Appendix B
Summary of 2008 Background Investigation

Background Study of Soil

In September 2008 the USACE-Baltimore Field Team conducted a background study of concentrations of metals and polynuclear aromatic hydrocarbons (PAH) in soil outside the boundaries of the site (Fort Totten Coast Guard Station Formerly Used Defense Site). The background study considered whether the PAHs and metals in the soil at the site differ from selected background locations, and to establish baseline concentrations of metals and PAHs in the soil in the area surrounding the site. The site has a long history within a major metropolitan area, resulting in soils that contain old fill materials. The earliest reported land use at this location was by Native Americans, with subsequent recorded history beginning in 1639. The land underlying the site was filled over the course of many years prior to military occupation to create land formerly known as Thorne Neck, Wilkins Neck, and Willets Point. Of primary interest for this study are patterns of contamination that may be attributed to military disposal or releases and thus may be eligible for restoration, versus the presence of urban fill used over hundreds of years that may not be eligible or appropriate for restoration. Although recent and repeated miscellaneous dumping is apparent at Area 1 and there was a release of mercury in Area 5, the general presence of metals and PAHs found in the soil at the site is evidently not a result of discernible disposal activities or releases, as discussed below.

PAHs and metals are released to the environment during incomplete combustion of organic material including wood, coal, petroleum, garbage, and also are associated with human activities such as cooking and heating. Industrial and vehicle fuel products containing crude oil, coal tar, creosote, and asphalt often contain PAHs, even prior to combustion. Today, we recognize that elevated levels of PAHs in the environment may come both anthropogenic events such as structure fires, or from more natural events such as forest fires. Materials containing PAHs and metals were used over time to fill the land surface in the course of developing the site. In urban settings such as Fort Totten, deposition of airborne particulates from historic and current urban activity continues to this day, resulting in ubiquitous, consistent, and elevated levels of PAHs and metals. Prior to recent environmental legislation efforts, emissions to the atmosphere were unregulated, and fill materials were used that contained contaminants that would not be acceptable today as clean fill. Such dirty fill has for many years been an artifact of industrialization in older populated areas such as New York City.

The background study derived threshold concentrations of PAH and metal in the soils near the site to compare with soil samples of the site. Comparisons of concentrations along with site observations were made of fill material containing coal, cinders, and other combustion byproducts of unknown origin. Also, hypothesis tests of site and background samples were conducted to help distinguish whether the central tendencies of concentrations in site soils differ from the background. Taken together, threshold values, hypothesis tests, and site observations were used to help determine if the site has been contaminated by military disposal activities as opposed to regional conditions and generalized historic filling practices that employed contaminated materials.

Sampling Activities for Soil

Fifteen background soil sample locations, all within a 0.5 mile radius of the site, were identified and sampled as part of the background study [Figure 2-6 of the Final RI work plan (Watermark, 2011)]. Two soil samples were collected by hand auger at each soil sample location: one from 0 to 3 inches below ground surface (bgs) and the other 18 to 24 inches bgs. Samples were collected in the city park near the site on 16-18 September 2008 from fill and non-fill areas. The sample locations were located adjacent to urban features (paved roads) and all sampling points were spaced at least 50 feet apart.

The USACE-Baltimore Field Team collected 30 primary samples, 3 duplicate and 3 quality assurance (QA) split samples for analysis of TAL metals and TCL SVOCs. The primary and duplicate samples were analyzed by GPL Laboratories, Frederick, MD. The QA split samples were analyzed by Analytical Laboratory Service, Inc. (ALSI), Middletown, PA. TAL metals are aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, selenium, silver, sodium, thallium, vanadium, and zinc. TCL SVOCs consisted of 65 semi-volatile organic compounds including PAHs. GPL used EPA Methods 6010B/7471A and 8270C-low detection limit to analyze TAL metals and TCL SVOCs, respectively. ALSI used EPA Methods 6010C/7471A and 8270D to analyze TAL metals and TCL SVOCs, respectively.

Appendix B
Summary of 2008 Background Investigation

The USACE Automatic Data Review (ADR) Program was used to assess the chemical data quality and analytical results for TAL metals and TCL SVOCs analysis by GPL and ALSI. To assess the data quality and QA/QC of the primary, duplicate and QA split samples, the ADR v8.2 software program was utilized. None of the data were rejected by data validation, thus all the sample results were used in the evaluation of background conditions.

Evaluation of Background Conditions for Soil

Table B-1 gives the maximum, minimum, mean, median, range, standard deviation, skewness, coefficient of variance, and 95% UTL (they were similar to the 95% UPL) of metals in the background soil study samples. In many cases, the number of samples was inadequate for statistics by ProUCL. For PAHs in the background, summary statistics are shown in Table B-2. Table B-3 shows the calculated background threshold values (BTV) for each analyte in both shallow and deep soil. The hypothesis test results are presented in Appendix M.

The validated background soil sample results were compiled into a single database, tabulated, and used as input data to the USEPA ProUCL program. The 95% Upper Tolerance Limit (95% UTL) and the 95% Upper Prediction Limit (95% UPL) were calculated for each of the analytes detected in the background samples. The 95% UTL was selected as the BTV. The 95% UTLs were calculated at a 95% confidence level and 90% coverage. This is a value below which at least 90 percent of samples from the background are expected to be less than or equal (with no inference about the remaining 10 percent of the samples) and 95 percent confidence. The UPL also was computed, representing the value of a predicted sample (in this case k=1, which is the number of future observations) falling within a distribution of values of the estimated sample interval. The UPL was predicted as a value that when repeated many times has at least a 95 percent chance of falling within the sample interval. Although the UPL can provide an additional point of comparison, and may more effectively control false positives, in this case the UPL did not alter the findings based on the UTL.

Conclusions for Soil

The fifteen available soil samples representing background are useable for statistical analysis. Because the site is built on very old fill containing coal and combustion byproducts and is located in a developed area near major roadways, the regional background concentrations of PAHs and metals around the site are expected to be elevated in comparison to a rural area. This was confirmed by visual observations at the site and the background study. The concentrations are elevated, highly variable, as expected based on observations, professional judgment, and experience at many urban sites. The analysis confirms that the PAHs and metals at the site are of generally poor quality, consisting of very old fill with heterogeneous fill materials and contaminants accumulated over a very long time. The fill at the site appears to be older and of lower quality than the nearby fill materials from the background near roadways. The urban soil and fill material at the site indicate a local baseline condition rather than a disposal area to be restored.

The RI report compares risk estimates for the background concentrations to soil samples collected at the site in order to estimate the incremental risk that represents excessive contamination over what is expected in the area surrounding the site. The incremental risk estimates are intended to support site decisions with respect to maintaining existing nonresidential land uses, or additional land use restrictions to protect human health.

Site-Wide Groundwater Characterization

There are five existing monitoring wells at the site; one in Area 2, one in Area 3, two in Area 4, and one in Area 5 [Figures 2-2 through 2-5 of the Final RI work plan (Watermark, 2011)]. A summary of the two previously conducted groundwater sampling rounds are presented in Table B-4. The groundwater samples collected from a few wells had low detections of VOCs and SVOCs, with the exception of MW-4, which has several PAH detections. There is a low but consistent level of metals in the groundwater, either dissolved or in sediments that did not precipitate before collection. There are no drinking water sources downgradient of, or at the site, and none are expected.

Organic chemicals do not generally impact the groundwater at the site, except for PAHs in MW-4. Drinking water analyses were used for samples containing PAHs, resulting in benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[ghi]perylene, benzo[k]fluoranthene, chrysene, fluoroanthene, and indeno[1,2,3-cd]pyrene exceeding NYSDEC guidance values. NYSDEC guidance values include the Technical and Operational Guidance for Ambient Water Quality (TOG Standards) and the NYSDEC 703.5 Groundwater Quality Standards. It should be pointed out that the standards for these chemicals are very stringent due to inherent toxicity when consumed as drinking water. The chemical properties of these semi-volatile chemicals (e.g., very low water solubility), however, make it unlikely that they are dissolved in the groundwater or any water likely to be used for consumption. It is more likely that the semivolatile chemicals in groundwater are attached to suspended particulate matter in the shallow groundwater.

Table B-1
Background Concentration Calculations for Metals in Soil
Supplemental Remedial Investigation #2
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

Analyte	Minimum	Maximum	Mean	Median	SD	Skewness	95% UTL w/ 90% Coverage (mg/kg)
Aluminum (dp)	8,900	21,300	13,318	12,600	3,954	0.66	16,830
Aluminum (sh)	2,280	15,500	7,880	7,335	2,904	0.866	13,200
Antimony (dp)	0.07	8.9	1.752	0.55	2.925	1.968	0.654
Antimony (sh)	0.23	6.3	0.823	0.59	0.934	3.994	1.684
Arsenic (dp)	2.1	10	4.94	3.9	2.982	0.769	7.599
Arsenic (sh)	2.6	19.2	5.853	5.3	2.722	2.155	10.73
Barium (dp)	25	358	131.3	73	124.1	1.333	160.1
Barium (sh)	36.1	449	101.8	83.55	71.45	2.426	113.7
Beryllium (dp)	0.053	0.657	0.2	0.155	0.159	2.453	0.749
Beryllium (sh)	0.046	0.78	0.289	0.275	0.127	0.886	0.62
Cadmium (dp)	0.047	1.48	0.489	0.13	0.549	0.94	0.77
Cadmium (sh)	0.02	2.6	0.582	0.37	0.54	1.948	2.5
Calcium (dp)	314	14,100	4,090	2,380	4,753	1.439	16,223
Calcium (sh)	290	29,700	4,528	2,590	5,316	2.723	12,100
Cobalt (dp)	6.4	12	8.589	8.46	1.699	0.678	12.2
Cobalt (sh)	3.1	35.5	6.054	5.45	3.722	6.759	9.122
Copper (dp)	9.6	2,470	253.7	29	671	3.512	67.33
Copper (sh)	14.5	346	59.31	36.85	68.06	3.045	84.44
Chromium (dp)	16	33.5	24.5	24	6.819	0.113	29.58
Chromium (sh)	4.9	32	18.65	18.3	4.948	0.551	32.76
Iron (dp)	16,200	34,100	24,015	22,100	6,357	0.225	23,254
Iron (sh)	5,790	34,800	15,757	14,700	4,863	1.606	23,696
Lead (dp)	8.6	1060	262.5	139	353.8	1.42	448.9
Lead (sh)	45	1540	296.4	190	274.8	2.377	523
Magnesium (dp)	2,465	7,620	4,233	3,680	1,722	0.853	4,433
Magnesium (sh)	485	14,000	2,839	2,355	1,998	4.211	4,802
Manganese (dp)	198	485	335.1	339	87.72	0.221	586.4
Manganese (sh)	46.6	618	297.8	295.5	107.9	0.798	626.7
Mercury (dp)	0.021	2.7	0.588	0.285	0.763	2.144	2.26
Mercury (sh)	0.08	5	0.831	0.53	1.007	2.736	1.2
Nickel (dp)	13	24	18.69	19	3.66	-0.0105	96.41
Nickel (sh)	7	27.1	16.34	16.2	3.762	0.588	33.68
Potassium (dp)	626	3,330	1,279	1060	700.8	2.283	2,194
Potassium (sh)	340	1,580	938.6	940.5	278.2	-0.226	1,286
Selenium (dp)	0.094	0.86	0.41	0.38	0.26	0.7	0.439
Selenium (sh)	0.18	1.7	0.659	0.595	0.275	1.32	--
Silver (dp)	0.39	0.39	0.39	0.39	N/A	N/A	0.211
Silver (sh)	0.2	2.4	0.826	0.615	0.728	1.67	--
Sodium (dp)	32	229	124.1	119	71.25	0.152	277.2
Sodium (sh)	38	404	150.3	148	55.22	1.382	250
Thallium (dp)	0.092	2.76	0.352	0.14	0.725	3.585	0.892
Thallium (sh)	0.012	2.9	0.322	0.16	0.689	3.975	--
Vanadium (dp)	21	40	28.72	29	6.062	0.549	37.44
Vanadium (sh)	11	47.7	26.79	26.35	6.478	0.689	55.95
Zinc (dp)	29	539	178	71	186.4	1.133	308.4
Zinc (sh)	43	581	173.5	132	130.9	1.751	289.4

Notes:
dp - deep - represents soil collect from 18 to 24 inches below the ground surface
sh - shallow - represents soil collected from 0 to 3 inches below the ground surface
mg/kg - miligram per kilogram SD - standard deviation
N/A - not available UTL - upper tolerance limit

Table B-2
Background Concentration Calculations for PAHs in Soil
Supplemental Remedial Investigation #2
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

Variable	Minimum	Maximum	Mean	Median	SD	Skewness	95% UTL with 90% Coverage (ug/kg)
2-Methylnaphthalene (dp)	2.4	21	8.28	6.2	7.492	1.714	14.23
2-Methylnaphthalene (sh)	2.8	22	8.089	4.1	7.665	1.561	--
Acenaphthene (dp)	1.6	84	23.54	13	29.87	1.745	54.48
Acenaphthene (sh)	1.6	84	13.7	4.9	20.98	2.702	84
Acenaphthylene (dp)	1.2	25	7.356	5.5	7.141	2.23	28.74
Acenaphthylene (sh)	2.4	29	9.006	7.8	6.363	2.037	27.67
Anthracene (dp)	1.5	190	38.46	7.35	65.11	1.966	401.5
Anthracene (sh)	3.6	160	32.49	13	42.24	2.176	151.5
Benzo(a)anthracene (dp)	2.2	590	105.6	26.5	181	2.155	917.7
Benzo(a)anthracene (sh)	35	590	152.5	100	139.4	2.238	503.4
Benzo(a)pyrene (dp)	2.2	510	86.86	28.5	143.3	2.335	720
Benzo(a)pyrene (sh)	34	350	137.8	120	92.86	1.211	427.7
Benzo(b)fluoranthene (dp)	4	740	128.5	39.5	217.5	2.282	944.3
Benzo(b)fluoranthene (sh)	51	580	232.1	180	160.7	1.202	739.3
Benzo(g,h,i)perylene (dp)	7.4	270	61.58	25	81.68	1.863	201.5
Benzo(g,h,i)perylene (sh)	24	190	80.76	63	51.04	1.124	232.4
Benzo(k)fluoranthene (dp)	2.2	120	35.61	13	41.5	1.242	320.4
Benzo(k)fluoranthene (sh)	15	120	54.88	42	33.88	0.834	165.5
bis(2-ethylhexyl) phthalate (dp)	11	85	30.75	24.5	20.2	1.531	86.9
bis(2-ethylhexyl) phthalate (sh)	46	610	151.7	94	158.7	2.436	610
Butylbenzyl Phthalate (dp)	8.6	52	21.36	17	17.82	1.826	34.33
Butylbenzyl Phthalate (sh)	9.2	360	62.35	25	97.13	2.653	235.9
Carbazole (dp)	6.6	100	39.52	16	39.46	1.132	66.49
Carbazole (sh)	5.6	100	21.19	12	24.73	2.836	--
Chrysene (dp)	1.9	640	94.48	26.5	176.7	2.598	781.2
Chrysene (sh)	33	410	131.4	100	95.34	1.724	415.5
Dibenzo(a,h)Anthracene (dp)	4.1	52	19.76	10.2	18.66	0.98	41.65
Dibenzo(a,h)Anthracene (sh)	4.4	42	18.17	14	11.37	1.13	39.04
di-n-Butyl Phthalate (dp)	3.6	14	6.21	5.65	3.07	2.091	10.57
di-n-Butyl Phthalate (sh)	4.4	130	21.29	10	30.65	3.352	83.13
Fluoranthene (dp)	2.6	980	159.7	41	280.7	2.354	1462
Fluoranthene (sh)	60	700	219.9	150	175.1	1.6	704.1
Fluorene (dp)	1.6	99	27.66	13	36.21	1.643	65.18
Fluorene (sh)	1.6	99	14.24	5.6	23.9	3.14	64.18
Indeno(1,2,3-cd)pyrene (dp)	2	170	41.29	12	57.73	1.755	344.6
Indeno(1,2,3-cd)pyrene (sh)	20	170	64.76	52	40.5	1.363	182.4
Naphthalene (dp)	1.2	29	8.3	3.5	10.15	1.795	19.36
Naphthalene (sh)	1.6	29	6.386	4.15	7.088	2.858	--
Phenanthrene (dp)	1.5	1,000	154.5	19.5	314.7	2.372	1448
Phenanthrene (sh)	32	1,000	179.2	79	241.5	2.801	707.2
Pyrene (dp)	3.4	1,900	261.3	56.5	515.3	2.705	2,319
Pyrene (sh)	79	1,100	319.6	210	270.4	1.89	1044

Notes:
dp - deep - represents soil collect from 18 to 24 inches below the ground surface
mg/kg - miligram per kilogram
N/A - not available
PAHs - polyaromatic hydrocarbons
SD - standard deviation
sh - shallow - represents soil collected from 0 to 3 inches below the ground surface
UTL - upper tolerance limit

Table B-3
Summary of Calculated Background Concentrations
Supplemental Remedial Investigation #2
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

	Calculated Background Concentrations in Shallow Soil	Calculated Background Concentrations in Deep Soils
Depth:	0-3 inches	18-24 inches
Metals		
Aluminum	13,200	16,830
Antimony	1.68	0.65
Arsenic	10.73	7.60
Barium	113.70	160.10
Beryllium	0.62	0.75
Cadmium	2.50	0.77
Calcium	12,100	16,223
Chromium	32.76	29.58
Cobalt	9.12	12.20
Copper	84.44	67.33
Iron	23,696	23,254
Lead	522.50	448.90
Magnesium	4,802	4,433
Manganese	626.70	586.40
Mercury	1.20	2.26
Nickel	33.68	96.41
Potassium	1,286	2,194
Selenium	--	0.44
Silver	--	0.21
Sodium	250	277.20
Thallium	--	0.89
Vanadium	55.95	37.44
Zinc	289.40	308.40
PAHs		
2-Methylnaphthalene	--	0.01
Acenaphthene	0.08	0.05
Acenaphthylene	0.03	0.03
Anthracene	0.15	0.40
Benzo(a)anthracene	0.50	0.92
Benzo(a)pyrene	0.43	0.72
Benzo(b)fluoranthene	0.74	0.94
Benzo(g,h,i)perylene	0.23	0.20
Benzo(k)fluoranthene	0.17	0.32
bis(2-ethylhexyl) phthalate	0.61	0.09
Butylbenzyl Phthalate	0.24	0.03
Carbazole	--	0.07
Chrysene	0.42	0.78
Dibenzo(a,h)Anthracene	0.04	0.04
di-n-Butyl Phthalate	0.08	0.01
Fluoranthene	0.70	1.46
Fluorene	0.06	0.07
Indeno(1,2,3-cd)pyrene	0.18	0.34
Naphthalene	--	0.02
Phenanthrene	0.71	1.45
Pyrene	1.04	2.32

Notes:

Calculated background concentrations were calculated using the 95% Upper Tolerance Limit with 90% coverage

All Concentrations are in milligrams per kilogram.

Table B-4
Historic Groundwater Sample Results
Supplemental Remedial Investigation #2
Fort Totten Coast Guard Station Formerly Used Defense Site
Queens, New York

Sample Name	NYSDEC 1998 TOG Standards	NYSDEC 703.5 Groundwater Standards	National Primary Drinking Water Regulations Maximum Contaminant Level	MW1-GW-01-01	MW1-GW-0402-01	MW2-GW-01-01	MW2-GW-0402-02	MW3-GW-01-01	MW3-GW-0402-01	MW4-GW-01-01	MW4-GW-01-01D	MW4-GW-01-22	MW4-GW-0402-01	MW5-GW-01-01	MW5-GW-0402-01
Date				7/11/2000	4/10/2002	7/15/2000	4/25/2002	7/12/2000	4/10/2002	7/14/2000	7/14/2000	7/14/2000	4/25/2002	7/13/2000	4/10/2002
Well				MW-1	MW-1	MW-2	MW-2	MW-3	MW-3	MW-4	MW-4	MW-4	MW-4	MW-5	MW-5
VOCs (ug/L)															
Acetone	50	--	--	2 (U)	1.39 (U)	10 (U)	1.39 (U)	2 (U)	1.39 (U)	10 (U)	NS	10 (U)	8.9	2 (U)	1.39 (U)
Bromoform	50	--	--	1 (U)	0.2 (U)	5 (U)	3.0	1 (U)	0.2 (U)	5 (U)	NS	5 (U)	1.7	1 (U)	0.2 (U)
Chloroethane	5	5	--	1 (U)	0.2 (U)	5 (U)	0.6	1 (U)	0.2 (U)	5 (U)	NS	5 (U)	0.3 (J)	1 (U)	0.2 (U)
Chloroform	7	7	--	1 (U)	0.1 (U)	**9**	5.7	1 (U)	0.1 (U)	5 (U)	NS	5 (U)	1.7	1 (U)	0.1 (U)
Methylene Chloride	5	5	--	1 (U)	1.4	5 (U)	4.2	1 (U)	0.9	5 (U)	NS	5 (U)	2.8	1 (U)	1.1
Xylenes (total)	5	5	10,000	1 (U)	0.2 (U)	5 (U)	0.3 (J)	1 (U)	0.2 (U)	5 (U)	NS	5 (U)	0.2 (U)	1 (U)	0.2 (U)
SVOCs (ug/L)															
Benzo(b)fluoranthene	0.002	--	--	10 (U)	NS	9.5 (U)	NS	10 (U)	NS	1.2 (J)	NS	9.5 (U)		9.5 (U)	--
bis(2-Ethylhexyl)phthalate	5	5	--	10 (U)	0.9 (U)	9.5 (U)	0.4 (J)	10 (U)	**14.0**	9.5 (U)	NS	9.5 (U)	2.0 (U)	9.5 (U)	0.7
Butylbenzylphthalate	50	5	--	10 (U)	0.04 (J)	9.5 (U)	0.02	10 (U)	0.1 (J)	9.5 (U)	NS	9.5 (U)	0.5 (J)	9.5 (U)	0.05 (J)
Chrysene	0.002	--	--	10 (U)	0.02 (U)	9.5 (U)	0.02 (U)	10 (U)	0.02 (U)	1.1 (J)	NS	9.5 (U)	**14.0**	9.5 (U)	0.02 (U)
Dibenzofuran	--	--	--	10 (U)	0.02 (U)	9.5 (U)	0.02 (U)	10 (U)	0.02 (U)	9.5 (U)	NS	9.5 (U)	0.9 (J)	9.5 (U)	0.02 (U)
Diethylphthalate	50	--	--	10 (U)	0.4 (J)	9.5 (U)	2.0	10 (U)	2.0	9.5 (U)	NS	9.5 (U)	0.8 (J)	9.5 (U)	3.0
Dimethylphthalate	50	--	--	10 (U)	0.08 (J)	9.5 (U)	0.1 (J)	10 (U)	0.1 (J)	9.5 (U)	NS	9.5 (U)	0.2 (J)	9.5 (U)	0.1 (J)
Di-n-butyl phthalate	--	50	--	10 (U)	0.8	9.5 (U)	0.5	10 (U)	0.6	9.5 (U)	NS	9.5 (U)	4.0 (J)	9.5 (U)	0.7
Fluoranthene	50	--	--	10 (U)	NS	9.5 (U)	NS	10 (U)	NS	2.8 (J)	NS	9.5 (U)	NS	9.5 (U)	NS
Phenanthrene	50	--	--	10 (U)	NS	9.5 (U)	NS	10 (U)	NS	1.4 (J)	NS	9.5 (U)	NS	9.5 (U)	NS
Pyrene	50	--	--	10 (U)	NS	9.5 (U)	NS	10 (U)	NS	1.8 (J)	NS	9.5 (U)	NS	9.5 (U)	NS
PAHs (ug/L)															
2-Methyl-Naphthalene	--	--	--	0.95 (U)	0.03 (U)	0.39 (U)	0.03 (U)	0.96 (U)	0.03 (U)	6.7 (P)	6.2 (D)	1.1	0.8 (J)	0.95 (U)	0.03 (U)
Acenaphthene	20	--	--	0.95 (U)	0.02 (U)	0.44 (U)	0.02 (U)	0.96 (U)	0.02 (U)	11 (P)	6.2 (P)(D)	1.6 (D)	0.3 (U)	0.95 (U)	0.02 (U)
Acenaphthylene	--	--	--	1.9 (U)	0.03 (U)	0.71 (U)	0.03 (U)	1.9 (U)	0.03 (U)	0.71 (U)	7.1 (U)	7.1 (U)	2	1.9 (U)	0.03 (U)
Anthracene	50	--	--	0.14 (U)	0.02 (U)	0.039 (U)	0.02 (U)	0.14 (U)	0.02 (U)	1.1	0.39 (U)	**0.14**	10	0.14 (U)	0.02 (U)
Benzo(a)anthracene	0.002	--	--	0.14 (U)	0.03 (U)	0.053 (U)	0.03 (U)	0.14 (U)	0.03 (U)	**4.1 (E)**	**4.4 (D)**	**0.71**	**10**	0.14 (U)	0.03 (U)
Benzo(a)pyrene	0.002	--	0.2	0.14 (U)	0.02 (U)	0.036 (U)	0.02 (U)	0.14 (U)	0.02 (U)	**4.4 (E)**	**4.7 (D)**	**0.77**	**20**	0.14 (U)	0.02 (U)
Benzo(b)fluoranthene	0.002	--	--	0.19 (U)	0.02 (U)	0.08 (U)	0.02 (U)	0.19 (U)	0.02 (U)	**5.9 (P)**	**7.2 (D)**	**1.1**	**9**	0.19 (U)	0.02 (U)
Benzo(g,h,i)perylene	--	--	--	0.19 (U)	0.02 (U)	0.086 (U)	0.02 (U)	0.19 (U)	0.02 (U)	3.5	4.0 (P)(D)	0.56	6	0.19 (U)	0.02 (U)
Benzo(k)fluoranthene	--	--	--	0.14 (U)	0.02 (U)	0.052 (U)	0.02 (U)	0.14 (U)	0.02 (U)	2.6	2.5 (P)(D)	0.47	14	0.14 (U)	0.02 (U)
Chrysene	0.002	--	--	0.14 (U)	0.02 (U)	0.032 (U)	0.02 (U)	0.14 (U)	0.02 (U)	**5.1 (E)**	**5.4 (D)**	**0.83**	**2**	0.14 (U)	0.02 (U)
Dibenzo(a,h)anthracene	--	--	--	0.24 (U)	0.02 (U)	0.077 (U)	0.02 (U)	0.24 (U)	0.02 (U)	.52 (P)	0.77 (U)	.75 (P)	32	0.24 (U)	0.02 (U)
Fluoranthene	50	--	--	0.19 (U)	0.02 (U)	0.098 (U)	0.02 (U)	0.19 (U)	0.02 (U)	15 (E)	13 (D)	2.5	0.9 (J)	0.19 (U)	0.02 (U)
Fluorene	50	--	--	0.19 (U)	0.02 (U)	0.095 (U)	0.02 (U)	0.19 (U)	0.02 (U)	0.095 (U)	0.95 (U)	0.095 (U)	10	0.19 (U)	0.02 (U)
Indeno(1,2,3-cd)pyrene	0.002	--	--	0.14 (U)	0.02 (U)	0.063 (U)	0.02 (U)	0.14 (U)	0.02 (U)	**3.7**	**4 (D)**	**.62 (P)**	0.3 (U)	0.14 (U)	0.02 (U)
Naphthalene	10	--	--	0.95 (U)	0.14 (U)	0.26 (U)	0.03 (U)	0.96 (U)	0.14 (U)	0.26 (U)	2.6 (U)	2.6 (U)	0.9 (J)	0.95 (U)	0.14 (U)
Phenanthrene	50	--	--	0.14 (U)	0.02 (U)	0.054 (U)	0.02 (U)	0.14 (U)	0.02 (U)	7.4 (E)	7.6 (D)	0.91	17	0.14 (U)	0.02 (U)
Pyrene	50	--	--	0.19 (U)	0.02 (U)	0.079 (U)	0.02 (U)	0.19 (U)	0.02 (U)	10.0 (E)(P)	9.5 (D)	1.7	23	0.19 (U)	0.02 (U)
Metals (ug/L)															
Aluminum	100	--	50-200	**235**	**620**	**351**	90	**185.0 (B)**	100	**270**	NS	**345**	10	**683**	50
Antimony	3	300	6	1.0 (U)	0.2 (U)	1.0 (U)	0.2 (U)	**3.5 (B)**	0.2 (U)	**1.0 (B)**	NS	1.0 (U)	0.2 (U)	1.0 (U)	0.2 (U)
Barium	1,000	1,000	2,000	102.0 (B)	90	12.3 (U)	15	53.8 (B)	74	57.9 (B)	NS	55.6 (B)	100	23.7 (B)	32
Cadmium	5	5	5	0.41 (B)	0.2 (U)	0.44 (B)	0.20 (U)	0.34 (B)	0.20 (U)	0.2 (U)	NS	0.2 (U)	0.20 (U)	0.2 (U)	0.20 (U)
Calcium	--	NS	--	50,500	31,200	15,100	21,400	53,800	60,500	48,700	NS	47,000	62500	15900 (E)	34,400
Chromium (Total)	50	50	100	1.6 (B)	**51**	7.3 (B)	14	6.9 (B)	14	2.1 (B)	NS	2.4 (B)	16	6.1 (B)	12
Cobalt	110	--	--	7.5 (U)	0.4 (U)	7.5 (U)	3	7.5 (U)	0.4 (U)	7.5 (U)	NS	7.5 (U)	0.4 (U)	7.5 (U)	0.4 (U)
Copper	200	200	1,300	2.1 (U)	11	3.2 (B)	0.6 (U)	2.1 (U)	0.6 (U)	1.1 (B)	NS	1.2 (B)	14	2.1 (U)	0.6 (U)
Iron	300	300	300	150	**1,200**	**600**	240	178	**880**	275	NS	**427**	230	**1,490**	140
Lead	25	25	15	1.7 (B)	0.9 (U)	3.7	0.9 (U)	2.3 (B)	0.9 (U)	10.5	NS	10.3	13	2.9 (B)	0.9 (U)
Magnesium	35,000	35,000	--	27,200	17,100	5,760	7,850	24,600	30,200	27,200	NS	26,700	**37,800**	11800 (E)	21,800
Manganese	300	300	50	20.7	46	2.4 (U)	5	2.4 (U)	8	2.4 (U)	NS	2.4 (U)	0.1 (U)	4.7 (B)	0.1 (U)
Nickel	100	1,000	--	24.2 (B)	50	7.6 (B)	20	13.1 (U)	0.4 (U)	3.0 (B)	NS	3.4 (B)	20	13.1 (U)	10
Potassium	--	--	--	4260	3330	1,180	1,460	1,750	2,130	2,070	NS	2080	2630	1,080	1,880
Selenium	10	10	50	1.8 (U)	1. (U)	2.3 (B)	1. (U)	3.2 (B)	1. (U)	4.0 (B)	NS	3.1 (B)	1. (U)	1.8 (U)	1. (U)
Sodium	20,000	20,000	--	**26,700**	**25,500**	10,300	9,700	8,630	7,700	2,070	NS	**73,300**	**110,000**	18,800	**25,400**
Vanadium	14	--	--	5.6 (U)	0.9000	5.6 (U)	0.04 (U)	5.6 (U)	0.04 (U)	5.6 (U)	NS	5.6 (U)	0.04 (U)	5.6 (U)	0.04 (U)
Zinc	2,000	--	5,000	10.7 (B)	20	4.6 (B)	20	1.7 (U)	0.7 (U)	1.7 (U)	NS	1.7 (U)	40	1.7 (U)	0.7 (U)

Notes:
B = Indicates that the analyte was found in the associated method blank as well as in the sample, which may be indicative of blank contamination.
D = Indicates concentration is reported from a secondary dilution analysis.
E = Indicates compound exceeded the calibration range of the instrument.
J = Indicates an estimated value.
P = Indicates a reported value from a gas comatograph (GC) analysis when there is greater than 25% difference of concentration between the two GC columns.

U = Indicates compound was analyzed for but not detected.
-- = No Standard
NS = Not Sampled
Bold - Concentration exceeds one or more standard

Table Prepared by ELM
Table Checked by RR