITS FOR METALS IN SEDIMENTS

Metal	ERL*	ERM*
Antimony (Sb)	2	25
Arsenic (As)	8.2	70
Cadmium (Cd)	1.2	9.6
Chromium (Cr)	81	370
Copper (Cu)	34	270
Lead (Pb)	47	220
Mercury (Hg)	0.15	0.71
Nickel (Ni)	21	52
Silver (Ag)	1	3.7
Zinc (Zn)	150	410

* units are µg/g dry sediment, equivalent to ppm
Source: NJDEP Guidance for Sediment Quality Evaluation, (November 1998).
EPA REMAP (December 2003).

TABLE 5
ERL AND ERM VALUES FOR ORGANIC CONTAMINANTS IN SEDIMENTS

Analyte	ERL*	ERM*
Polycyclic Aromatic Hydrocarbons (PAHs)		
Acenaphthene	16	500
Acenaphthylene	44	640
Anthracene	85.3	1100
Fluorene	19	540
2-Methyl Napthalene	70	670
Napthalene	160	2100
Phenanthrene	240	1500
Benz(a)anthracene	261	1600
Benzo(a)pyrene	430	1600
Chrysene	384	2800
Dibenzo(a,h)anthracene	63.4	260
Fluoranthene	600	5100
Pyrene	665	2600
Total PAH	4022	44792
Pesticides and PCBs		
p,p'-DDE	2.2	27
Total DDT	1.6	46
Total PCBs	23	180
Other Pesticides		
Chlordane	0.5	6
Dieldrin	0.02	8
Endrin	0.02	45

* units are ng/g dry sediment, equivalent to ppb

Source: NOAA (1998)

TABLE 6
METAL CONCENTRATIONS IN SEDIMENT AT STATIONS IN ARTHUR KILL

Station	Sampling Date	Metals (ppm)								
		Silver	Arsenic	Cadmium	Chromium	Mercury	Nickel	Lead	Antimony	Zinc
NB203	16-Jul-98	2.15	24.5	1.66	90.2	2.98	29.3	166	3.38	239
NB204	16-Jul-98	2.55	16.9	1.84	91.9	2.4	36.9	132	2.12	274
NB208	13-Aug-98	1.57	11.6	0.777	95.1	1.05	37.8	76.2	1.26	196
NB209	14-Aug-98	3.63	24.3	2.57	149	4.13	46	177	3.65	380
NB210	18-Jul-98	1.73	14.3	1.34	83	2.97	26.5	92.9	2.88	167
NB211	17-Aug-98	2.52	16	4.14	155	5.21	70.4	187	2.01	376
NB213	15-Aug-98	4.3	13.1	2.26	182	3.37	51.8	206	2.41	550
NB214	18-Jul-98	1.19	11.4	1.06	57.8	1.49	22.2	70.6	1.41	155
NB219	18-Jul-98	4.46	33	5	145	5.66	41.8	315	8.52	387
NB224	16-Jul-98	2.77	13.2	2.2	97.4	4.49	32.1	133	2.27	252
NB229	14-Aug-98	1.76	12.8	1.08	104	1.02	39	173	2.58	386
NB230	21-Aug-98	1.05	11.6	0.901	85.4	0.66	27	106	1.22	158

Source: USEPA REMAP (2003)

TABLE 7
TOXIC ORGANIC CHEMICAL CONCENTRATIONS IN SEDIMENT AT ARTHUR KILL (PPB)

Stations	NB203	NB204	NB208	NB209	NB210	NB211	NB213	NB214	NB219	NB224	NB229	NB230
Sampling Date	**7/16/98**	**7/16/98**	**8/13/98**	**8/14/98**	**7/18/98**	**8/17/98**	**8/15/98**	**7/18/98**	**7/18/98**	**7/16/98**	**8/14/98**	**8/21/98**
HEXACHLOROBENZENE	0	0	0	0	0	0	0	0	0.9	0	0	0
ACENAPHTHENE	67	0	0	0	0	150	0	0	59	0	0	0
ACENAPHTHYLENE	260	91	0	0	0	230	0	67	140	110	57	0
ALDRIN	0	0	0	0	0	0	0	0	0	0	0	0
ALPHA-BHC	1	0	0	0	0	1.9	0	0.7	1.6	1.4	0	0
ALPHA CHLORDANE	0	0	0	0	0	0	0	0	0	0	0	0
ANTHRACENE	350	130	56	120	79	660	68	110	300	190	160	0
BENZ(A)ANTHRACENE	820	320	100	210	93	890	170	210	490	360	240	0
BENZO(A)PYRENE	1000	490	140	310	130	1100	200	350	620	500	270	56
BENZO(E)PYRENE	290	200	99	110	67	300	58	130	270	230	100	0
BENZO(B)FLUORANTHENE	1100	640	180	390	170	1300	260	410	810	720	320	77
BENZO(K)FLUORANTHENE	450	190	63	130	47	390	77	140	240	220	130	0
BENZO(G,H,I)PERYLENE	0	0	0	160	97	0	130	220	500	0	120	34
BETA-BHC	0	0	0	0	0	0	0	0	0	0	0	0
BIPHENYL	40	17	0	0	0	45	0	0	44	30	0	0
CHRYSENE	880	410	130	260	92	1000	210	250	580	430	240	0
CIS-NONACHLOR	0	0	0	0	0	0	0	0	0	0	0	0
DELTA-BHC	0	0	0	0	0	0	0	0	0	0	0	0
DIBENZO(A,H)ANTHRACENE	0	0	0	0	0	0	0	0	0	0	0	0
DIELDRIN	0	0	0	0	0	0	0	1.3	0	2.1	0	0
2,6-DIMETHYLNAPHTHALENE	180	100	0	0	40	270	0	67	240	120	36	0
ENDOSULFAN I	0	0	0	0	0	0	0	0	0	0	0	0
ENDRIN	0	0	0	0	0	0	0	0	0	0	0	0
FLUORANTHENE	1300	490	240	570	150	2100	350	340	980	650	550	37

TABLE 7 (CONTINUED)
TOXIC ORGANIC CHEMICAL CONCENTRATIONS IN SEDIMENT AT ARTHUR KILL (PPB)

Stations	NB203	NB204	NB208	NB209	NB210	NB211	NB213	NB214	NB219	NB224	NB229	NB230
Sampling Date	7/16/98	7/16/98	8/13/98	8/14/98	7/18/98	8/17/98	8/15/98	7/18/98	7/18/98	7/16/98	8/14/98	8/21/98
FLUORENE	0	0	0	0	0	0	0	0	0	0	0	0
GAMMA CHLORDANE	3.9	0	0	0	0	0	0	0	0	0	0	0
HEPTACHLOR	0	0	0	0	0	0	0	0	0	0	0	0
HEPTACHLOR EPOXIDE	0	0	0	0	0	0	0	0	0	0	0	0
INDENO(1,2,3-C,D)PYRENE	0	0	0	180	96	0	130	0	0	0	150	36
GAMMA-BHC	0	0	0	0	0	0	0	0	0	0	0	0
1-METHYLNAPTHALENE	70	28	0	0	0	84	0	33	54	43	0	0
2-METHYLNAPHTHALENE	140	57	0	36	0	150	0	49	120	83	0	0
1-METHYLPHENANTHRENE	0	0	0	0	0	0	0	0	0	0	0	0
MIREX	0	0	0	0	0.9	0	0	0	5.3	0	0	0
METHOXYCHLOR	0	0	0	0	0	0	0	0	0	0	0	0
NAPHTHALENE	180	93	0	53	0	230	58	76	210	140	0	0
O,P'-DDD	0	0	0	0	0	0	0	0	0	91.2	0	0
O,P'-DDE	30.8	18.2	0	18.7	8.7	51.8	0	12.4	0	50.6	0	0
O,P'-DDT	0	0	0	0	0	0	0	0	0	189.8	0	0
OXYCHLORDANE	0	0	0	0	0	0	0	0	0	0	0	0
PERYLENE	114	75.8	15.7	41.5	11.2	100.1	11.2	72.6	28.2	326.7	0	4.3
PHENANTHRENE	49.1	28	0	25.6	9.8	73.6	6.5	19.7	36.9	130.1	0	2.3
P,P'-DDD	359.5	315.3	13.2	59.3	44	551.9	5.7	573.5	46.5	2019	0	3.7
P,P'-DDE	670	320	96	220	90	630	130	220	460	370	150	36
P,P'-DDT	380	220	98	200	64	1100	170	180	280	230	330	0
PYRENE	1500	530	200	490	200	1900	330	420	1200	760	470	64
TRANS-NONACHLOR	0	0	0	0	0	0	0	0	0	0	0	0

TABLE 7 (CONTINUED)
TOXIC ORGANIC CHEMICAL CONCENTRATIONS IN SEDIMENT AT ARTHUR KILL (PPB)

Stations	NB203	NB204	NB208	NB209	NB210	NB211	NB213	NB214	NB219	NB224	NB229	NB230
Sampling Date	7/16/98	7/16/98	8/13/98	8/14/98	7/18/98	8/17/98	8/15/98	7/18/98	7/18/98	7/16/98	8/14/98	8/21/98
2,3,5-TRIMETHYLNAPHTHALENE	0	0	0	0	0	0	0	0	0	0	0	0
1,2,3,4,7,8-HXCDD	2.52	0	0	13.14	0.95	3.18	–	1.24	0	0	1.83	0.31
1,2,3,4,7,8-HXCDF	19.06	18.48	6.74	41.59	10.94	25.85	–	12.01	15.25	15.02	4.12	1.42
1,2,3,6,7,8-HXCDD	10.16	9.69	6.18	36.23	0.89	15.21	–	5.8	0	5.7	6.3	0.23
1,2,3,6,7,8-HXCDF	9.21	9.78	3.41	23.88	5.68	12.62	–	6.3	9.1	5.66	2.19	0.76
1,2,3,7,8,9-HXCDD	0	0	3.83	23.93	5.19	8.48	–	0	0	3.18	3.79	0.5
1,2,3,7,8,9-HXCDF	0	0	0	10.8	0	5.14	–	0	0	0	1.3	0.33
1,2,3,4,6,7,8-HPCDD	156.7	159.8	83.14	419.5	78.94	281.8	–	92.29	70.37	65.73	68.75	19.99
1,2,3,4,6,7,8-HPCDF	96.88	103	33.2	254.3	50.95	149	–	59.41	61.87	47.74	22.49	8.24
1,2,3,7,8-PECDD	2.79	0	0	10.41	0	0	–	1.2	0	0	0	0.16
1,2,3,7,8-PECDF	7.03	0	3.83	18.16	4.04	9.99	–	5.52	0	8.42	2.14	0.67
1,2,3,4,7,8,9-HPCDF	7.92	9.62	2.78	20.41	6	11.24	–	0	8.49	7.07	1.93	0.85
2,3,4,6,7,8-HXCDF	10.92	10.57	4.4	28.57	5.97	12.4	–	7.64	10.54	5.12	2.88	1.07
2,3,4,7,8-PECDF	5.98	8.9	4.17	33.15	6.11	22.68	–	0	0	0	2.8	1.06
OCDD	2501	2246	1188	5735	1233	2738	–	1182	785.2	739	851.2	349.4
OCDF	196.1	190.8	65.98	437.2	97.38	294.8	–	106.3	141	108.6	27.49	15.58
2,3,7,8-TCDD	13.33	12.73	0	66.2	9.75	29.4	–	5.87	3.49	6.82	0	0.66
2,3,7,8-TCDF	12.42	0	7.91	30.67	8.24	17.94	–	9.79	9.28	27.01	5.48	1.76

Source: USEPA REMAP (2003).

TABLE 8
METAL CONCENTRATIONS (µg/g OF DRY WEIGHT) IN ARTHUR KILL SEDIMENTS

PARAMETER	Arthur Kill Ambient Station 7	Arthur Kill at end of Pralls Island	Arthur Kill below Outer Bridge	Arthur Kill between Morses Cr. And Piles Cr.	Arthur Kill East Jersey and Front St Stormwater Overflow	Arthur Kill near Isle of Meadow's	Arthur Kill near mouth of Rahway River	Arthur Kill near Tuft's Point	Arthur Kill near West Charleston, Staten Is.	Arthur Kill near Woodbridge Creek outlet
Aluminum	15300	13200	15000	15800	13600	5180	16500	4310	9850	8510
Antimony	1.2	2.6	1.4	1.1	8	0.58	1.8	1	2	0.75
Arsenic	117	26.9	27.9	23.4	72.6	8	25.7	10.9	33.8	13.7
Barium	827	287	103	390	762	70.4	238	38.3	122	46.7
Beryllium	1.3	0.76	0.91	0.95	0.93	0.37	0.88	0.34	0.63	0.65
Cadmium	3.8	5.4	2.2	2.5	14.8	0.69	3.1	0.6	2.7	0.98
Calcium	6220	3830	11200	10200	4860	2700	14300	1980	10800	9710
Chromium	176	142	88.5	125	349	31.5	111	24.5	96.8	35.6
Cobalt	13.8	9.4	9.7	12.8	16.1	4.8	11.1	4.4	7.7	8.9
Copper	600	360	208	287	959	84.4	264	99.8	250	157
Iron	40500	29400	34300	38100	34000	12600	33100	11900	25000	21200
Lead	951	212	153	230	476	51.1	191	34.8	134	76.1
Magnesium	7690	6490	7340	10000	7770	2700	8200	2050	4950	4760
Manganese	375	299	328	503	288	141	352	75.3	189	201
Mercury	3.60	8.93	2.81	4.60	24.09	1.02	6.23	0.68	1.59	0.66
Methylmercury	12.9	7.13	2.12	5.75	0.452	1.38	4.1	0.45	0.49	0.75
Nickel	58.9	37.5	32.4	50.1	60.7	12.8	42.3	13.6	33.6	42.5
Potassium	3560	3160	3760	4120	3000	1580	3850	1170	2570	2070
Selenium	14.2	2.6	1.9	2.3	8.62	1.2	2	1	3	1.5
Silver	3.2	5.5	3	4.9	8.7	0.89	3.3	0.7	2.3	1.1
Sodium	11300	7910	10700	12100	13000	3520	11500	2300	8100	6920
Thallium	1.9	1.3	1.6	2	9.11	0.99	1.5	0.85	1.3	1.3
Vanadium	47.2	45.7	46.4	57.6	62.4	18.2	49.3	14.7	40.8	28.1
Zinc	724	378	308	381	725	109	387	88	261	177

Source: Contaminant Assessment and Reduction Project (CARP).

TABLE 9
PCB CONCENTRATIONS (µg/g OF DRY WEIGHT, EQUIVALENT TO PPB) BY HOMOLOGUE AND TOTAL IN ARTHUR KILL SEDIMENTS

Stations in Arthur Kill	Homologue										TOTAL
	mono	di	tri	tetra	penta	hexa	hepta	octa	nona	deca	
Arthur Kill Ambient Station 7	1.5	19.5	85.1	164.3	138.9	117.9	76.8	22.6	5.6	3.7	636.0
Arthur Kill at end of Pralls Island	3.1	64.2	224.3	509.6	376.3	277.1	154.8	45.5	10.9	8.7	1674.5
Arthur Kill below Outer Bridge	1.5	30.5	91.3	169.7	118.8	89.2	49.7	14.7	4.2	2.7	572.3
Arthur Kill between Morses Cr. And Piles Cr.	2.6	31.3	103.6	227.4	193.3	167.5	92.1	28.2	6.8	5.3	858.1
Arthur Kill East Jersey and Front St Stormwater OV	4.9	122.2	496.2	1300.5	726.7	560.5	285.5	97.9	23.2	14.0	3631.6
Arthur Kill near Isle of Meadow's	0.3	3.8	14.8	34.1	27.6	25.5	15.6	4.9	0.9	0.6	128.2
Arthur Kill near mouth of Rahway River	1.1	17.2	83.8	235.0	230.7	183.6	100.1	32.7	6.0	3.9	894.0
Arthur Kill near Tuft's Point	0.3	3.5	12.3	26.8	21.4	17.4	10.3	3.0	0.7	0.4	96.1
Arthur Kill near West Charleston, Staten Is.	0.8	28.5	143.5	309.6	174.3	100.4	45.4	13.8	3.2	2.7	822.2
Arthur Kill near Woodbridge Creek outlet	0.7	19.6	143.1	545.6	386.1	151.8	39.8	9.9	2.1	1.3	1300.2

Note: See Figure 4.12-5 for station locations.
Source: Contaminant Assessment and Reduction Project (CARP), 2003.

TABLE 10
PAHS/PESTICIDES CONCENTRATIONS (ng/g OF DRY WEIGHT, EQUIVALENT TO PPB) IN ARTHUR KILL SEDIMENTS

Parameter	Station Name									
	Arthur Kill Ambient Station 7	Arthur Kill at end of Pralls Island	Arthur Kill below Outer Bridge	Arthur Kill between Morses Cr. and Piles Cr.	Arthur Kill East Jersey and Front St Stormwater Overflow	Arthur Kill near Isle of Meadow's	Arthur Kill near mouth of Rahway River	Arthur Kill near Tuft's Point	Arthur Kill near West Charleston, Staten Is.	Arthur Kill near Woodbridge Creek outlet
PAHs										
Acenaphthene	49	61	22	89	270	12	47	15	18	190
Acenaphthylene	200	125	46	110	68	17	59	23	33	26
Anthracene	310	305	100	490	2200	58	250	79	150	1300
Fluorene	56	83	38	120	430	15	71	27	30	300
2-Methylnaphthalene	150	250	73	220		34	110	36	67	180
Naphthalene	290	430	180	430	580	86	210	140	130	160
Phenanthrene	290	565	270	1000	960	130	530	98	150	3200
Benz[a]anthracene	590	915	360	1100	1800	150	620	130	270	3000
Benzo[a]pyrene	830	430	470	1100	1700	170	670	170	280	1800
Chrysene	830	690	320	1100	2600	150	610	100	240	3100
Dibenz[a,h]anthracene	140	165	62	120	260	21	79	19	39	230
Fluoranthene	1200	1950	570	2200	4100	280	1300	210	340	11000
Pyrene	1800	2250	700	2200	5200	330	1400	280	690	9100
Pesticides										
2,4'-DDD	100	86	6.9	120	190	19	53	10	11	82
2,4'-DDE	56	57	7.5	43	610	7.7	20	6	24	9.4
2,4'-DDT	9.1	2.25	3.7	31	0.0029	8.1	11	3.2	0.76	0.24
4,4'-DDD	610	310	23	950	370	530	140	54	49	310
4,4'-DDE	140	150	19	110	890	25	56	29	60	53
4,4'-DDT	1400	159	9.9	1400	7	910	80	250	11	13
Aldrin	0.1	0.625	0.31	0.2	0.048	1.6	0.34	0.42	2.2	2.8
BHC, alpha	0.86	0.27	0.062	1	1.5	0.048	0.11	0.037	0.078	0.027
BHC, beta	0.32	0.15	0.029	0.28	0.0029	0.073	0.073	0.021	0.051	0.037

TABLE 10 (CONTINUED)
PAHS/PESTICIDES CONCENTRATIONS (ng/g OF DRY WEIGHT, EQUIVALENT TO PPB) IN ARTHUR KILL SEDIMENTS

Parameter	Station Name									
	Arthur Kill Ambient Station 7	Arthur Kill at end of Pralls Island	Arthur Kill below Outer Bridge	Arthur Kill between Morses Cr. and Piles Cr.	Arthur Kill East Jersey and Front St Stormwater Overflow	Arthur Kill near Isle of Meadow's	Arthur Kill near mouth of Rahway River	Arthur Kill near Tuft's Point	Arthur Kill near West Charleston, Staten Is.	Arthur Kill near Woodbridge Creek outlet
BHC, gamma	0.16	0.08	0.022	0.17	0.67	0.083	0.036	0.012	0.03	0.034
Chlordane,alpha (cis)	8.6	12.2	0.57	5.2	23	1.5	7.1	0.64	1.4	3.9
Chlordane,gamma (trans)	10	15.6	1.2	6.2	36	1.6	8.9	0.85	3.4	3.8
Chlordane,oxy-	0.1	0.054	0.032	0.036	0.22	0.2	0.075	0.028	0.009	0.061
Dieldrin	4.7	4.4	0.47	1.5	14	1	2.2	0.36	3.4	4.4
Endosulfan sulfate	0.1	0.078	0.015	0.03	2.9	0.11	0.019	0.019	0.011	0.068
Endosulfan, alpha	0.1	0.435	0.18	0.6	2.9	0.57	0.4	0.18	0.64	0.64
Endosulfan, beta	0.1	0.945	0.26	0.23	2.9	0.64	0.33	0.16	0.35	0.45
Endrin	0.1	0.56	0.23	0.17	2.9	0.56	0.08	0.06	0.067	0.2
Endrin aldehyde	0.1	0.29	0.076	0.081	2.9	0.38	0.092	0.046	0.068	0.28
Endrin ketone	0.1	0.36	0.33	0.12	2.9	0.25	0.095	0.09	0.049	0.087
Heptachlor	0.1	0.0475		0.036	0.0029	0.058	0.037	0.018	0.037	0.17
Heptachlor epoxide	0.32	0.178	0.022	0.17	2.9	0.045	0.3	0.022	0.025	0.17
Hexachlorobenzene	15	5.25	0.53	1.7	78	0.93	2.1	1.1	2.1	1.4
Methoxychlor	2.1	2.9	1.2	5.4	2.3	1.5	1.5	0.69	1.4	24
Mirex	0.1	0.175	0.039	0.085	0.0029	0.034	0.051	0.11	0.74	0.032
Nonachlor, cis-	1.3	4.1	0.65	1.5	8.2	1.2	2	0.33	2.3	1.1
Nonachlor, trans-	4.6	8.3	0.67	4.9	14	2.1	5.3	0.49	1	2.3

Source: Contaminant Assessment and Reduction Project (CARP)

TABLE 11
DIOXIN/FURAN CONCENTRATIONS (pg/g OF DRY WEIGHT, TEQ) IN ARTHUR KILL SEDIMENTS

PARAMETER	Arthur Kill Ambient Station 7	Arthur Kill below Outer Bridge	Arthur Kill between Morses Cr. and Piles Cr.	Arthur Kill East Jersey and Front Street Stormwater Overflow	Arthur Kill near Isle of Meadow's	Arthur Kill near mouth of Rahway River	Arthur Kill near Tuft's Point	Arthur Kill near West Charleston, Staten Is.	Arthur Kill near Woodbridge Creek outlet
2,3,7,8-TCDD	13.0	14.0	39.0	144.0	3.0	16.0	2.9	18.0	4.3
1,2,3,7,8-PeCDD	1.0	2.9	3.2	11.7	1.6	1.5	0.4	2.1	1.5
1,2,3,4,7,8-HxCDD	0.2	0.7	0.8	2.7	0.5	0.4	0.1	0.4	0.2
1,2,3,6,7,8-HxCDD	1.0	2.3	2.7	13.6	0.3	1.5	0.4	2.8	1.0
1,2,3,7,8,9-HxCDD	1.0	2.0	2.2	9.4	0.3	1.1	0.3	1.8	0.8
1,2,3,4,6,7,8-HpCDD	3.1	3.8	4.9	24.6	0.7	2.9	0.5	2.2	1.4
OCDD	4.7	4.4	5.7	26.8	1.1	3.6	0.7	2.3	2.1
2,3,7,8-TCDF	1.8	3.4	4.6	23.5	0.7	3.0	1.1	2.3	2.7
1,2,3,7,8-PeCDF	0.4	0.9	0.6	3.5	0.1	0.6	0.1	0.8	0.2
2,3,4,7,8-PeCDF	5.0	10.0	9.0	43.2	1.5	6.0	1.9	9.0	5.5
1,2,3,4,7,8-HxCDF	3.3	6.0	6.2	27.0	0.9	4.1	1.1	5.9	2.6
1,2,3,6,7,8-HxCDF	1.1	2.3	2.1	13.0	0.3	1.1	0.4	2.1	0.9
1,2,3,7,8,9-HxCDF	0.1	0.2	0.5	1.4	0.4	0.3	0.1	0.2	0.2
2,3,4,6,7,8-HxCDF	1.1	1.8	2.1	9.5	0.2	1.2	0.5	1.7	0.7
1,2,3,4,6,7,8-HpCDF	1.2	2.2	2.5	17.2	0.3	1.5	0.4	1.7	0.6
1,2,3,4,7,8,9-HpCDF	0.1	0.2	0.2	1.7	0.0	0.1	0.0	0.2	0.1
OCDF	0.3	0.3	0.4	2.3	0.0	0.2	0.1	0.2	0.1
Dioxin/Furan (pg/g dry weight, TEQ)	38.4	57.3	86.6	375.0	12.1	45.0	10.9	53.8	24.6

Source: Contaminant Assessment and Reduction Project (CARP), 2003.