DuPont Pompton Lakes Works
2000 Cannonball Road
Pompton Lakes, NJ 07442

July 2, 2012

Mr. Anthony Cinque
New Jersey Department of Environmental Protection
Division of Responsible Party Site Remediation
401 East State Street
P.O. Box 028
Trenton, New Jersey 08625-0028

RE: Wanaque River Investigation
DuPont Pompton Lakes Works Site
Pompton Lakes, New Jersey
PI# 007411

Dear Mr. Cinque:

Attached for your review and approval is the Wanaque River Investigation Sampling Plan for additional activities requested by the New Jersey Department of Environmental Protection (NJDEP). These activities are related to the NJDEP review of the Wanaque River Remedial Investigation Report and comments provided on the report. Also attached for your records are responses to additional comments provided by NJDEP Bureau of Environmental Evaluation and Risk Assessment on the report.

DuPont would like to schedule the additional investigation activities as outlined in the Sampling Plan as soon as possible. As such, any comments NJDEP may have on this plan would be appreciated as soon as possible.

If you have any questions, please contact me at (973) 492-7733.

Sincerely,

David E Epps

David E. Epps, P.G.
Project Director, Pompton Lakes Works
DuPont Corporate Remediation Group

cc: Clifford Ng – USEPA (electronic copy)
PLW Central File

Wanaque River Investigation
Sediment and Pore Water Sampling Plan
DuPont Pompton Lakes Site
Pompton Lakes, New Jersey

July 2012 Project No.: 18985748.00004

URS Corporation

335 Commerce Drive, Suite 300
Fort Washington, PA 19034

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Appendices

1.0 Introduction

URS Corporation (URS) has prepared this sampling plan on behalf of E.I. du Pont de Nemours and Company (DuPont) to outline a proposed sediment and pore water investigation in the Wanaque River (river) near the DuPont Pompton Lakes Works site (Site) located in Pompton Lakes, New Jersey (Figure 1-1). The overall purpose of this additional investigation is to support the development of an interim remedial measure (IRM) work plan to address potential ecological exposure to mercury in river sediments.

The revised *Wanaque River Remedial Investigation Report* (RIR) submitted to the New Jersey Department of Environmental Protection (NJDEP) in July 2011 recommended that an Interim Remedial Measure (IRM) be implemented consistent with NJDEP *Technical Requirements for Site Remediation* (7:26E-1.12) to mitigate potential human health and ecological exposure to mercury in depositional sediments in Reach 2 downstream of WR-16 to the former dam (Figure 1-1). NJDEP requested additional evaluation of ecological exposure in areas outside of the potential IRM project area in an RIR comment letter dated March 21, 2012. Additional characterization of river substrate types, consistent with NJDEP comments, was completed in February 2012 to map fine-grained depositional areas of the river; this sampling plan proposes a sediment and pore water investigation to characterize mercury concentrations in mapped fine-grained deposits outside of the potential IRM area. The following sections detail the objectives, study design, sampling methodology, data evaluation, schedule, and reporting for the proposed effort.

1.1 Objectives

The overall objective of the proposed sampling is to further define mercury concentrations in sediment and pore water to evaluate potential ecological exposure to mercury in the Wanaque River. The proposed sampling will expand upon previous efforts to characterize sediment mercury concentrations and provide pore water mercury data to characterize potential exposure in the sediment interstices just below the sediment-surface water interface.

Additional sediment sampling is proposed to further define mercury concentrations in fine-grained sediment deposits identified in areas outside of the potential IRM project area during the February 2012 substrate mapping survey. The specific data objectives of the proposed sediment sampling and analyses are to (Table 1-1):

- Characterize total mercury (THg) concentrations and physical parameters of surficial sediments from select fine-grained sediment deposits outside of the potential IRM project area between WR-13 and WR-22; and
- Vertically characterize THg concentrations and physical parameters in the mapped sediment deposit at WR-21.

The proposed sampling effort will also evaluate pore water THg and methylmercury (MeHg) concentrations in the two primary habitat types present in the river: fine-grained sediment deposits observed the channel margins and cobble/pebble habitats, which represent the predominant benthic habitat type. The specific data objectives of the proposed pore water sampling and analyses are to (Table 1-1):

- Characterize mercury concentrations in pore water from Reach 1, upstream of the property boundary; to establish reference pore water mercury concentrations;
- Evaluate potential ecological exposure to THg and MeHg in sediment pore water from fine-grained sediment habitats and cobble/pebble habitats within the channel; and
- Qualitatively assess MeHg production in fine-grained sediment habitats relative to cobble/pebble habitats within the channel based on a weight-of-evidence evaluation of available information (e.g., analytical data, *in situ* parameters, and physical habitat features).

2.0 Scope of Investigations

The sampling plan provides a framework for conducting sediment and pore water investigations in the Wanaque River. The investigation will be conducted on the Wanaque River adjacent to the Western Manufacturing Area (WMA) in Reach 2 and downstream of the former dam in Reach 3 (Figure 1-1); additional reference samples for pore water will be collected in Reach 1 upstream of the site boundary. The design and placement of sampling stations was developed based on the results of previous investigations summarized in the RIR (URS, 2011a) and the findings of a detailed substrate characterization and mapping initiative conducted by URS in February 2012. The following sections provide specific details regarding the study design, sample collection and analysis, data quality assurance, and health and safety procedures related to the proposed sediment and pore water investigation.

2.1 Study Design

The proposed sediment and pore water investigation is based on a targeted sampling approach to define mercury concentrations in areas outside of the potential IRM area between approximately WR-13 and WR-22. Consistent with previous sampling efforts in the Wanaque River, additional sediment sampling focuses on depositional areas within the Wanaque River where fine-grained sediment deposits were identified during the substrate characterization and mapping effort. Exposure to ecological receptors inhabiting fine-grained sediment deposits may potentially be greater due to the capacity of fine-grained sediments to adsorb mercury. Based on bulk sediment analyses, lower THg concentrations would be expected in coarse-grained substrates relative to fine-grained substrates. Thus, focusing sampling efforts on mapped locations of fine-grained sediments will conservatively characterize potential ecological exposure to mercury in sediment and pore water in the areas outside of the potential IRM area.

The evaluation of sediment pore water represents an important line of evidence in assessing potential toxicity of mercury to sediment-associated ecological receptors. Measurements of pore water provide direct information regarding the fraction of sediment-associated contaminants that are likely to be most available to ecological receptors [U.S. Environmental Protection Agency (USEPA), 2002]. As a result, various studies indicate that the bioavailability and toxicity of constituents in sediments, particularly metals, are correlated with the bioavailable fraction of constituents in pore water rather than total constituent concentrations in bulk sediment (Di Toro et al., 2005; Ankley et al., 2006; Hansen et al., 1996; Ankley et al., 1991; Di Toro et al., 1992; and Luoma, 1989). Specific details regarding the study design and sample selection in are discussed below by reach.

Reach 1

Limited pore water sampling will be conducted in Reach 1 to provide representative pore water data from the reference reach upstream of the site boundary. Four pore water samples are proposed in Reach 1 (Figure 2-1): two pore water samples will be co-located with existing sediment sampling stations WR-07 and WR-08 and two pore water samples will be located between existing stations WR-07 and WR-08 in an area of coarser-grained cobble/pebble substrate. Existing sediment data are available to provide representative reference data for Reach 1; therefore, no additional sediment sampling is proposed.

Reach 2

Six additional sediment samples and 11 pore water samples are proposed in Reach 2 of the Wanaque River from WR-13 downstream to WR-16 (Figure 2-2). The six additional sediment samples target fine-grained silt and clay deposits observed along the channel margins during the substrate mapping effort. The locations of the proposed sediment sampling stations were selected based on the approximate size of the identified deposits and the spatial coverage of existing sediment samples.

Eight of 11 proposed pore water samples in Reach 2 are co-located with sediment mercury transects from previous sampling events conducted in 2010 and 2011 (Figure 2-2). These stations were selected to characterize pore water mercury conditions within fine-grained sediment, as well as in coarser cobble/pebble substrates located in the center of the channel. Observations made during the substrate mapping effort indicate a predominance of cobble/pebble substrate throughout much of the channel in Reach 2, with moderate embeddedness of sand and, to a lesser extent, silt material. Sampling in both fine-grained deposits and cobble/pebble habitat types will provide representative data characterizing mercury exposure in the predominant benthic habitats in the Wanaque River.

The remaining three pore water samples will be spatially and temporally paired with proposed sediment sampling stations (Figure 2-2). These proposed pore water samples, like the proposed sediment samples, target fine-grained deposits of silt and clay observed on the channel margins. No samples are proposed in the potential IRM area, which extends from approximately station WR-16 downstream to the former dam.

Reach 3

Nine additional sediment samples and six pore water samples are proposed in Reach 3 of the Wanaque River from WR-19 downstream to WR-22 (Figure 2-3a and Figure 2-3b). Eight of nine proposed sediment samples target fine-grained silt and clay deposits observed along the channel margins and one proposed sample targets fine sand substrates adjacent to a fine-grained deposit. The locations of the proposed sediment sampling stations were selected based on the approximate size of the identified deposits and the spatial coverage of existing sediment samples.

Four of nine sediment stations in Reach 3 are proposed in the vicinity of existing station WR-21 upstream of Wilderness Island on the north bank. Currently, only one surficial sediment sample is available at station WR-21 to characterize sediment mercury concentrations in the relatively large, fine-grained deposit delineated in this area during substrate mapping. Three additional surficial sediment samples are proposed within the mapped fine-grain deposit and one sample is proposed in the fine sand material in the channel adjacent to the deposit (Figure 2-3b). Substrate mapping indicated that the sediment deposit in the vicinity of station WR-21 contains sediment depths of approximately four to five feet. Therefore, in addition to the proposed sampling of surficial sediments, a sediment core will be collected from proposed sample WR-21B to vertically characterize mercury concentrations and physical sediment parameters (Figure 2-3b).

Two of six proposed pore water samples in Reach 3 (WR-19 and WR-20) are co-located with sediment mercury transects from previous sampling events in 2010 and 2011 (Figure 2-3a and 2-3b). These locations were selected to characterize pore water mercury concentrations in cobble/pebble and fine sand substrate conditions. The remaining four pore water samples are spatially and temporally paired with proposed sediment sampling stations. Three proposed pore water samples target fine-grained deposits of silt and clay (WR-19C, WR-21B, WR-22C) and one sample targets the cobble/pebble and sand material south of the WR-21 deposit (WR-21C).

2.2 Sample Collection Methods and Analytical Scope

The following sections summarize the procedures for collecting sediment and pore water samples.

2.2.1 Sediment

Surficial sediment samples for chemical analysis will be collected within the wetted channel using a petite Ponar (area = 36 in^2). This sampling approach is consistent with previous phases of sampling and is based on general guidance and principles outlined in USEPA *Methods for Collection, Storage and Manipulation of Sediments for Chemical and Toxicological Analyses: Technical Manual* (USEPA, 2001) and NJDEP *Guidance for Sediment Quality Evaluations* (NJDEP, 1998). A detailed standard operating procedure (SOP) for the collection of surficial sediment samples is presented in Appendix A. Surficial sediment samples will be analyzed for mercury, total organic carbon (TOC), and grain size. A summary of the proposed samples and analyses, including analytical methods is provided in Table 1-1.

In addition to surficial sediment sampling, mercury concentrations and physical sediment parameters will be characterized vertically in the fine-grained sediment deposit located near station WR-21 downstream of the potential IRM area (Figure 2-3b). An undisturbed sediment core will be collected using dedicated butyrate tubing or an equivalent coring device. The undisturbed sediment core will be sampled at approximately four intervals: top six inches of the core, bottom six inches of the core, and two intermediate sampling intervals. The depths of the intermediate sampling intervals will be determined in the field based on the visual stratigraphy of the core and a field screening of mercury concentrations in the core using a hand-held x-ray fluorescence (XRF) analyzer. Intermediate sampling intervals will be selected to target sediment layers that likely contain the greatest concentrations of mercury in the vertical profile based on XRF screening and visual observation of physical sediment characteristics. Additional sampling intervals may be considered based on the findings of the visual stratigraphy and field screening procedures. A detailed standard operating procedure (SOP) for the collection of sediment core samples is presented in Appendix A.

2.2.2 Pore Water

Pore water samples will be collected and analyzed to evaluate potential ecological exposure to THg and MeHg in sediments outside of the proposed IRM project area between WR-13 and WR-22. Pore water samples will be collected by suction using a PushPoint sampler (i.e., Henry Probe) inserted into the substrate. The PushPoint will be inserted into the sediments until the screened portion of the sampler is two to three inches below the sediment-surface water interface. The requisite volume of pore water (approximately 100 mL) will be slowly extracted from sediments by syringe. The extracted pore water sample will be field-filtered using a 0.45 µm filter and analyzed for mercury and methylmercury. A detailed SOP for the collection of pore water is provided in Appendix B. A summary of the proposed samples and analyses, including analytical methods is provided in Table 1-1.

In addition to the collection of pore water samples for laboratory analyses, water quality parameters will be measured *in situ* for unfiltered pore water and surface water samples using a Myron 6P meter or equivalent. Measured water quality parameters will include temperature, specific conductivity (SC), oxidation-reduction potential (ORP), and pH. Temperature and SC measurements will be used as field validation of whether overlying surface water has been drawn into the pore water sample; comparable measurements of both parameters in surface water and pore water may indicate the influence of surface water in the pore water sample. If comparable measurements of temperature and SC are observed in pore water and surface water samples, additional measurements will be recorded prior to collecting an analytical sample. Professional judgment-based measurements of temperature and SC in pore water and overlying surface water and the position of the PushPoint sampler in the sediment (i.e., depth of the screen) will be used to determine whether an extracted pore water sample is representative of exposure conditions for sediment-dwelling invertebrate receptors. Samples deemed representative of exposure conditions for sediment-dwelling invertebrate receptors will satisfy the study objectives specified in Section 1.1 and, as a result, will be submitted to the designated laboratory for analysis.

2.3 Quality Assurance/Quality Control

Quality assurance and quality control (QA/QC) samples will be collected with sediment and pore water samples to help identify and minimize potential sources of sample contamination due to field procedures and to evaluate potential variability introduced by sample collection and handling. QA/QC procedures and objectives that will apply to the proposed sampling and analysis of sediment and pore water in the Wanaque River are presented in detail in Appendices A and B, respectively. The QA/QC procedures are consistent with the previous sampling events in the Wanaque River (URS, 2011a).

2.4 Health and Safety

All field activities will be conducted in accordance with the Pompton Lakes Works Facility Health and Safety Plan, as amended for site-specific work. A Project Safety Analysis (PSA) will be conducted prior to the initiation of field work to ensure all parties understand any foreseeable safety hazards associated with completing the proposed pore water and sediment sampling effort.

3.0 Data Evaluation and Reporting

Sediment data will be evaluated consistent with the procedures presented in the revised Wanaque River RIR (URS, 2011a). Sediment data for Reach 2 (Site Reach) and Reach 3 (Downstream Reach) will be evaluated relative to the following benchmark concentrations:

- Freshwater sediment screening guidelines specified in NJDEP *Guidance for Sediment Quality Evaluations* (NJDEP, 1998)
- Background threshold value (BTV) as calculated in EPA ProUCL v. 4.0 based on Reach 1 (Upstream Reach) sediment concentrations (URS, 2011a).

Pore water data will be evaluated relative to aqueous toxicity benchmarks for THg and MeHg. Filtered pore water results will initially be evaluated relative to conservative surface water quality standards for THg and MeHg that are established for the general protection of aquatic life (New Jersey Surface Water Quality Standards (NJSWQS) N.J.A.C. 7:9B and CCME, 2003, respectively). For pore water concentrations which exceed the surface water quality standards, an additional comparison of measured mercury concentrations will be made to literature-derived aqueous toxicity values that are specifically relevant to benthic invertebrate test organisms.

The findings of the sediment and pore water investigations completed since the July 2011 submittal of the revised Wanaque River RIR to NJDEP will be summarized in a brief technical report. The technical report will summarize the key findings of the RIR and present the findings of the additional investigations that have been completed since July 2011, including additional sediment sampling in November 2011 and substrate mapping in February 2012. The technical report will provide an integrated summary of investigations in the Wanaque River that may be used to support the preparation of the Wanaque River IRM Work Plan.

4.0 Project Schedule and Personnel

The following sections detail the schedule of investigations and reporting, as well as key project personnel involved in the implementation of the sampling plan.

4.1 Schedule

Pending NJDEP concurrence with the proposed sampling design presented in this sampling plan, field activities are proposed for the summer of 2012. Upon completion of the data evaluation process described in the preceding section, the findings of the investigation will be presented to the NJDEP in a brief technical report. It is anticipated that the summary technical report will be presented to NJDEP 45 days after the receipt of analytical data.

4.2 Project Personnel

The following principal personnel have been identified to implement the investigations detailed in the work plan.

Name/Affiliation	Title/Responsibility
Mr. David Epps	DuPont Project Director
Mr. Edward Seger	DuPont Technical Lead
Ms. Maryann Nicholson	DuPont Technical Lead
Mr. Gary Long	URS Technical Coordinator
Mr. Andrew Port	OBG Site Safety Officer

The individuals listed above will be supported by a variety of technical disciplines from DuPont and URS.

5.0 References

Ankley, G.T., Thomas, N.A., Di Toro, D.M., Hansen, D.J., Mahony, J.D., Berry, W.J., Swartz, R.C., Hoke, R.A., Garrison, A.W., Allen, H.E., and C.S. Zarba. 2006. Assessing potential bioavailability of metals in sediments: A proposed approach. Environmental Management. 18:331-337.

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Luoma, S.N. 1989. Can we determine the biological availability of sediment-bound trace elements? Hydrobiologia 176/177:379-396.

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URS. 2011b. Health and Safety Plan. Wanaque River Remedial Investigation. DuPont Pompton Lakes Works. November 2011.

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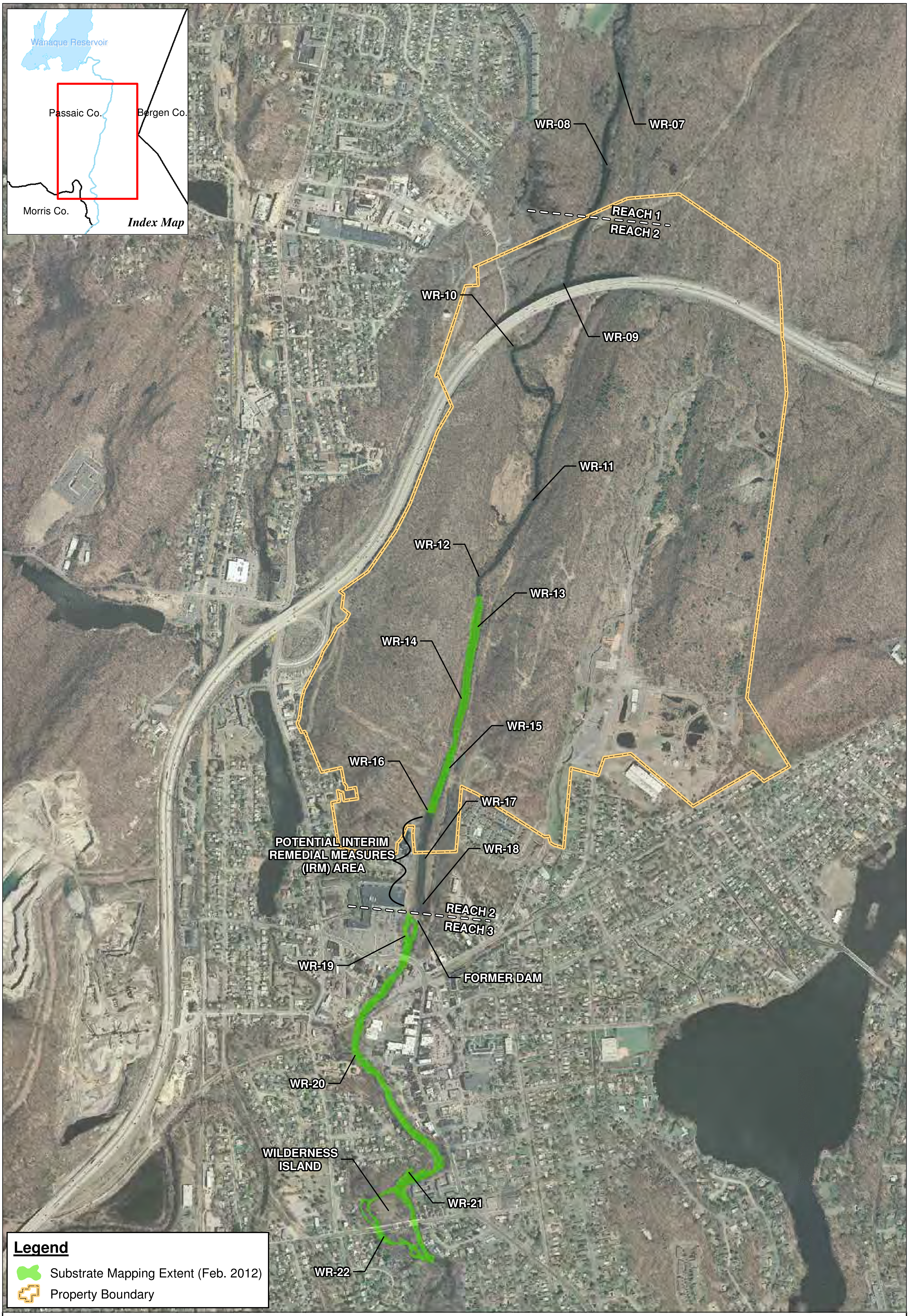
Tables

TABLE 1-1
PROPOSED SEDIMENT AND PORE WATER INVESTIGATION TASKS
WANAQUE RIVER INVESTIGATION
DUPONT POMPTON LAKES SITE
POMPTON LAKES, NEW JERSEY

Investigation Task	Data Objectives	Depth Interval	Sampling Device	Measured Parameters	Location	Number of Stations/Samples
Characterization of sediments in fine-grained deposits	1) Characterize mercury concentrations and physical parameters of surficial sediments from select fine-grained sediment deposits mapped	Surficial grab	Petite Ponar	**Analytical:** THg: USEPA 7471A TOC: Lloyd Kahn Grain size: ASTM D422 ***In situ* surface water parameters**: Temperature, pH, dissolved oxygen, specific conductivity, oxidation-reduction potential (ORP)	**Reach 2:** Upstream of potential IRM to WR-13 (Figure 2-1)	6
					Reach 3: Downstream of potential IRM area to WR-22 (Figure 2-2a and 2-2b)	9
	2) Vertically characterize mercury concentrations and physical parameters	4 sampling intervals: -top 6" of core; -bottom 6" of core; and - 2 intermediate intervals determined based on visual stratigraphy of sediment layers and field screening (i.e., XRF) of THg concentrations	Core		**Reach 3:** Mapped deposit at WR-21 (Figure 2-2b)	1
Characterzation of potential ecological exposure to mercury in sediment pore water	1) Evaluate the background pore water conditions 2) Evaluate potential ecological exposure to THg and methylmercury (MeHg) in sediment pore water in fine-grained sediment habitats and cobble/gravel habitats within the channel 3) Qualitatively assess MeHg production in fine-grained sediment habitats relative to cobble/gravel habitats within the channel based on a weight-of-evidence evaluation	Filtered (0.45 µm) samples of pore water collected approximately 1 to 4 inches below the surface water-sediment interface using a	PushPoint sampler (i.e., Henry probe)	**Analytical:** THg: USEPA 1631 MeHg: USEPA 1630 ***In situ* sediment parameters:** Temperature, pH, ORP	**Reach 1:** Upstream of Site Boundary (WR-07 - WR-08)	- 2 fine-grained sediment - 2 cobble/pebble
					Reach 2: Upstream of Potential IRM (WR-13 - WR-16)	- 8 fine-grained sediment - 3 cobble/pebble
					Reach 3: Downstream of Potential IRM (Former Dam - WR-22)	- 4 fine-grained sediment - 2 fine sand or cobble/pebble

Notes:
IRM: Interim remedial measure
THg: Total mercury
TOC: Total organic carbon
MeHg: Methylmercury

Figures



Source: Aerial Photography - NJDEP 2007

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Figure 1-1
Substrate Mapping Extent & Reach Overview Map

Wanaque River Remedial Investigation
DuPont Pompton Lakes Works

Pompton Lakes, New Jersey

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Analyte	Units	NJFWSC LEL	Background Data¹	WR-07 Result
MERCURY	MG/KG	0.2	0.351	0.084
TOC	%	--	--	2.24
PERCENT FINES	% Passing	--	--	16

Analyte	Units	NJFWSC LEL	Background Data¹	WR-08 Result
MERCURY	MG/KG	0.2	0.351	0.33
TOC	%	--	--	1.63
PERCENT FINES	% Passing	--	--	74

Source: Aerial Photography - NJDEP 2007

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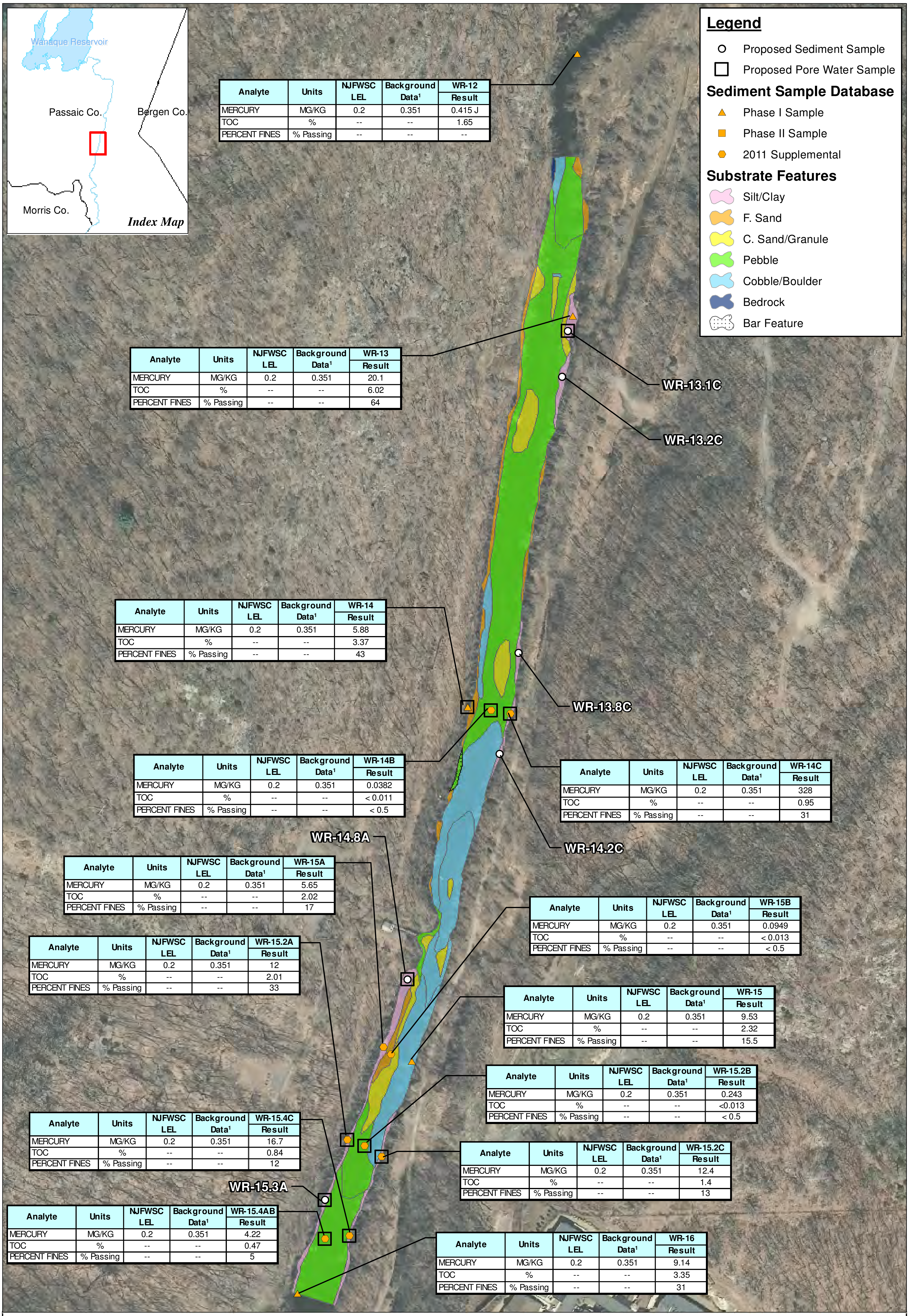
PROJECT NO. 18985452.00004

Figure 2-1
Proposed Reach 1 Sampling Stations WR-07 to WR-08
With Existing Sediment Data & Substrate Mapping

Wanaque River Remedial Investigation
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Path: S:\Projects\IMS\DUPONT\PMPTNLKS\Projects\WanaqueRiverRIR\2012\Fig 2-1 DuPont Wanaque River Proposed Sampling.mxd



Analyte	Units	NJFWSC LEL	Background Data¹	WR-12
				Result
MERCURY	MG/KG	0.2	0.351	0.415 J
TOC	%	--	--	1.65
PERCENT FINES	% Passing	--	--	--

Analyte	Units	NJFWSC LEL	Background Data¹	WR-13
				Result
MERCURY	MG/KG	0.2	0.351	20.1
TOC	%	--	--	6.02
PERCENT FINES	% Passing	--	--	64

Analyte	Units	NJFWSC LEL	Background Data¹	WR-14
				Result
MERCURY	MG/KG	0.2	0.351	5.88
TOC	%	--	--	3.37
PERCENT FINES	% Passing	--	--	43

Analyte	Units	NJFWSC LEL	Background Data¹	WR-14B
				Result
MERCURY	MG/KG	0.2	0.351	0.0382
TOC	%	--	--	< 0.011
PERCENT FINES	% Passing	--	--	< 0.5

Analyte	Units	NJFWSC LEL	Background Data¹	WR-14C
				Result
MERCURY	MG/KG	0.2	0.351	328
TOC	%	--	--	0.95
PERCENT FINES	% Passing	--	--	31

Analyte	Units	NJFWSC LEL	Background Data¹	WR-15A
				Result
MERCURY	MG/KG	0.2	0.351	5.65
TOC	%	--	--	2.02
PERCENT FINES	% Passing	--	--	17

Analyte	Units	NJFWSC LEL	Background Data¹	WR-15B
				Result
MERCURY	MG/KG	0.2	0.351	0.0949
TOC	%	--	--	< 0.013
PERCENT FINES	% Passing	--	--	< 0.5

Analyte	Units	NJFWSC LEL	Background Data¹	WR-15.2A
				Result
MERCURY	MG/KG	0.2	0.351	12
TOC	%	--	--	2.01
PERCENT FINES	% Passing	--	--	33

Analyte	Units	NJFWSC LEL	Background Data¹	WR-15
				Result
MERCURY	MG/KG	0.2	0.351	9.53
TOC	%	--	--	2.32
PERCENT FINES	% Passing	--	--	15.5

Analyte	Units	NJFWSC LEL	Background Data¹	WR-15.2B
				Result
MERCURY	MG/KG	0.2	0.351	0.243
TOC	%	--	--	<0.013
PERCENT FINES	% Passing	--	--	< 0.5

Analyte	Units	NJFWSC LEL	Background Data¹	WR-15.4C
				Result
MERCURY	MG/KG	0.2	0.351	16.7
TOC	%	--	--	0.84
PERCENT FINES	% Passing	--	--	12

Analyte	Units	NJFWSC LEL	Background Data¹	WR-15.2C
				Result
MERCURY	MG/KG	0.2	0.351	12.4
TOC	%	--	--	1.4
PERCENT FINES	% Passing	--	--	13

Analyte	Units	NJFWSC LEL	Background Data¹	WR-15.4AB
				Result
MERCURY	MG/KG	0.2	0.351	4.22
TOC	%	--	--	0.47
PERCENT FINES	% Passing	--	--	5

Analyte	Units	NJFWSC LEL	Background Data¹	WR-16
				Result
MERCURY	MG/KG	0.2	0.351	9.14
TOC	%	--	--	3.35
PERCENT FINES	% Passing	--	--	31

Source: Aerial Photography - NJDEP 2007

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Figure 2-2
Proposed Reach 2 Sampling Stations Upstream to WR-13
With Existing Sediment Data & Substrate Mapping

Wanaque River Remedial Investigation
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

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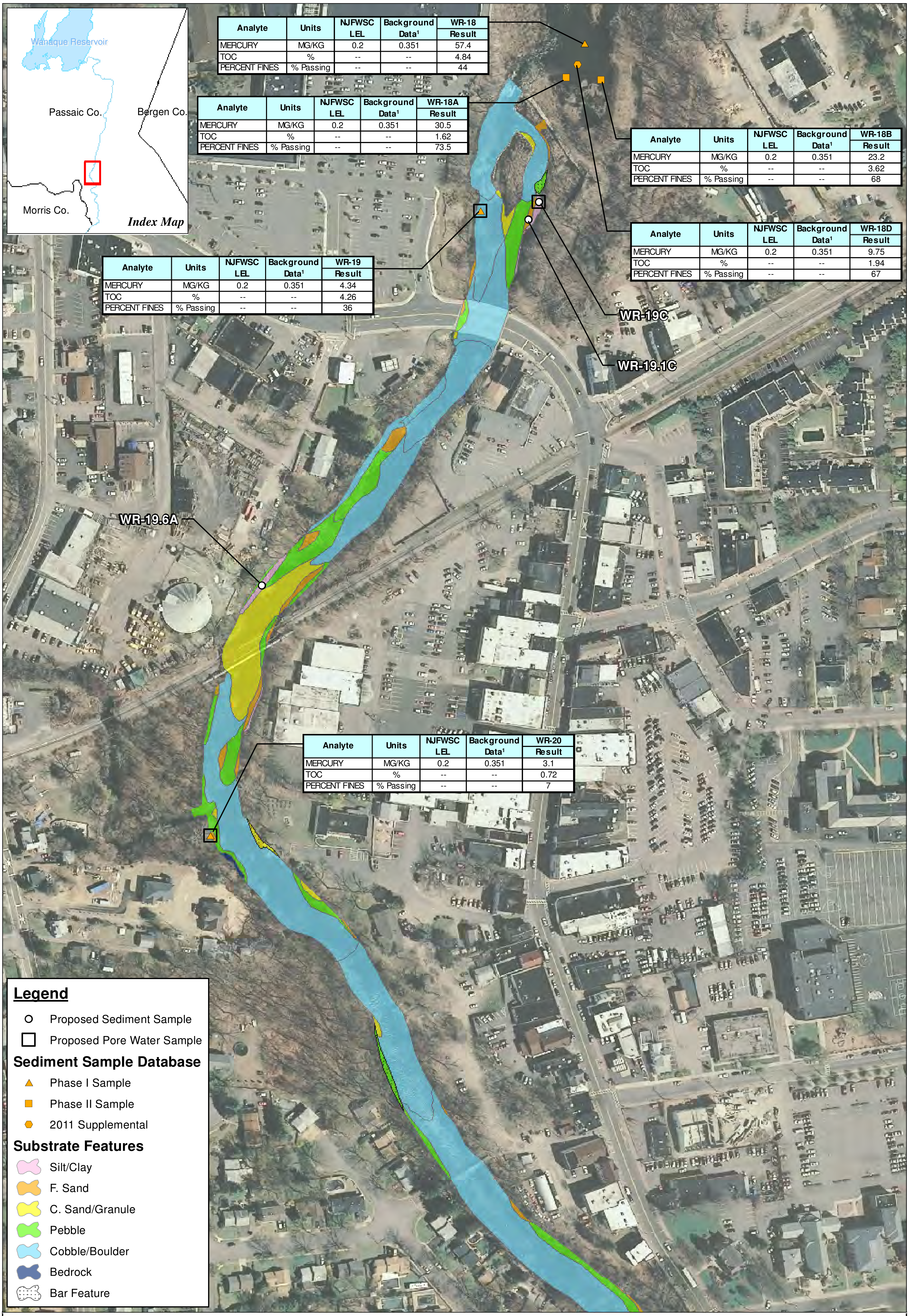


Analyte	Units	NJFWSC LEL	Background Data[1]	WR-18 Result
MERCURY	MG/KG	0.2	0.351	57.4
TOC	%	--	--	4.84
PERCENT FINES	% Passing	--	--	44

Analyte	Units	NJFWSC LEL	Background Data[1]	WR-18A Result
MERCURY	MG/KG	0.2	0.351	30.5
TOC	%	--	--	1.62
PERCENT FINES	% Passing	--	--	73.5

Analyte	Units	NJFWSC LEL	Background Data[1]	WR-18B Result
MERCURY	MG/KG	0.2	0.351	23.2
TOC	%	--	--	3.62
PERCENT FINES	% Passing	--	--	68

Analyte	Units	NJFWSC LEL	Background Data[1]	WR-18D Result
MERCURY	MG/KG	0.2	0.351	9.75
TOC	%	--	--	1.94
PERCENT FINES	% Passing	--	--	67

Analyte	Units	NJFWSC LEL	Background Data[1]	WR-19 Result
MERCURY	MG/KG	0.2	0.351	4.34
TOC	%	--	--	4.26
PERCENT FINES	% Passing	--	--	36

Analyte	Units	NJFWSC LEL	Background Data[1]	WR-20 Result
MERCURY	MG/KG	0.2	0.351	3.1
TOC	%	--	--	0.72
PERCENT FINES	% Passing	--	--	7

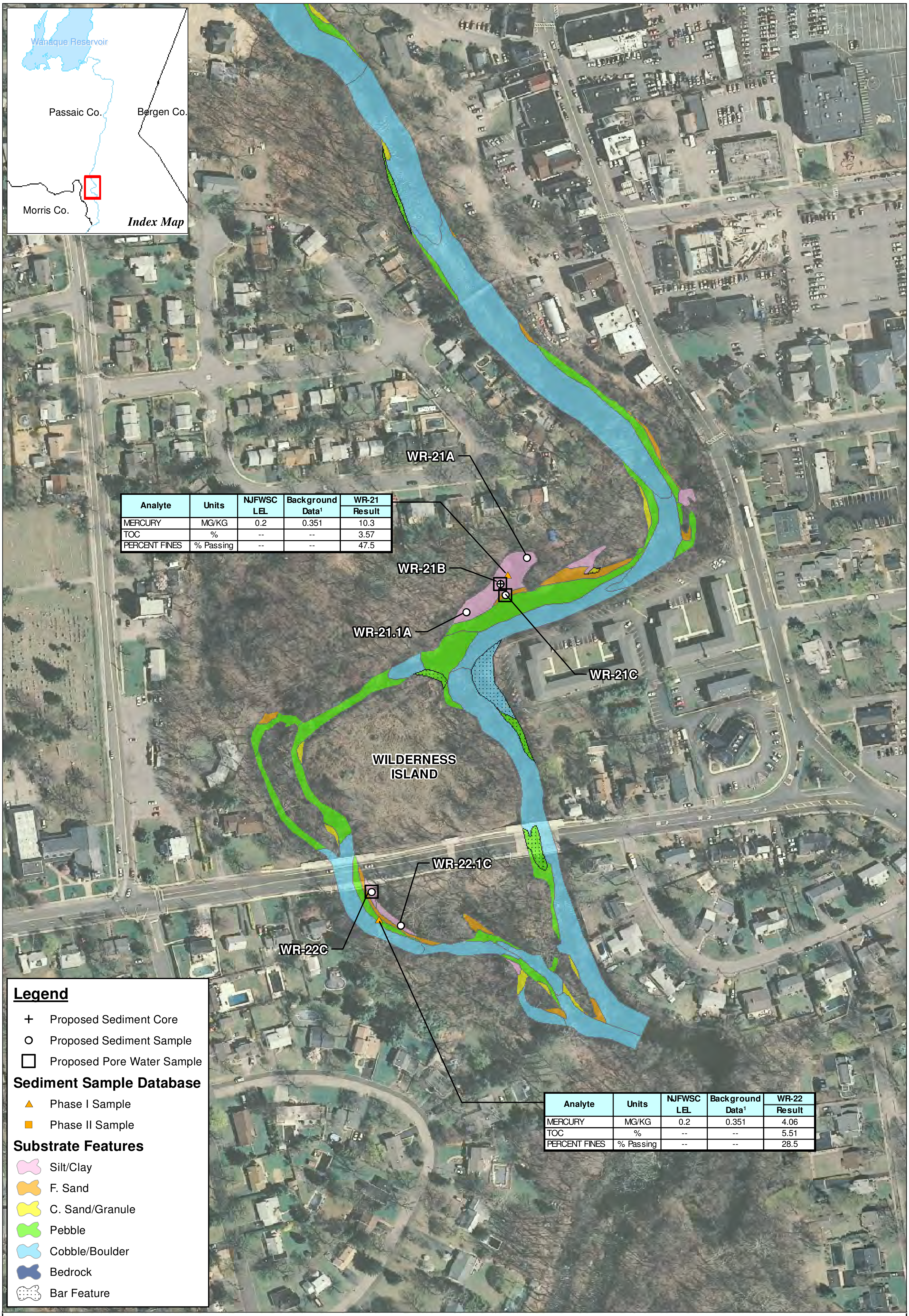
Source: Aerial Photography - NJDEP 2007

Figure 2-3a
Proposed Reach 3 Sampling Stations Downstream to WR-22
With Existing Sediment Data & Substrate Mapping

Wanaque River Remedial Investigation
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

PROJECT NO. 18985452.00004

Path: S:\Projects\IMS\DUPONT\PMPTNLKS\Projects\WanaqueRiverRIR\2012\Fig 2-3a DuPont Wanaque River Proposed Sampling.mxd



Analyte	Units	NJFWSC LEL	Background Data[1]	WR-21 Result
MERCURY	MG/KG	0.2	0.351	10.3
TOC	%	--	--	3.57
PERCENT FINES	% Passing	--	--	47.5

Analyte	Units	NJFWSC LEL	Background Data[1]	WR-22 Result
MERCURY	MG/KG	0.2	0.351	4.06
TOC	%	--	--	5.51
PERCENT FINES	% Passing	--	--	28.5

Legend

- + Proposed Sediment Core
- ○ Proposed Sediment Sample
- ☐ Proposed Pore Water Sample

Sediment Sample Database

- ▲ Phase I Sample
- ■ Phase II Sample

Substrate Features

- 🟪 Silt/Clay
- 🟧 F. Sand
- 🟨 C. Sand/Granule
- 🟩 Pebble
- 🟦 Cobble/Boulder
- ▨ Bedrock
- ⬚ Bar Feature

Source: Aerial Photography - NJDEP 2007

PROJECT NO. 18985452.00004

Figure 2-3b
Proposed Reach 3 Sampling Stations Downstream to WR-22
With Existing Sediment Data & Substrate Mapping

Wanaque River Remedial Investigation
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Appendices

Appendix A

Sediment Sampling Guidelines

Guidelines for Surficial Sediment Sampling and Sediment Core Sampling

Sediment Sampling Procedures

Sediment sampling procedures for the Wanaque River investigation are summarized in the following steps:

1. Collect surficial sediment samples from the biologically active layer (i.e., top 0 to 4 inches) at 15 stations within Reach 2 and Reach 3.
2. Collect a sediment core sample at station WR-21B.
3. Measure GPS coordinates with sub-meter accuracy using a Trimble GeoXH GPS unit or similar equipment at each location.
4. Access sample stations either by wading or using a boat.
5. Sample analytical parameters for each sediment station as specified in Table 1-1.

The detailed procedures for collecting sediment samples for analytical chemistry and physical parameters are consistent with USEPA (2001), as summarized below.

Equipment

The following equipment/supplies may be used to collect sediment samples:

☐ Boat

☐ Stainless-steel petite Ponar™

☐ Butyrate plastic coring tubes with caps (2-3 in. diameter)

☐ X-ray fluorescence (XRF) meter

☐ Power shears

☐ Anchoring device and line as necessary

☐ Stainless-steel spatula

☐ Stainless-steel bowls and spoons

☐ Water siphon

☐ Decontamination supplies

☐ Sample bottles and labels provided by the laboratory

☐ Cooler with ice

☐ Long cooler suitable for chilling the at-depth core

☐ Field logbook/field data sheets

- ☐ Indelible ink pen
- ☐ Sampling location map
- ☐ Water quality meter for *in-situ* water quality testing
- ☐ GeoXH GPS unit or equivalent
- ☐ Camera
- ☐ Cellular telephone and field radio
- ☐ Appropriate health and safety equipment:
  - Safety glasses
  - Hard hat
  - Steel toe boots/waders
  - High-visibility vest
  - Nitrile gloves and leather gloves

Instrument Calibration

Electronic equipment used during sampling will include a multi-functional surface water meter (e.g., Myron 6P or YSI 600XL). The meters will be operated, calibrated and maintained according to manufacturer's guidelines and recommendations. Calibration of the field instruments will be performed on a daily basis and the stability of the calibration will be verified during sampling activities as warranted. Operation and calibration of the field instruments will be performed by field personnel properly trained in these procedures and calibration data will be documented in the field logbook and/or data sheet.

Decontamination Procedures

Before sampling begins, the sediment sampler, stainless-steel bowls, and spoons will be decontaminated. The equipment will also be decontaminated between sampling locations. The following is a list of equipment/supplies that may be needed to perform decontamination:

- ☐ Brushes
- ☐ Wash tubs
- ☐ Buckets
- ☐ Sponges or paper towels
- ☐ Alconox detergent (or equivalent)
- ☐ 10% Nitric Acid Solution
- ☐ Potable tap water
- ☐ Organic-free water (deionized or distilled water)
- ☐ Hand-held sprayers or spray bottles
- ☐ Aluminum foil

- ☐ Trash bags
- ☐ Plastic sheeting

The following steps will be used to decontaminate the sediment sampler, stainless-steel bowls, and spoons:

1. Dress in suitable safety equipment to reduce personal exposure as required by the health and safety plan (HASP).
2. Scrape off/field wash gross quantities of the sampled medium found on equipment at the sampling site.
3. Spray equipment that will not be damaged by water with a solution containing Alconox or low-sudsing detergent along with potable water and scrub with a bristle brush or similar utensil.
4. Rinse equipment with tap water.
5. Rinse sampling equipment a second rinse of dilute (10%) nitric acid.
6. Rinse equipment with a deionized or distilled water rinse.

Following decontamination, the sampling equipment will be placed in a clean area and will remain closed to prevent contact with dust and unclean surfaces. If the equipment is not to be used immediately, the equipment will be covered or wrapped in aluminum foil, plastic sheeting or heavy-duty trash bags to minimize potential contamination.

Surficial Sediment Collection

Wading will be considered if the water depth is shallow, water velocity is manageable, and the substrate is cohesive enough to make wading feasible. If samples are collected by wading, each sample location will be approached from downstream to minimize sediment disturbance at the sampling station. If wading is not feasible, a boat may be used to reach the sampling locations. Caution will be used when conducting sampling from either the boat or wading. Health and safety procedures for conducting work over water are detailed in the HASP and are a required component of the sampling.

The following procedures will be used during surficial sediment sampling:

1. If a boat is necessary, anchor the boat at the sampling stations. Record GPS coordinates if not previously recorded.
2. Measure and record water depth.
3. Record water quality field measurements (pH, temperature, dissolved oxygen, specific conductivity, turbidity, and oxidation-reduction potential) *in-situ* at approximately 1 foot above the bottom of the water body, where possible.
4. Decontaminate sampling equipment and don a new pair of latex/nitrile gloves.
5. Open stainless-steel petite Ponar and secure trigger bar.
6. Using a secure line, slowly lower the petite Ponar grab through the water column until approximately 1 foot above the sediment surface.

7. Allow petite Ponar grab to free fall the remaining distance to bottom. The petite Ponar will automatically trigger.
8. Slowly retrieve the petite Ponar grab in a controlled manner to minimize sample disturbance or loss of fines.
9. Remove the top of the petite Ponar to siphon excess water.
10. Inspect the sediment grab for the following:
    - Surface sediment is undisturbed and overlying water is present
    - Sediment level does not touch screen
    - Sediment grab is even across sampler
    - Desired sediment penetration depth has been achieved
    - Sediments did not wash out during sample retrieval
11. Discard grab if inadequate, being careful not to disturb adjacent sediments at the station.
12. Open petite Ponar grab over stainless-steel bowl, allowing bowl to catch sediment.
13. Repeat the steps for lowering and retrieving the petite Ponar (if necessary) to obtain sufficient quantity of sediment for analysis.

Procedures for filling sample jars are as follows:

1. Don a new pair of latex/nitrile gloves before filling containers.
2. Homogenize the sample removing obvious non-representative materials (e.g., vegetation).
3. Fill the remaining jars in the following order:
    - Mercury;
    - Total organic carbon and grain size.
4. Place samples in an iced cooler as soon as possible.
5. Record all appropriate data and field observations of sediment visual characteristics in field logbook and/or field data sheet.
6. Decontaminate sampling equipment and don a new pair of latex/nitrile gloves before sampling.

Sediment Core Collection

Wading will be considered if the water depth is shallow, water velocity is manageable, and the substrate is cohesive enough to make wading feasible. If samples are collected by wading, each sample location will be approached from downstream to minimize sediment disturbance at the sampling station. If wading is not feasible, a boat may be used to reach the sampling locations. Caution will be used when conducting sampling from either the boat or wading. Health and safety procedures for conducting work over water are detailed in the HASP and are a required component of the sampling.

The following procedures will be used in the field during at-depth sediment sampling:

1. Anchor the boat at the sampling stations. Record GPS coordinates if not previously recorded.
2. Measure and record water depth.
3. Record water quality field measurements (pH, temperature, dissolved oxygen, conductivity, turbidity, salinity, and oxidation-reduction potential) *in-situ* at approximately 1 foot above the bottom of the water body, where possible.
4. Decontaminate sampling equipment and don a new pair of latex/nitrile gloves.
5. Cap the top of a dedicated butyrate plastic core tube and submerse it until it reaches the surface water – sediment interface.
6. Remove the cap and slowly advance the core tube into the sediment until refusal is reached.
7. Record the depth of the core before capping the top end and slowly remove the core tube from the sediment.
8. Upon removal from the water surface cap the bottom of the core and place on a flat surface.
9. Use a pipe cutter to cut and carefully drain the excess water at the upper extent of the sediment and recap for storage in a cooler.

The following procedures will be used for x-ray fluorescence (XRF) analysis of the sediment core:

1. Cut the core liner lengthwise on either side of the core using power shears and remove the plastic liner, exposing the intact core.
2. Using wire, cut along the edge of the core liner and expose ‘fresh’ material.
3. Perform visual inspection of the core record its characteristics (e.g., color, texture, presence of organic material and odors, etc.) in a field logbook and/or field data sheet.
4. Screen the core using the XRF analyzer in six inch increments to determine where the highest mercury concentrations are found. Results of the XRF analysis should be recorded in a field logbook and/or field data sheet.
5. Remove the top six inches of the core for sample analysis.
6. Remove the bottom six inches of the core for sample analysis.
7. Remove the two highest intermediate samples based on the XRF analysis. Additional sampling intervals may be considered based on the findings of the visual stratigraphy and field screening.

Procedures for filling sample jars are as follows:

1. Don a new pair of latex/nitrile gloves before filling containers.
2. Homogenize the sample removing obvious non-representative materials (e.g., vegetation).
3. Fill the remaining jars in the following order:

  - Mercury;
  - Total organic carbon and grain size.
4. Place samples in an iced cooler as soon as possible.
5. Record all appropriate data and field observations of sediment visual characteristics in field logbook and/or field data sheet.
6. Decontaminate sampling equipment and don a new pair of latex/nitrile gloves before sampling.
7. Record all appropriate data and field observations of sediment characteristics (e.g., texture, color, odor) in field logbook and/or field data sheet.

Field Quality Assurance/Quality Control

Field quality assurance/quality control (QA/QC) samples are designed to help identify and minimize potential sources of sample contamination due to field procedures and to evaluate potential error introduced by sample collection and handling.

Field/Equipment Blanks

Field blanks associated with a non-aqueous matrix will be performed at a rate of 5% of the non-aqueous samples collected throughout the sampling event, not to exceed a rate of one per day. It is necessary to collect field blank and equipment blank samples each day that sampling occurs to demonstrate that contamination has been controlled.

Duplicate Sample

Duplicate samples will be collected at a rate of 5% of the total samples collected for sediment analyses. Locations selected for the collection of duplicates will be selected randomly.

Matrix Spikes and Matrix Spike Duplicates

Matrix spike/matrix spike duplicate (MS/MSD) samples will be collected at a rate of 5% of the total number of samples in each matrix, not to exceed one per day. At sampling locations where MS/MSD samples are to be collected, a sufficient volume of sampling material, as required by the laboratory will be collected. MS/MSD sampling locations will be selected randomly throughout the sampling program.

Sample Identification, Handling, and Chain-of-Custody

Samples will be identified, handled, and recorded as described in this sampling guideline. The sample parameters for analysis, preservation, and handling are specified sampling plan. Each sample container has a sample label affixed to the outside. The sampler marks each label with the following information using indelible ink:

☐ Project name

☐ Sample identification number

☐ Date and time of collection

☐ Initials of sampling technician

- ☐ Requested analysis
- ☐ Method of preservation

Sample containers will be packed in bubble wrap to minimize breakage or damage to samples and placed in metal or plastic coolers. Wet ice will be placed around sample containers and additional cushioning material will be added to the cooler, if necessary. A chain-of-custody (COC) and other relevant paperwork will be put in a sealable plastic bag (e.g., Ziploc) and placed on top of the sample containers or taped to the inside lid of the cooler. The cooler will be taped closed and a signed custody seal will be affixed to the side of the cooler. Laboratory address labels will be placed on top of the cooler.

All samples are expected to contain low levels of contamination and will be packaged and shipped as environmental samples in accordance with applicable federal and state regulations. Shipments will be scheduled to meet holding time requirements. The laboratory will be notified to be prepared to receive a shipment of samples. If the number, type, or date of shipment changes due to site constraints or program changes, the laboratory will be informed.

URS has established a program of sample COC that will be followed during sample handling activities in both field and laboratory operations. The primary purpose of COC procedures is to document the possession of the samples from collection through shipping, storage, and analysis to data reporting and disposal. The Task Manager or his/her designee will be responsible for monitoring compliance with COC procedures.

Tracing sample possession will be accomplished using the COC record. A COC entry will be recorded for every sample, and a COC record will accompany every sample shipment to the laboratory. At a minimum, the COC record will contain the following information for each sample:

- ☐ Sample number and identification of sampling point
- ☐ Date and time of collection
- ☐ Sample type
- ☐ Number, type, and volume of sample container(s)
- ☐ Sample preservative
- ☐ Analysis requested
- ☐ Name, address, and phone number of laboratory or laboratory contact
- ☐ Signature, dates and times of persons in possession
- ☐ Any necessary remarks or special instructions

Once the COC is complete and the samples are ready for shipment, the COC will be placed inside the shipping container, and the container will be sealed. Samples are considered to be in custody if they are within sight of the individual responsible for their security or locked in a secure location. Each person who takes possession of the samples, except the shipping courier, is responsible for sample integrity and safekeeping.

Field Logbook and Field Data Sheet

The most important aspect of documentation is thorough, organized, and accurate record keeping. All information pertinent to the investigation will be recorded in the field logbook and/or field data sheets. Entries will include the following, as applicable:

- ☐ Project name and number
- ☐ Name of sampler and field personnel
- ☐ Date and time of sample collection
- ☐ Sample number, location, and depth
- ☐ Sampling method
- ☐ Sampling media
- ☐ Sample type
- ☐ Sample physical characteristics
- ☐ Observations at the sampling site (e.g., weather conditions)
- ☐ Summary of daily tasks and information concerning sampling changes, scheduling modifications, and change orders dictated by field conditions

Field investigation situations vary widely. No general rules can include each type of information that must be entered in a logbook or data sheet for a particular site. Site-specific recording will include sufficient information so that the sampling activity can be reconstructed without relying on the memory of field personnel.

Health and Safety Procedures

To avoid incidents or injuries during sampling, the following health and safety procedures should be followed:

- ☐ Toxic or otherwise harmful concentrations of metals or other constituents are unlikely to be encountered while sampling pore water in rivers and streams. However, sampling crews should be trained in the general hazards of field sampling (e.g., waterborne pathogens) and how to minimize risks of exposure.
- ☐ Operating in or around waterbodies carries the inherent risk of drowning. U.S. Coast Guard approved personal flotation devices must be worn when operating or sampling from a boat, when sampling in more than a few feet of water, or when sampling in swift currents.
- ☐ Collecting samples in cold weather, especially around cold waterbodies, carries the risk of hypothermia, and collecting samples in extremely hot and humid weather carries the risk of dehydration and heat stroke. Sampling team members should wear adequate clothing for protection in cold weather and should carry an adequate supply of water or other liquids for protection against dehydration in hot weather.
- ☐ Sampling team members must cover exposed skin and/or use sunscreen for protection from sun exposure.

- ☐ When working on all waterbodies, sampling teams must develop and employ an emergency response plan, including the use of an onshore monitor that is accountable for the whereabouts of the team. The monitor can request aid if the team fails to report in at end of workday and can provide assistance to rescuers or the team under any emergency situation.

Reference

USEPA. 2001. Methods for Collection, Storage, and Manipulation of Sediments for Chemical and Toxicological Analyses: Technical Manual. USEPA Office of Water. EPA-823-B-01-002. October 2001.

Appendix B

Pore Water Sampling Guidelines

Guidelines for Sediment Pore Water Sampling Using a PushPoint Sampler

Pore Water Sampling Procedures

Pore water sampling procedures for the Wanaque River investigation are summarized in the following steps:

1. Collect pore water samples from the biologically active layer (i.e., top 0 to 4 inches) at 21 stations within Reach 2 and Reach 3.
2. Measure GPS coordinates with sub-meter accuracy using a Trimble GeoXH GPS unit or similar equipment at each location.
3. Access sample stations either by wading or using a boat.
4. Sample analytical parameters for each sediment station as specified in Table 1-1.

The detailed procedures for collecting pore water samples for analytical chemistry and *in situ* water quality parameters are summarized below.

Equipment

The following equipment/supplies may be used to collect pore water samples:

- ☐ Boat
- ☐ Chest waders/rubber boots
- ☐ Stainless-steel PushPoint Sampler with guard rod
- ☐ MHE Screen-Soks
- ☐ Steel sampling platform
- ☐ Dedicated 0.45-µm filters
- ☐ Syringe, with Luer-Lok type fitting
- ☐ Tubing
- ☐ Decontamination supplies
- ☐ Sample bottles and labels provided by the laboratory
- ☐ Cooler with ice
- ☐ Field logbook/field data sheets
- ☐ Pencils and waterproof/permanent marking pens
- ☐ Sampling location map
- ☐ Myron 6P water quality meter or equivalent for *in situ* water quality testing

- ☐ GeoXH GPS unit or equivalent
- ☐ Camera
- ☐ Cellular telephone
- ☐ Chain-of-custody (COC) forms
- ☐ Custody seals
- ☐ Appropriate health and safety equipment
  - ▪ Safety glasses
  - ▪ Hard hat
  - ▪ Steel toe boots/waders
  - ▪ High-visibility vest
  - ▪ Nitrile gloves and leather gloves

Instrument Calibration

Electronic equipment used during sampling will include water quality meters capable of reading temperature and specific conductivity using minimal sample volume (e.g., Myron 6B). The meters will be operated, calibrated and maintained according to the manufacturer guidelines and recommendations. Calibration of field instruments will be performed on a daily basis and the stability of the calibration will be verified during sampling activities, as warranted. Field personnel properly trained in these procedures will perform operation and calibration of the field instruments and calibration data will be documented in the field logbook and/or data sheet.

Decontamination Procedures

The PushPoint sampler will be decontaminated before sampling begins and between sampling stations. The following steps will be used to decontaminate the sediment sampler, stainless-steel bowls, and spoons:

- ☐ Be aware of safety procedures. Don appropriate personal protective equipment (PPE).
- ☐ Clean the exterior of the guard rod, steel sampling platform, and PushPoint sampler with a stiff brush and Alconox solution.
- ☐ Rinse the exterior with tap water.
- ☐ Decontaminate the bore of the PushPoint sampler using a garden sprayer filled with Alconox and the cleaning adapter provided with the sampler.
- ☐ Insert the sampling port of the PushPoint into the cleaning adapter and deliver at least 100 mL of pressurized Alconox solution through the sampler and out the screened zone into a waste receptacle.
- ☐ Gently insert the guard rod into the PushPoint to its end to dislodge any bridged material.

- ☐ Re-rinse the bore, in addition to the guard rod and sampling platform, with at least 100 milliliters (mL) of pressurized Alconox solution as described above.
- ☐ Rinse inside of tubing using the same methods as the bore using pressurized distilled water.
- ☐ Rinse inside of tubing with dilute (10%) nitric acid.
- ☐ Completely rinse all components of the sampler with a DI or distilled water rinse.

Following decontamination, the sampling equipment will be placed in a clean area and wrapped in plastic sheeting, heavy-duty trash bags, or provided materials to minimize potential contamination from contact with dust and unclean surfaces.

Pore Water Collection

Wading will be considered if the water depth is shallow, water velocity is manageable, and the substrate is cohesive enough to make wading feasible. If samples are collected by wading, each sample location will be approached from downstream to minimize sediment disturbance at the sampling station. If wading is not feasible, a boat may be used to reach some of the sampling locations. Caution will be used when conducting sampling from the boat or by wading.

The following methods will be used in the collection of Pore water samples:

1. Where applicable (e.g., fine-grained sediments), place a dedicated Screen-Sok (MHE Products) over the screened end of the PushPoint sampler and secure the top of the Screen-Sok to the sampler using electrical tape if necessary.
2. Insert the guard rod into the bore of the PushPoint sampler.
3. Holding the handles of the guard rod and PushPoint sampler together so that guard rod remains fully inserted in the PushPoint sampler, insert the PushPoint sampler into the sediment using a gentle twisting motion until the entire screen is 2 to 3 inches below the sediment-surface water interface.
4. Remove the guard rod from the bore of the PushPoint sampler without disturbing the position of the deployed sampler (Once the guard rod has been removed, it should not be reinserted into the device until the bore of the PushPoint has been thoroughly cleansed of all sediment).
5. Attach tubing to the PushPoint sample port and syringe
6. Withdraw the piston on the syringe slowly and clamp tubing prior to removing the syringe.
7. Remove the syringe and discard the first aliquot of water that is withdrawn from the sampler and then collect a volume sufficient to measure specific conductivity and water temperature.
    - The volume of the aliquot is dependent on the length and diameter of the tubing and the PushPoint.

8. Measure and record the specific conductivity and water temperature of the sample using a Myron 6P meter or equivalent.
9. Compare specific conductivity and temperature values in interstitial water samples relative to surface-water samples.
   - Measures of specific conductivity and water temperature in interstitial water that are comparable to surface-water values can either suggest that overlying surface water may have been drawn into the interstitial water sample or that surface water is exchanging with overlying water at a particular sampling location.
10. If values are comparable, adjust position of PushPoint sampler and re-measure specific conductance and water temperature after discarding the first aliquot of water from new location.
    - If after multiple measurements of specific conductivity and temperature in pore water and overlying surface water result in compare values, professional judgment must be used when to determine whether an extracted pore water sample is representative of exposure condition for sediment-dwelling invertebrate receptors.
11. Fill the syringe
12. Clamp tubing before removing the syringe in order to minimize the introduction of air into tubing.
13. Collect an additional volume of sample sufficient to measure specific conductivity and water temperature.
14. Measure and record the specific conductivity and water temperature of the sample.
15. Transfer water from syringes into laboratory supplied bottleware. Where possible, filtered samples should be filtered prior to filling bottleware.
16. Place the cap on the laboratory-supplied sampling bottle and place the filled sample on ice.
17. Decontaminate non-dedicated equipment between sample stations according to the procedures outlined above.

Field Quality Assurance/Quality Control

Field quality assurance/quality control (QA/QC) samples are designed to help identify and minimize potential sources of sample contamination due to field procedures and to evaluate potential error introduced by sample collection and handling.

Field/Equipment Blanks

It is necessary to collect field blank and equipment blank samples each day that sampling occurs to demonstrate that contamination has been controlled.

Duplicate Sample

Due to the limited volume of sample that is able to be collected, duplicate samples will be collected only if sufficient sample volume can be obtained.

Matrix Spikes and Matrix Spike Duplicates

Separate samples for matrix spikes (MS) and matrix spike duplicates (MSD) do not have to be collected unless the laboratory requests because these analyses can be run by most laboratories using an actual sample.

Sample Identification, Handling, and Chain-of-Custody

Samples will be identified, handled, and recorded as described in this sampling guideline. The sample parameters for analysis, preservation, and handling are specified in the sampling plan. Each sample container has a sample label affixed to the outside. The sampler marks each label with the following information using waterproof ink:

- ☐ Project name
- ☐ Sample identification number
- ☐ Date and time of collection
- ☐ Initials of sampling technician
- ☐ Requested analysis
- ☐ Method of preservation

Sample containers will be packed in bubble wrap to minimize breakage or damage to samples and placed in metal or plastic coolers. Wet ice will be placed around sample containers and additional cushioning material will be added to the cooler, if necessary. A chain-of-custody (COC) and other relevant paperwork will be put in a sealable plastic bag (e.g., Ziploc) placed on top of the sample containers or taped to the inside lid of the cooler. The cooler will be taped closed and a signed custody seal will be affixed to the side of the cooler. Laboratory address labels will be placed on top of the cooler.

All samples are expected to contain low levels of contamination and will be packaged and shipped as environmental samples in accordance with applicable federal and state regulations. Shipments will be scheduled to meet holding time requirements. The laboratory will be notified to be prepared to receive a shipment of samples. If the number, type, or date of shipment changes due to site constraints or program changes, the laboratory will be informed.

URS has established a program of sample COC that will be followed during sample handling activities in both field and laboratory operations. The primary purpose of COC procedures is to document the possession of the samples from collection through shipping, storage, and analysis to data reporting and disposal. The Task Manager or his/her designee will be responsible for monitoring compliance with COC procedures.

Tracing sample possession will be accomplished using the COC record. A COC entry will be recorded for every sample, and a COC record will accompany every sample shipment to the laboratory. At a minimum, the COC record will contain the following information for each sample:

- ☐ Sample number and identification of sampling point
- ☐ Date and time of collection
- ☐ Sample type
- ☐ Number, type, and volume of sample container(s)
- ☐ Sample preservative
- ☐ Analysis requested
- ☐ Name, address, and phone number of laboratory or laboratory contact
- ☐ Signature, dates and times of persons in possession
- ☐ Any necessary remarks or special instructions

Once the COC is complete and the samples are ready for shipment, the COC will be placed inside the shipping container, and the container will be sealed. Samples are considered to be in custody if they are within sight of the individual responsible for their security or locked in a secure location. Each person who takes possession of the samples, except the shipping courier, is responsible for sample integrity and safekeeping.

Field Logbook and Field Data Sheet

The most important aspect of documentation is thorough, organized, and accurate record keeping. All information pertinent to the investigation will be recorded in the field logbook and/or field data sheets. Entries will include the following, as applicable:

- ☐ Project name and number
- ☐ Name of sampler and field personnel
- ☐ Date and time of sample collection
- ☐ Sample number, location, and depth
- ☐ Sampling method
- ☐ Sampling media
- ☐ Sample type
- ☐ Sample physical characteristics
- ☐ Observations at the sampling site (e.g., weather conditions)
- ☐ Summary of daily tasks and information concerning sampling changes, scheduling modifications, and change orders dictated by field conditions

Field investigation situations vary widely. No general rules can include each type of information that must be entered in a logbook or data sheet for a particular site. Site-specific recording will include sufficient information so that the sampling activity can be reconstructed without relying on the memory of field personnel.

Health and Safety Procedures

To avoid incidents or injuries during sampling, the following health and safety procedures should be followed:

- ☐ Toxic or otherwise harmful concentrations of metals or other constituents are unlikely to be encountered while sampling pore water in rivers and streams. However, sampling crews should be trained in the general hazards of field sampling (e.g., waterborne pathogens) and how to minimize risks of exposure.
- ☐ Operating in or around waterbodies carries the inherent risk of drowning. U.S. Coast Guard approved personal flotation devices must be worn when operating or sampling from a boat, when sampling in more than a few feet of water, or when sampling in swift currents.
- ☐ Collecting samples in cold weather, especially around cold waterbodies, carries the risk of hypothermia, and collecting samples in extremely hot and humid weather carries the risk of dehydration and heat stroke. Sampling team members should wear adequate clothing for protection in cold weather and should carry an adequate supply of water or other liquids for protection against dehydration in hot weather.
- ☐ Sampling team members must cover exposed skin and/or use sunscreen for protection from sun exposure.
- ☐ When working on all waterbodies, sampling teams must develop and employ an emergency response plan, including the use of an onshore monitor that is accountable for the whereabouts of the team. The monitor can request aid if the team fails to report in at end of workday and can provide assistance to rescuers or the team under any emergency situation.

URS

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Fort Washington, PA 19034
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MEMORANDUM

TO: David Epps, DuPont Project Director
DATE: June 29, 2012

FROM: Gary Long
PROJECT: Wanaque River Investigation

URS JOB NO.: 18985748 FININFO NO.: 507843 cc :

SUBJECT: **Responses to NJDEP BEERA Comments Dated March 21, 2012 Regarding the July 2011 Wanaque River Remedial Investigation Report**
Pompton Lakes, New Jersey

The following memorandum provides responses to the New Jersey Department of Environmental Protection (NJDEP) Bureau of Environmental Evaluation and Risk Assessment (BEERA) comments on the July 2011 Wanaque River Remedial Investigation Report (RIR) prepared for the DuPont Pompton Lakes Works located in Pompton Lakes, New Jersey. This memorandum follows previous correspondence with NJDEP BEERA regarding the RIR, as listed below in chronological order:

- July 2011: Revised RIR submitted to NJDEP BEERA;
- December 13, 2011: NJDEP BEERA provides a comment letter on the July 2011 RIR;
- January 16, 2012: DuPont responds to the RIR comments in a memorandum to NJDEP BEERA; and
- March 21, 2012: NJDEP BEERA provides comments on the January 16, 2012 response-to-comments memorandum.

The text of the March 21, 2012 NJDEP BEERA comments is provided below followed by the response in bold.

NJDEP Comments and Responses:

NJDEP General Comment: The first NJDEP comment concerned the lack of ground water information (e.g. ground water samples, flow direction, sample location maps) in the BEE to substantiate the claim that ground water is not acting as a contaminant migration pathway to the river. The NJDEP recommended that sediment samples be collected from the Wanaque River. URS responded that the Wanaque River RIR and BEE "summarized the findings of ground water investigations described in greater detail in the Western Manufacturing Area (WMA) RIR and specific groundwater investigation reports".

The WMA RIR (Parsons, revised December 2011) does not contain any ground water data tables or figures, and is predominantly about soils. The WMA RIR discusses ground water to the extent that it references a Site Investigation Groundwater Report from December 2004. URS notes that "since the preparation of the WMA RIR and the Wanaque River RIR, DuPont has been working with NJDEP to design and implement additional investigations in the WMA to supplement existing groundwater information." This effort is to include installation and sampling of temporary well points. Once available, data from these investigations "will be integrated with existing information into the conceptual site model, which will include evaluating potential groundwater migration to the Wanaque River."

The NJDEP finds the proposed additional investigations conceptually acceptable, but is not aware of any work plans from DuPont to conduct such supplemental investigations in the WMA. When the additional work is done, the historic ground water information (i.e. from the December 2004 Site Investigation Groundwater Report) should be presented in an all-inclusive document with the newly acquired data.

Response: Additional investigations within the WMA are on-going and have been implemented based on discussions at technical meetings held with NJDEP on December 6 and 8, 2011 and January 17, 2012. The findings of the additional groundwater investigations in the WMA will be integrated with existing groundwater information to update the site conceptual model to evaluate the potential for impacted groundwater to migrate to the Wanaque River. The integrated findings will be presented in a *Supplemental Remedial Investigation Report* that will be submitted to the NJDEP. Therefore, to the extent possible, the integrated information will be contained in one document. However, references to other documents may be needed to note where the information was previously provided.

NJDEP Response to Comment 1 - DuPont is working to design and implement additional investigations in the Western Manufacturing Area (WMA) to supplement existing ground water information and evaluate potential ground water migration to the Wanaque River. If this work reveals additional investigations are necessary, data from the on-going ground water investigations will be used as the basis to design a pore water sampling program to target areas of potential ground water-to-surface water interaction.

From an ecological investigation perspective, this response is acceptable.

Response: NJDEP acceptance of the proposed approach is acknowledged. Ecological exposure resulting from potentially complete migration pathways of impacted groundwater to the Wanaque River that are identified by the on-going groundwater investigations will be evaluated based on a pore water sampling program. As stated in the previous response, integrated groundwater information from the WMA will be used as the basis for designing the pore water sampling program. The specific objective of this pore water sampling program will be to evaluate potentially complete migration pathways of impacted groundwater to the Wanaque River; this effort will be in addition to the targeted pore water sampling that is proposed for the summer of 2012 (See response to Comment #2 below), which is intended to evaluate potential ecological exposure to mercury in sediment pore water outside of the potential IRM area between WR-13 and WR-22.

NJDEP Response to Comment 2 - Previous sampling of sediments in the Wanaque River revealed mercury concentrations exceeded the 2 ppm Severe Effects Level (SEL). DuPont's proposal to conduct additional investigations "to address NJDEP concerns regarding potentially spatially-limited areas of elevated sediment mercury concentrations upstream of the proposed IRM area to WR-13 and downstream of the proposed IRM area to WR-22" is acceptable. Following substrate mapping of sediments, NJDEP looks forward to reviewing further analytical sediment sampling results of these areas documented by previous sampling to represent elevated mercury concentrations, along with a weight-of-evidence evaluation of exposure based upon all site-specific lines of evidence. Although soils in upland site areas have been sampled extensively, potential recontamination of the river remains largely unaddressed.

Response: NJDEP acceptance of the area of additional sediment mercury characterization is acknowledged (upstream of the proposed IRM area to WR-13 and downstream of the proposed IRM area to WR-22). Detailed substrate mapping of this area was completed in February 2012 (see attached sampling plan) and additional analytical sampling to characterize mercury concentrations in fine-grained sediment deposits is planned for July 2012, as detailed in the attached sampling plan. Concurrent with the additional sediment mercury characterization, a targeted pore water sampling program will also be conducted to evaluate potential ecological exposure in the areas outside of the potential IRM area between WR-13 and WR-22. The findings of these investigations will be summarized in a brief technical report to NJDEP. This technical report will include a weight-of-evidence evaluation of exposure based on available site-specific lines of evidence presented in the revised Wanaque River Remedial Investigation Report and the findings of investigations conducted since the July 2011 submittal of the RIR. A concise sampling plan detailing the investigation objectives and procedures for implementing the proposed sampling is being submitted to NJDEP with this response memorandum for review and concurrence prior to the planned sampling in the summer of 2012.

The potential for re-contamination of the river by upland soils will be addressed in the Wanaque River IRM Work Plan, in addition to the on-going investigations of the WMA.

<u>NJDEP Response to Comment</u> 3 - NJDEP recognizes DuPont's position that outside of the proposed IRM area, ecological exposure to mercury and other COPECs in sediment is relatively limited. Even though DuPont contends they are addressing "the area of greatest ecological exposure to mercury in sediments", that does not dismiss them from NJDEP's requirement to address additional areas of potential exposure nor does it characterize our concerns as unreasonable. The Department routinely requires that levels above the LEL are given a closer look; therefore, the fact that COPEC levels in some of these areas outside of the proposed IRM area exceed their respective SEL is of even greater concern. Ecological criteria must be addressed in addition to human health criteria.

Response: As stated in the previous response, a targeted sediment pore water sampling program will be conducted in areas outside of the potential IRM between WR-13 and WR-22 (see attached sampling plan). The objective of this sampling program will be to evaluate potential ecological exposure to total mercury (THg) and methylmercury (MeHg) in sediment pore water. The concentrations of constituents in pore water are better correlated with the bioavailability and toxicity of constituents relative to bulk sediment concentrations; therefore, the evaluation of pore water represents an important line of evidence in the evaluation of THg and MeHg exposure to sediment-associated receptors.

Pore water data will be used in a weight-of-evidence evaluation of potential ecological exposure to THg and MeHg in areas where sediment THg concentrations exceed the LEL and/or SEL. A concise sampling plan detailing the investigation objectives and procedures for implementing the proposed sampling is being submitted to NJDEP with this response memorandum for review and concurrence prior to the planned summer 2012 sampling program.