Conceptual Site Model

Newark Bay Study Area

January 2019

Revision 3

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Acronyms and Abbreviations

1940 horizon	1940 sediment horizon
2,3,7,8-TCDD	2,3,7,8-tetrachlorodibenzo-*p*-dioxin
AOC	Administrative Order on Consent
(the) Bay	Newark Bay
BAZ	biologically active zone
Be-7	beryllium-7
BERA	Baseline Ecological Risk Assessment
BHHRA	Baseline Human Health Risk Assessment
bss	below sediment surface
CDF	confined disposal facility
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
cm	centimeter
COPC	contaminant of potential concern
CPG	Cooperating Parties Group
CSM	Conceptual Site Model
CSO	combined sewer overflow
CWA	Clean Water Act
cy	cubic yard(s)
DDT	dichlorodiphenyltrichloroethane
DEAR	Phase I and Phase II Data Evaluation and Analysis Report (Tierra 2014c)
Deposition Report	Phase I and Phase II Sediment Deposition Report (Tierra 2011)
DQO	data quality objective
ETM	estuarine turbidity maximum

FS	Feasibility Study
ft	foot/feet
GLEC	Great Lakes Environmental Center
GSH	Glenn Springs Holdings, Inc.
HARS	Historic Area Remediation Site
HDP	Harbor Deepening Project
HydroQual	HydroQual, Inc.
MLLW	mean lower low water
mm	millimeter
MPI	Malcolm Pirnie, Inc.
MSL	mean sea level
NBSA	Newark Bay Study Area
N.J.A.C.	New Jersey Administrative Code
NOAA	National Oceanic and Atmospheric Administration
Normandeau	Normandeau Associates, Inc.
NPDES	National Pollutant Discharge Elimination System
NY/NJ	New York/New Jersey
NYSDEC	New York State Department of Environmental Conservation
OU	operable unit
PAH	polycyclic aromatic hydrocarbon
PBDE	polybrominated diphenyl ether
PCB	polychlorinated biphenyl
PCDD	polychlorinated dibenzo-*p*-dioxin
PCDF	polychlorinated dibenzofuran
pCi/g	picocuries per gram
pg/L	picograms per liter
Phase I RIWP	Phase I Remedial Investigation Work Plan

Phase II RIWP	Phase II Remedial Investigation Work Plan
POTW	publicly owned treatment work
ppt	parts per trillion
PVSC	Passaic Valley Sewerage Commissioners
QAPP	Quality Assurance Project Plan
redox	reduction-oxidation
REMAP	Regional Estuarine and Monitoring Program
RI	remedial investigation
SI	sediment investigation
SIU	significant industrial user
SOW	Statement of Work
SQT	sediment quality triad
SSC	suspended sediment concentration
SVOC	semivolatile organic compound
Tierra	Tierra Solutions, Inc.
TPH	total petroleum hydrocarbons
µm	micrometers
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
VOC	volatile organic compound

1. Introduction

The Diamond Alkali Superfund Site, which borders the Passaic River (Figure 1-1), was added to the Superfund National Priorities List on September 21, 1984 because of contaminants present at the site and in the river. Four different operable units (OUs) are associated with the site today and are shown on Figure 1-1: the former manufacturing plant and surrounding properties at 80 and 120 Lister Avenue (OU1), the lower 8.3 miles of the Passaic River (OU2), the Newark Bay Study Area (NBSA; OU3), and the lower 17 miles of the Passaic River (OU4; U.S. Environmental Protection Agency [USEPA] 2016a). Pursuant to the Administrative Order on Consent (AOC) under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA Index 02-2004-2010; USEPA 2004), Glenn Springs Holdings, Inc., (GSH) on behalf of Occidental Chemical Corporation (the successor to Diamond Shamrock Chemicals Company [formerly known as Diamond Alkali Company]), is presently conducting a Remedial Investigation/Feasibility Study (RI/FS) for the NBSA.

1.1 Newark Bay Study Area

Newark Bay (the Bay) is a 6.3-square-mile enclosed embayment on the western side of the New York/New Jersey (NY/NJ) Harbor Estuary. The Bay is adjacent to four large cities (Newark, Elizabeth, Bayonne, and Jersey City), and is fringed on its western side by port facilities, industrial facilities, and Newark Liberty International Airport. On its northern side, the Hackensack and Passaic Rivers flow into the Bay, while on the southern side the Bay is connected to New York Harbor (NY) and Raritan Bay (NJ) through two tidal straits: the Kill van Kull and Arthur Kill, respectively. The NBSA has been defined as the Bay and portions of key tributaries, including the Hackensack River, Arthur Kill, and Kill van Kull (Figures 1-1 and 1-2). The Passaic River is not included in the definition of the NBSA as it is presently being investigated as a separate OU. However, investigations of the Passaic River and NBSA OUs are being conducted in a comparable manner and with careful consideration of their linkages for the purposes of CERCLA management decision-making, and broader environmental management considerations.

1.2 Conceptual Site Model Development

This Conceptual Site Model (CSM) is an ongoing iterative feature in the RI/FS process, and describes the current understanding of the NBSA, including the inter-relationship between sources, contaminated media, and receptors in this complex and dynamic estuary. USEPA guidance *Data Quality Objectives Process for Hazardous Waste Site Investigations* (USEPA 2000) and *Guidance on Systematic Planning Using the Data Quality Objectives Process* (USEPA 2006a), identifies CSM development as one of the first and most important activities in sampling plan design, advocating that a CSM should be initiated at the start of a project and carefully maintained and updated throughout the life of site activities as new data and information become available. USEPA's *Principles for Managing Contaminated Sediment Risks at Hazardous Waste Sites* (USEPA 2002) and *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites* (USEPA 2005) also call for the use of a CSM in the decision-making process for sediment sites. This CSM was prepared in accordance with these guidance documents.

The specific objectives of this CSM include:

- Provide a framework for data completeness determination to prepare the RI Report
- Summarize the current understanding of relationships between sources, nature and extent, fate and transport, exposures and receptors, and trends of key contaminants in the NBSA
- Identify the available datasets to be incorporated in the RI Report and provide a synthesis level summary of the key information from Phase I, II, and III RI investigations.

To initiate the field investigations for the NBSA, Tierra Solutions Inc. (Tierra) first developed a Preliminary CSM (Tierra 2005) based on historical data and used the model to plan the first two phases (Phase I and Phase II) of the RI (Tierra 2005, 2007). The data generated from these first two investigations were used, including USEPA comments on the resulting reports (USEPA 2012), to create a revised interim CSM in 2013 (Tierra 2013b). The revised CSM was then used to develop the third phase (Phase III) of the RI. The Phase III data, including risk assessment data collected during Phase III activities, filled the data gaps identified following Phases I/II, and was used to revise the interim CSM to create this CSM.

It is anticipated that this CSM will be ultimately finalized as a component of the RI Report. The data and information to complete the RI have now been collected. These are summarized as part of this CSM and will be analyzed and interpreted in detail as part of the RI Report.

2. Environmental and Development History and Use of the Newark Bay Study Area

Newark Bay is central to one of the most urbanized and industrialized areas in the United States. It has experienced more than two centuries of environmental degradation that is attributable to many factors, including shoreline and land development (U.S. Army Corps of Engineers [USACE] 2006), wetlands/habitat loss, garbage and sewage disposal, dredging and dredged material disposal, and releases of contaminants from a variety of sources and locations (Iannuzzi et al. 2002). It is important to understand the factors that have created the present conditions, and present and future contaminant inputs, to determine the constraints on human use and the ecology of the system, and how these constraints may need to be addressed under the many regulatory and stakeholder programs that will collectively influence future management, use, and restoration of the Bay. CERCLA can only address the incremental impact that chemical contaminants have on NBSA use and resources. Therefore, it is important to understand the relative level of environmental risks/impacts that contaminants pose in the system—as opposed to impacts from other stressors—and to what degree they can and should be managed relative to the overall goals for present and future human and ecological use and conditions in this urban estuary. This in turn, requires an understanding of the environmental history of the NBSA, and the major factors/forces that have shaped its development into the complex industrial port system that it is today, including environmental changes and conditions that have resulted from this development and that will persist into the future.

2.1 Historical Development of the Newark Bay, Shorelines, and Dredged Channels

The environmental history of the Bay parallels the development of the New York City metropolitan area. Most shipping and economic development in the 19th century clustered around Manhattan and Brooklyn, but as the pace of development quickened in the first half of the 20th century, the Bay eventually supplanted Manhattan as the primary port by mid-century. Over that period, approximately 80 to 90% of the pre-existing shoreline of the Bay was developed, and ecological habitats correspondingly diminished (Iannuzzi et al. 2002; USACE 2009). A mid-19th century bathymetric map (Hassler 1844) depicts a shallow Bay (controlling depth less than 10 feet) that was bordered on the west and north by extensive wetlands.

Newark and Elizabeth (known in its early history as Elizabethtown and Elizabethport), much like surrounding communities, started as small towns surrounded by farms, forest, and wetlands (Hassler 1844). By the 1840s, railways bisected wetlands and connected Newark to Jersey City and Elizabeth setting the pre-conditions for future industrial development. By the early 20th century, housing developments covered most of the Bayonne peninsula, and the cities of Newark and Elizabeth on the west side were greatly expanded, as the growing industrial manufacturing complex in the Newark region replaced agriculture, and large numbers of people moved to the area. Newark Bay has evolved into its primary use—a highly modified, major shipping port. The Bay has been the site of myriad industries for more than two centuries (Meyers 1945; Cunningham 1954; Brydon 1974; Iannuzzi et al. 2002). The development of the port system required extensive land development, achieved through “reclamation” of the meadowlands (wetlands) along the Bay and the Hackensack River during the 20th century. As the area’s population and industrial development grew, transportation needs increased and a large network of roads, bridges, airports, and port facilities was constructed. A present land use map of the NBSA is presented on Figure 2-1.

Industrialization of the Bay was facilitated by development of navigational channels in the NY/NJ Harbor Estuary starting in the mid-1800s through channel deepening and widening by the USACE New York District (see Figure 1-2 for present navigation channel system). Table 2-1 presents the Bay's history of dredging, navigation channel widening, and wetlands alteration. Bathymetry surveys have been conducted since the early 1900s by the National Oceanic and Atmospheric Administration (NOAA) and USACE, and historical nautical charts prepared by the NOAA illustrate the shaping of the Bay. Most recently, bathymetry surveys were conducted as part of the latest channel deepening projects completed in 2016.

The depth and width of the navigational channels have continually grown since the early 1900s (USACE 2006), although channels in some adjacent water bodies (e.g., the lower Passaic River and Hackensack Rivers) are no longer maintained to their previously authorized depths. The navigation channel in the Bay north of the port channels is not maintained to previously authorized depths, even though it is still subject to large vessel traffic (e.g., wastewater treatment sludge barges). Substantial maintenance dredging of the existing channels is required. During the most recent maintenance dredging, approximately 285,000 cubic yards (cy) of material were removed from critically shoaled areas of the Port Newark approach channels. Currently, channel conditions are being monitored. The next maintenance dredging contract is expected to be awarded in 2018 (USACE 2018).

It is important to distinguish the annual maintenance dredging from construction dredging, which may be considerably larger but occurs only once for any given project modification and typically removes parent bed material, whereas maintenance dredging removes newly accumulated material. In September 2016, the USACE completed the Harbor Deepening Project (HDP). It included deepening in the Kill van Kull, Arthur Kill, Elizabeth Channel, and the southern portion and middle reaches of the Bay (Figure 2-2) to accommodate the large post-Panamax ships, which have drafts of 48 feet (ft) or more. With the completion of the project, 50 ft of water access is available in the major channels in New York Harbor and the Bay, including the channels leading to the terminals in the NBSA (USACE 2016). The estimated total volume of dredged material removed as a result of the entire project (including New York Harbor and the NBSA) was 52,000,000 cy. Dredged material was placed at the Historic Area Remediation Site (HARS; located offshore in the Atlantic Ocean adjacent to the NY/NJ Harbor Estuary), or was beneficially reused for grading/closure materials, marsh restorations, and artificial reef development (USACE 2004, 2013). Figure 2-2 presents the limits of the completed HDP.

2.2 Current and Future Human and Ecological Use

The following summarizes key information on the human and ecological use of the NBSA that is provided in detail in the *Problem Formulation* (Tierra 2013a), *Newark Bay Study Area Reconnaissance Survey Report* (Tierra 2015b), and *Pathways Analysis Report* (USEPA 2006b)[1]. Detailed exposure-based risk assessments are planned and will be provided in the baseline human health risk assessment (BHHRA) and baseline ecological risk assessment (BERA) reports. Collectively, the data and information compiled to date under the

[1] The *Pathways Analysis Report* is presently being revised by Battelle and the USEPA.

RI process provides a good understanding of the Bay ecosystem, and the human and ecological use and exposure pathways in the NBSA.

2.2.1 Human Use and Exposure Pathways

Human use of the NBSA is primarily industrial and commercial. Recreational use is more limited due to access limitations from the shoreline types (i.e., bulkhead, bridges, sheet piling, and mudflats) and surrounding urban/industrial/commercial land use. Access for recreation is through available public access areas and pleasure boating (i.e., from marinas inside and outside of the NBSA). The likely current and future human users of the NBSA include recreational users (waders, swimmers, and boaters), anglers/sportsmen, workers, and residents and transients. These populations may be exposed to contaminants through direct contact with near-shore sediments and/or surface water during recreational activities, such as fishing, boating, working, or wading. They may also incidentally ingest contaminants from sediment and/or surface water during these activities. The most significant pathway by which people may be exposed to contaminants in the NBSA is expected to be from consuming fish and/or crab (Figure 2-3). Human use of the NBSA shoreline is depicted on Figure 2-4 and is categorized as follows (Tierra 2015b):

- Disturbed Uplands – 18%
- Undisturbed Uplands – 26%
- Industrial/Commercial – 36%
- Recreational – 12%
- Residential – 11%.

The urban and industrial history of the Bay has contributed to substantial loads of industrial contaminants to the ecosystem, many of which (i.e., polychlorinated dibenzo-*p*-dioxins/dibenzofurans [PCDD/PCDFs], polychlorinated biphenyls [PCBs], mercury, and pesticides in particular) are accumulated by aquatic organisms in the Bay (Iannuzzi et al. 2002). Humans may also come into contact with comparatively less bioaccumulative contaminants in the Bay, such as polycyclic aromatic hydrocarbons (PAHs) and other volatile and semivolatile organic compounds (VOCs/SVOCs). Monitoring and research since the mid-1970s have resulted in the State of New Jersey taking several steps, including consumption advisories, closures, and bans on fish sales, to limit the exposure of the fish-eating public to toxic contaminants in the Bay. Consumption advisories still exist today in the northeast region of New Jersey for certain fish species, and the general public is advised not to eat American eel or white perch from the NBSA. Harvest and consumption of blue crab from the NBSA is banned (New Jersey Department of Environmental Protection and New Jersey Department of Health and Senior Services 2017). Some consumption of fish and crab from the Bay has been reported, despite the advisories and ban (Pflugh et al. 1999). People catch and consume fish and crab in the Bay, including species identified in the advisories. This has been reported along the Bayonne waterfront on the eastern side of the Bay; on the pilings of the Central Railroad of New Jersey/Newark Bay Bridge (also known as Old Bay Bridge), which was demolished in the 1980s; and other piers, exposed rocky shorelines, pilings, and docks (Anglerweb.com, accessed April 27, 2017).

Exposure to contaminants in the NBSA is primarily associated with fishing and boating. Human receptors identified as engaging in these activities include a recreational user (wader, swimmer, and boater) and an

angler/sportsman (USEPA 2006b). Workers may also be exposed to Bay sediment. Human use of the system is not expected to differ substantially in the future from present conditions. Potential exposure routes resulting from sediment and surface water include ingestion of fish and crab, ingestion of other species (e.g., waterfowl, turtles), dermal contact, incidental ingestion, and inhalation (via ambient air). The exposure risks for each of these pathways will be evaluated in the BHHRA.

2.2.2 Ecological Use and Exposure Pathways

Wetland and tributary losses, and present-day shorelines covered by bulkheads, rip-rap, buildings, and impervious surfaces (i.e., pavement and concrete) limit the available wildlife habitat in the NBSA, particularly nesting and foraging areas for birds and mammals (Iannuzzi et al. 2002). Subtidal flats are the primary habitat areas for aquatic organisms in the Bay, with intertidal mudflats and vegetated wetlands comprising only a small portion of the overall shoreline area (Figure 2-1). Degraded structures and pilings offer some habitat for aquatic species. Shooter's Island offers some forested and wetland habitat for birds. North and south of the NBSA, there are extensive tidal wetlands associated with the Hackensack River and the Arthur Kill that provide wildlife habitat for birds and mammals.

Despite the changing habitat conditions in the ecosystem during the 20th century, the Bay acts as a spawning ground, migratory pathway, and a nursery/foraging area for a variety of aquatic organisms. Essential fish habitats identified for 21 finfish species in the Bay are presented by life stage in Table 2-2. The identified fish species have habitats designated in the Bay for one or more important life stages (i.e., eggs, larvae, juveniles, adults, or spawning adults). The shortnose and Atlantic sturgeon (*Acipenser brevirostrum, oxyrhynchus*) are federally listed as protected species in the NBSA (USACE 1997, 2010). Detailed descriptions of the biological communities in the NBSA (vegetation, benthic invertebrates, fish, shellfish, reptiles, birds, and mammals) are provided in the *Problem Formulation* (Tierra 2013a).

Following discharge to the NBSA, contaminants can partition between the dissolved- and particulate-phase in the water column. Chemicals in the particulate-phase can then be transferred to the sediment bed by settling or be resuspended from the bed to the water column. The estimated depth of the biologically active zone (BAZ), the area where biological activity and benthic exposures to contaminants occur, is approximately 6 inches throughout the Bay (Tierra 2008b). Bioaccumulation of contaminants is dependent on a variety of factors including contaminant type and speciation, metabolism, lipid content of the organisms, and physicochemical attributes of the sediment and porewater (e.g., organic carbon and sulfide content). Contaminants can enter the food web via accumulation in tissues of biota exposed directly to contaminants in the water column, sediments/porewater, and/or in the tissues of prey items (Figure 2-3). Food web interactions are likely the most significant exposure pathways for wildlife that forage in the NBSA.

For aquatic organisms, such as fish and invertebrates, exposure to contaminated media (i.e., sediment and surface water) occurs via direct contact (e.g., absorption) or ingestion/uptake. Although birds and mammals are in direct contact with contaminated media, exposure via direct or dermal contact is negligible due to the presence of feathers and fur. Field reconnaissance of the NBSA (Tierra 2015b) indicated little evidence of reptile use in the NBSA. Similarly, inhalation of contaminants, such as volatile compounds in sediment or surface water by wildlife, is negligible. The exposure risks for aquatic organisms and wildlife (i.e.,

representative benthic invertebrates, fish, reptiles, birds, and mammals) will be evaluated in detail in the BERA.

3. Remedial Investigations and Data Supporting the Conceptual Site Model

Under the RI program, extensive sampling, analysis, survey, and testing activities have been conducted throughout the NBSA in three phases, each informed by prior phase(s) results. All necessary sampling to conduct the RI and complete the risk assessments (i.e., BERA and BHHRA) is complete[2]. Substantive data have been collected in the following categories:

- Sediment chemistry (surface layer and cores)
- Sediment profile imaging and related studies to define the BAZ
- Surface water chemistry
- Porewater chemistry
- Sediment toxicity testing (laboratory)
- Sediment bioaccumulation testing (laboratory)
- Fish and shellfish (blue crab/softshell clam) tissue chemistry
- Benthic invertebrate community surveys
- Bathymetric surveys
- Habitat and shoreline surveys
- Secondary data/information compilation and evaluation.

Field data collections also included various in-situ observations of water elevations, current speeds, surface water quality, and qualitative fish surveys. A summary of the available information to support the RI is provided in Table 3-1. This section provides an overview of the RI goals, objectives, and regulatory decisions that have been used to compile the overall data- and information-base for conducting the RI and risk assessments, and for use in the FS and management decision-making.

3.1 Remedial Investigation Goals, Objectives, and Regulatory Decision-Making

The RI goals are defined in the NBSA AOC and are as follows:

1. *Nature and Extent of Sediment Contamination (RI Goal 1)*: “Determine the horizontal and vertical distribution and concentration of PCDDs, PCDFs, PCBs, PAHs, pesticides and metals, for the Newark Bay Study Area sediments in accordance with the provisions of this SOW” (USEPA 2004, Statement of Work [SOW], Section A.1)
2. *Risk Assessment (RI Goal 2)*: “Determine the primary human and ecological receptors (endpoints) of PCDDs, PCDFs, PCBs, PAHs, pesticides and metals contaminated sediments in the Newark Bay Study Area” (USEPA 2004, SOW, Section A.2)
3. *Source Identification (RI Goal 3)*: “Determine the significant direct and indirect continuing sources of PCDDs, PCDFs, PCBs, PAHs, pesticides and metals to the sediments in the Newark Bay Study Area” (USEPA 2004, SOW, Section A.3).

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[2] All Phase III sediment samples are being reanalyzed for PAHs due to analytical bias.

Due to the complexity of the NBSA, the RI was implemented in multiple phases (Phase I, Phase II, and Phase III). Prior to undertaking any field work, an *Inventory and Overview Report of Historical Data* (Tierra 2004, Volume 1a) was prepared. This comprehensive compilation of existing data helped develop a preliminary CSM and design the initial field effort (i.e., Phase I Sediment Investigation [SI]). Phase I of the SI program was conducted in 2005 pursuant to the USEPA Region 2-approved *Phase I Remedial Investigation Work Plan* (Phase I RIWP; Tierra 2005). The Phase I RIWP established nine data quality objectives (DQOs) to confirm that data collected during the Phase I SI were consistent with, and contributed to, the three RI goals listed above. The nine DQOs are presented in the Phase I RIWP.

Phase I analytical data suggested that certain Phase I sediment cores did not extend deep enough to capture the 1940 horizon (as called for in the NBSA AOC). Consequently, these areas were re-sampled with deeper cores in Phase II. Phase III of the RI included collection of crab, clam, and fish tissue samples; co-located surface sediment samples with clam samples; toxicity testing; bioaccumulation testing; and an ex-situ porewater study for risk assessment purposes (Tierra 2014a, 2014b, 2015a). The risk assessment data collection efforts were followed by the Phase III SI. The Phase III SI was conducted in 2016 as an extension of the Phase I and Phase II SIs and implemented pursuant to the USEPA Region 2-approved Phase III Quality Assurance Project Plan (QAPP) (Tierra 2016a, 2016b). The purpose of the Phase III SI was to fill contaminant nature and extent data gaps and to characterize subunits of the NBSA at an appropriate scale for RI/FS decision-making because the Phase I/II data only allow for Bay-wide decision-making (USEPA 2015). As such, the Phase III DQOs were established to confirm that data collected during the Phase III sampling program were consistent with, and contributed to, meeting RI Goal 1 listed above, as well as to support RI/FS decision-making (Tierra 2016a).

3.2 Sampling and Analysis Investigations Conducted Under the Remedial Investigation/Feasibility Study Program

The field activities for the Phase I and Phase II SIs were conducted during 2005 and 2007, respectively, and were performed consistent with the Phase I and Phase II RIWPs (Tierra 2005, 2007). To provide potential source identification information, some sampling extended beyond the NBSA boundaries into the Hackensack River as part of Phase I and into the Hackensack River, Arthur Kill, Kill van Kull, and Elizabeth River during Phase II. Field activities for the Phase III SI were conducted in 2016 and were performed consistent with the Phase III QAPP (Tierra 2016a). Under the RI, two bathymetry surveys (2005 and 2012/2013), an evaluation of the BAZ, and an evaluation of sediment data and sedimentation rates (Tierra 2008a, 2008b, 2011, 2014c) were performed.

In addition to the Phase I, II, and III SIs, a shoreline/habitat survey and three sampling programs were conducted as part of the Phase III field activities to support the BHHERA. A shoreline/habitat survey was conducted in 2013 in accordance with the Reconnaissance Survey Work Plan (Tierra 2013d), a crab and clam sampling program was conducted in 2014 in accordance with the Crab and Clam QAPP (Tierra 2014a), a fish sampling program was conducted from 2014 through 2016 in accordance with the Fish Sampling and Analysis QAPP (Tierra 2014b), and a sediment quality triad (SQT) and porewater sampling program was conducted in 2015 in accordance with the SQT and Porewater QAPP (Tierra 2015a).

Additional information regarding these field activities are provided in the following reports:

- Phase I and Phase II Sediment Investigation Field and Data Report (Tierra 2008a)
- Estimation of the Biologically Active Zone (Tierra 2008b)
- Phase I and Phase II Sediment Deposition Report (Deposition Report; Tierra 2011)
- Multi-beam and Single-beam Bathymetric Survey Final Report (Tierra 2013c)
- Phase I and Phase II Data Evaluation and Analysis Report (DEAR; Tierra 2014c)
- Newark Bay Study Area Reconnaissance Survey Report (Tierra 2015b)
- Crab and Clam Field and Data Reports (Normandeau Associates, Inc. [Normandeau] 2017; GSH 2017a)
- Fish Field and Data Reports (Normandeau 2017; Tierra 2017)
- SQT and Porewater Field and Data Reports (GSH 2017b, 2017c)
- Phase III Field Report (GSH 2017d).

A summary of the components of the data collected under the Phases I through III field activities is provided in Table 3-1. Summary tables of samples number, analytes, and detections for sediment, tissue, and porewater collected under the RI/FS program are provided in Appendix A.

3.3 Secondary Data

Historical studies have been conducted to understand the contaminant distribution in water, sediment, and biota in the Bay and surrounding areas, and their potential effects on humans and the Bay ecosystem. Throughout the RI process to date, searches have been performed to identify, locate, and evaluate such studies and determine their usefulness to support the RI and risk assessments. Details and data summaries for these secondary datasets are provided in the DEAR (Tierra 2014c). Table 3-2 provides an overview of the available secondary data.

3.4 Hydrodynamic, Sediment Transport, and Modeling Studies

Numerical modeling of the lower Passaic River and Newark Bay system is being performed by the Cooperating Parties Group (CPG) pursuant to the AOC effective May 8, 2007 (USEPA 2007). The work is being conducted according to the *Final Modeling Work Plan* (HydroQual, Inc. [HydroQual] 2006a) and the *Final Modeling Work Plan Addendum* (HydroQual 2006b). The modeling consists of four sub-models: hydrodynamic, sediment transport, contaminant fate and transport, and bioaccumulation.

It is the USEPA's intent to use the models to inform management decisions for the NBSA. The models have been developed to calculate the movement of water, sediment, and contaminants to estimate contaminant concentrations in water, sediment, and biota. The bioaccumulation model is expected to provide a means to estimate the future contaminant concentrations in tissue in response to reduction of contaminant concentrations in surface sediment. The utility of these models in the RI/FS for the NBSA will depend on the understanding of the system and contaminant trends from the existing empirical data, and availability of sufficient data to calibrate and verify the models. The evaluation of model needs will be made during the development of the RI Report.

4. Characteristics of the Newark Bay Study Area

Understanding the physical and ecological characteristics of the NBSA is fundamental to the development of this CSM and to evaluating the history and future of incremental risks and trends of contamination in the NBSA. The following subsections describe the geology and hydrodynamics of the system. A summary of the ecology and habitats of the NBSA was provided above in Section 2.2.

4.1 Physiography and Geology

The Bay is situated within the Newark Basin portion of the Piedmont physiographic province, which itself is located between the Atlantic Coastal Province and the Appalachian Province (Suszkowski 1978). The Newark Basin is underlain by sedimentary rocks (sandstones, shales, limy shales, and conglomerates), igneous rocks (basalt and diabase), and metamorphic rocks (schists and gneiss). These rocks are from the mid-Triassic to early Jurassic periods. Bedrock underlying the Bay consists of the Lockatong Formation (light to dark gray silty argillite and laminated mudstone that has been thermally metamorphosed to hornfels where intruded by diabase), Passaic Formation (interbedded red-brown sandstones and shales), and Jurassic diabase (dark gray to black, moderately fractured igneous rock [the Palisades]) (Nichols 1968; Olsen et al. 1984; Drake et al. 1996). Figure 4-1 presents a cross-sectional view of the geology of the NBSA.

During the Pleistocene period of glaciations, the ancestral channels of the Hudson, Raritan, Hackensack, and Passaic Rivers were established in the glacial outwash plain along the Atlantic coast and became submerged as the sea level rose. The rise in sea level reduced flow velocities and created long-term permanent depositional environments in the coastal plain estuaries (Roman et al. 2000). The materials that were deposited above the red clay, commonly referred to as black silt, represent more recent (post-Pleistocene) estuarine deposits of sand, silt, and organic matter. The red brown Pleistocene clay layer represents an interval of native material in the NBSA deposited before the industrial period. The red brown Pleistocene clay layer was tested by the USACE and USEPA and determined to be essentially free of contaminants and suitable for HARS (USACE 2007). This clay layer was used to estimate deposition rates in the Phase I and Phase II cores (Tierra 2011).

A combination of extensive shoreline filling and reshaping, channel development (dredging and dredged material disposal), and water diversion structures built along the larger regional tributaries have reshaped the natural shoreline and altered regional hydrology and sediment input patterns. Growth and inland development have also transformed the region and resulted in roads, parking lots, and other structures that have modified the immediate watershed and runoff. First River, for example, no longer exists as a surface feature (Iannuzzi et al. 2002). Dredging in the NBSA (and the NY/NJ Harbor Estuary in general) for more than 130 years has also substantially influenced the geomorphology of the Bay (see Section 2.1). Between 1855 and 1989, water volume in the Bay increased by 15% from dredging activities, while its surface area decreased by 26% from shoreline filling projects (Steinberg et al. 2004). These changes in volume and surface area produced an estimated 55% increase in mean depth for the Bay. The changing shape and depth of the Bay, in addition to the changing characteristics of the watershed and tributaries, have influenced the hydrodynamics of the region over the past century. These will be further characterized by time period in

the RI Report. Changes to such hydrodynamic characteristics of a system can change tidal velocities, as well as sedimentation patterns and rates (Pence 2004).

4.2 Geomorphology

Anthropogenic activities have had a significant impact on the evolution and geomorphology of the NBSA since the mid-1800s, resulting in its current shape. During the development of the Phase I and Phase II SIs (Tierra 2005, 2007), the NBSA was divided into seven distinct geomorphic areas (Figure 4-2). Geomorphic areas were defined based on comparable bathymetry and slopes, natural (e.g., mudflats or wetlands) and man-made (e.g., Navigation and Port Channels) features, water depth, hydrodynamic conditions, and historical influences. They include the following:

- Subtidal Flats
- Historically Disturbed Subtidal Flats
- Transitional Slopes
- Navigation Channels
- Port Channels
- Intertidal Areas
- Industrial Waterfront Areas.

These geomorphic features are important in understanding key processes affecting contaminant fate and transport in the Bay. Table 4-1 presents a summary of the surface area, mean depth, and the percentage of the NBSA covered by each geomorphic area as recorded in the 2012/2013 bathymetric survey (Tierra 2013c). It is expected these areas are likely to be similar in 2017. The shorelines of the NBSA are composed mainly of bulkheads, rip-rap, buildings, and impervious surfaces (i.e., pavement and concrete). Additional details regarding geomorphic area identification and delineation is provided in the DEAR (Tierra 2014c).

A confined disposal facility (CDF; Cell 1S) was constructed over an area of approximately 27 acres, as shown on Figure 4-2. In February 1999, water depths within the CDF were reported at approximately 45 ft below the surrounding sediment surface at the edge of the cell (Matthew et al. 1999). The CDF is nested within a subtidal flat in the central portion of the Bay, between the Port Newark and Elizabeth Channels. This facility has been utilized to accept dredge and other materials that were unacceptable for disposal at other sites. The actual Bay CDF footprint comprises less than 1% of the NBSA. The CDF was closed in June 2012, and a final cap consisting of 3 ft of sand was applied to the site (Port Authority of New York and New Jersey 2012; Newark Bay Study Area Coordination Team 2012). Table 4-1 presents a summary of the surface area, mean depth, and the percentage of the NBSA covered by the CDF.

4.3 Hydrodynamics

The NBSA has complex hydrodynamics and sediment transport processes. The Bay and its tributaries constitute a mesotidal, partially mixed estuary under most flow conditions. Tides are primarily semidiurnal (twice a day), with a mean tide range of approximately 5 ft. The NBSA receives freshwater inflow primarily from the Passaic and Hackensack Rivers at its northern end and smaller contributions from small creeks

and various municipal discharges around the perimeter of the Bay. Seasonally variable flows from the Passaic and Hackensack Rivers can alter the position of the salt front and increase sediment loading at the head of the Bay. At its southern end, the NBSA exchanges estuarine waters with the Kill van Kull, which connects to Upper New York Bay, and the Arthur Kill, which connects to Raritan Bay.

The NBSA's bathymetry consists of dredged navigation channels and adjacent shallow tidal flats with sharp elevation gradients in between the navigation channels and the subtidal flats. Recent bathymetric maps for the Bay are provided in Appendix B.

Hydrodynamics and sediment bed conditions in the Bay likely continue to adjust to the recent deepening of the navigation channels. Channel deepening alters tidal exchange volumes and bottom velocities, reduces bed roughness in the dredged channels, promotes greater retention of sediment within the navigation channels, and consequently may also alter sediment transport in the northern portions of the Bay (north of the deepened channels) and the northern tributaries. The timing and potential effects of channel deepening and potential influence on long-term time trends and fate of contaminants in surface sediments of the Bay will be further examined in the preparation of the RI Report.

4.3.1 Circulation

Tidal circulation patterns and wind-driven episodic events have been well-studied within the NBSA (Burke et al. 2002; Chant 2003, 2006; Pecchioli et al. 2006; Pence 2004; Rankin et al. 2002; Sommerfield and Chant 2010; Suszkowski 1978; Wakeman 2006). Hydrodynamics of the Bay are externally forced by several physical processes: 1) freshwater flows from multiple rivers, creeks, combined sewer overflows (CSOs), and stormwater outfalls; 2) tidal forcing entering through the Arthur Kill and Kill van Kull; and 3) local and regional meteorological events, which produce waves, circulation, and storm surge (Herrington et al. 2002; Wakeman 2006).

Seasonal variations in salinity include a general decrease in salinity during the spring (Sommerfield and Chant 2010), with a spatial pattern that is dependent on the locations and magnitudes of freshwater input. Rainfall runoff events impact salinity distributions on shorter time scales (Sommerfield and Chant 2010). Historically, the NBSA experiences a range of event-based meteorological flooding that includes elevated riverine inputs from precipitation events throughout the year in the upper Passaic and Hackensack watersheds and coastal storm surge events that have typically occurred during August to October. The late summer period coincides with the lowest river base flows, and are a time when salinity intrudes far up the tributaries and the Bay becomes increasingly saline.

The mixing of fresh and saline waters in the NSBA produces both horizontal and vertical density gradients that alter circulation and mixing patterns and frequently produces a two-layer circulation, including density driven estuarine circulation (Hansen and Rattray 1965). These processes generate an outflow of freshwater at the surface and inflow of saline water near the bed (Chant 2006; Pence 2004; Suszkowski 1978; Wakeman 2006) and can result in asymmetry of the tides where the ebb current may be larger than the flood current or vice versa. The asymmetry varies in response to the strength of the river flow rate and salinity variations in the Bay and influences the circulation of the Bay. The density stratification is enhanced

during high freshwater flow from the Passaic River, producing an increase in the landward-flow in the bottom layer (Chant 2006). This estuarine gravitational circulation pattern can be interrupted (i.e., become more uniform with depth) during periods of very low freshwater discharge or during strong meteorological events, which tend to mix the water column. The variable conditions in the Bay make it challenging to identify a long-term average circulation pattern (Chant 2006).

Flows through the Kill van Kull and Arthur Kill are influenced by the density and hydraulic gradients due to variations in tides and meteorological forcing. Because the Kill van Kull is shorter, straighter, and aligned with the east-west tidal forcing, it typically experiences flows about an order of magnitude greater than the flow in the Arthur Kill (Caplow et al. 2003). While there are variations in the daily meteorological and tidal currents in the Kill van Kull and the Arthur Kill, typically, net circulation is counter-clockwise around Staten Island (Figure 7-2; Blumberg et al. 1999), but strong or persistent meteorological events can at times alter or reverse this circulation pattern (Chant 2003, 2006; Pence 2004; Rankin et al. 2002; Thomas 1993).

Flow conditions in the deep navigation channels are influenced by a combination of tidal/estuarine circulation, exchanges with the kills, and river input from the northern tributaries. Flow conditions in the shallow subtidal flats are more affected by local and regional wind-driven circulation and by wind waves. The two most significant drivers of bed stresses and erosion events in the navigational channels are storm surge-induced flow velocities and prop and vessel wake turbulence from larger commercial ship traffic. Plumes of suspended sediment are produced by these processes (Figure 4-3), thereby influencing the transport of contaminants associated with the suspended sediments. Residence times of water in the Bay are highly variable and depend upon the magnitude of riverine inflows, tidal phasing, and meteorological events. For example, energetic wind and wave events can generate an intense flushing of the bay over a very brief period. However, such events are relatively rare and may impact shallow tidal flats more than deeper dredged channels. In the absence of extreme meteorological forcing, residence time is typically longer for the tidal flats and shorter for the deep channels. Caplow et al. (2003) conducted tracer and modeling studies to estimate residence times in the Bay, Arthur Kill, and Kill van Kull waterway. For a July 2002 field experiment, residence time within the inland waterway of the Bay, Arthur Kill, and Kill van Kull, was estimated at approximately 3.4 days based on the tracer data and 4.5 days based on the model. Model-generated residence times showed that in the Bay and Kill van Kull, the residence time is on the order of 1 day, indicating a greater tidal current flushing rate there than in the Arthur Kill, where the residence time is in the order of 3 to 5 days in the lower kill. The Caplow study evaluated the time required for the tracer to travel the full extent of the Kills, whereas the residence time of the Bay itself, as defined by water and dissolved constituents moving from the Bay to the head of the Kills is expected to be less than reported for excursion through the full length of the Kills.

4.3.2 Meteorological Forcing

Wind-generated currents affect mixing and sediment transport within the Bay (USACE 1997). Strong westerly wind events (mainly occurring in winter) can produce low water levels in Raritan Bay, increasing southward flow in the Arthur Kill, and enhancing the counter-clockwise circulation around Staten Island. Such circumstances can also lead to stronger outflow currents and a general lowering of water levels throughout the Bay.

The most frequent type of storms that affect the Bay are extra-tropical storms ("nor'easters") that occur primarily between October and April. Less frequent tropical storms occur in late summer and fall and are usually more powerful (e.g., Hurricanes Irene and Sandy) and can induce widespread flooding. Both types of events can also cause high water levels, large waves, and increased bed stress.

The longest fetch in the Bay is along the southwest-to-northeast direction, and wave heights can be more than 6 ft for the most severe storms but are typically less than 4 ft (USACE 1997). Storm-tide elevations for the region range from 7.8 ft mean lower low water (MLLW) for the 2-year storm to 10.6 ft MLLW at Bergen Point for the 100-year storm (USACE 1997). For context, water levels during Hurricane Irene in 2011 reached 10.2 ft MLLW, and during Hurricane Sandy in 2012, reached 14.6 ft MLLW at Bergen Point. NOAA's datum values for the NOAA gauge at Bergen Point are provided on Figure B-1 in Appendix B.

Water level extremes are becoming larger due to sea-level rise (Kemp and Horton 2013); however, data for New York Harbor since the mid-19th century suggests that a secular increase in storm tides is also occurring. The magnitude of the once in 10-year storm has increased by more than 2.3 ft since the mid-1850s, while sea level has reportedly only risen 1.5 ft (Talke et al. 2014). It is difficult to estimate how frequency and intensity of events will vary in the future and there remains uncertainty in the rate of sea level rise.

Changes in wind-generated currents and storm surges affect bed stresses (and therefore erosion and deposition patterns) and circulation patterns. As described in Section 4.3.1, most parcels of water are within one tidal excursion of a boundary; therefore, changes in bed stresses and circulation patterns can result in suspended sediment and the contaminants associated with the suspended sediment to be exported, imported, or exchanged across any interface within several tidal cycles (see discussion of residence times in Section 4.3.1).

4.4 Sediment Transport

Important sediment transport processes in the Bay are summarized herein and further described, as they affect contaminant fate and transport, in Section 7. These processes are influenced by the complex geomorphology and hydrodynamics of the Bay (as previously discussed) and the interactions between the Bay proper and its tidal tributaries.

4.4.1 Sediment Processes

Characteristics of recently deposited sediment reflect and influence sediment resuspension and deposition. The weight percentages of sand, silt, clay, and loss on ignition (organic carbon) are presented on Figure 4-4 (Sommerfield and Chant 2010). Sand (grain size between 2 millimeters [mm] and 0.063 mm) content is highest in the north bay near the Hackensack River mouth, in the central bay across from Port Newark, and in the south bay south of Port Elizabeth. The percentage of sand is higher with proximity to the navigation channel. Non-cohesive sediments are primarily sand and gravel-sized materials (>63 micrometers [µm]). Non-cohesive sediments that may be present in shoreline wave break zones and in portions of the navigational channel, especially in the southern Bay area, are subject to more frequent disturbances by passing ships, tidal and estuarine circulation processes, and constitute an important fraction of sediment

delivery to the Bay. It takes higher shear stress to erode and resuspend non-cohesive sand-sized particles compared to unconsolidated silt and clay-sized particles. Of equal importance, areas of elevated shear tend to limit the deposition of finer-grained particulates.

Cohesive sediments are composed primarily of clay-sized (<2 µm) and silt-sized (<63 µm) particles, mixed with organic matter and sometimes small quantities of very fine sand. Cohesive sediments have inherent stability associated with cohesive bonding forces. The percentage of silt and clay is higher on the subtidal flats (Figure 4-4). These types of sediment are prevalent and form the sediment bed of the subtidal flats, although studies have shown the presence of a thin veneer (of several mm thickness) of loose unconsolidated sediments on the flats that are easily resuspended by wind and tides. Once resuspended, silt- and clay-sized particles can be carried farther distances due to lower settling rates compared to sand. However, the cohesive stability characteristics of the sediment on the subtidal flats are important in the long-term fate of historical contaminant inventories buried in these sediments.

Regions of elevated suspended sediment concentrations in surface water, called estuarine turbidity maximum (ETM), occur when fine sediments from freshwater sources contact salt water. The ETMs play a role in trapping suspended sediments resulting in areas of deposition, including contaminants associated with the suspended sediments. ETMs occur along salinity gradients in the NBSA, Passaic River, and Hackensack River. As described in Section 4.3.2, the salinity in the NBSA varies with river flows and tides and, therefore, the location of the ETM varies. There is often deposition near the ETM; therefore, as the ETM moves, the associated depositional zone will also move. Under most conditions, the ETM at the head of salinity intrusion is upstream of the Bay, in the Hackensack and the Passaic Rivers (Chant et al. 2011; HydroQual 2008).

Channel deepening in the Bay has affected the hydrodynamics, including variability in tides, and the sediment transport, including the location and magnitude of sediment resuspension and deposition. Tidal velocity in the deeper south Bay navigation channel (depth 50 ft mean sea level [MSL]) is approximately 30% less than in the shallower north Bay channel (depth 35 ft MSL) (datum conversion factors are provided in Appendix B). Flow conditions required to resuspend sediment likely occur less frequently in the southern Bay. Contaminant transport and sediment bed processes in the Bay are likely still adjusting to these major physical changes.

Short-term localized resuspension and deposition can occur because of vessel traffic. The ability of ships to resuspend sediment is demonstrated on Figure 4-3, where satellite imagery shows turbidity plumes being caused by vessels. USACE (2009) projects an increase in vessel traffic, facilitated by the higher Bayonne Bridge. Clarke et al. (2015) compared propwash resuspension to dredging effects on turbidity in the NBSA. Turbidity was measured to evaluate suspended sediment concentration (SSC) in the wake of vessels, and the SSC plumes were found to vary considerably depending on vessel size and on the manner of vessel movement. Large surface-to-bottom plumes were associated with vessel turning at the entrance to berths. Peak SSC levels were much higher than background conditions and elevated near-bed SSC levels were measured for more than an hour after the vessel’s movement ceases. Deep-draft navigation contributes appreciably to sediment resuspension, and shallow-draft tug/barge traffic had little effect on resuspension. Mobilization of sediments by vessel traffic is more likely in the heavily trafficked navigation channels from the

kills to Port Elizabeth and Port Newark, and less likely in the navigation channels north of Port Newark, which have much less frequent ship traffic.

Radioisotope data of beryllium-7 (Be-7) indicate there is recent deposition of sediment in the Navigation Channel in the northern portion of the Bay (Sommerfield and Chant 2010; Huntley et al. 1995). Tierra (2013a) also reported on Be-7 as an indicator of recent (short-term) deposition. A Be-7 activity of >0.5 picocuries per gram (pCi/g) is referenced as an indicator of recent deposition (Tierra 2013a). In Newark Bay, Be-7 activity varied by geomorphic area. The Port Channels and Navigation Channels had the highest Be-7 activity (1.69 and 1.24 pCi/g, respectively), with maximum Be-7 activities within the NBSA observed at the end of Port Newark and Piersons Creek. The Transitional Slopes had an average Be-7 activity of 1.03 pCi/g, and the Subtidal Flats had the lowest Be-7 activity (average 0.50 pCi/g). The Be-7 activity in Historically Disturbed Subtidal Flats (0.53 pCi/g) and undisturbed Subtidal Flats (0.48 pCi/g) were similar, suggesting that Historically Disturbed Subtidal Flats that at one time were high-deposition areas have since stabilized and exhibit similar characteristics with undisturbed Subtidal Flats.

Estimates of long-term average sedimentation rates in the NBSA are available from: 1) comparison of bathymetric surveys (Suszkowski 1978); 2) sediment budget analyses (Suszkowski 1978; Wakeman 2006); 3) converting dredge volumes to shoaling rates (USACE 2006); and 4) evaluation of sediment radioisotope data (Tierra 2011). The long-term average sedimentation rates estimated using radioisotopes are considered the most accurate because they are based on data collected, with the specific objective of measuring sedimentation rates. Different radioisotopes can be used to estimate deposition over different time periods. Pb-210 and Cs-137 are used to evaluate long-term sediment deposition (decades to a century; Olsen et al. 1978; Orson et al. 1990; Van Metre et al. 2004), while Be-7 can be used to evaluate short-term sediment deposition (months; Neubauer et al. 2002). Rates estimated based on Cs-137 are long-term averages over the period since peak atmospheric nuclear weapons testing in 1963, or the advent of detectable levels in the environment in the mid-1950s. The non-radioisotope methods use data collected for other purposes but are interpreted to estimate deposition rates and may be less accurate. Table 4-2 presents the comparison in long-term sedimentation rates (inches per year) among different studies. However, as discussed above, the long-term historical sedimentation rates may not represent current sedimentation rates, because of the changes to the system resulting from dredging and shoreline filling.

4.4.2 Sediment Budget

Sediment transport and deposition in the Bay is complex and varies based on spring and neap tides, ebb and flood tides, and location within the NBSA. Under typical conditions, the Bay experiences a localized convergence of sediment flux from the rivers and the kills, and therefore, is a regional sediment deposition area (Wakeman 2006; Sommerfield and Chant 2010; HydroQual 2008). Based on Be-7 data, as discussed in Section 4.4.1, the Navigation Channels appear to have the highest recent sediment deposition rates. Sommerfield and Chant (2010) suggest that suspended sediments in the northern portion of the Bay do not leave the Bay during ebb tide or during periods of normal freshwater discharge to the Bay, and only up to about 15% of sediments in the southern portion of the Bay might exit the system. During a Passaic River high-flow event, measurements of the radionuclide Be-7, a tracer for recent deposition, indicated that deposition was greatest in the northern portion of the Bay, primarily within the Navigation Channel upstream

of Port Newark (Sommerfield and Chant 2010; Huntley et al. 1995). There was little evidence of flood-tide-related deposition on the Subtidal Flats. In the southern portion of the Bay, Sommerfield and Chant (2010) indicate that most of the Kill van Kull sediment influx is not carried into the northern portion of the Bay. The convergence of sediment deposition in the Bay is consistent with the frequent navigational dredging because of sediment deposition.

Estimates of sediment loads vary but there is general agreement that the magnitude of sediment load to the NBSA is, from highest to lowest: Kill van Kull, Passaic River, Arthur Kill, the Hackensack River, and other sources (LMS 2004; Suszkowski 1978; Lowe et al. 2005; Sommerfield and Chant 2010). The Passaic River introduces sediment into the Bay principally during infrequent high-flow events. Kill van Kull, Arthur Kill, and the Hackensack River can be both sources of sediment to the NBSA and a sink of sediment from the NBSA. The Arthur Kill primarily is a sink of sediment from the NBSA but periodically is a source.

There is seasonal variability in sediment transport in the NBSA. Sediment export from the Bay to Upper New York Bay via the Kill van Kull is largest during the spring season when high freshwater discharge from the tributaries tends to occur.

The Passaic River introduces sediment into Newark Bay principally during high-flow events. For example, during a single high-flow event when the peak flow on December 14, 2008, was 5,610 cfs at Little Falls, the Passaic River exported approximately 8,000 metric tons (MT) to the Bay (calculated as the measured sediment concentrations times the Passaic River flow rates), representing nearly half of its estimated annual load of 17,000 MT per year (MT/yr; as estimated Sommerfield and Chant 2010). The frequency of such high-flow events can be evaluated based on historical flow data. The return periods of the annual maximum flow rate were analyzed at Little Falls. For example, approximately once every two years (on average) the annual maximum flow exceeds 6,000 cfs. A flow of this this magnitude or greater has occurred 580 days out of 43,693 daily records, or 1.3 percent of the days since 1897. Such flows are responsible for much of the terrestrial sediment loading to Newark Bay. Similarly, since 1897, there were 33 days during which the 10-year flow of 12,400 cfs at Little Falls was exceeded. Because of the dominant role of high-flow events in the Passaic River on sediment loading to northern Newark Bay, significant inter-annual variations occur in sediment delivery into Newark Bay. During the summer months, there tends to be landward (i.e., toward the Bay) sediment fluxes into the NBSA from the Kill van Kull due to: 1) low sediment supply from the Passaic River; and 2) decreased salinity stratification. The Kill van Kull is less than one tidal excursion long, and sediment fluxes depend strongly on external events. Sediment supply from Newark Bay depends on high Passaic River flows, which typically occur from November to May, with the highest average flows occurring in March. Chant (2006) reported estimated net sediment fluxes in the Kill van Kull for four deployment periods that varied widely, ranging from a net seaward transport of -12,000 MT/yr to a net landward transport of 200,000 MT/yr depending on Passaic River flow and the lateral location of the ADCP mooring. Observational estimates of the net sediment flux in the Kill van Kull (and the entire NBSA) are very sensitive to the forcing conditions (tides, river flow, wind) and to the lateral position of the mooring in the Kill van Kull cross-section (Chant 2006; Sommerfield and Chant 2010). The seaward transports occurred during a peak in Passaic River discharge when the moorings were located on the north side of the channel and the large landward transports occurred during drought conditions when the mooring was located on the south side of the channel. Both wind forcing and river flow tend to be variable during the fall, and the net sediment flux

through the Kill van Kull during these times depends on the timing of high freshwater flow events and synoptic sea level conditions. Tropical storms (like Irene) during late summer and fall can be significant sediment supply events but occur sporadically. Winter is likely to be a time of high landward sediment flux. Westerly winds are dominant in the winter and drive a strong counter-clockwise circulation around Staten Island, and therefore, a westward flow through the Kill van Kull. Although Passaic River flows are moderate to high during the winter, a net landward sediment flux (into the Bay) through the Kill van Kull typically occurs in the winter.

5. Sources of Contamination

The NBSA is known to be contaminated with a wide variety of organic compounds and inorganic chemicals (i.e., PCBs, PCDD/PCDFs, PAHs, pesticides, herbicides, SVOCs, VOCs, inorganics/metals, and other organic compounds). As conceptualized on Figure 5-1, there are many known sources of contaminants to the Bay, including:

- Industrial discharges
- Publicly owned treatment works (POTWs), CSOs, storm sewers, and other non-point sources
- Spills, leaks, and accidental discharges from marine and industrial sources
- Atmospheric deposition and groundwater discharges
- Tributary inputs from each of the sources listed, and transport of re-mobilized legacy sediments from tributaries.

Existing contamination in the NBSA is primarily from historical and present sources from each of these categories, which in combination have been released over more than a century paralleling the urban and industrial history of the Bay. The relative influence or importance of these various sources is not easily quantifiable, and likely varies depending on the geographic area, COC group, temporal fate and transport processes, and the depth of the contaminated sediment layer under consideration. Additional information regarding sources of contaminants in the Bay is provided in the *Report on Investigation of Sources of Pollutants and Contaminants* (Tierra 2006). A summary of the potential sources of contaminants to the NBSA is provided in Appendix C.

5.1 Industrial Sources

There are numerous industrial sources of contaminants that contributed to and likely continue to contribute to NBSA contamination. Direct discharge and runoff of contaminants from industrial facilities located along the waterfronts of the Bay and its tributaries are significant sources of a variety of contaminants (Interstate Sanitation Commission 1981, 1988). Industrial waterfront properties that could be potential historical or current sources of contamination to the NBSA include industrial, commercial, and manufacturing operations; landfills; and dredge spoils fill or deposit areas. In total, 177 of these properties operating from the mid-1800s to present are identified in the *Report on Investigation of Sources of Pollutants and Contaminants* (Tierra 2006). These potential industrial sources are presented in Table C-1 of Appendix C. A large proportion of the companies identified in Table C-1 are related to chemical, oil, or storage/distribution. Chemical-related companies are often involved in chemical manufacturing, storage, and distribution. Oil-related companies are frequently associated with manufacturing, blending, storage, and/or distribution of petroleum products. The storage/distribution-related companies frequently provide warehouses, freight yards, and trucking to support the shipping industry. Industrial source discharge mechanisms included storm sewer outfalls, CSOs, wastewater outfalls, surface runoff, spills, leaks, and direct discharge. POTWs, CSOs, and storm sewer outfalls are further discussed in Section 5.3, and spills are further discussed in Section 5.4. Specific discharge mechanisms and documented discharges from industrial sources along the NBSA waterfront are included in Table C-1. Chemicals that have been identified in the documented discharges

include various solvents, metals, acids, petroleum products, pesticides, PCBs, PCDD/PCDFs, and unpermitted discharges of wastewater (Tierra 2006).

Table 5-1 provides a list of recipients of General Notice Letters from the USEPA for Newark Bay. These letters serve to notify the recipients of their potential liability relating to contaminant discharges to the NBSA, such as those described above.

5.2 Tributary Inputs

The NBSA has four primary tributaries: the Passaic River and Hackensack River to the north, and the Arthur Kill and Kill van Kull to the south. These and other smaller tributaries (such as the Peripheral Ditch and Pierson's Creek) have numerous upstream waterways that all contribute to the loading of contaminants into the NBSA (Shrestha et al. 2014; Tierra 2006). Tributaries impact NBSA water and sediment quality via transport of dissolved-phase and sediment-associated contaminants, which can be from both legacy and present-day sources. Sediment transport and deposition is discussed in Sections 4.4 and 7.1. The planned remediation in the lower 8 miles of the Passaic River (i.e., OU2) is intended to reduce the contaminated sediment load into the NBSA. As such, this project is closely aligned with the RI/FS for the NBSA and will be carefully considered throughout the remedial decision-making process. Similarly, the potential remediation in the upper 9 miles of the LPRSA will be taken into consideration as needed.

Details regarding industrial sources found along several of the NBSA tributaries can be found in the *Report on Investigation of Sources of Pollutants and Contaminants* (Tierra 2006). CSOs that discharge to tributaries within the NBSA boundary are shown on Figure 5-2, including nearby significant industrial users (SIUs).

As part of a U.S. Geological Survey (USGS) study examining concentrations and loads of chemicals and sediments to the Newark and Raritan Bays, the Hackensack River and Passaic River were studied as tributaries to the Bay. The Passaic River (USGS gage 01389500 at Little Falls, New Jersey) has a mean daily discharge of 1,132 cfs (cubic feet per second), while the Hackensack River (USGS gage 01378500 at New Milford, New Jersey) has a daily discharge of 90.4 cfs that is controlled by an upstream reservoir (Bonin and Wilson 2006). Water and sediment from these two rivers were sampled between 2000 to 2003 during both stormflow and low-flow conditions for PCBs, PCDDs/PCDFs, PAHs, organochlorine pesticides, mercury, lead, and cadmium. Measured concentrations were used to estimate average annual loads between 1975 and 2000 as shown in Table 5-2 (Wilson and Bonin 2007). The annual loads show that both the Hackensack and Passaic Rivers serve as sources of contamination to the Newark Bay, although the Passaic River represents a much greater annual loading (approximately two orders of magnitude) for the parameters measured than does the Hackensack River.

The Passaic River, Hackensack River, Elizabeth River, Newark Bay, Kill van Kull, and Arthur Kill were all evaluated for contamination as part of a study conducted by the Stevens Institute of Technology (2007). In this study, sediment and water samples were collected and analyzed over 12 sampling events between 2000 and 2002. Target analytes included suspended sediment, dissolved organic carbon, particulate organic carbon, PCBs, PCDDs/PCDFs, PAHs, pesticides, and metals. Results from this study (summarized in Table 5-3) show that all of these contaminant classes are present in these tributaries of the Bay, suggesting that

each of these tributaries is a source of contaminants to the NBSA. This has also been confirmed via a variety of sampling programs conducted in the past several years as part of the Diamond Alkali Superfund Site and other CERCLA initiatives.

5.3 Publicly Owned Treatment Works, Combined Sewer Overflows, and Storm Sewers

Before construction of POTWs for the municipalities of Newark, Jersey City, Bayonne, Elizabeth, and Staten Island in the 1950s and 1960s, there was continuous discharge of raw sewage from outfalls in the NBSA and its tributaries. Currently, sewage is treated before discharge, except during heavy precipitation events, when bypassing of the POTW occurs. Bypassing is employed by the POTW to avoid excess surcharging at a POTW plant. Regional sewerage authorities, such as Passaic Valley Sewerage Commissioners (PVSC), control and operate certain intercepting sewers, regulators connecting the intercepting sewers to the local systems, treatment works, and discharge points for treated effluent. The municipalities control the local sewerage system infrastructure, including storm sewers, sanitary sewers and/or combined sewer networks, and discharge/overflow points. Bypassing typically takes the form of overflows from CSOs throughout a local sewerage system, and sometimes from specific relief points, such as Bayonne's emergency relief points that discharge to the NBSA (GSH 2018). Table C-2 of Appendix C lists the CSOs that discharge to the NBSA. Discharges of untreated or partially treated effluent from Newark and Elizabeth POTWs to the NBSA are presented in Table C-3 of Appendix C. Figure 5-2 shows the locations of local sewerage systems, CSOs, and POTWs that discharge to the NBSA. Note that the main outfall for PVSC discharges to the Upper New York Bay, and the outfall shown along the NBSA discharges only when the main outfall's hydraulic capacity is exceeded during precipitation (Tierra 2006). Figure 5-2 also shows the locations of SIUs, which are defined under 40 Code of Federal Regulations (CFR) 403.0. This category generally includes:

- Industrial users subject to Categorical Pretreatment Standards under 40 CFR 403.6 and 40 CFR chapter I, subchapter N
- Any other industrial user that discharges an average of 25,000 gallons per day or more of process wastewater to the POTW (excluding sanitary, non-contact cooling, and boiler blowdown wastewater); contributes a process waste stream that makes up 5% or more of the average dry weather hydraulic or organic capacity of the POTW; or is designated as such by the Control Authority on the basis that the industrial user has a reasonable potential for adversely affecting the POTW's operation or for violating any Pretreatment Standard or requirement.

In addition to the federal definition above, the State of New Jersey defines SIU in New Jersey Administrative Code (N.J.A.C.) 7:14A-1.2 to include users that are:

- A hazardous waste facility that received a permit in accordance with N.J.A.C. 7:26G-12
- A discharger of landfill leachate, which is either pure, treated, or diluted
- A discharger of 25,000 gallons per day or more of process wastewater and/or polluted groundwater that is pumped from the ground to decontaminate an aquifer.

Between 2000 and 2004, contaminants were measured in samples of discharges from POTWs, CSOs, and storm sewer outfalls (Great Lakes Environmental Center [GLEC] 2008). Similar concentrations of

target analytes were found in treated effluents from all POTWs that were sampled. Only one of the 12 POTWs included in the study, Joint Meeting of Essex/Union, has a main effluent discharge to the NBSA (Figure 5-2). PCBs, chlorinated pesticides, PAHs, PCDDs, PCDFs, and metals were all detected in effluent samples collected from the Joint Meeting of Essex/Union POTW (GLEC 2008), suggesting that POTW outfalls are sources of contaminants to NBSA. Analyte concentrations measured in POTW-treated effluent were generally lower than CSO and storm sewer outfall effluent. CSOs and storm sewer outfalls were also shown to discharge PCBs, PAHs, chlorinated pesticides, PCDDs/PCDFs, and metals to the NBSA and its tributaries (GLEC 2008). Numerous storm sewers from municipalities located within the NBSA discharge to the Bay and/or its tributaries. Analytical data for aqueous samples collected in 2008 by Malcolm Pirnie, Inc. (MPI), at several locations along the Passaic River, show that several contaminants have discharged at higher concentrations from storm sewers than from CSOs (MPI 2008a, 2008b).

Ongoing permitted discharges from POTWs, CSOs, and storm sewers are all potential sources of contaminants to the NBSA (GLEC 2008). This is an important consideration for the RI and FS, as cleanup goals for NBSA sediments should consider ongoing contaminant inputs within the present and future urban port. The USEPA (2013) discusses the different objectives between the Clean Water Act (CWA), which regulates the discharge of pollutants to surface water bodies, and CERCLA, which is being used to assess sediment quality in the NBSA. The CWA objective is to protect designated water uses. Promulgated water quality criteria are developed to protect the designated water uses. Point source discharges, including from POTWs, CSOs, and storm sewers, are regulated under the National Pollutant Discharge and Elimination System (NPDES), with effluent limits based on water quality criteria for designated uses. CERCLA criteria are risk-based, with the objective of reducing exposure to humans and biota to protective levels. This difference in objectives can result in legal discharges under NPDES that meet CWA criteria, but result in contamination or recontamination of sediment sites with CERCLA criteria (USEPA 2013). The USEPA recommends coordination between USEPA staff on CWA regulation of water bodies and CERCLA remediation of sediment sites (USEPA 2013, 2015, 2017). The CSO and storm sewer evaluations for the NBSA are ongoing.

5.4 Spills

Table C-4 of Appendix C lists significant contaminant spills that have occurred in the NBSA. As indicated in the table, some of these discharges occurred onsite at industrial facilities with storm sewers that discharge to NBSA waters, some occurred on piers of industrial facilities along the NBSA, and some spills occurred on-board cargo ships entering Newark ports.

5.5 Atmospheric Deposition and Groundwater

Atmospheric deposition may also contribute contaminants to the NBSA. Airborne particulates with contaminants adsorbed to their surfaces could be a contamination source if they are deposited on the surface of the Bay. Atmospheric deposition has been found to be a source of contamination for nearby water bodies. For example, the NY/NJ Harbor Estuary Program (1996) found that atmospheric deposition accounted for 3% of the total PCB input to the habitats and biological communities in NY/NJ Harbor Estuary. Atmospheric deposition was an important source of metals and organic chemicals to the NY/NJ Harbor

Estuary (NY/NJ Harbor Estuary Program 1996). Atmospheric deposition was a source of PCBs to the Hudson River Estuary and of mercury to the Hudson-Raritan Basin (Totten et al. 2004; Themelis and Gregory 2001). Atmospheric deposition as a source of contaminants to the NBSA has not been quantified.

Groundwater is another potential source of contamination in the NBSA, associated not only with upland contamination impacting groundwater, but also with shoreline areas that have been created through deposition of dredged or other fill material (much of it dredged materials from the Bay). Groundwater sources to the NBSA have not been quantified.

6. Nature and Extent of Contamination

This section provides an overview of the data collected to characterize the NBSA (including sediment, tissue, surface water, porewater, toxicity, bioaccumulation, and benthic invertebrate community data) and preliminarily summarizes the nature and extent of contamination within the NBSA. The understanding of the nature and extent of contaminants in the NBSA is largely supported by the data collected under the RI program documented in Section 3.1. It is enhanced and further supported by data collected for purposes other than the RI program (secondary data). A full analysis of the nature and extent of contamination will be conducted during the development of the RI Report.

6.1 Media and Contaminants of Potential Concern

As part of the Phase I, Phase II, and/or Phase III investigations, sediment (surface and subsurface), tissue (crab, clam, and fish), and porewater were sampled and analyzed for some or all the following: PCDDs/PCDFs, VOCs, SVOCs, Aroclor PCBs, congener PCBs and homologues, pesticides, chlorinated herbicides, total petroleum hydrocarbons (TPH), metals, butyltins, cyanide, total organic carbon, percent lipids, and moisture content. Appendix A presents the number of samples collected for each media and their associated analyses, and lists the analytes detected and not detected for each media. The 2016 Phase III sediment statistics are provided in Appendix D; other data collected during RI activities were presented in previous data reports listed in Section 3. The individual contaminants that were not detected were not included in further analyses or data presentations.

Surface water samples collected by the Passaic River CPG as part of the Chemical Water Column Monitoring programs were analyzed for the following: PCDDs/PCDFs, VOCs, SVOCs, congener PCBs, pesticides, metals (including mercury and methyl mercury), and butyltins.

All data were considered in this data evaluation process. However, given the large number of individual contaminants and contaminant groups, an initial subset of 18 contaminants of potential concern (COPCs) were selected for preliminary statistical analyses and discussions in this CSM. These 18 select contaminants and contaminant groups were identified based on their frequency of detection, presence of statistical outliers, and representativeness of the contaminant groups identified in the RI goals (see Section 3). The 18 select contaminants and contaminant groups, referred to hereafter as select contaminants, include the following: total Aroclor PCBs, total congener PCBs, total PAHs, total dichlorodiphenyltrichloroethane (DDT) (4,4'), total alpha + gamma chlordane, 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (2,3,7,8-TCDD), TPH, bis(2-ethylhexyl)phthalate, arsenic, barium, cadmium, chromium, copper, lead, mercury, nickel, silver, and zinc. An in-depth discussion of how the 18 select contaminants were selected and how the totals are calculated is presented in the DEAR (Tierra 2014c).

Contaminants analyzed as part of the Phase I, Phase II, and Phase III investigations are those most commonly analyzed for in CERCLA programs. However, they do not account for the substantial numbers and types of additional contaminants that may be present in the NBSA, including emerging contaminants of concern such as pharmaceuticals, personal care products, and flame retardants. The USEPA has identified the following as potential emerging contaminants of concern: bisphenol A; phthalates; perfluorinated

compounds; penta-, octa-, and decabromodiphenyl ethers; short-chain chlorinated paraffins; benzidine dyes; diisocyantes; nonylphenol and nonylphenol ethoxylates; and siloxanes (USEPA 2010). Some of these emerging contaminants have already been detected in the NBSA. For example, a sediment investigation conducted by the New York State Department of Environmental Conservation (NYSDEC) for the Contaminant Assessment and Reduction Project detected polybrominated diphenyl ethers (PBDEs) (flame retardants) in the Bay sediments (NYSDEC 2003). In conjunction with Phase II activities, polychlorinated naphthalenes and PBDEs were found to be present in sediment throughout portions of the NBSA (Tierra 2010).

6.2 Data Synthesis and Presentation Methods and Geographic Units

The horizontal and vertical distribution of Phase I, Phase II, and Phase III contaminant concentrations throughout the NBSA sediments were grouped into the following data categories for the preliminary nature and extent characterization (Tierra 2014c, 2016a):

- NBSA-wide: within the boundaries of the NBSA
- 2-mile extended areas: areas extending approximately 2 miles beyond the NBSA boundaries into the Hackensack River, Passaic River, Elizabeth River, Kill van Kull, Morses Creek, Piles Creek, and Arthur Kill
- Geographic areas: Newark Bay North, Newark Bay Central (including Port Channels), Newark Bay South, and the 2-mile extended areas (Figure 6-1)
- Geomorphic areas: described in Section 4.2 and presented on Figure 6-2
- USEPA-defined subunits: subunits of the geomorphic areas identified as a result of “consideration of modeled bottom shear stresses, bathymetry, geomorphological features, and navigational/anthropogenic activity” (USEPA 2015; Figure 6-3)
- Depositional areas: based on the USACE (2006) delineation of sediment accumulation areas (Figure 6-2)
- East-west designations with respect to the Navigation Channel: east of the Navigation Channel, west of the Navigation Channel, and within the Navigation Channel
- Be-7 bearing locations: areas having Be-7 activity equal to or greater than 0.5 pCi/g
- Depth intervals: surface (0 to 0.5 ft below sediment surface [bss]), mid-depth (0.5 to 3.5 ft bss), and subsurface (greater than 3.5 ft bss).

Data were evaluated using a variety of statistical and visual evaluations. Summary statistics, linear modeling (analysis of variance, analysis of covariance, and mixed effects models) and multiple comparison tests were used for evaluating the distribution of contaminants in sediment. Data were also evaluated visually using figures showing scatter plots, surface sediment concentrations, maximum detected concentrations, arithmetic means by geographic area, cumulative frequency plots, concentration depth profiles, box and whisker plots, Bay mile plots, and the Environmental Visualization Systems simulation (Appendices E and F). A detailed discussion of each of these statistical evaluation methods is presented in Appendix G. Collectively, these evaluations provide a good understanding of the distribution of COPCs in the NBSA, and the necessary spatial resolution to evaluate localized contamination and potential management strategies.

6.3 Sediment

This section provides a brief summary of the sediment quality in the NBSA and discusses the analyses completed to demonstrate that the nature and extent of COPCs in the NBSA is adequately characterized to complete the RI. The Phases I through III sediment data indicate that metals concentrations tend to be highest in the southern portion of the Bay and industrial waterfront areas, while concentrations of organic compounds are more variable between geographic/geomorphic areas, depending on depth. In surface sediments, PCDDs/PCDFs and PAHs tend to be higher in the northern portion of the Bay, while PCB and DDT concentrations are higher in the southern portion of the Bay.

In Phase III surface sediment, the select contaminants for metals, total Aroclor PCBs, total DDT (4,4'), and TPH had higher concentrations in USEPA Subunit 1, at the southern end of the NBSA (Table G-2d). Concentrations of 2,3,7,8-TCDD and total alpha + gamma chlordane were highest in USEPA Subunit 4 at the northern end of the NBSA (Table G-2d). Total PAH concentrations were highest in USEPA Subunit 3 in the northern portion of the navigation channel (Table G-2d). The stratified mean concentrations for the NBSA are presented in Table 6-1.

The ranges of concentrations of select contaminants are less variable in surface sediments compared to mid-depth and subsurface sediments within the NBSA (Tierra 2014c). No consistent horizontal pattern in concentrations throughout mid-depth and subsurface sediment depth intervals was observed (Appendices E, F, and G). The mean concentrations for most select contaminants were higher in the mid-depth and subsurface sediments, compared to surface sediment samples, indicating a long-term temporal trend of declining concentrations in all geographic units (Table G-1).

One of the Phase I project quality objectives was to estimate the approximate depth of the 1940 sediment horizon in the NBSA (Tierra 2005). The Deposition Report (Tierra 2011) presents the methods to define the 1940 sediment horizon (1940 horizon). Phase I and Phase II coring programs were designed to collect sediment cores down to the 1940 horizon. Visual evaluations of the subsurface sediment data indicate the thickness of sediment above the 1940 horizon (Appendix F). The thickness varies across the NBSA from nearly zero in the navigation channels where there is frequent dredging, including dredging into bedrock, to over 10 ft in historically disturbed subtidal flat areas. Part of the 1940 horizon determination included using multiple lines of evidence to evaluate sedimentation rates. Sedimentation rates and areas of sediment accumulated since 1940 were used to evaluate COPC concentrations and the potential for natural recovery.

Areas within the historically disturbed subtidal flats appear to have had higher sedimentation rates than the NBSA as a whole. These are specific areas within the subtidal flats that were altered by anthropogenic activities, such as dredging or other construction activity. Intermittent natural sedimentation and lack of maintenance dredging has since filled the former depressions to a sediment bed elevation comparable with the surrounding subtidal flats. There was only minimal difference between Be-7 activity (a relative indicator of recent sediment deposition) in the historically disturbed subtidal flats and the subtidal flats. This suggests that, while deposition rates in historically disturbed subtidal flats may have at one time been higher (during the period when depressions were filling in), these areas have since filled in and stabilized, consistent with the current conditions of the undisturbed subtidal flats (Tierra 2011). Therefore, the surficial features and

habitats of the historically disturbed subtidal flats are similar to the surrounding subtidal flats; only the subsurface sediment characterization and contaminant depth profiles differ. The USACE identified 18 sediment accumulation areas in the historically disturbed subtidal flats that contain higher mean concentrations of almost all the select contaminants at the mid-depth and subsurface depth intervals compared to surface sediment (Table G-1b). The USACE sediment accumulation areas also contain higher mean concentrations of most of the select contaminants in the mid-depth and subsurface depth intervals compared to mid-depth and subsurface sediment outside of the USACE sediment accumulation areas (Table G-1b).

6.4 Biota Tissue

This section provides a brief summary of the COPC distributions observed in tissue samples (blue crab, softshell clam, and fish) collected within the NBSA between 2014 and 2016. The detailed analyses and evaluations of these tissue data, including calculation of exposure risks to humans and ecological receptors, is ongoing and will be completed during the development of the BERA and BHHRA reports.

Average concentrations of most COPCs in blue crab and softshell clam tissue were similar throughout the NBSA, although some differences were noted. For both species, total DDT (4,4') is greatest in Newark Bay South, while mercury and 2,3,7,8-TCDD are greatest in Newark Bay North. Mean concentrations by geographic area are presented in Appendix H (Table H-1).

The average concentrations of most COPCs in fish tissue were similar throughout the NBSA, although some differences were noted. For white perch and benthic forage fish (*Fundulus spp*.), total DDT (4,4') is greatest in Newark Bay South, while 2,3,7,8-TCDD is greatest in Newark Bay North. Mean concentrations by species and tissue type are presented in Appendix H (Table H-2).

6.5 Surface Water and Porewater

Surface water in the NBSA was monitored in 2011, 2012, and 2013, with more than 200 samples collected and analyzed for typical water quality parameters, as well as contaminant concentrations. Summary statistics for all physical and chemical observations in NBSA surface water are provided in Appendix I (Table I-1).

The variability in COPC concentrations in surface water is relatively low with respect to space, time, flow regime, depth or tidal cycle, reflecting the low variability in suspended solids concentrations in the Bay to which contaminants are preferentially associated. Box plots illustrate the distributions of COPC concentrations, which are characterized by tight ranges with a few outliers (Figures I-1 through I 17). Mean surface water concentrations were slightly greater at the northernmost monitoring stations in the Bay for 2,3,7,8-TCDD (Figure I-2), total PCB congeners (Figure I-15), total PAHs (Figure I-14), barium (Figure I-4), chromium (Figure I-6), copper (Figure I-7), mercury (including methyl mercury) (Figure I-9 and I-10), lead (Figure I-8), zinc (Figure I-13), and total alpha + gamma chlordane (Figure I-16). These stations also tended to have slightly higher total suspended solids concentrations. Total DDT (4,4') (Figure I-17) concentrations in surface water were highest at the southernmost monitoring station located in the mouth of the Arthur Kill.

The box plot results for 2,3,7,8-TCDD should be interpreted with caution due to the low frequency of detection (36%). Detection limits ranged from 0.3 to 3.3 picrograms per liter (pg/L), with a mean of 1.1 pg/L.

Appendix J presents summary statistics (including number of detections, minimum and maximum concentrations, mean and median concentrations, and standard deviations) for 30 porewater samples collected from the NBSA and evaluated for select organic compounds (PCDDs/PCDFs, PCBs, and pesticides) and inorganics/metals as part of the SQT assessment (Table J-1). In general, relative concentrations of organic compounds and inorganics/metals in porewater tend to track those found in their corresponding bulk sediment samples. A detailed evaluation of the porewater data will be performed as part of the SQT assessment for the BERA.

6.6 Toxicity Testing

Results for 10- and 28-day amphipod (*Leptocheirus plumulosus*) toxicity tests conducted in 2015 at 30 sampling stations in the NBSA are summarized in Appendix K (Table K-1). Ten-day survival was similar to control at 28 of the 30 stations, and 28-day survival was statistically significantly different from control at six of the 30 stations. There was considerable variability in the sub-lethal (i.e., growth and reproduction) toxicity endpoints, a phenomenon that is typical in standardized toxicity testing and makes these endpoints difficult to interpret. The toxicity testing program will be discussed in greater detail in the BERA.

On Figure 6-4, the most recent survival data (2015) is presented with the results from previous 10-day toxicity studies on the amphipod, *Ampelisca abdita*, conducted by the USEPA between 1998 and 2003 as part of its Regional Estuarine and Monitoring Program (REMAP). Ten out of the 12 test results in 1998 exhibited mortality that was significantly greater than laboratory control, and the USEPA reported that 46% of the Bay sediments were classified as toxic (USEPA 2003). The much lower rate of 10-day mortality observed in 2015 suggests that conditions may have improved for benthic invertebrates in the NBSA. However, there is some uncertainty in the comparison due to the different species of amphipods used in the studies.

With respect to 2015 results, acute toxicity (i.e., 10-day survival significantly different from control) was observed at locations 151 and 154 in Newark Bay South (Figure 6-4). Survival was 39% and 32% respectively at these locations compared to laboratory control survival, which was 90% (Table K-1). Toxicity based on 28-day survival (i.e., 28-day survival significantly different from control) was observed at six of 30 stations: 158 and 160 in Newark Bay North, 141 and 143 in Newark Bay Central, and 151 and 154 in Newark Bay South (Figure 6-4: Table K-1). A detailed evaluation of the toxicity test data will be performed as part of the SQT assessment during the development of the BERA.

6.7 Benthic Invertebrate Community Analysis

Benthic community data were collected in 2015 at 30 sampling stations in the NBSA (GSH 2017c). Abundance and taxa richness at each station are shown on Figure 6-5. Polychaeta was the dominant family comprising 61.2% of total abundance, followed by Crustacea (18.3%), and family

abundance was similar among geographic areas. Additional benthic community metrics data are provided in Appendix K.

Three benthic metrics, the Shannon-Wiener diversity index, Pielou's evenness index, and Swartz's dominance index (Table K-2), were calculated to assess diversity, evenness, and richness in the NBSA. These metrics will be compared to those from an appropriate reference area in the BERA. The B-IBI (Table K-3), a measure of overall habitat quality (GSH 2017c), was also calculated. The B-IBI is a quantitative method that uses biological activity to assess water body conditions between sites experiencing anthropogenic stress as compared to non-stressed reference locations across different habitat types. The B-IBI evaluates existing conditions by evaluating field metrics that, when combined, can effectively describe benthic communities (Weisberg et al. 1998). A multi-metric B-IBI, was developed for the saline environment of the NY/NJ Harbor area and is commonly used within the NY/NJ Harbor Estuary Program and its component agencies as a tool to assess benthic invertebrate community status at sites throughout the Harbor, including the NBSA. Scores of 3.0 or greater are indicative of good habitat quality. The 2015 B-IBI scores for the NBSA ranged from 1.8 to 4.2, with an overall average of 3.1 (GSH 2017c). Nine (three in the north, one in the central, and five in the south) of 30 stations had a score less than 3.0. By comparison, the overall average B-IBI scores from the 1993/1994, 1998, and 2003 REMAP (USEPA 1998, 2003, 2016b) studies for the Bay were 2.4, 1.4, and 2.3, respectively (Table K-4). The remaining 21 stations from 2015 have scores indicating no impact compared to regional reference areas. Of these nine stations with scores less than 3.0, only one station (148 in the southern Bay) had a B-IBI score (less than 2) that suggested substantive impacts to the benthic community (Table K-3). By comparison, only 3% of the sampling areas within the NBSA from the 1993/1994, 1998, and 2003 REMAP (USEPA 1998, 2003, 2016b) had B-IBI scores greater than 3.0. As with the toxicity data, these comparisons suggest an improvement in sediment conditions for benthic communities may have occurred in the last 15 to 20 years. More detailed evaluations of the benthic community data will be completed as part of the SQT assessment that will be conducted for the BERA.

7. Fate and Transport of Contaminants in the Newark Bay Study Area

A conceptual model of contaminant fate and transport is presented on Figures 7-1 and 7-2. This integrates the physical, hydrodynamic, and sediment transport processes described in Section 4; and data/information on sources and nature/extent of COPCs in Sections 5 and 6, respectively.

7.1 Fate and Transport Processes

Section 6 presents the COPCs that are considered in the fate and transport processes. Hydrodynamics are the primary driver of both dissolved and sediment-sorbed COPC transport through the combined water-column and sediment-bed system. The NBSA hydrodynamics can be divided into advective and dispersive components. Advection is driven by freshwater inflows, tidal forcing, local meteorological conditions, wave action, boat wakes and prop wash, and gravitational circulation (flows resulting from density gradients induced by salinity or temperature differences). Dispersion (spreading of sediment and COPCs) is largely controlled by turbulence, although concentration-gradient-based diffusion can also be important in low-flow areas or within the sediment bed. The hydrodynamic processes are described in Section 4.3.

The COPCs are either dissolved in the water column or associated with particulates, and therefore, are transported as aqueous (dissolved) or sorbed components, respectively. Many of the COPCs have high partition coefficients and thus, are typically sediment-sorbed. Dissolved COPCs may be truly dissolved or bound to micro-scale organic particles or colloids with extremely low settling rates. The transport of dissolved COPCs is described by advection, dispersion, and reaction processes, where the dissolved COPCs are advected by the water velocity and spread by turbulent dispersion. The dissolved COPC may leave the surface water system by sorbing onto suspended or bed sediment and depositing in the sediment or by volatilizing at an air-water interface. The dissolved COPC may be modified by the reaction process, which can transform the COPC from one phase (e.g., mercury) to another phase (e.g., methyl mercury) or can destroy the COPC (e.g., break the COPC down into a non-toxic chemical). The dissolved mass of COPCs in the Bay is occasionally susceptible to export due to high flushing rates associated with riverine flooding and meteorologically driven events.

The transport of sorbed COPCs are dependent on sediment dynamics. Sediment-sorbed COPCs are typically associated with fine-grained cohesive sediments, including the organic fraction. Non-cohesive sediment influences COPC fate and transport to a lesser degree due to lower COPC binding capacity. However, non-cohesive sediment transport is important from the standpoint of mixing with the cohesive sediments in the bed, both in the vertical and horizontal directions, which affects the spatial and temporal distribution of the contaminants in the bed (van Ledden 2002). For cohesive sediments, processes influencing their transport include suspended load transport, aggregation, disaggregation, settling, deposition, consolidation, burial, bioturbation, and erosion. Cohesive sediments are prone to flocculation at the ETM, which plays an important role in COPC transport and deposition via preferential accrual of COPC inventories in the sediment bed (i.e., near the ETM). For non-cohesive sediments, processes influencing their transport include suspended load and bedload transport, discrete particle settling through the water column, deposition to the bed, entrainment into the water column, and bed armoring. Sediment transport in the NBSA is discussed in more detail in Section 4.4. Sorbed COPCs can desorb, particularly if the local

water chemistry (e.g., salinity, pH, reduction oxidation [redox]) changes. Desorbed COPCs in the sediment bed are subject to advective and diffusive transport within the porewater of the bed or between the porewater and the overlying water column.

As summarized in Section 2.2 (and illustrated on Figure 2-3), COPCs enter the food web by direct exposure in the water column, in sediments, and/or in the tissues of prey. For aquatic plants and organisms, such as fish and invertebrates, exposure to contaminated media (water and sediment) occurs by direct contact (e.g., absorption) or ingestion/uptake. Upper-trophic level wildlife receptors, including birds and mammals, are in direct contact with contaminated media, such as air, water, and sediments, but a more significant exposure occurs through the ingestion/uptake of tissues of prey items. Non-polar organic compounds, such as PCDD/PCDFs and PCBs, preferentially partition into organic materials, which consequently mediate dissolved concentrations and play an important role in bioavailability. Changes in sediment carbon content may occur from changes in nutrient inputs and primary production (e.g., from CSO controls or increases in POTW discharges) that could influence future trends in bioavailability. Ionic contaminants, such as many metals, are also preferentially associated with fine particles, especially the charged surfaces of fine clay particles, which are present in significant proportion in NBSA sediments (see grain size data on Figure 4-4). Metals speciation and complexation with minerals in sediments depend strongly on salinity and redox conditions. Sediments throughout the NBSA are predominantly marine sediments and complexation and sulfides may affect the bioavailability of divalent metals.

COPCs may exit the NBSA via transport to the Hackensack River or kills, burial in the sediment bed, dredging, decay, volatilization, or bioaccumulation in organisms that leave the Bay. Biogeochemical transformation processes can reduce the mass of organic compounds over time or alter the bioavailability and toxicity of metals. Organic compounds may also be metabolized, volatilized, or exported by fish. The COPCs with chemical transformation cycles, such as mercury, have very complex fate and transport processes as each chemical form is influenced by these processes differently. The sediment chemical composition of classes of contaminants, such as PAHs or PCDD/PCDFs, can be altered over time as fate and transport processes differentially affect lower and heavier molecular weight compounds or congeners.

Key fate and transport processes affecting sorbed and dissolved contaminants in the Bay are depicted in summary on Figures 7-1 and 7-2. Based on sediment mass budgets and hydrodynamic information described in Section 4, it is speculated that the ultimate fate of the majority of COPC mass entering the Bay is primarily: 1) flushing from the Bay via the kills in the aqueous or suspended sediment phase, 2) removal from the Bay by maintenance dredging, or 3) incorporation in the sediment bed of the subtidal flats through cohesive consolidation and burial or degradation over time. Other processes that may affect COPCs are biogeochemical degradation in the water column, volatilization losses, and biological uptake (other potential loss mechanisms). It is anticipated that future simulations with updated models of the Bay will be used to quantify the relative importance of transport mechanisms within the NBSA. The RI will present mass balance summaries to quantify and document which fate and transport mechanisms are most important in governing long-term fate and exposure concentrations of COPCs in the NBSA surface sediments.

7.2 Trends in Contaminant Concentrations

The Bay is a complex system at the interface of oceanic and fluvial environments with multiple points of input and numerous sources of various COPCs. These multiple sources, occurring at different times and locations, interacted with the physics of the system to produce the observed sediment bed contaminant distributions. Multiple investigations of the NBSA over a period of decades have increasingly resolved the nature of sediments and sediment COPCs in the Bay. The results of these investigations are generally consistent in terms of findings, despite the complex hydrodynamic history of the Bay and the occurrence of large storm events during the period of sampling. Surface sediment toxicity and contaminant concentrations have both declined in the NBSA over time. Input of major point sources of contaminants has been greatly reduced from historical levels and the observed trends reflect this. Available information indicates that these trends also reflect the Bay's inherent natural recovery processes. Therefore, continued source reductions and natural recovery processes may lead to continuing declines in surface sediment contaminant levels. This section summarizes available information regarding sediment contaminant concentration changes over time.

Repeat sampling of surface sediments over a period of 11 years through the Phases I through III sediment investigations has documented reductions in average concentrations at the sediment surface. Surface sediment samples collected over three phases from 2005 to 2016 to complete the RI provide substantive data to evaluate changes in COPC concentrations over time. Statistical methods were used to compare concentrations observed during Phases I and II (2005 to 2007) to those observed during Phase III (2014 to 2016). Details of the statistical methods and results are described in Appendix G. The data were evaluated in two ways: 1) a trend analysis of co-located results from 37 locations[3] and 2) a means comparison of all data from the two time periods controlling for spatial variation using the USEPA subunits. Results of the analyses suggest that COPC concentrations for many of the 18 select chemicals have declined over this 11-year period from approximately 20% to 70%. Statistically significant declines were noted for the chemicals shown in Table 7-1. The 37 co-located samples are depicted on Figure 7-3. This apparent trend warrants further investigation to evaluate the potential for natural recovery to be taking place in the NBSA.

Long-term concentration trends observable through depth profiling in deposition areas suggest declines in surface sediment concentrations over time. These decreasing trends are illustrated in the concentration depth profiles presented in Appendix F and suggest that sediment burial is a potential recovery mechanism. Evidence of burial-driven recovery is reflected in radio-dated sediment core profiles (Tierra 2011). Additional analysis of natural trends will be undertaken in development of the RI Report.

Available sediment datasets for the NBSA bracket periods of intense storms, informing how these storm events may impact changes in surface sediment contaminant concentrations. The USGS, in cooperation

[3] The co-located analysis included only core sediment samples from 2005, 2007, and 2016. Grab sediment samples from the 2014 Crab/Clam and 2015 SQT were not included in this analysis to reduce potential confounding due to sampling methodology.

with the USEPA, analyzed sediment samples collected from the top 2 centimeters (cm) in various locations throughout the NBSA in 2013 after the 2012 Hurricane Sandy storm event (USGS 2015). Samples from 23 locations in the NBSA were analyzed for various COPCs, including 2,3,7,8-TCDD. Concentrations of 2,3,7,8-TCDD from that sampling event ranged from 4.3 to 110 parts per trillion (ppt) (mean: 52.8 ppt). In addition, of these 23 locations, nine locations were co-located with samples collected during the 1998 REMAP (USEPA 2003), which also sampled the top 2 cm of sediments. Seven of the eight REMAP stations with available data in both time periods showed a decrease in concentrations. The average percent reduction for all eight stations is 46% over the time period. These observations suggest that major storms on the scale of Hurricane Sandy are not disrupting natural recovery from taking place in the NBSA. A comparison of these co-located data is shown in Table 7-2.

Future trends and long-term fate of COPCs are strongly dependent on magnitude of continuing sources, sediment transport and deposition/burial processes, navigational channel ship-related mixing and sediment redistribution processes, and navigational channel dredging. Analysis of how these processes contribute to observed rates of recovery will be further addressed in development of the RI/FS. Continuing sources associated with the urban/industrialized watershed, atmospheric inputs, and seaport activity must be expected to sustain a future level of impairment. The limitations on COPC levels reduction and surface sediments recovery in the NBSA will be evaluated in the RI Report.

8. Conclusions

The NBSA is central to one of the most urbanized and industrialized areas in the United States and has experienced more than 200 years of environmental degradation. The contributing factors include shoreline and land development (USACE 2006), wetlands destruction, habitat degradation, garbage and sewage disposal, dredging and dredged material disposal, and releases of contaminants (Iannuzzi et al. 2002). Its primary configuration and use at present and for the foreseeable future is as an industrial/commercial shipping port. Collectively, the Bay and its tributaries form an estuarine system that exhibits complex hydrodynamics and physicochemical processes. This CSM describes the understanding of the key inter-relationships between sources of contaminants, contaminated media, and potential human and ecological receptors/exposures in the NBSA. An initial overview of apparent data trends that will help to define key issues for the subsequent RI and FS evaluations is also included.

Under the AOC RI program, extensive sampling, analysis, survey, and testing activities have been conducted throughout the NBSA in three phases, each informed by prior phase(s) results and iterations of this CSM. All necessary sampling to conduct the RI and complete the risk assessments (i.e., BERA and BHHRA) is now complete. Substantive, high quality data have been collected in the following categories:

- Sediment chemistry (surface layer and cores)
- Sediment profile imaging and related studies to define the BAZ
- Surface water chemistry
- Porewater chemistry
- Sediment toxicity testing (laboratory)
- Sediment bioaccumulation testing (laboratory)
- Fish and shellfish (blue crab/softshell clam) tissue chemistry
- Benthic invertebrate community surveys
- Bathymetric surveys
- Habitat and shoreline surveys
- Secondary data/information compilation and evaluation.

Field data collections also included various in-situ observations of water elevations, current speeds, surface water quality, and qualitative fish surveys. A summary of the available information to support the RI is provided in Tables 3-1 and 3-2.

Collectively, the data and information from these investigations have been compiled and evaluated to develop this CSM. In addition, preliminary (i.e., pre-RI) evaluations of the spatial and temporal datasets provide a means to evaluate potential key findings and trends in the data that will inform further analyses for the RI. Following the completion of the Phase III SI, the data gaps identified in earlier versions of the CSM have been filled and the RI can now be completed. Conceptual diagrams of the environmental conditions, hydrodynamics, and fate and transport processes in the NBSA are provided on Figures 2-3, 5-1, 7-1, and 7-2.

A summary of the extent and distribution of representative organic and inorganic COPCs is provided in this CSM. The nature and extent of impacted media will be described in detail in the complete RI Report. In general, metals concentrations tend to be highest in the southern Bay and industrial waterfront areas, while concentrations of organic compounds are more variable between geographic and geomorphic areas, depending on depth. In surface sediments, PCDDs/PCDFs and PAHs tend to be higher in the northern portion of the NBSA, while PCB and DDT concentrations are higher in the southern area. The NBSA has been broken down in this CSM into geographic and geomorphic areas, as well as practical subunits within these areas. The evaluation of the physical, chemical, and biological data within these various geographic areas will help focus the RI, risk assessments, and remedial decision-making on localized areas of the Bay.

Comparison of recent sediment chemistry datasets (2013 post-Hurricane Sandy and 2016 Phase III) to older data indicate that surface sediment concentrations of COPCs are declining in the NBSA. Furthermore, sediment core profiles evidence that this recovery is driven in part by burial of older sediments and deposition of sediment with lower concentrations than historical sediment. Sediment toxicity test data collected in 2015 in comparison to data collected between 1993 and 2003 (USEPA 2003) support this finding, showing substantially lower toxicity in the recent NBSA-wide dataset. Benthic community B-IBI indices from the 2015 sampling program also demonstrate that NBSA sediments support a normal estuarine benthic community in terms of composition, diversity, and abundance. In contrast, the 1993 to 2003 B-IBI indices indicated that nearly all the Bay sediments did not support normal benthic communities. Future additional unbiased sediment sampling is needed to confirm the potential action and magnitude of natural recovery in the NBSA.

There are exceptions to these temporal trends, both from chemistry and toxicity perspectives, that will require further evaluation during the RI Report preparation. Localized contamination and toxicity, and risk (evaluated from various geomorphic, geographic subunit, and location-specific perspectives) will be a key focus for the RI and FS. Additionally, it does not appear that periodic storm events (e.g., Hurricane Sandy) adversely affect sediment conditions in the Bay.

This CSM was developed and structured in a manner to inform and focus the completion of the RI Report and risk assessments (human health and ecological) for the NBSA. In addition to the Phase I through III datasets, historical data and information will provide perspectives on changes in COPC exposure concentrations in the NBSA over time that can provide a baseline for understanding how the system responds to the ongoing processes and source control activities that are underway. Collectively, the data and information compiled to date under the RI process provides a good understanding of the Bay ecosystem, and the human and ecological use and exposure pathways in the NBSA. The combined datasets are sufficient to prepare the RI/FS for the NBSA and to focus on specific areas of the Bay that may warrant remedial considerations. The planned remediation in the lower 8 miles of the Passaic River (OU2) is intended to reduce the contaminated sediment load into the NBSA from one of its primary tributaries. As such, this project is closely aligned with the RI/FS for the NBSA and will be carefully considered throughout the remedial decision-making process. Similarly, the potential remediation in the upper 9 miles of the LPRSA will be taken into consideration as needed during the NBSA RI/FS process.

The NBSA has been shaped by a variety of natural and anthropogenic forces. Chemical contamination is one of the many stressors in the Bay that constrain human and ecological use of the waterway. This CSM compiles and summarizes important data and information on the environmental conditions of the NBSA and provides an integrated understanding of the physical, geographical, ecological, and chemical fate and transport processes within the system. The intention is that this CSM will provide the foundation for the development of the RI Report and FS and ultimately aid in the remedial decision-making for the NBSA.

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Tables

Table 2-1
History of Dredging Activities Within Newark Bay

Area	Year	New Dredge Depth (feet Mean Low Water)	Wetlands and Channel Widths
Newark Bay	1844	< 10	The bay was bordered by extensive wetlands in the western and northern areas.
Newark Bay navigation channel south, central, and north reaches	1912	16	The wetlands in the western and northern areas were mostly intact but were bisected by multiple railways.
Newark Bay navigation channel south, central, and north reaches	1916	20-21	Port Newark terminal was built over reclaimed wetlands. The width of the shipping channel in the southern bay was increased to 400 feet.
Arthur Kill	1917	25	
Newark Bay navigation channel south and middle reaches and Port Newark reaches	1923	30	
Passaic River and Newark Bay navigation channel north reach	1923	20	
Passaic River and Newark Bay navigation channel north reach	early 1930s	30	
Hackensack River	1954	32-34	
Newark Bay navigation channel south and middle reaches and Port Elizabeth reaches	1960s to 1970s	Not Applicable	Most of the remaining wetlands in the western area were reclaimed. The width of southern Newark Bay was reduced in half with the building of the Elizabeth Channel.
Newark Bay navigation channel south, central, and north reaches	1960s to 1970s	35	
Newark Bay navigation channel south reach	1966	Not Applicable	Channel near Kill van Kull was widened to 700 feet.
Newark Bay navigation channel south reach	1973	Not Applicable	Channel near Kill van Kull was widened to 800 feet.
Newark Bay navigation channel south reach	1980	Not Applicable	Channel near Kill van Kull was widened to 1000 feet.
Newark Bay navigation channel south, central, and north reaches	1980s	40	
Newark Bay navigation channel south, central, and north reaches	1999 to 2016	50-52	See Figure 2-2 for extent of dredging.
Kill van Kull	1999 to 2016	50-52	See Figure 2-2 for extent of dredging.
Newark Bay navigation channel south reach	1999 to 2016	Not Applicable	Channel near Kill van Kull was widened to 1700 feet.
Kill van Kull navigation channel Elizabethport reach	1999 to 2016	40-43	See Figure 2-2 for extent of dredging.

Table 2-2
Essential Fish Habitat Designations by Life Stage for Newark Bay

Species	Eggs	Larvae	Juveniles	Adults	Spawning Adults
Red hake (*Urophycis chuss*)	✓	✓	✓	✓	–
Winter flounder (*Pseudopluronectes americanus*)	✓	✓	✓	✓	✓
Windowpane flounder (*Scopthalmus aquosus*)	✓	✓	✓	✓	✓
American plaice (*Hippoglossoides platessoides*)	–	✓	✓	✓	–
Atlantic sea herring (*Clupea harengus*)	–	✓	✓	✓	–
Bluefish (*Pomatomus saltatrix*)	✓	✓	✓	✓	–
Atlantic butterfish (*Peprilus triacanthus*)	–	✓	✓	✓	–
Atlantic mackerel (*Scomber scombrus*)	–	–	✓	✓	–
Summer flounder (*Paralichthys dentatus*)	–	✓	✓	✓	–
Scup (*Stenotomus chrysops*)	✓	✓	✓	✓	–
Black sea bass (*Centropristus striata*)	–	–	✓	✓	–
King mackerel (*Scomberomorus cavalla*)	✓	✓	✓	✓	–
Spanish mackerel (*Scomberomorus maculates*)	✓	✓	✓	✓	–
Atlantic mackerel (*Scomber scombrus*)	–	–	✓	✓	–
Cobia (*Rachycentron canadum*)	✓	✓	✓	✓	–
Dusky shark (*Carcharhinus obscurus*)	–	✓	✓	–	–
Sand tiger shark (*Carcharias taurus*)	–	✓	✓	–	–
Sandbar shark (*Carcharhinus plumbeus*)	–	✓	✓	–	–
Clearnose skate (*Raja eglanteria*)	–	–	✓	✓	–
Little skate (*Raja erinacea*)	–	–	✓	✓	–
Winter skate (*Leucoraja ocellata*)	–	–	✓	✓	–

Notes:
✓ indicates habitat is suitable for lifestage.
– indicates habitat is not suitable for lifestage.

Acronyms and Abbreviations:
USACE = U.S. Army Corps of Engineers

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Table 3-1
Summary of Remedial Investigation Sampling Programs

RI Phase	Year Conducted	Sampling Program	Number of Sampling Locations	Sampling Depth (ft bss)	Sample Type	Sample Analyses	Number of Samples	Sampling Program Details
Phase I	2005	BAZ Investigation	NA	NA	NA	NA	NA	Investigation activities confirmed 0.5-ft depth bss was sufficient for BAZ sampling.
	2005	Bathymetric Survey	NA	NA	NA	NA	NA	Used to define geomorphic areas and to assist field crews with sediment core collection.
	2005	Sediment Investigation	69	0 to 11	Sediment	Chemistry, Radiochemisty	Chemistry: 301 Radiochemistry: 547	Sampling interval: 0.5- to 2-ft. Radiochemistry analyses conducted at 51 locations at non-contiguous 2-inch sampling intervals. Be-7 analyses conducted on top 1-inch of sediment at all locations.
Phase II	2007	Sediment Investigation	50	0 to 29.5	Sediment	Chemistry, Radiochemistry	Chemistry: 385 Radiochemistry: 491	Sampling interval: 0.5- to 2-ft. Radiochemistry analyses conducted at 29 locations at non-contiguous 2-inch sampling intervals. Be-7 analyses conducted on top 1-inch of sediment at all locations.
Phase III	2012/2013	Bathymetric Survey	NA	NA	NA	NA	NA	Conducted to support hydrodynamic and sediment transport modeling for the Lower Passaic River Study Area and to support the NBSA CSM.
	2013	Reconnaissance Survey	NA	NA	NA	NA	NA	Conducted to provide qualitative observations of shoreline features and characteristics of the NBSA as part of the Baseline Human Health and Ecological Risk Assessment.
	2014	Crab and Clam Sampling Program	18	0 to 0.5	Sediment	Chemistry	18	Co-located clam and surface sediment collected at each location.
			18	NA	Softshell Clam Tissue	Chemistry	18	
			37	NA	Blue Crab Tissue	Chemistry	111	Hepatopancreas, edible muscle, and carcass tissue samples collected at each location.
	2014, 2015, 2016	Fish Sampling Program	NA	NA	Tissue	Chemistry	190	Target species selected to represent key trophic levels and feeding guilds. Whole body, fillet, and liver fish tissue samples collected.
	2015	SQT & Porewater Sampling Program	43	0 to 0.5	Sediment	Chemistry	43	SQT analyses, benthic invertebrate community analysis, and porewater chemistry analyses conducted at 30 stations. Bioaccumulation tests conducted at a subset of eight stations. Chemistry analyses conducted on an additional 13 locations to support the BHHRA.
			8	NA	Tissue	Chemistry	8	
			30	0 to 0.5	Porewater	Chemistry	30	
			30	0 to 0.5	Toxicity	NA	30	
			30	0 to 0.5	Benthic Invertebrate Community	NA	90	
	2016	Sediment Investigation	193	0 to 0.5	Sediment	Chemistry	193	Sampling interval: 0- to 0.5-ft.

Acronyms and Abbreviations:
BAZ = biologically active zone
BE-7 = beryllium-7
ft bss = feet below sediment surface
NA = not applicable
SQT = Sediment Quality Triad

Table 3-2
Summary of Available Secondary Data[1]

Sample Type	Program	Reference
Sediment	1993/1994 Regional Estuarine and Monitoring Program (REMAP)	USEPA 1998
	1998 Regional Estuarine and Monitoring Program (REMAP)	USEPA 2003
	1998 to 2001 Contaminant Assessment and Reduction Program (CARP)	NYSDEC 2003
	1999 to 2006 Honeywell Sediment Investigations	Parsons and ENVIRON 2004; ENVIRON 2005, 2006
	2003 Regional Estuarine and Monitoring Program (REMAP)	https://archive.epa.gov/emap/archive-emap/web/html/nynj03.html
	2005 PSE&G West End Supplemental Remedial Investigation	PSE&G 2006
	2005 USEPA High Resolution Coring Program	USEPA 2005
	2007 to 2008 USEPA High Resolution/Low Resolution Supplemental Sediment Sampling Program	USEPA 2008
	2008 CPG Low Resolution Coring Program	AECOM 2010
	2008 USACE Stratified Sampling Project	USACE 2010
	2012 CPG Low Resolution Coring Supplemental Sampling Program	AECOM 2012
	2013 Post-Hurricane Sandy Sampling Program	USGS 2015
Fish	1980s NJDEP Fish Sampling	NJDEP 1982, 1983, 1985
	1980s Brown et al. and Rappe et al.	Brown et al. (1994), Rappe et al. (1991)
	Contamination Assessment & Reduction Project (CARP)	NYSDEC 2004a, 2004b, 2004c, 2005, 2006
	Additional Studies	Cooper and Buchanan 2007; Bugel 2009, 2011; Gale et al. 2000
Blue Crab	New Jersey Routine Monitoring Program for Toxics in Fish	Horwitz et al. 2006
Birds	Contamination Assessment & Reduction Project	Parsons 2003
Surface Water	2011-2013 CPG Chemical Water Column Monitoring Programs	Available on http://ourpassaic.org/

Notes:
[1]Secondary data are those derived from studies that were not conducted as part of the NBSA AOC RI investigations.

Acronyms and Abbreviations:
AOC = Administrative Order on Consent
CPG = Cooperating Parties Group
NBSA = Newark Bay Study Area
NJDEP = New Jersey Department of Environmental Protection
NYSDEC = New York State Department of Environmental Conservation
PSE&G = Public Service Enterprise Group
RI = Remedial Investigation
USACE = United States Army Corps of Engineers
USEPA = United States Environmental Protection Agency

Table 3-2
Summary of Available Secondary Data[1]

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Table 3-2
Summary of Available Secondary Data[1]

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USGS. 2015. Estuarine Bed-Sediment-Quality Data Collected in New Jersey and New York after Hurricane Sandy, 2013. Data Series 905. Reston, Virginia.

Table 4-1
Area Coverage in the NBSA

Geomorphic Area	Area (acres)	% of NBSA Area	Average Depth[1] (ft NAVD88)
Subtidal Flats	1737.9	42.6	7.5
Historically Disturbed Subtidal Flats	251.4	6.2	8.4
Transitional Slopes	411.1	10.0	26
Navigation Channels/Port Channels	1277.3	31.3	50[2]
Intertidal Areas	28.9	0.7	3.2
Industrial Waterfront Areas	346.4	8.5	17
Confined Disposal Facility[3]	27.4	0.7	6.1

Footnotes:
[1] Average depths were tide-corrected from the 2012/2013 bathymetric survey (Tierra 2013c).
[2] Average depth of the Navigation Channels/Port Channels is estimated based on the Harbor Deepening Project completed in 2016.
[3] The confined disposal facility is not a designated geomorphic area but is an area of importance as described in Section 4.2.

Acronyms and Abbreviations:
% = percent
ft = feet
NAVD88 = North American Vertical Datum 1988
NBSA = Newark Bay Study Area

Table 4-2
Comparison of Sedimentation Rates Among Different Studies

Method	Based on Bathymetry Data	Based on Dredge Volume Data	Based on Sediment Radioisotope Data[3]
Bay-wide	--	0.7[1]	--
Navigation channel	1.2 - 12[2]	2.31[1]; 5 - 13[2]	>2.5
Intertidal flats	--	--	0.2
Transitional Slopes	--	--	0.94
Subtidal flats	0.14[1]	--	0.37
Historically Disturbed Subtidal	--	--	1.68
Industrial Waterfront Areas	--	--	1.32

Notes:
Sedimentation rates are provided in inches per year.

Sources:
[1]Suszkowski (1978)
[2]USACE (2006)
[3]Tierra (2011)

Table 5-1
General Notice Letter Recipients

Recipient of General Notice Letter	Date of Letter
Honeywell International, Inc.	8/24/2006
Prentiss, Inc.	8/24/2006
Public Service Electric & Gas	8/24/2006
Troy Chemical Corporation	8/24/2006
Amcol Realty Co.	7/13/2007
BASF Catalysts LLC	7/13/2007
Bayer Corporation	7/13/2007
Chevron Texaco Corporation	7/13/2007
Colt Corporation	7/13/2007
Columbia Terminals, Inc.	7/13/2007
E.I. duPont de Nemours and Company	7/13/2007
General Cable Industries, Inc.	7/13/2007
ISP Environmental Services, Inc.	7/13/2007
OENJ Cherokee Corporation	7/13/2007
Beazer East, Inc.	9/3/2009
Cytec Industries, Inc.	9/3/2009
Exxon Mobil Corporation	9/3/2009
Koppers Inc.	9/3/2009
Reichhold, Inc.	9/3/2009
CycleChem, Inc.	1/31/2012
IBM Corporation	1/31/2012
ICI Americas Inc.	1/31/2012

Note: The NBSA OU is part of the Diamond Alkali Superfund site (DASS).

Table 5-2
Estimated Annual Tributary Chemical Loads (1975 - 2000)

Parameter	Units	Estimated Annual Load	
		Hackensack River	Passaic River
Suspended sediment	kg/yr	395,000	22,700,000
Dissolved organic carbon	kg/yr	215,000	4,260,000
Particulate organic carbon	kg/yr	113,000	589,000
PCBs (total)	kg/yr	74	7,200
Dioxins and difurans (sediment-bound)	g/yr	2.2	260
PAHs (total)	kg/yr	15	1,000
Organochlorine pesticides (total)	g/yr	420	6,400
Mercury (total)	kg/yr	0.073	8.0
Lead (total)	kg/yr	20	2,100
Cadmium (total)	kg/yr	0.26	88

Notes and Abbreviations:
g/yr = gram per year
kg/yr = kilogram per year
PAH = polycyclic aromatic hydrocarbons
PCB = polychlorinated biphenyl
Data are from the Organic Compounds and Trace Elements in Tributaries to Newark and Raritan Bays, New Jersey report (Wilson and Bonin 2007).

Table 5-3
NBSA Tributary Water Quality Monitoring Results

Parameter	Units	Passaic River	Hackensack River	Elizabeth River	Newark Bay	Kill Van Kull	Arthur Kill
Suspended sediment	mg/L	16.54 - 34.45	18.99 - 45.32	10.91	7.54 -11.67	11.76	7.78 - 11.34
Dissolved organic carbon	mg/L	4.38 - 5.46	3.52 - 7.54	3.44	2.99 - 4.24	3.22	2.68 - 3.03
Particulate organic carbon	mg/L	1.24 - 2.01	0.89 - 3.56	0.98	0.41 - 0.70	0.45	0.41 - 0.58
PCBs (total dissolved)	pg/L	4,233 - 5,117	3,489 - 5,517	3,260	3,275 - 4,727	2,825	3,012 - 3,788
PCBs (total suspended sediment)	ng/g sed	689 - 879	596 - 921	2,166	650 - 861	611	750 - 879
Dioxins and furans (total dissolved)	pg/L	155.1 - 244.6	108.7 - 200.6	362.4	27.8 - 74.4	43.1	68.5 - 72.1
Dioxins and furans (total suspended sediment)	pg/g sed	8,484 - 10,958	7,041 - 9,315	30,434	3,769 - 7,761	3,967	7,252 - 9,796
2,3,7,8-TCDD (total suspended sediment)	pg/g sed	140.9 - 278.7	35.2 - 113.9	66	23.4 - 97.9	21.0	32.4 - 32.9
PAHs (total dissolved)	ng/L	518 - 760	281 - 908	1,099	81 - 167	135	149 - 172
PAHs (total suspended sediment)	ng/g sed	22,464 - 47,488	11,405 - 23,527	90,419	10,481 - 17,977	11,452	10,764 - 19,754
Pesticides (total dissolved)	ng/L	3.59 - 5.81	2.33 - 3.92	4.46	1.92 - 3.06	1.60	4.29 - 6.32
Pesticides (total suspended sediment)	ng/g sed	267 - 743	120- 165	1,384	122 - 205	123	565 - 650
Mercury (total)	ng/L	38.0 - 61.9	43.4 - 190.8	32.8	15.7 - 37.2	18.1	28.9 - 47.5
Lead (total)	ng/L	5,303 - 9,205	3,416 - 7,965	10,898	1,937 - 3,120	1,722	2,138 - 3,080
Cadmium (total)	ng/L	130.4 - 144.0	134.5 - 155.3	146.9	108.2 - 117.8	102.6	101.5 - 127.3

Notes and Abbreviations:
2,3,7,8-TCDD = 2,3,7,8-tetrachlorodibenzo-*p*-dioxin
g sed = gram of sediment
L = liter
mg = milligram
ng = nanogram
PAH = polycyclic aromatic hydrocarbons
PCB = polychlorinated biphenyl
pg = picogram
Data are from the Ambient Monitoring of Water Quality within Major Tributaries & the Estuary report ("the Report"; Stevens Institute of Technology 2007). Additional data and details can be found in the Report. When samples were collected at multiple time points in a day, daily geometric means were presented in the Report, along with an overall arithmetic mean of the daily geometric means for each sampling location. These overall arithmetic means are presented in this table. Ranges of overall arithmetic means are provided for waterbodies with more than one sampling location and/or sampling depth.

Table 6-1
Phase III Stratified Mean Surface Sediment Concentrations in the NBSA

Chemical	Units	Number of Samples[1]	Number of Detects	Stratified Mean[2]	Standard Error	95% Confidence Limits		Median	Minimum Detect	Maximum Detect
						Lower	Upper			
2,3,7,8-TCDD	ppt	254	254	67.8	7.67	55.2	80.4	42.8	0.12	1710
Arsenic	ppm	254	254	16.1	0.702	15	17.3	13.3	1.18	115
Barium	ppm	254	254	146	8.4	132	160	117	5.5	1260
Cadmium	ppm	254	252	1.56	0.125	1.35	1.76	0.91	0.0592	24.6
Chromium	ppm	254	254	107	5.59	98	116	95.8	3.95	777
Copper	ppm	254	254	123	6.27	113	133	100	1.5	924
Lead	ppm	254	254	146	15.4	121	172	111	2.18	2190
Mercury	ppm	254	254	1.92	0.131	1.7	2.14	1.48	0.0051	22.1
Nickel	ppm	254	254	41.2	1.32	39	43.4	37.9	3.83	282
Silver	ppm	254	253	1.64	0.0857	1.5	1.78	1.46	0.0448	12
Zinc	ppm	254	254	254	17.4	226	283	220	8.18	6810
bis(2-Ethylhexyl)phthalate	ppb	253	198	930	190	610	1200	340	96	38000
TPH	ppm	254	246	260	18	230	290	190	6.5	2900
Total DDT (4,4)	ppb	254	254	68	8.6	53	82	26	0.093	1800
Total Aroclor PCBs (Sum of 9 Aroclors)	ppb	254	239	200	15	170	220	140	6.4	2500
Total PCB Congeners (209)	ppt	254	254	382,000	27,800	336,000	428,000	277,254	2,480	5,030,000
Total Alpha + Gamma Chlordane	ppb	254	244	5	0.4	4.3	5.6	4.3	0.039	32

Notes:

[1] Sample counts and statistics include sediment samples collected during all Phase III sampling activities, including the 2014 Crab and Clam sampling program, the 2015 SQT sampling program, and the 2016 Phase III SI sampling program. Sample counts exclude samples with analytical results that were rejected in the data validation process.

[2] The stratified mean is a spatially weighted average (i.e. the average of each EPA subunit average, weighted by the area of the subunit) using the EPA subunits depicted on Figure 6-3.

One half the detection limit was substituted for non-detect data.

PAHs in sediment are being reanalyzed due to laboratory bias and are not presented

Acronyms and Abbreviations:

95LCL = One-sided 95% Lower Confidence Limit
95UCL = One-sided 95% Upper Confidence Limit
2,3,7,8-TCDD = 2,3,7,8-tetrachlorodibenzo-p-dioxin
DDT = dichlorodiphenyl-trichloroethane
N = sample size
PCB = polychlorinated biphenyl
ppb = parts per billion; ppm = parts per million; ppt = parts per trillion
TPH = total petroleum hydrocarbon

Table 7-1
Results of Temporal Evaluation of Surface Sediment Concentrations

Chemical	Average Percent Decrease from 2005 to 2016 at 37 locations[1]	Average Percent Decrease in Mean Concentrations for all Data from Phase I/II to Phase III[2]
2,3,7,8-TCDD	31%	37%
Cadmium	27%	27%
Chromium	20%	20%
Copper	23%	23%
Lead	22%	17%
Mercury	28%	39%
Silver	31%	38%
bis(2-Ethylhexyl)phthalate[3]	87%	87%
TPH[4]	76%	82%
Total DDT	40%	28%
Total Aroclor PCBs	71%	73%
Total PCB Congeners	46%	51%

Notes:

[1] Estimated from the linear mixed model: $\log_e$(concentration) = intercept + (β* year0) + γ_i where year0 = 0 in 2005 and γ_i is the random intercept for colocation i. Co-locates are shown on Figure 7-3. Non-detects excluded from analysis. See Appendix G for detailed statistical methods.

[2] Based on least square log mean estimates from the model: $\log_e$(concentration) = intercept + subunit + sampling period (phase I/II vs. Phase III). Subunits are shown on Figure 6-3. 1/2 detection limit was substituted for non-detect data. See Appendix G for detailed statistical methods.

[3]Phase III sediment PAH results were found to have a low analytical bias and therefore Phase III sediments were re-analyzed for PAHs. There is potential associated uncertainty in the Phase III semivolatile organic compound (SVOC) results since a similar analytical method was employed; however, SVOCs were not re-analyzed. Bis(2-Ethylhexyl)phthalate is not included in overall estimates of decline in organic chemicals due to the potential analytical uncertainty.

[4]Differences between sampling periods may be partially attributable to differences in the analytical methods used for TPH.

Surface sediment consists of samples from the interval 0 to 6 inches below sediment surface.
Phase III sediment PAH results were found to have a low analytical bias and therefore Phase III sediments were re-analyzed for PAHs. PAHs have yet to be included in the temporal analyses.

Acronyms and Abbreviations:
2,3,7,8-TCDD = 2,3,7,8-tetrachlorodibenzo-p-dioxin
DDT = dichlorodiphenyl-trichloroethane
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
TPH = total petroleum hydrocarbon

Table 7-2
Comparison of 2,3,7,8-TCDD Concentrations in the Top 2 cm of Sediment from the 1998 USEPA Regional Estuarine Monitoring Program and 2013 Post-Sandy Sampling Programs in the NBSA

Geographic Area	Station ID (2013)	2,3,7,8-TCDD (ppt)		Percent Reduction 1998-2013[3]
		1998 REMAP[1]	2013 Post-Sandy[2]	
North	NB427	75	61	19%
Central	NB416	119	110	8%
Central	NB406	17.3	4.3	75%
Central	NB426	40	94	-135%
Central	NB412	50	29	42%
Central	NB401	37.9	23	39%
Central	NB431	133	50	62%
South	NB423	109	13	88%
South	NB413	NA	32	NA
Mean Percent Reduction (90% Confidence Limits):				**46% (2%, 71%)**

Notes:
[1]Source: USEPA. 2003. Sediment Quality of the NY/NJ Harbor System: A 5-year Revisit (1993/1994–1998). EPA/902-R-03-002. U.S. Environmental Protection Agency, Region II, Edison, NJ.
[2]Source: USGS. 2015. Estuarine Bed-Sediment-Quality Data Collected in New Jersey and New York after Hurricane Sandy, 2013. Data Series 905. Reston, Virginia.
[3]Negative percent indicates increase.

Acronyms and Abbreviations:
2,3,7,8-TCDD = 2,3,7,8-tetrachlorodibenzo-p-dioxin
NA = not available
ppt = parts per trillion
USEPA = United States Environmental Protection Agency

Figures

City: Citrix Div/Group: IM/DV Created By: K. SINSABAUGH Last Saved By: ksinsabaugh
Newark Bay (B0009989.0053.00004)
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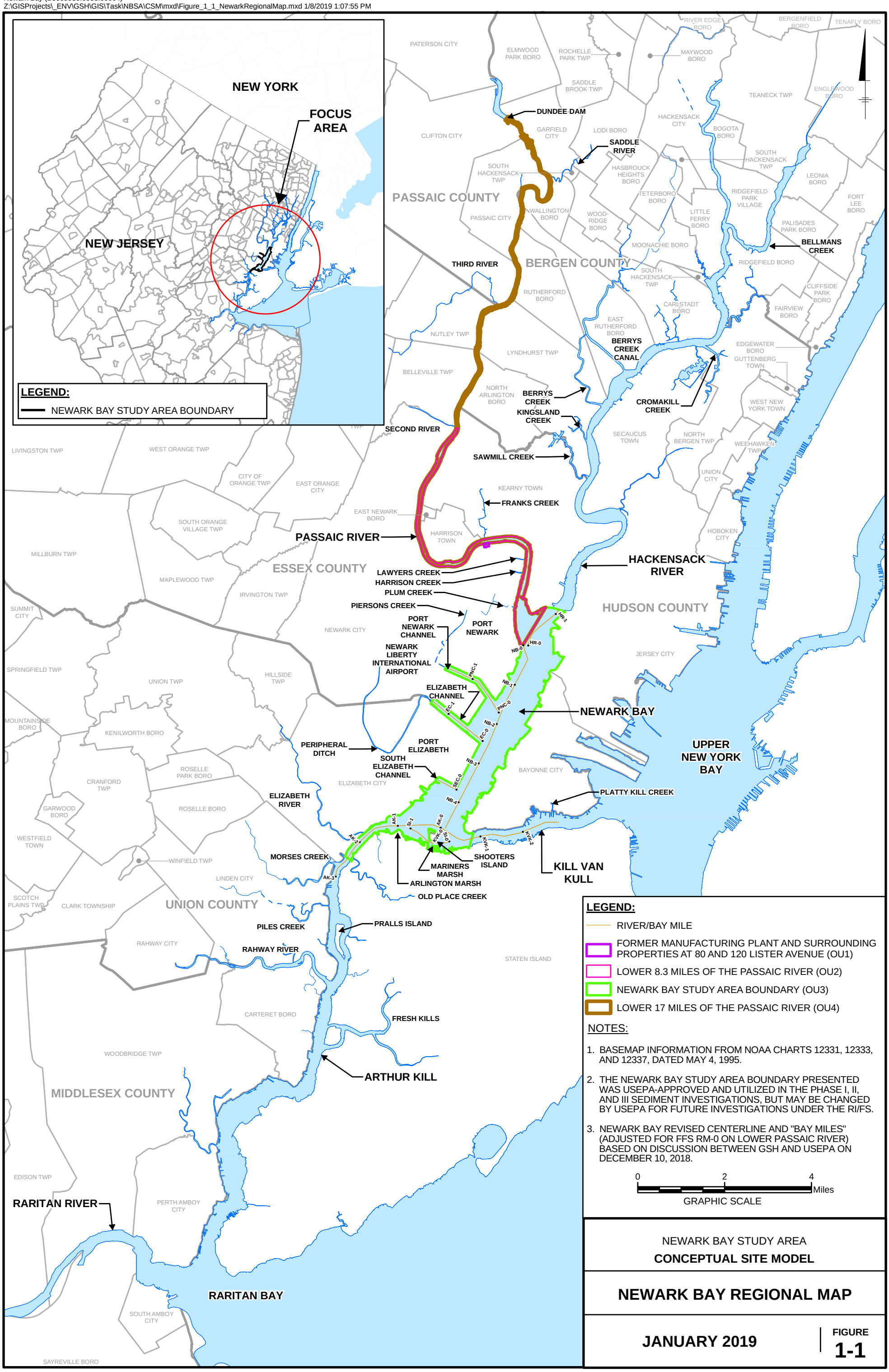

NEWARK BAY STUDY AREA

CONCEPTUAL SITE MODEL

NEWARK BAY REGIONAL MAP

JANUARY 2019

FIGURE
1-1

City: Citrix Div/Group: IM/DV Created By: K. SINSABAUGH Last Saved By: ksinsabaugh
Newark Bay (B0009989.0053.00004)
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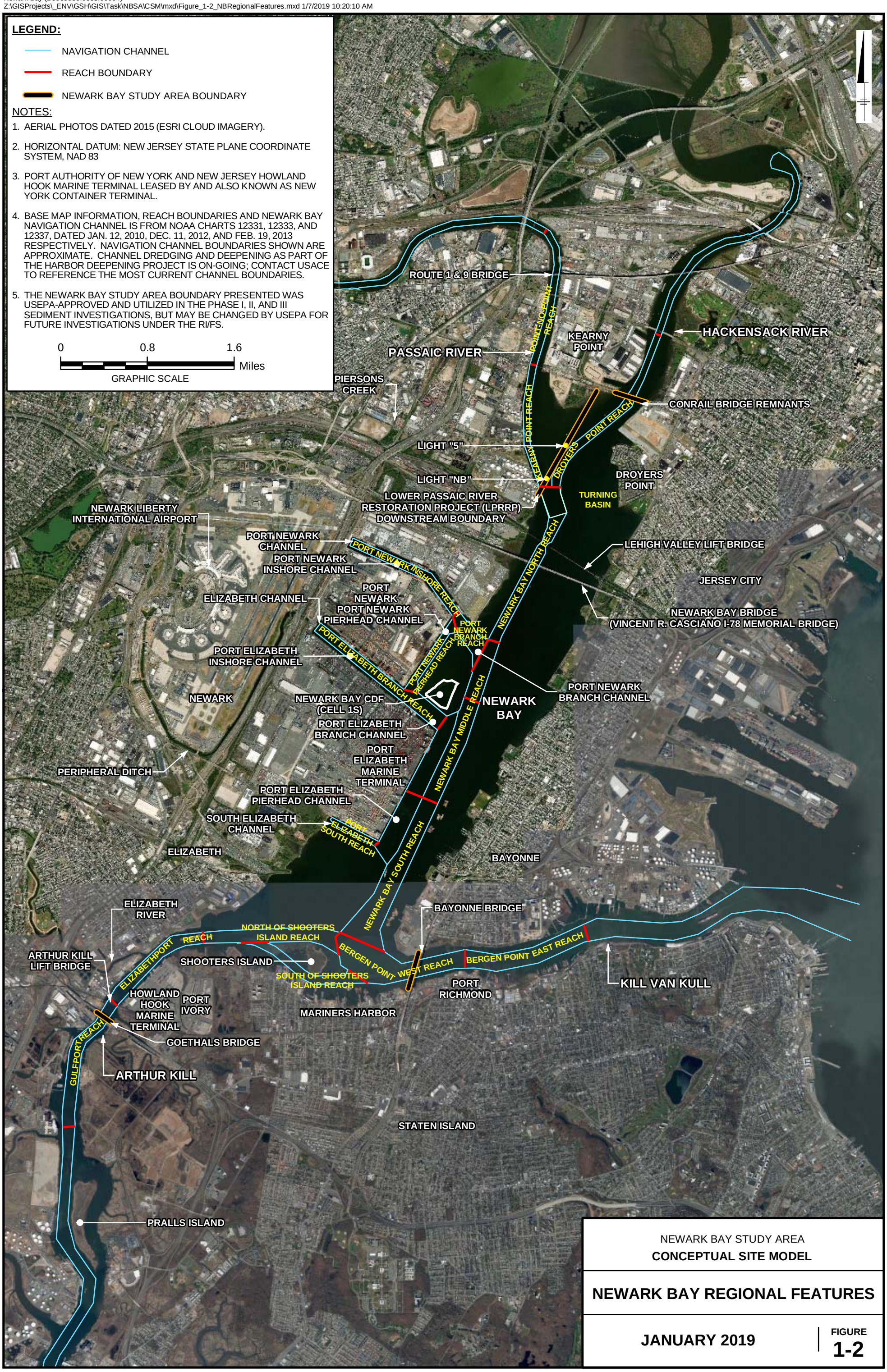


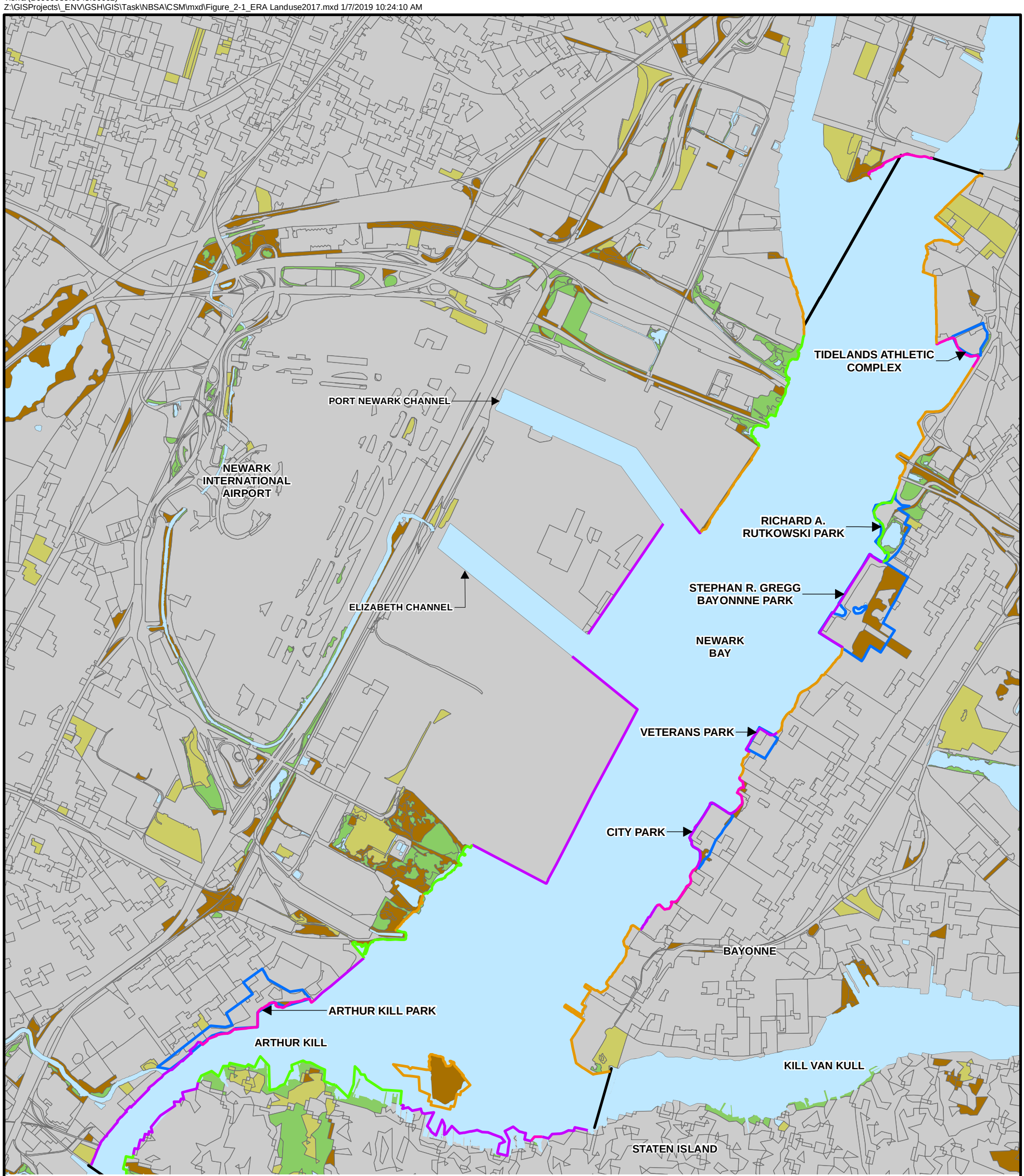
NEWARK BAY STUDY AREA
CONCEPTUAL SITE MODEL

NEWARK BAY REGIONAL FEATURES

JANUARY 2019

FIGURE
1-2

City: SYR Div/Group: IM Created By: K. SINSABAUGH Last Saved By: ksinsabaugh
Tierra (B0009989.0045.00002)
Z:\GISProjects_ENV\GSH\GIS\Task\NBSA\CSM\mxd\Figure_2-1_ERA Landuse2017.mxd 1/7/2019 10:24:10 AM

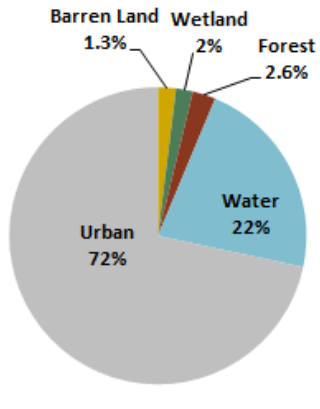


LEGEND:

- BARREN LAND
- FOREST
- URBAN
- WATER
- WETLANDS

OBSERVED SHORELINE HABITAT:

- BULKHEAD
- MIXED INTERTIDAL
- RIPRAP
- VEGETATION
- PARKS AND RECREATIONAL AREAS
- NEWARK BAY STUDY AREA BOUNDARY



Percentage of Land Cover

NOTES:

1. 2012 NEW JERSEY LAND USE DATA DOWNLOADED FROM THE NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION GEOGRAPHIC INFORMATION SYSTEM WEBSITE AT www.state.nj.us/dep/gis.
2. 2006 NEW YORK NATIONAL LAND COVER DATA DOWNLOADED FROM THE NEW YORK STATE GEOGRAPHIC INFORMATION SYSTEMS CLEARINGHOUSE AT www.nysgis.state.ny.us.
3. THE NEWARK BAY STUDY AREA BOUNDARY PRESENTED WAS USEPA-APPROVED AND UTILIZED IN THE PHASE I, II, AND III SEDIMENT INVESTIGATIONS, BUT MAY BE CHANGED BY USEPA FOR FUTURE INVESTIGATIONS UNDER THE RI/FS.

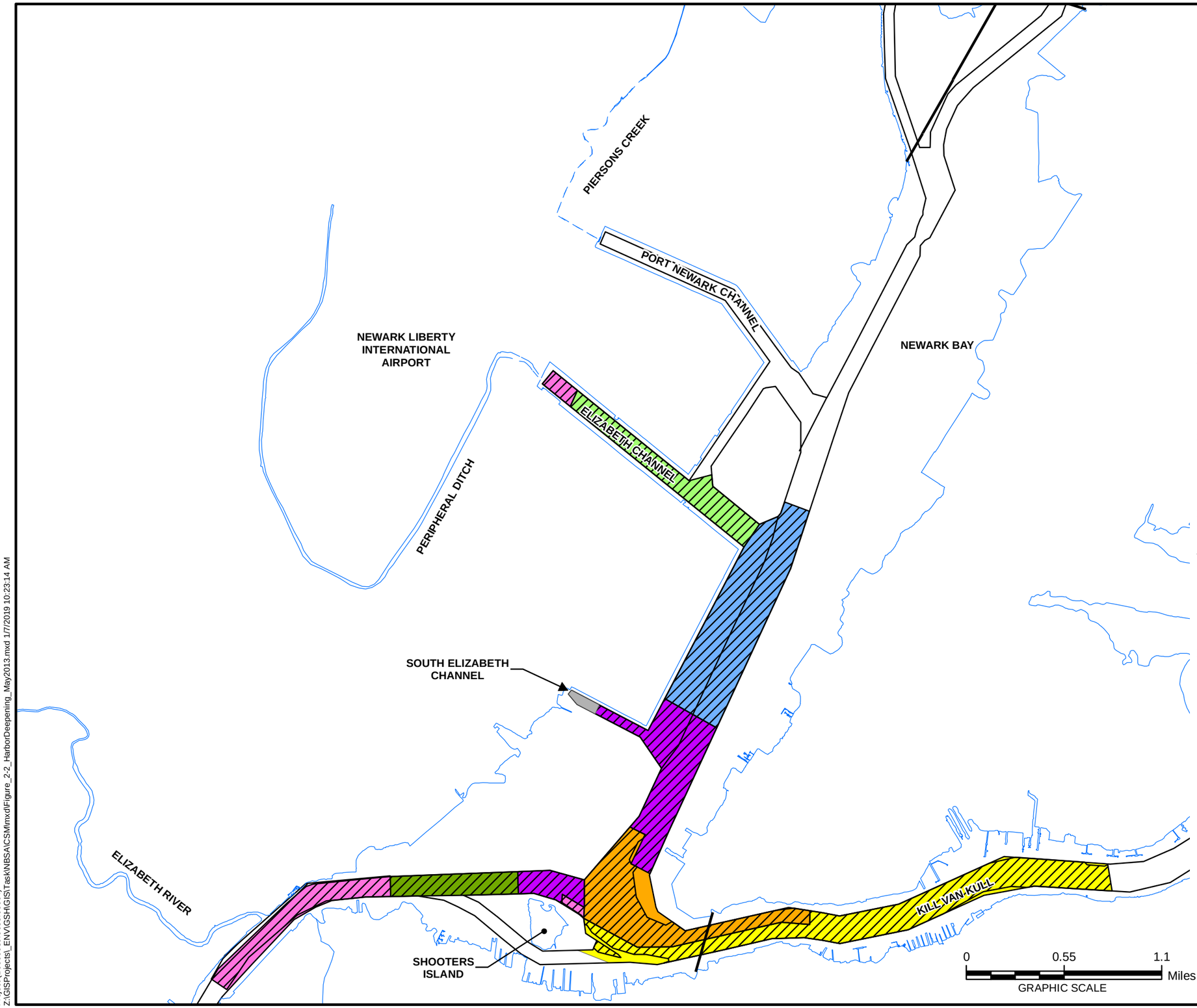
0 3,000 6,000 Feet
GRAPHIC SCALE

NEWARK BAY STUDY AREA
CONCEPTUAL SITE MODEL

LAND USE/ECOLOGICAL HABITATS

JANUARY 2019

FIGURE
2-1



LEGEND:

- NAVIGATION CHANNEL
- SHORELINE
- UNDERGROUND TRIBUTARY
- NEWARK BAY STUDY AREA BOUNDARY

NBSA HDP CONTRACT AREAS

- 5 - COMPLETE (2004)
- S-AK-1/S-NB-2 - COMPLETE (2012)
- S-AK-2 - COMPLETE (2013)
- S-AK-3 - COMPLETE (2016)
- S-E-1 - COMPLETE (2010)
- S-KVK-2 - COMPLETE (2007)
- S-NB-1 - COMPLETE (2011)
- DEFERRED WORK AREA
- COMPLETED CONTRACT AREAS

NOTES:

1. BASE MAP SOURCE: TOPO-METRICS, 1"=100', ORIGINAL MYLAR POSITIVES OF AERIAL PHOTOMETRICS SURVEY (1982). SECOND RIVER AND THIRD RIVER WERE DIGITIZED USING UNITED STATES GEOLOGICAL SURVEY TOPOGRAPHIC MAPS.
2. CONTRACT AREAS OBTAINED FROM A FIGURE PROVIDED BY THE U.S. ARMY CORPS OF ENGINEERS (USACE) ENTITLED "CONSOLIDATED IMPLEMENTATION OF THE NEW YORK AND NEW JERSEY HARBOR DEEPENING PROJECT (HDP)" DATED JANUARY 2004.
3. THE CONTRACT FOR S-NB-2 WAS COMBINED WITH THE CONTRACT FOR S-AK-1. THE COMBINED AREA IS CALLED S-AK-1.
4. THE CONTRACT AREA BOUNDARIES PRESENTED ON THIS FIGURE ARE BASED ON INITIAL PLANS AND MAY BE SLIGHTLY DIFFERENT FROM FINAL DESIGN BOUNDARIES.
5. ABBREVIATIONS ARE AS FOLLOWS:
   NBSA = NEWARK BAY STUDY AREA
   HDP = HARBOR DEEPENING PROJECT (50 FT)
6. DEFERRED WORK AREAS ESTIMATED FROM A 2012 PRESENTATION BY JOHN TAVOLARO (USACE) AND CONVERSATION WITH BRYCE WISEMILLER ON JUNE 6, 2012. THE DEFERRED WORK AREA AT ELIZABETH CHANNEL WAS INCLUDED AS PART OF DEEPENING WORK ASSOCIATED WITH THE S-AK-3 CONTRACT AREA.
7. BASE MAP INFORMATION AND NEWARK BAY NAVIGATION CHANNEL IS FROM NOAA CHARTS 12331, 12333, AND 12337, DATED JAN. 12, 2010, DEC. 11, 2012, AND FEB. 19, 2013 RESPECTIVELY. NAVIGATION CHANNEL BOUNDARIES SHOWN ARE APPROXIMATE. CHANNEL DREDGING AND DEEPENING AS PART OF THE HARBOR DEEPENING PROJECT IS ON-GOING; CONTACT USACE TO REFERENCE THE MOST CURRENT CHANNEL BOUNDARIES.

NEWARK BAY STUDY AREA

CONCEPTUAL SITE MODEL

NEW YORK/NEW JERSEY HARBOR DEEPENING PROJECT (50 ft)

JANUARY 2019

FIGURE 2-2

City: Citrix Div/Group: IM/DV Created By: K. Sinsabaugh Last Saved By: ksinsabaugh
Project (B0009989.0053.0004)
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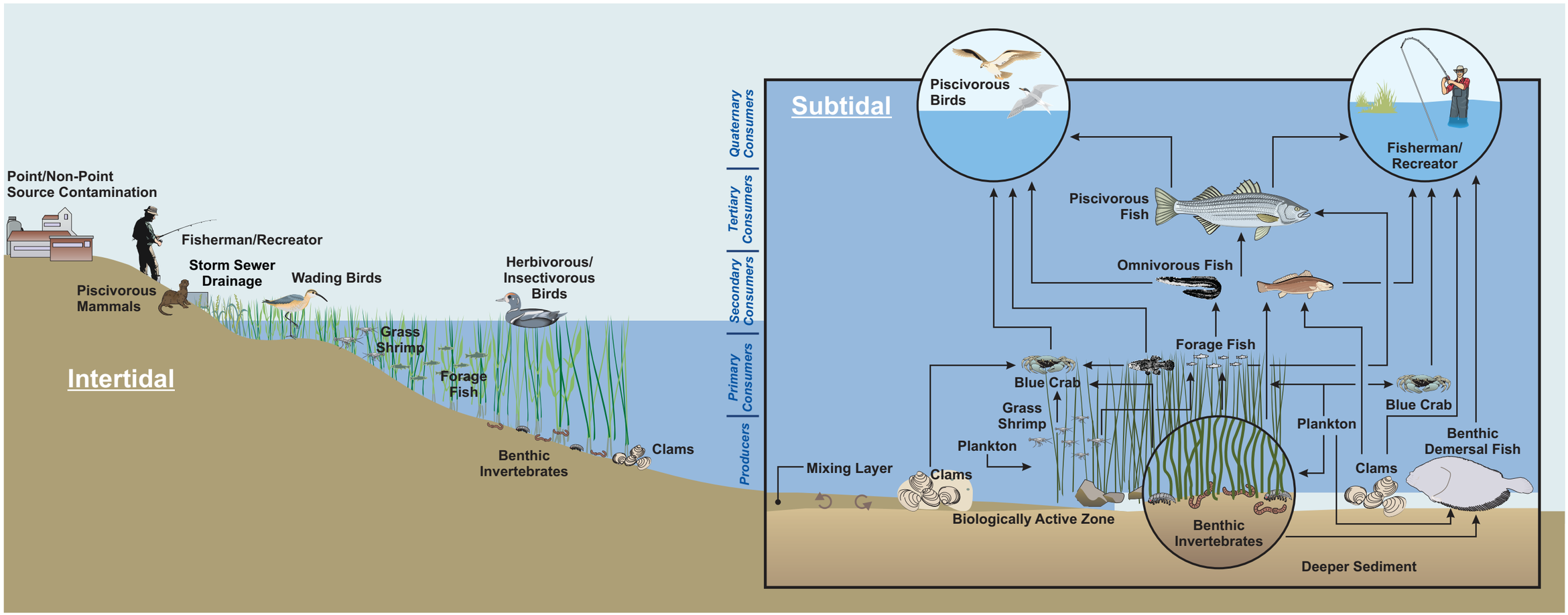

NEWARK BAY STUDY AREA

CONCEPTUAL SITE MODEL

CSM: HUMAN HEALTH AND ECOLOGICAL COMPONENTS

JANUARY 2019

FIGURE

2-3

01/02/2019 SYRACUSE, NY - K.SARTORI
BIM 360 Docs\OXY USA INC\NEWARK BAY - RI_RA_FS PROGRAM\2019\B0009989.0061 NB_CSM-fig2-3-JAN 2019.CDR

CITY: Citrix DIV/GROUP: IM/DV DB: K. Sinsabaugh LD: PIC: PM: TM: TR:
Newark Bay (B0009989.0028.00002)
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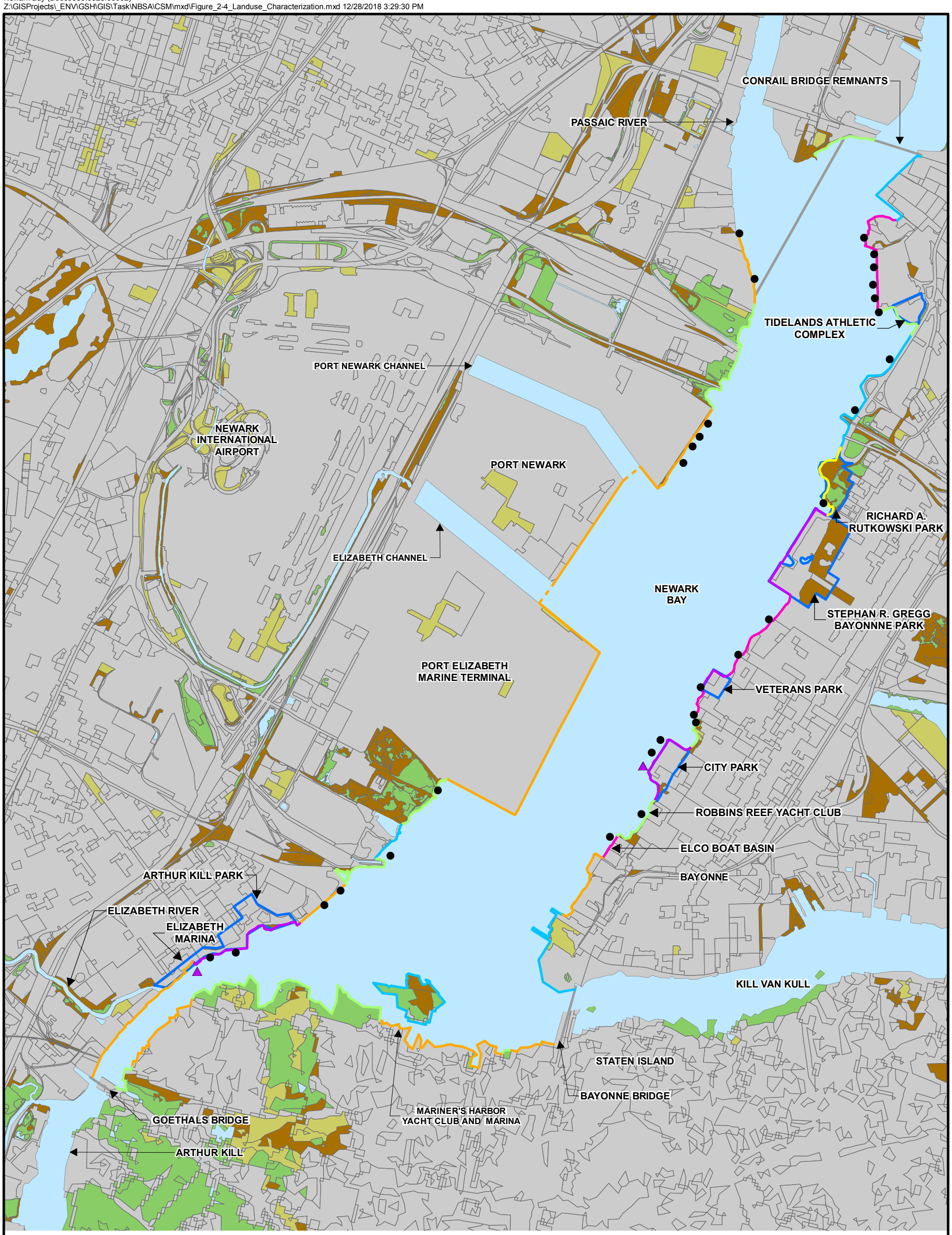


LEGEND:

- DISCHARGE PIPE OBSERVATION
- BOAT RAMP
- NEWARK BAY STUDY AREA BOUNDARY
- PARKS AND RECREATIONAL AREAS

OBSERVED SHORELINE USE:

- DISTURBED UPLANDS
- HABITAT
- HABITAT/RECREATIONAL
- INDUSTRIAL/COMMERCIAL
- RECREATIONAL
- RESIDENTIAL

LANDCOVER:

- BARREN LAND
- FOREST
- URBAN
- WATER
- WETLANDS

0 3,000 6,000 Feet
GRAPHIC SCALE

NOTES:

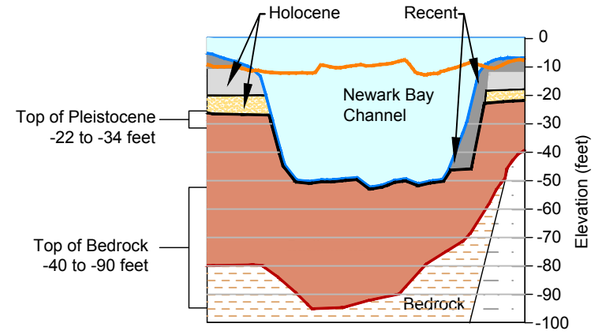
1. 2007 NEW JERSEY LAND USE DATA DOWNLOADED FROM THE NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION GEOGRAPHIC INFORMATION SYSTEM WEBSITE AT www.state.nj.us/dep/gis.
2. 2006 NEW YORK NATIONAL LAND COVER DATA DOWNLOADED FROM THE NEW YORK STATE GEOGRAPHIC INFORMATION SYSTEMS CLEARINGHOUSE AT www.nysgis.state.ny.us.
3. THE NEWARK BAY STUDY AREA BOUNDARY PRESENTED WAS USEPA-APPROVED AND UTILIZED IN THE PHASE I, II, AND III SEDIMENT INVESTIGATIONS, BUT MAY BE CHANGED BY USEPA FOR FUTURE INVESTIGATIONS UNDER THE RI/FS.
4. DISCHARGE PIPE OBSERVATIONS SHOWN DO NOT REPRESENT COMPREHENSIVE INVENTORY OF DISCHARGE PIPES LOCATED ALONG THE SHORELINE.
5. SHORELINE USE INFORMATION IS FROM THE NEWARK BAY STUDY AREA RECONNAISSANCE SURVEY REPORT, BASELINE HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT (TIERRA 2015B).

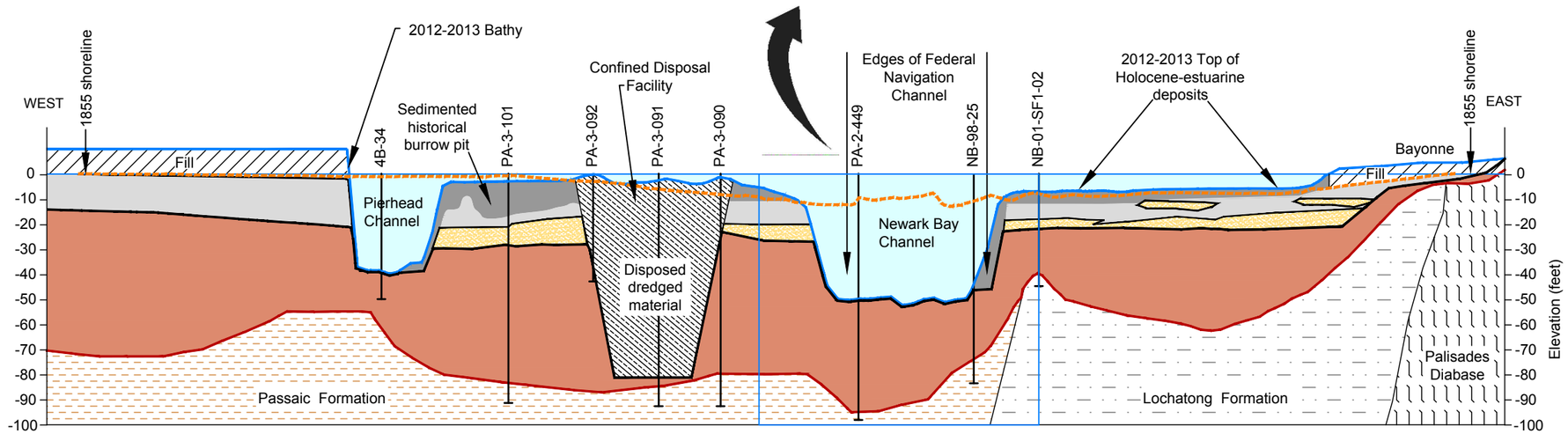
NEWARK BAY STUDY AREA
CONCEPTUAL SITE MODEL

SHORELINE LAND/HUMAN USE CHARACTERIZATION

JANUARY 2019

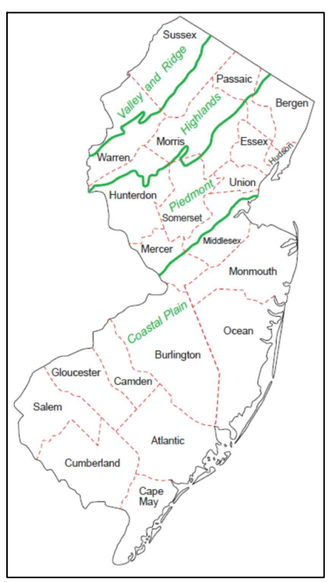
FIGURE
2-4





LEGEND:

- TOP OF BORING/SEA LEVEL
- 2012-2013 - BATHYMETRY
- 1855-BATHYMETRY
- HOLOCENE
- TOP OF PLEISTOCENE
- TOP OF BEDROCK
- BOTTOM OF BORING



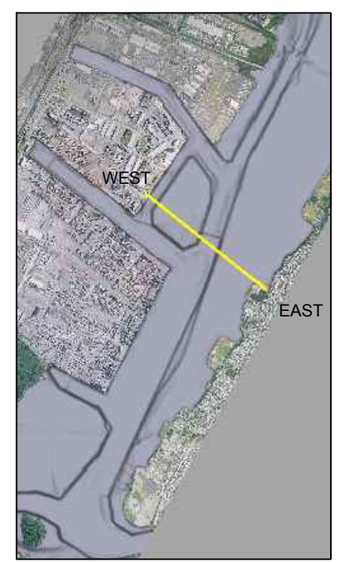
PHYSIOGRAPHIC PROVINCES AND COUNTIES OF NEW JERSEY

KEY:

- FILL
- BLACK FLUID MUD TO SILT (RECENT SEDIMENTS)
- GRAY SILT AND SAND (HOLOCENE ESTUARY DEPOSITS)
- GRAY AND BROWN SAND (HOLOCENE ESTUARY DEPOSITS)
- RED BROWN COBBLES, BOULDERS, CLAY AND SILT (PLEISTOCENE DEPOSITS)
- DIABASE
- RED BROWN SHALE AND SILTSTONE
- GRAY SANDSTONE AND BLACK SHALE

NOTES:

1. ELEVATIONS ARE RELATIVE TO THE USACE's NEW YORK HARBOR TIDAL DATUM MLW NGVD 29.
2. NEWARK BAY CHANNEL DETAIL AND LITHOLOGICAL INFORMATION ARE FROM THE USACE GEOMORPHOLOGICAL REPORT DATED DECEMBER 31, 2006.
3. INFORMATION FOR PHYSIOGRAPHIC PROVINCES OF NEW JERSEY WAS EXTRACTED FROM A NEW JERSEY GEOLOGICAL SURVEY (NJGS) INFORMATION CIRCULAR THAT CAN BE FOUND ON THE NJGS WEBSITE (WWW.STATE.NJ.US/DEP/NJGS).



CROSS SECTION LOCATION MAP

0 800' 1600'

GRAPHIC HORIZONTAL SCALE
VERTICAL EXAGGERATION = 15x

NEWARK BAY STUDY AREA
CONCEPTUAL SITE MODEL

GEOLOGIC CROSS-SECTION

JANUARY 2019

FIGURE **4-1**

CITY:SYR-NY DIV:GROUP:(ENV/CAD) DB:(A.REYES) K.SARTORI PIC:/PM:L.TOMLINSON TM:(Opt) LYR:(Opt)ON=*;OFF=*REF*
C:\Users\ksartori\OneDrive - ARCADIS\BIM 360 Docs\OXY USA INC\NEWARK BAY - RI_RA_FS PROGRAM\2019\B0009989.0061\01-DWG\NB_CSM-Fig4-1-GCS-JAN2019.DWG LAYOUT: 4-1 SAVED: 12/31/2018 1:37 PM ACADVER: 21.0S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ---- PLOTTED:
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XREFS: OXY-Title_LB
IMAGES: Physio Prov and Counties.jpg
XS-inset map.png

City: Citrix Div/Group: IM/DV Created By: K. Sinsabaugh Last Saved By: ksinsabaugh
Project (B0009989.0045.00002)
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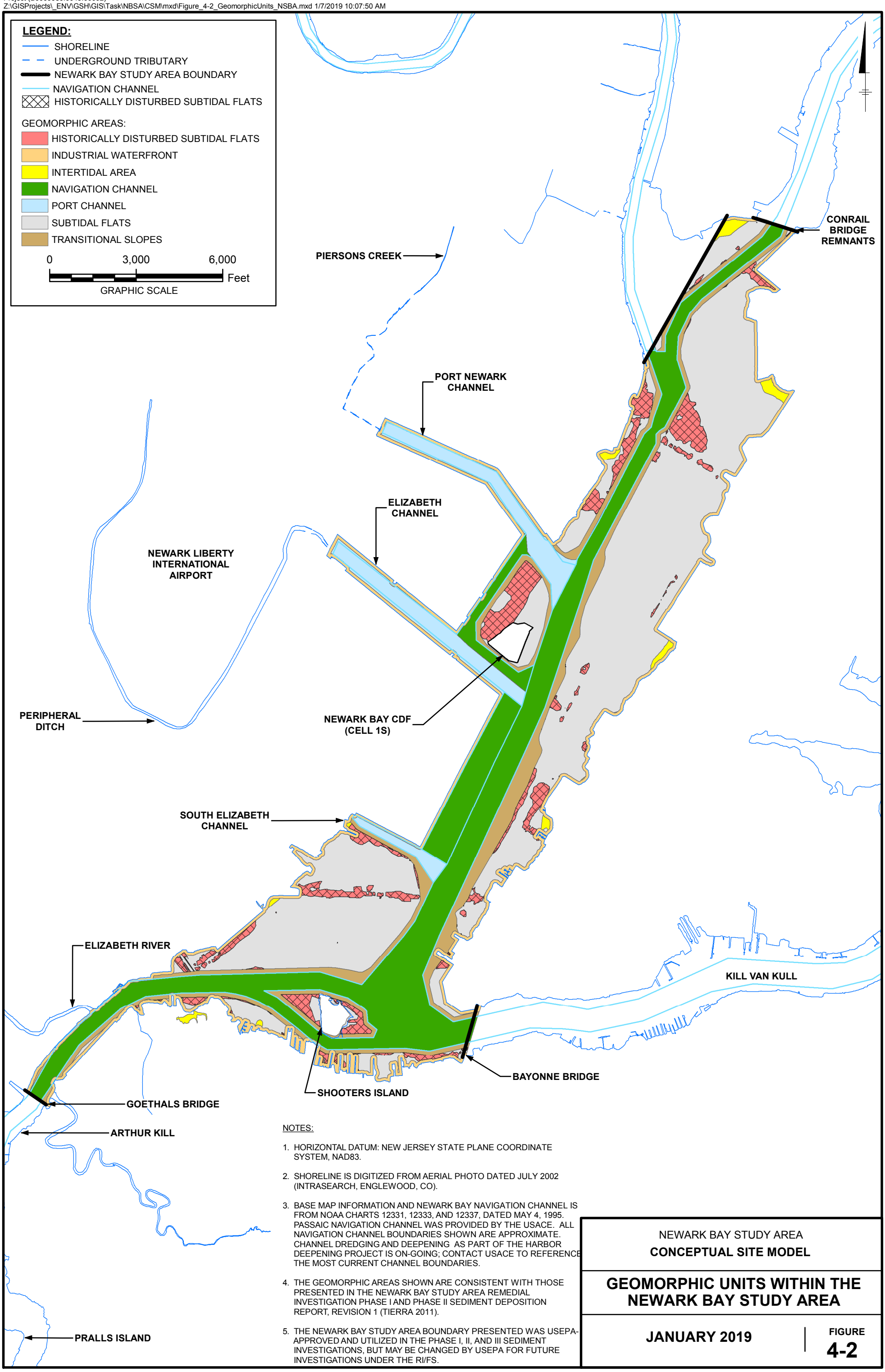


NOTES:

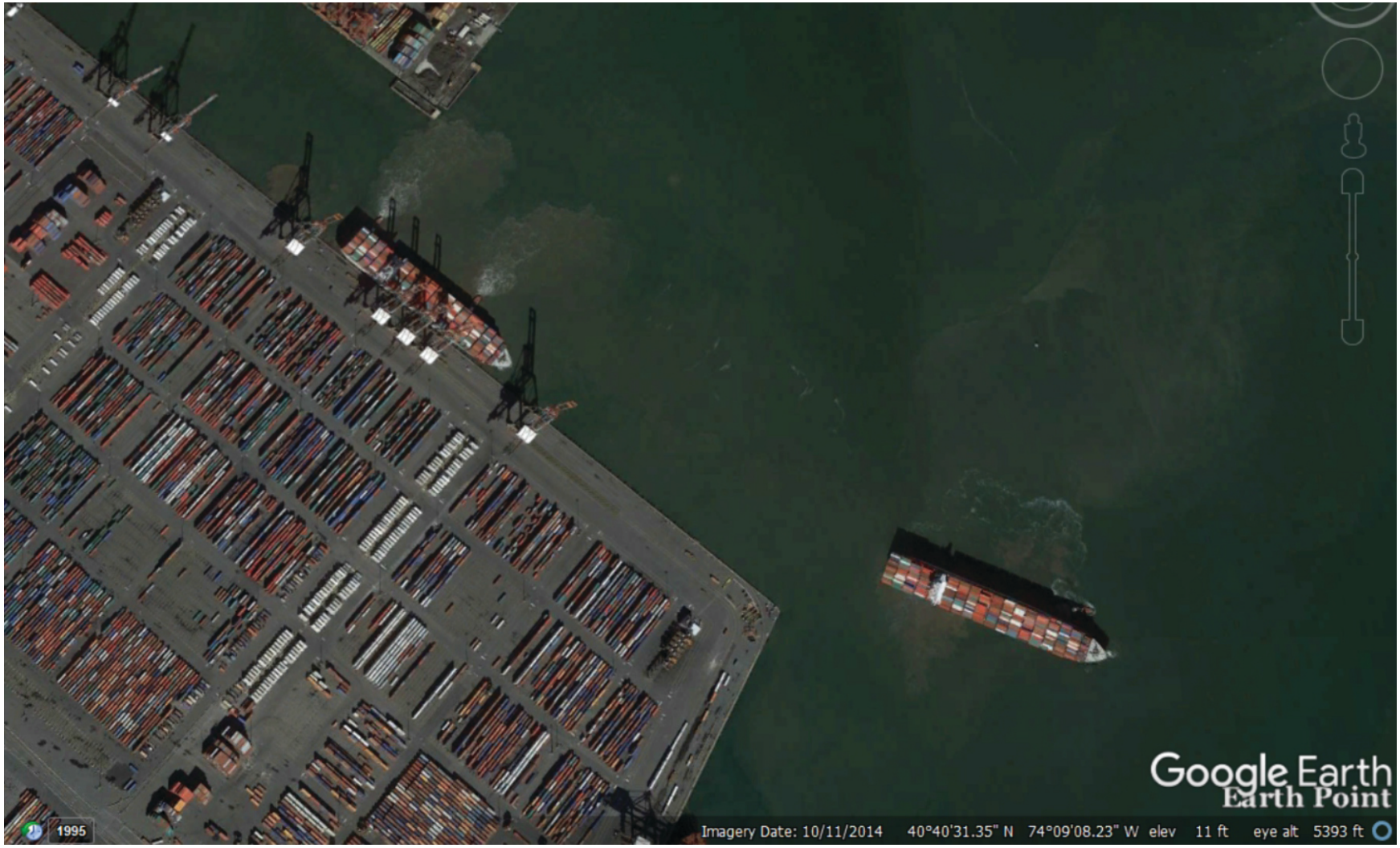
1. HORIZONTAL DATUM: NEW JERSEY STATE PLANE COORDINATE SYSTEM, NAD83.
2. SHORELINE IS DIGITIZED FROM AERIAL PHOTO DATED JULY 2002 (INTRASEARCH, ENGLEWOOD, CO).
3. BASE MAP INFORMATION AND NEWARK BAY NAVIGATION CHANNEL IS FROM NOAA CHARTS 12331, 12333, AND 12337, DATED MAY 4, 1995. PASSAIC NAVIGATION CHANNEL WAS PROVIDED BY THE USACE. ALL NAVIGATION CHANNEL BOUNDARIES SHOWN ARE APPROXIMATE. CHANNEL DREDGING AND DEEPENING AS PART OF THE HARBOR DEEPENING PROJECT IS ON-GOING; CONTACT USACE TO REFERENCE THE MOST CURRENT CHANNEL BOUNDARIES.
4. THE GEOMORPHIC AREAS SHOWN ARE CONSISTENT WITH THOSE PRESENTED IN THE NEWARK BAY STUDY AREA REMEDIAL INVESTIGATION PHASE I AND PHASE II SEDIMENT DEPOSITION REPORT, REVISION 1 (TIERRA 2011).
5. THE NEWARK BAY STUDY AREA BOUNDARY PRESENTED WAS USEPA-APPROVED AND UTILIZED IN THE PHASE I, II, AND III SEDIMENT INVESTIGATIONS, BUT MAY BE CHANGED BY USEPA FOR FUTURE INVESTIGATIONS UNDER THE RI/FS.

NEWARK BAY STUDY AREA
CONCEPTUAL SITE MODEL

GEOMORPHIC UNITS WITHIN THE NEWARK BAY STUDY AREA

JANUARY 2019

FIGURE 4-2



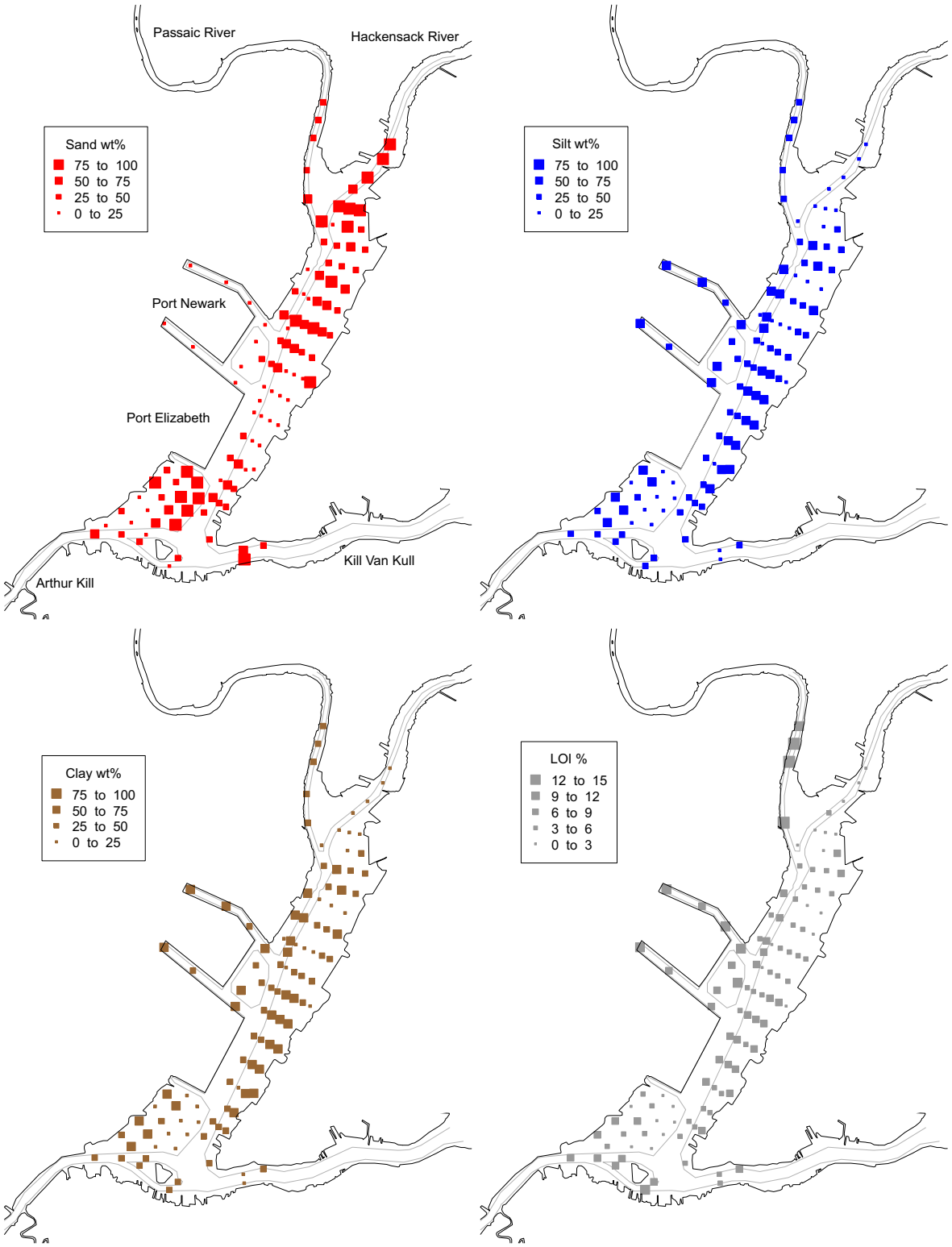
NEWARK BAY STUDY AREA

CONCEPTUAL SITE MODEL

VESSEL-INDUCED SEDIMENT RESUSPENSION

JANUARY 2019

FIGURE
4-3



NOTES:

1. IMAGE FROM FIGURE 12 OF THE SOMMERFIELD AND CHANT 2010 FINAL REPORT (MECHANISMS OF SEDIMENT TRAPPING AND ACCUMULATION IN NEWARK BAY, NEW JERSEY: AN ENGINEERED ESTUARINE BASIN)
2. LOI = LOSS ON IGNITION

NEWARK BAY STUDY AREA

CONCEPTUAL SITE MODEL

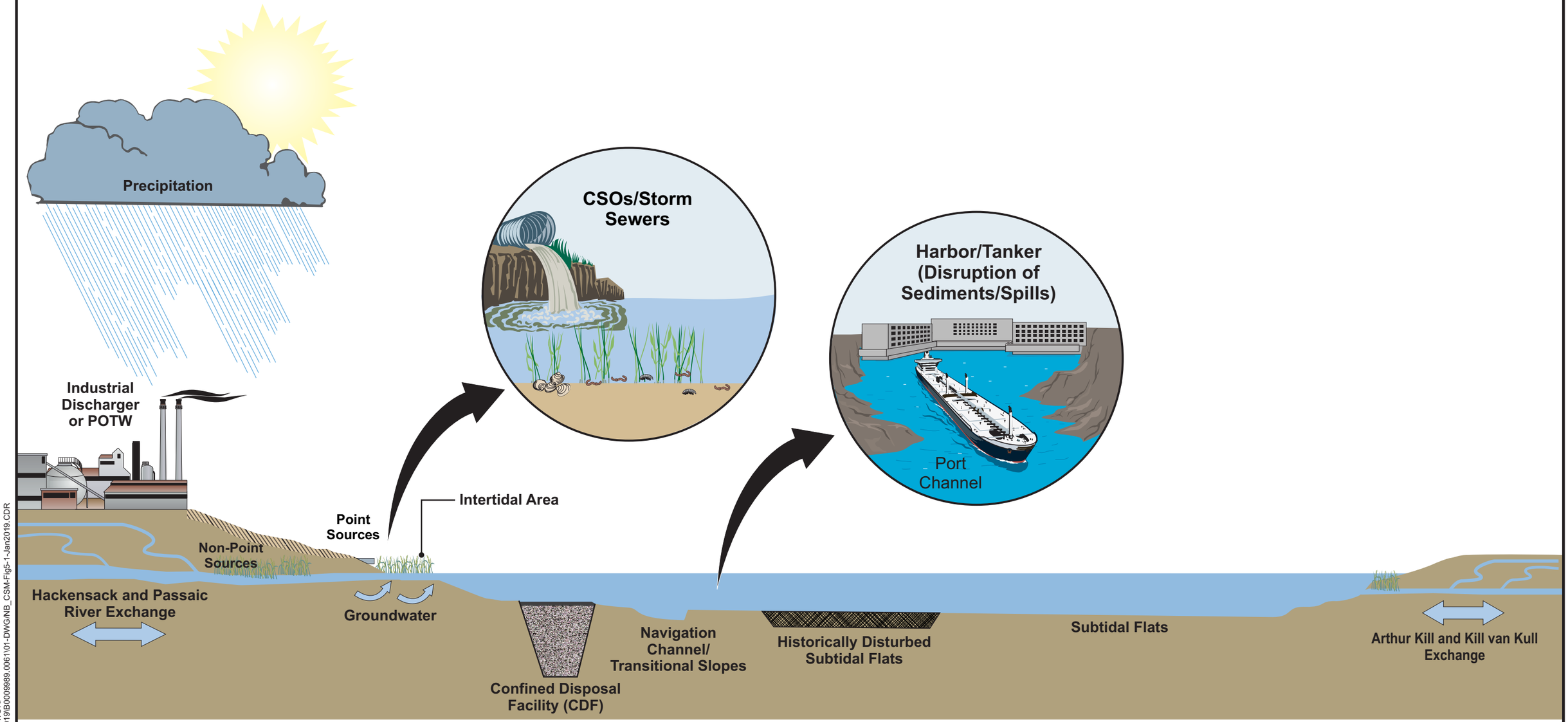
GRAIN SIZE AND LOI DISTRIBUTIONS FOR BED SEDIMENTS IN THE NEWARK BAY STUDY AREA

JANUARY 2019

FIGURE

4-4

02/02/2019 SYRACUSE, NY-ENV/CAD - K.SARTORI
OXY USA INC\NEWARK BAY - RI_RA_FS PROGRAM\2019\B0009989.0061\01-DWGNB_CSM-Fig4-4-Jan2019.CDR



NEWARK BAY STUDY AREA

CONCEPTUAL SITE MODEL

CSM: SOURCES

JANUARY 2019

FIGURE **5-1**

01/02/2019 SYRACUSE, DIV/GROUP: ENV/IM-DV K.SARTORI
OXY USA INC\NEWARK BAY - RI_RA_FS PROGRAM\2019\B0009989.0061\01-DWG/NB_CSM-Fig5-1-Jan2019.CDR

City: Citrix Div/Group: IM/DV Created By: K. Sinsabaugh Last Saved By: ksinsabaugh
Project (B0009989.0045.00002)
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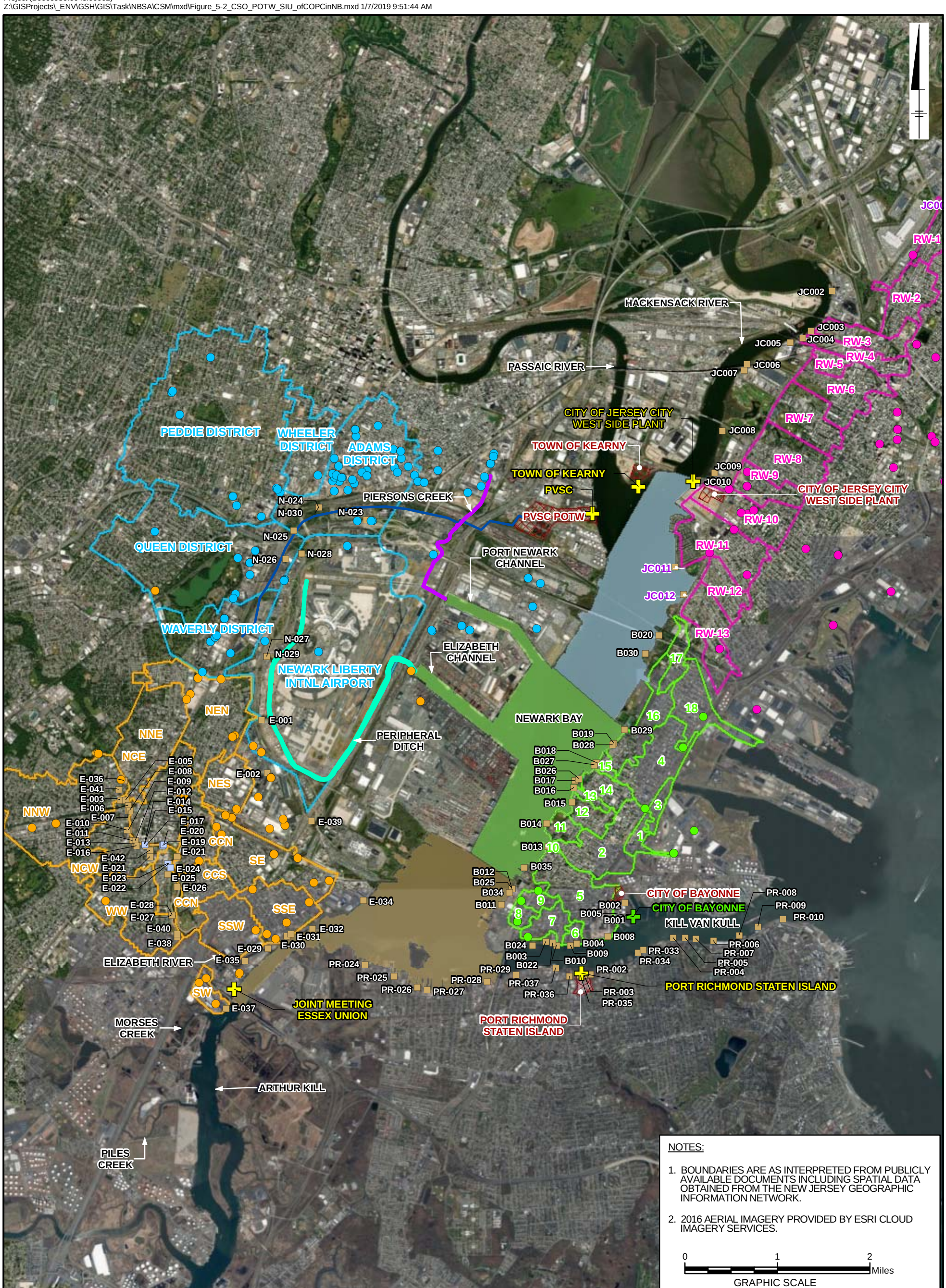

NOTES:

1. BOUNDARIES ARE AS INTERPRETED FROM PUBLICLY AVAILABLE DOCUMENTS INCLUDING SPATIAL DATA OBTAINED FROM THE NEW JERSEY GEOGRAPHIC INFORMATION NETWORK.
2. 2016 AERIAL IMAGERY PROVIDED BY ESRI CLOUD IMAGERY SERVICES.

0 1 2 Miles
GRAPHIC SCALE

LEGEND:

- BAYONNE SIU LOCATION
- ELIZABETH SIU LOCATION
- JERSEY CITY SIU LOCATION
- NEWARK SIU LOCATION
- ACTIVE CSO
- INACTIVE CSO
- PUMP STATION OUTFALL
- POTW OUTFALL
- PERIPHERAL DITCH
- PIERSON'S CREEK
- PVSC SOUTHSIDE INTERCEPTOR
- BAYONNE CSO DISTRICT
- JERSEY CITY CSO DISTRICT
- ELIZABETH CSO DISTRICT
- NEWARK CSO DISTRICT
- POTW AND/OR PUMP STATION LOCATION

NBSA GEOGRAPHIC AREAS:

- NEWARK BAY NORTH
- NEWARK BAY CENTRAL
- NEWARK BAY SOUTH

NEWARK BAY STUDY AREA

CONCEPTUAL SITE MODEL

CSO, POTW, AND SIU SOURCES OF COPCs IN NEWARK BAY

JANUARY 2019

FIGURE **5-2**

City: Citrix Div/Group: IM/DV Created By: K. Sinsabaugh Last Saved By: ksinsabaugh
Project (B0009989.0045.00002)
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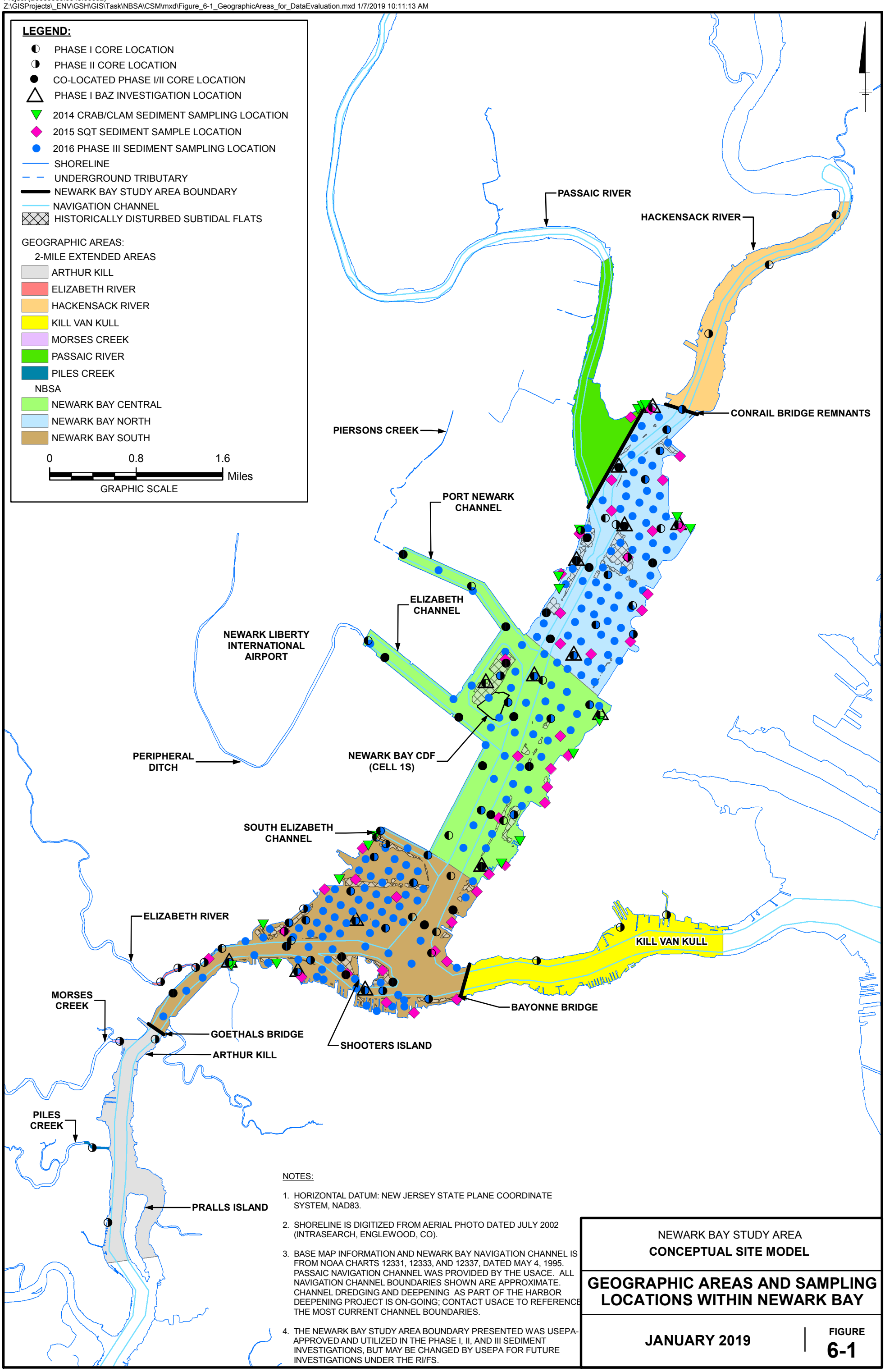

NOTES:

1. HORIZONTAL DATUM: NEW JERSEY STATE PLANE COORDINATE SYSTEM, NAD83.
2. SHORELINE IS DIGITIZED FROM AERIAL PHOTO DATED JULY 2002 (INTRASEARCH, ENGLEWOOD, CO).
3. BASE MAP INFORMATION AND NEWARK BAY NAVIGATION CHANNEL IS FROM NOAA CHARTS 12331, 12333, AND 12337, DATED MAY 4, 1995. PASSAIC NAVIGATION CHANNEL WAS PROVIDED BY THE USACE. ALL NAVIGATION CHANNEL BOUNDARIES SHOWN ARE APPROXIMATE. CHANNEL DREDGING AND DEEPENING AS PART OF THE HARBOR DEEPENING PROJECT IS ON-GOING; CONTACT USACE TO REFERENCE THE MOST CURRENT CHANNEL BOUNDARIES.
4. THE NEWARK BAY STUDY AREA BOUNDARY PRESENTED WAS USEPA-APPROVED AND UTILIZED IN THE PHASE I, II, AND III SEDIMENT INVESTIGATIONS, BUT MAY BE CHANGED BY USEPA FOR FUTURE INVESTIGATIONS UNDER THE RI/FS.

NEWARK BAY STUDY AREA
CONCEPTUAL SITE MODEL

GEOGRAPHIC AREAS AND SAMPLING LOCATIONS WITHIN NEWARK BAY

JANUARY 2019

FIGURE
6-1

City: Citrix Div/Group: IM/DV Created By: K. Sinsabaugh Last Saved By: ksinsabaugh
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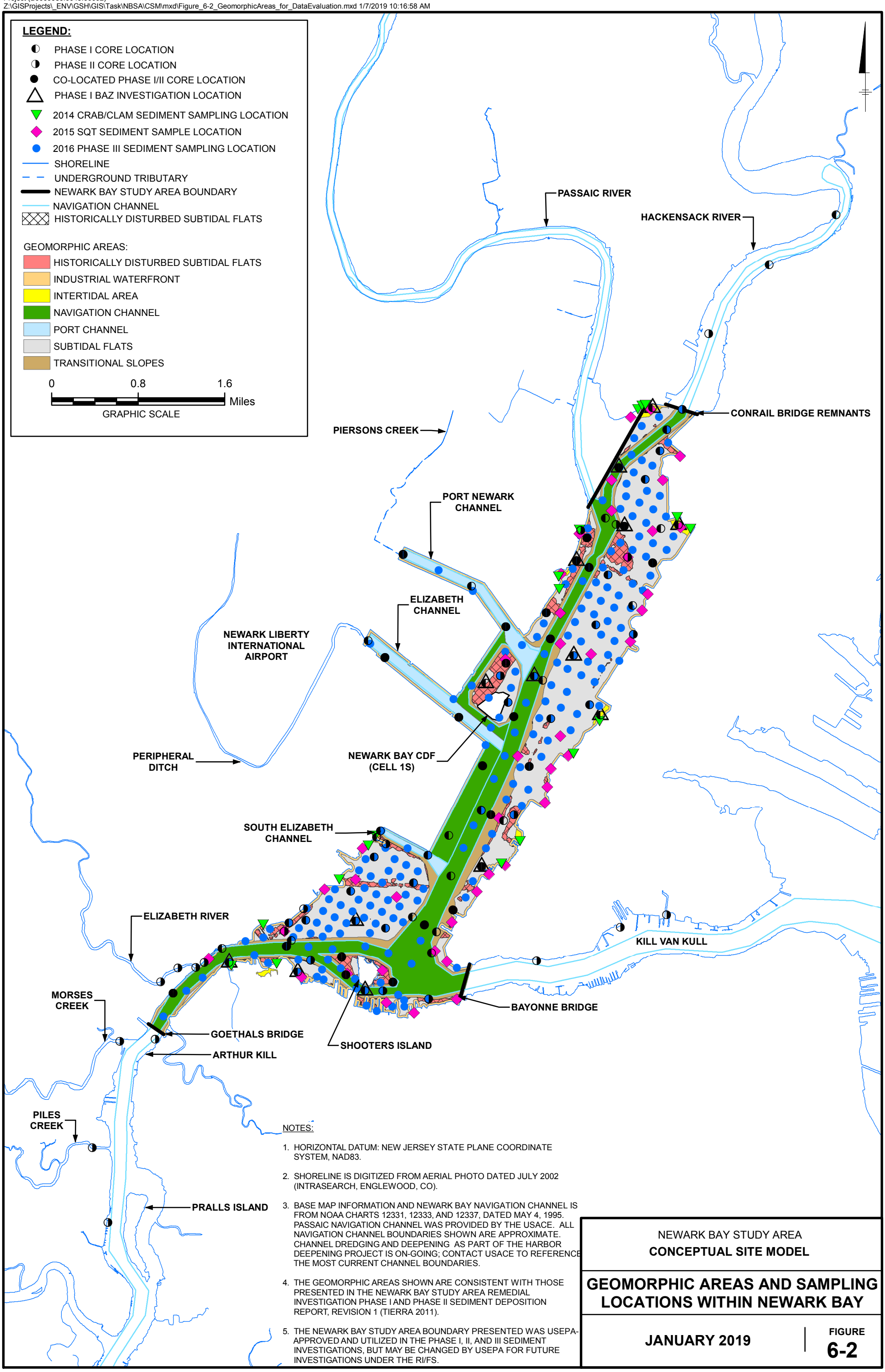

NOTES:

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4. THE GEOMORPHIC AREAS SHOWN ARE CONSISTENT WITH THOSE PRESENTED IN THE NEWARK BAY STUDY AREA REMEDIAL INVESTIGATION PHASE I AND PHASE II SEDIMENT DEPOSITION REPORT, REVISION 1 (TIERRA 2011).
5. THE NEWARK BAY STUDY AREA BOUNDARY PRESENTED WAS USEPA-APPROVED AND UTILIZED IN THE PHASE I, II, AND III SEDIMENT INVESTIGATIONS, BUT MAY BE CHANGED BY USEPA FOR FUTURE INVESTIGATIONS UNDER THE RI/FS.

NEWARK BAY STUDY AREA
CONCEPTUAL SITE MODEL

GEOMORPHIC AREAS AND SAMPLING LOCATIONS WITHIN NEWARK BAY

JANUARY 2019

FIGURE 6-2

City: Citrix Div/Group: IM/DV Created By: K. Sinsabaugh Last Saved By: kgpeters
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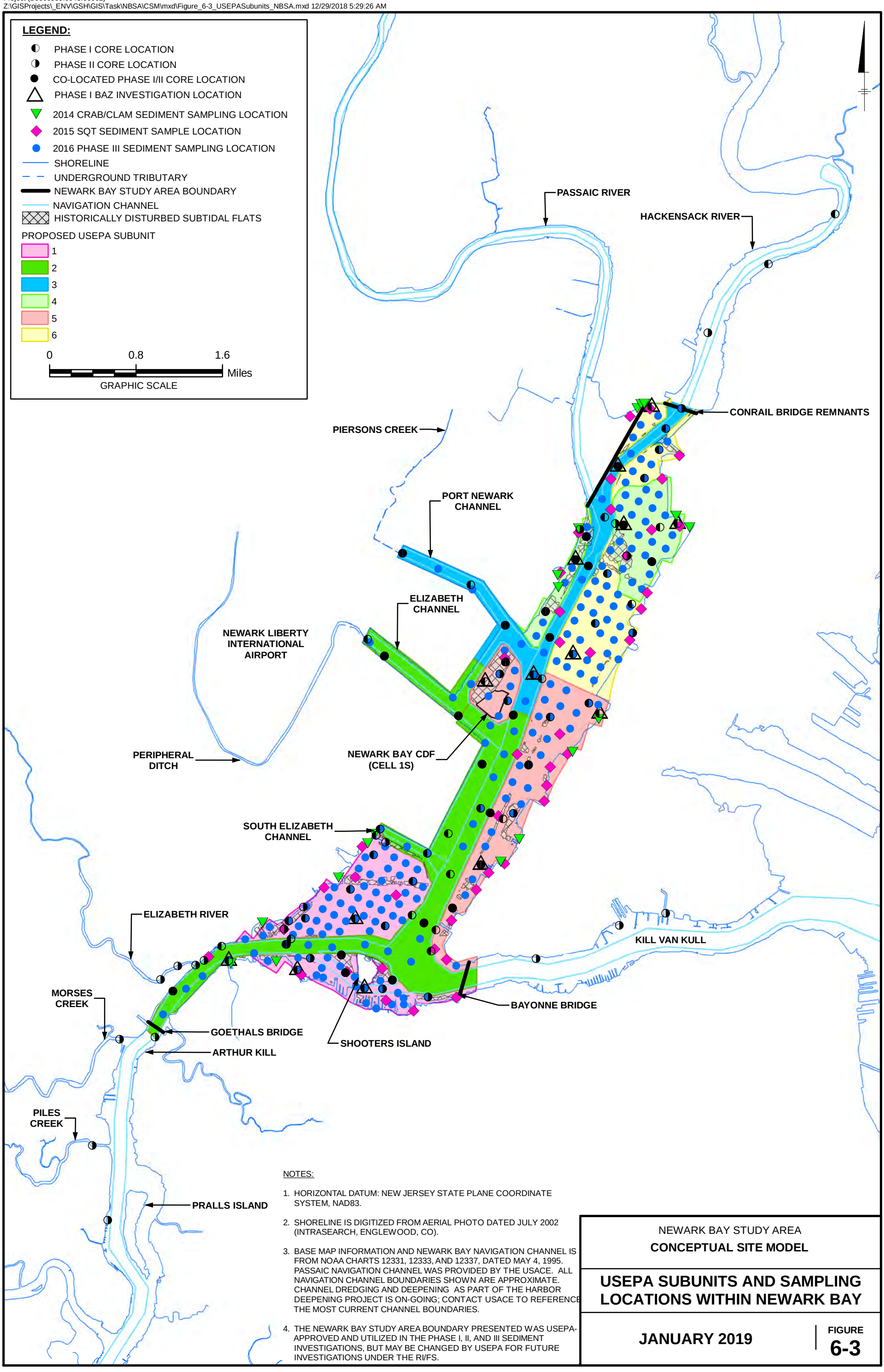

NOTES:

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4. THE NEWARK BAY STUDY AREA BOUNDARY PRESENTED WAS USEPA-APPROVED AND UTILIZED IN THE PHASE I, II, AND III SEDIMENT INVESTIGATIONS, BUT MAY BE CHANGED BY USEPA FOR FUTURE INVESTIGATIONS UNDER THE RI/FS.

NEWARK BAY STUDY AREA
CONCEPTUAL SITE MODEL

USEPA SUBUNITS AND SAMPLING LOCATIONS WITHIN NEWARK BAY

JANUARY 2019

FIGURE 6-3

City: Citrix Div/Group: IM/DV Created By: K. Sinsabaugh Last Saved By: ksinsabaugh
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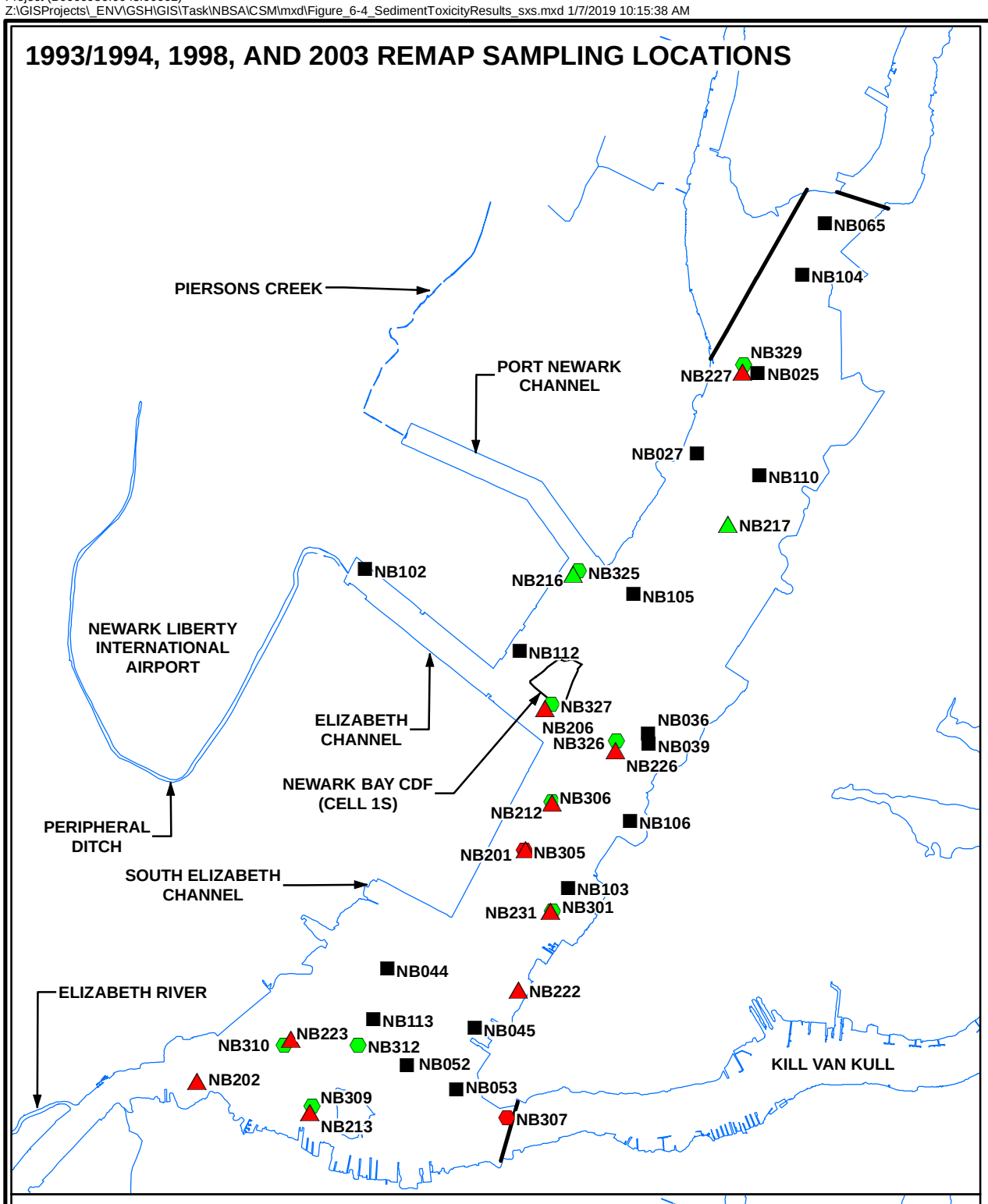
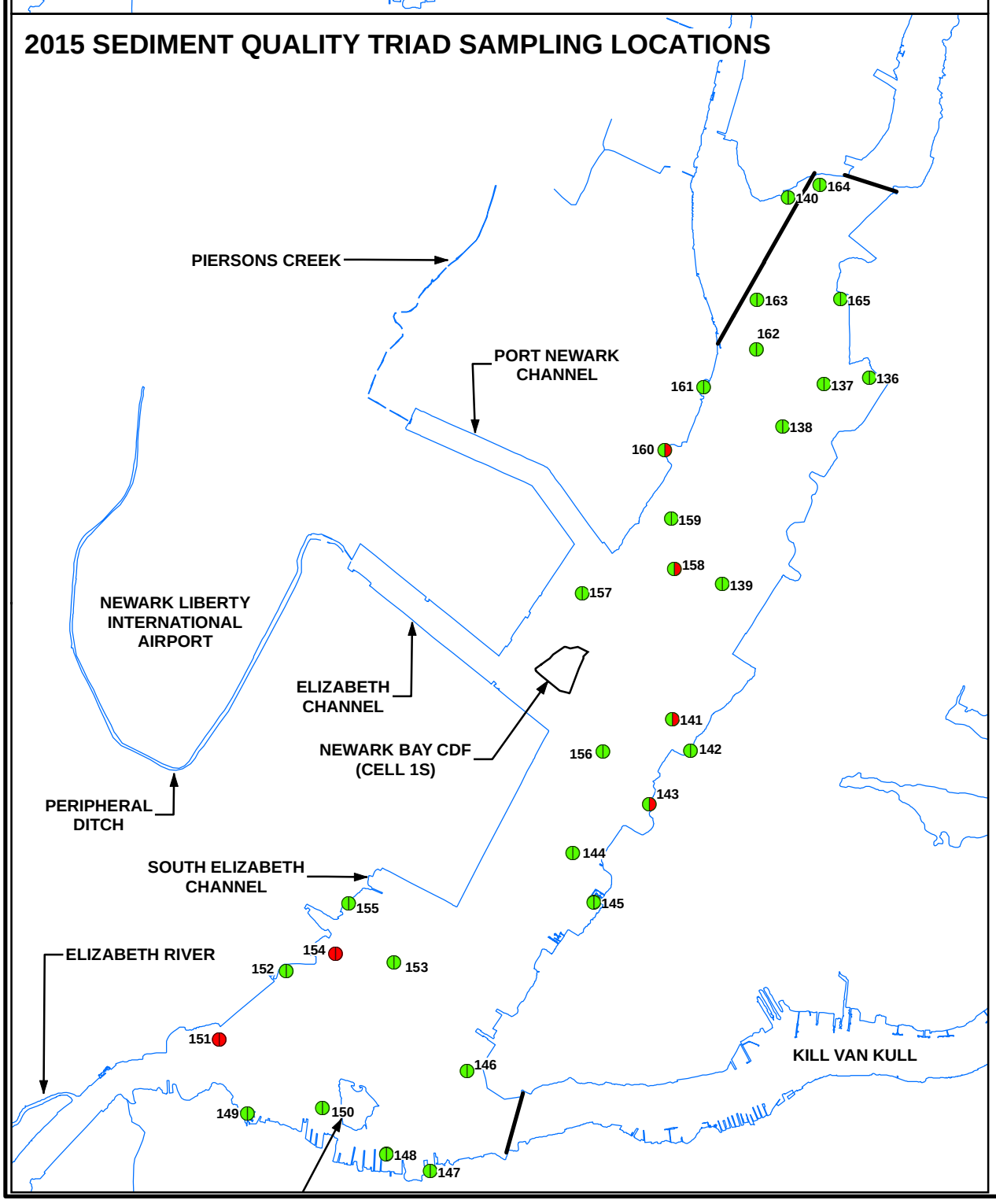
Z:\GISProjects_ENV\GSH\GIS\Task\NBSA\CSM\mxd\Figure_6-4_SedimentToxicityResults_sxs.mxd 1/7/2019 10:15:38 AM

1993/1994, 1998, AND 2003 REMAP SAMPLING LOCATIONS



2015 SEDIMENT QUALITY TRIAD SAMPLING LOCATIONS



LEGEND:

- 10 DAY SURVIVAL FOR *AMPELISCA ABDITA* REMAP 1993
- 10 DAY SURVIVAL FOR *AMPELISCA ABDITA* REMAP 1998
- 10 DAY SURVIVAL FOR *AMPELISCA ABDITA* REMAP 2003
- 10 DAY SURVIVAL FOR *LEPTOCHEIRUS PLUMULOSUS* SQT 2015
- 28 DAY SURVIVAL FOR *LEPTOCHEIRUS PLUMULOSUS* SQT 2015
- SURVIVAL STATISTICALLY DIFFERENT THAN CONTROLS
- SURVIVAL NOT STATISTICALLY DIFFERENT THAN CONTROLS
- NEWARK BAY STUDY AREA BOUNDARY
- SHORELINE
- UNDERGROUND TRIBUTARY

0 4,500 9,000 Feet
GRAPHIC SCALE

NOTES:

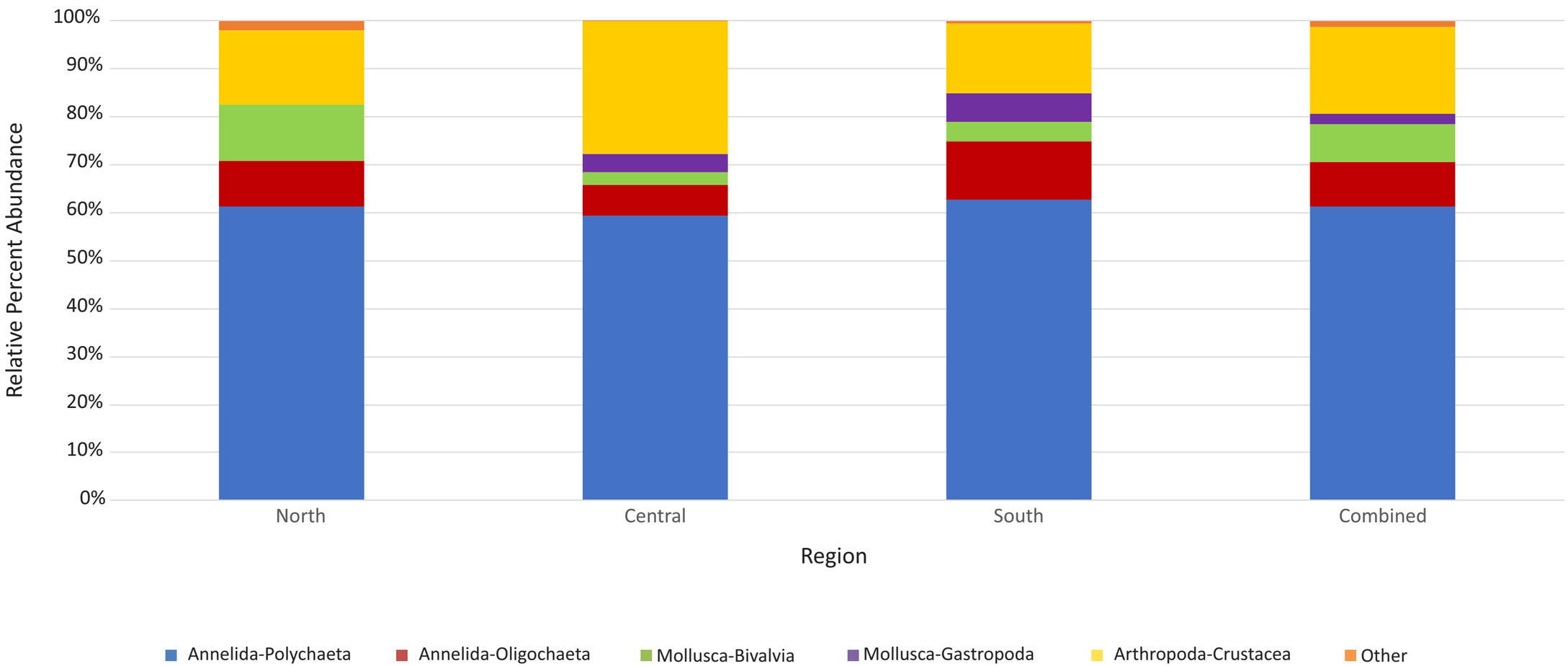
1. HORIZONTAL DATUM: NEW JERSEY STATE PLANE COORDINATE SYSTEM, NAD83.
2. SHORELINE IS DIGITIZED FROM AERIAL PHOTO DATED JULY 2002 (INTRASEARCH, ENGLEWOOD, CO).
3. THE 1993/1994 REMAP REPORT DID NOT INDICATE WHETHER SURVIVAL WAS STATISTICALLY DIFFERENT THAN CONTROLS AT EACH SAMPLING LOCATION; THEREFORE, SAMPLING LOCATIONS ARE SHOWN AS BLACK SQUARES.

NEWARK BAY STUDY AREA
CONCEPTUAL SITE MODEL

SEDIMENT TOXICITY RESULTS

JANUARY 2019

FIGURE
6-4



Other:

North - Hoplonemertea A, Tubulanidae, Gastropoda, Actinaria
Central - Hoplonemertea A, Polycladida
South - Hoplonemertea A, Tubulanidae, Lineidae, Polycladida,Stolidobranchia, Chelicerata

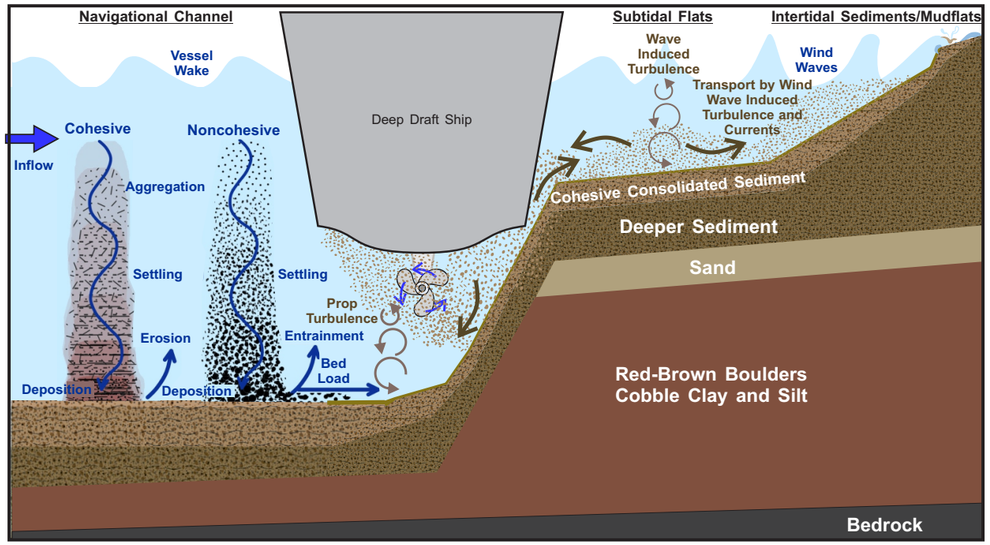
NEWARK BAY STUDY AREA
CONCEPTUAL SITE MODEL

SUMMARY OF THE BENTHIC INVERTEBRATE COMMUNITY

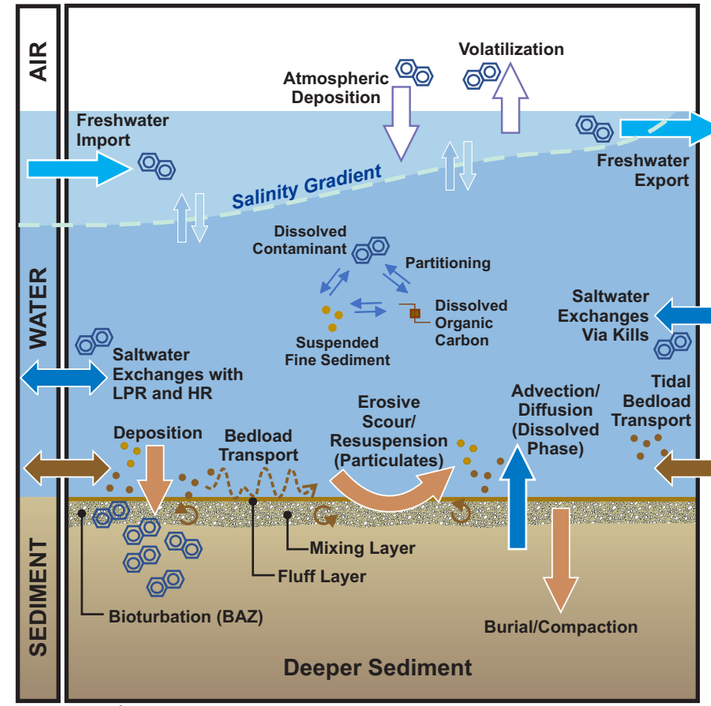
JANUARY 2019

FIGURE
6-5

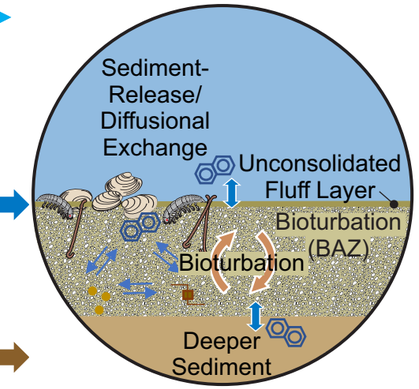
01/02/2019 SYRACUSE, NY - K.SARTORI
BIM 360 Docs\OXY USA INC\NEWARK BAY - RI_RA_FS PROGRAM\2019\B0009989.0061\01-DWG\ NB_CSM-Fig6-5-Jan2019.CDR



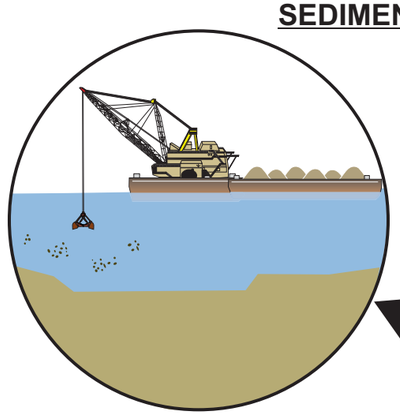
SEDIMENT TRANSPORT PROCESSES - INSET B



PHYSICAL PROCESSES - INSET A

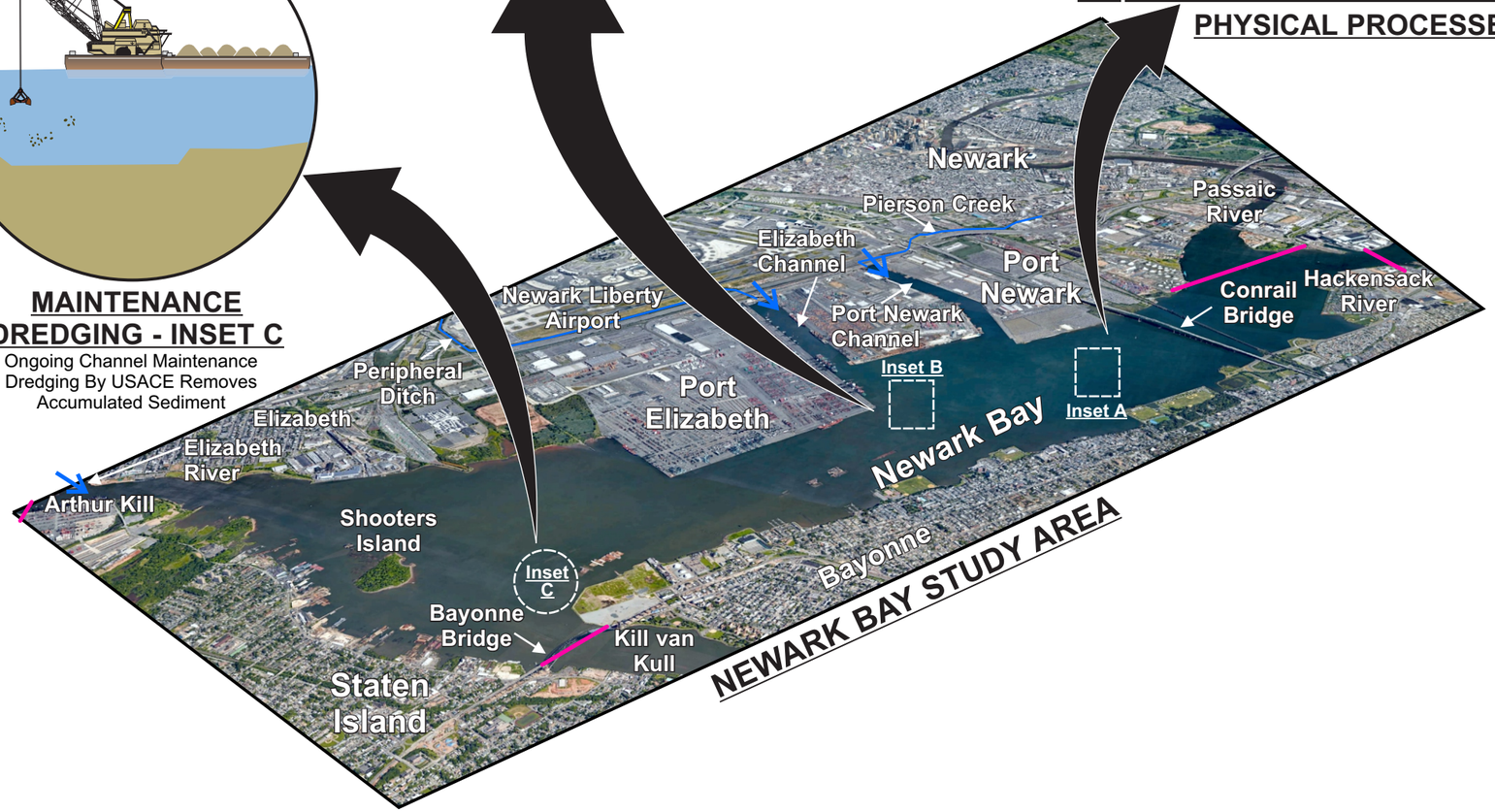


BIOLOGICALLY ACTIVE ZONE - INSET A-A



MAINTENANCE DREDGING - INSET C

Ongoing Channel Maintenance Dredging By USACE Removes Accumulated Sediment



Legend:

NBSA Boundaries

NEWARK BAY STUDY AREA
CONCEPTUAL SITE MODEL

NEWARK BAY STUDY AREA KEY FATE AND TRANSPORT PROCESSES SUMMARY

JANUARY 2019

FIGURE **7-1**

01/02/2019 SYRACUSE, NY - K.SARTORI
OXY USA INC\NEWARK BAY - RI_RA_FS PROGRAM\2019\B0009989.0061\01-DWG\NB_CSM-Fig7-1-Jan2019.CDR

City: Citrix Div/Group: IM/DV Created By: K. SINSABAUGH Last Saved By: ksinsabaugh
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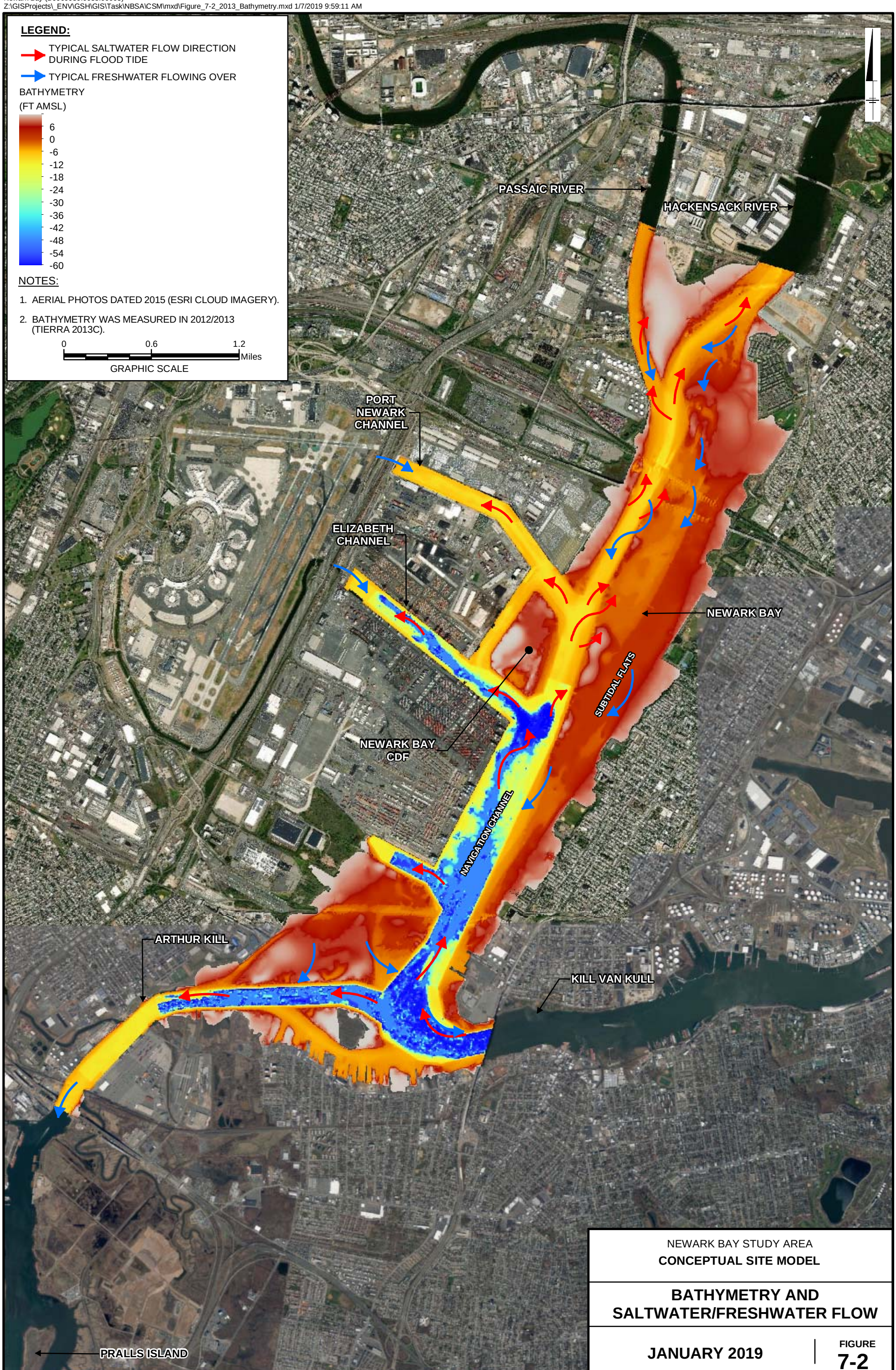

NEWARK BAY STUDY AREA
CONCEPTUAL SITE MODEL

BATHYMETRY AND SALTWATER/FRESHWATER FLOW

JANUARY 2019

FIGURE
7-2

City: Citrix Div/Group: IM/DV Created By: K. Sinsabaugh Last Saved By: ksinsabaugh
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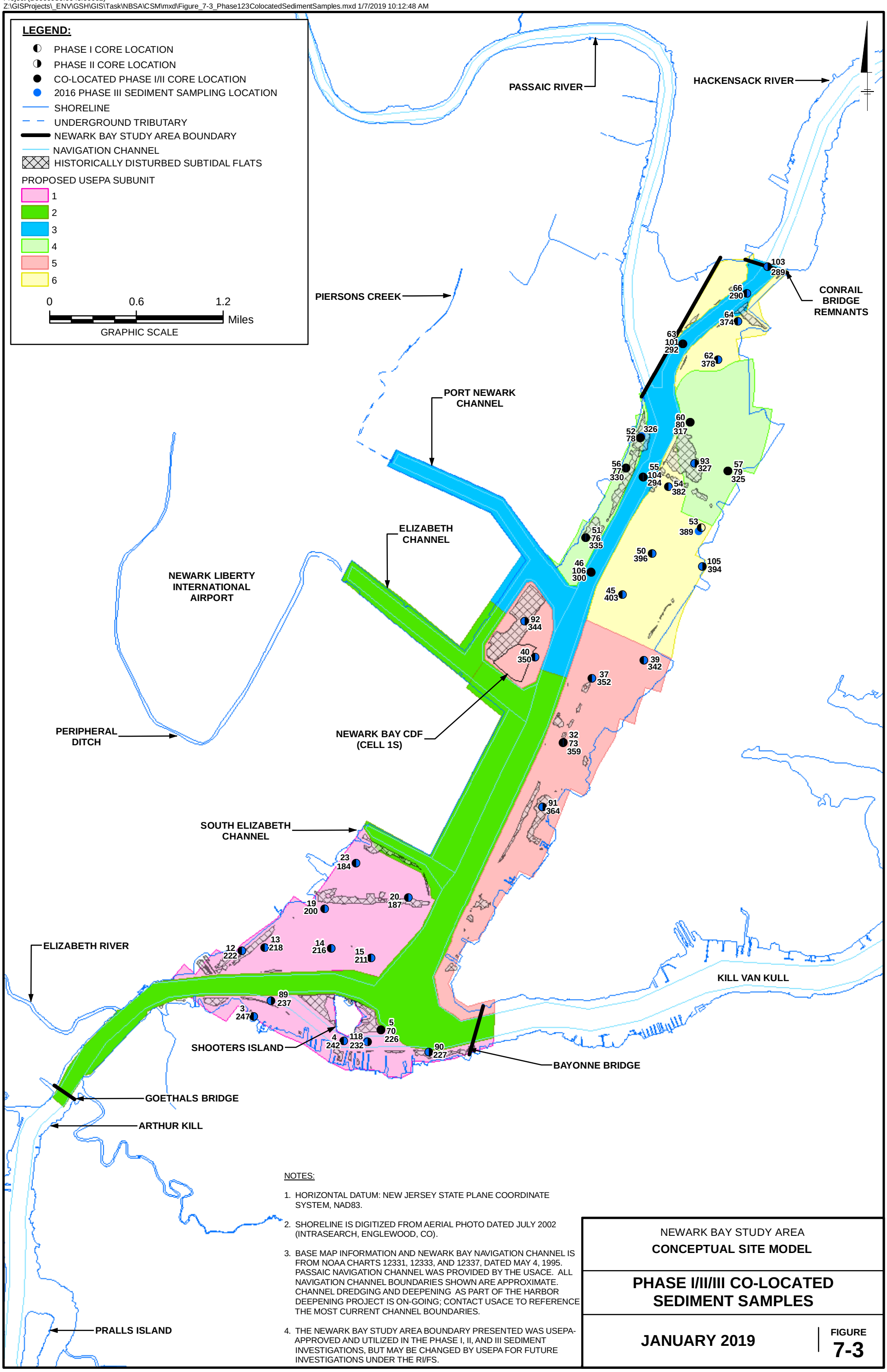

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NEWARK BAY STUDY AREA
CONCEPTUAL SITE MODEL

PHASE I/II/III CO-LOCATED SEDIMENT SAMPLES

JANUARY 2019

FIGURE
7-3

Appendix A

Table A-1
Number of Detections of Contaminants in Sediment, Tissue, and Porewater

Media	Analyte Group	Number of Individual Contaminants or Contaminant Groups Analyzed	Number of Individual Contaminants or Contaminant Groups Detected	Number of Individual Contaminants or Contaminant Groups Not Detected
Sediment	PCDDs/PCDFs, VOCs, SVOCs, Aroclor PCBs, congener PCBs and homologues, pesticides, chlorinated herbicides, TPH, metals, cyanide, butyltins, total organic carbon	609	542	67
Tissue (crab, clam, fish)	PCDDs/PCDFs, SVOCs, Aroclor PCBs, congener PCBs and homologues, pesticides, metals, butyltins, percent lipids	346	299	47
Porewater	PCDDs/PCDFs, PAHs, pesticides, congener PCBs and homologues, metals	277	254	23

Notes:
PCBs = polychlorinated biphenyls
PCDDs = Polychlorinated dibenzodioxins
PCDFs = Polychlorinated dibenzofurans
SVOCs = Semivolatile Organic Compounds
TPH = Total Petroleum Hydrocarbons
VOCs = Volatile Organic Compounds

Table A-2
Number of Sediment Samples in the NBSA by Analyte and Sampling Program

Parameter Group	Analyte	Number of Samples				
		Phase I	Phase II	Phase III	Crab/Clam	SQT
AVS/SEM	Acid Volatile Sulfide (AVS)	NA	NA	NA	16	43
	Cadmium	NA	NA	NA	18	43
	Copper	NA	NA	NA	18	43
	Lead	NA	NA	NA	18	43
	Mercury	NA	NA	NA	15	43
	Nickel	NA	NA	NA	18	43
	Zinc	NA	NA	NA	18	43
Dioxins/Furans	1,2,3,4,6,7,8-HpCDD	273	281	193	18	43
	1,2,3,4,6,7,8-HpCDF	273	281	193	18	43
	1,2,3,4,7,8,9-HpCDF	273	281	193	18	43
	1,2,3,4,7,8-HxCDD	273	281	193	18	43
	1,2,3,4,7,8-HxCDF	273	281	193	14	43
	1,2,3,6,7,8-HxCDD	273	281	193	18	43
	1,2,3,6,7,8-HxCDF	273	281	193	18	43
	1,2,3,7,8,9-HxCDD	273	281	193	18	43
	1,2,3,7,8,9-HxCDF	273	281	193	18	43
	1,2,3,7,8-PeCDD	273	281	193	18	43
	1,2,3,7,8-PeCDF	273	281	193	18	43
	2,3,4,6,7,8-HxCDF	273	281	193	17	43
	2,3,4,7,8-PeCDF	273	281	193	18	43
	2,3,7,8-TCDD	273	281	193	18	43
	2,3,7,8-TCDF	273	281	193	18	43
	OCDD	273	281	193	16	43
	OCDF	273	281	193	18	43
Herbicides	2,4,5-T	271	258	190	18	41
	2,4,5-TP (Silvex)	271	187	190	18	43
	2,4-D	271	270	191	18	43
	2,4-DB	271	129	192	18	43
Metals	Aluminum	272	281	193	18	43
	Antimony	259	264	193	18	43
	Arsenic	272	281	193	18	43
	Barium	272	281	193	18	43
	Beryllium	272	281	193	18	43
	Cadmium	272	281	193	18	43
	Calcium	253	281	192	18	42
	Chromium	272	281	193	18	43
	Cobalt	272	281	193	18	43
	Copper	267	281	193	18	43
	Hexavalent Chromium	NA	NA	NA	12	43
	Iron	272	281	193	18	43
	Lead	272	281	193	18	43
	Magnesium	272	281	193	18	43
	Manganese	272	281	193	18	43
	Mercury	272	281	193	18	43
	Methyl Mercury	NA	NA	193	18	43
	Nickel	272	281	193	18	43
	Potassium	235	281	193	18	43
	Selenium	255	281	192	18	43
	Silver	272	240	193	18	43
	Sodium	272	281	193	18	43

Table A-2
Number of Sediment Samples in the NBSA by Analyte and Sampling Program

Parameter Group	Analyte	Number of Samples				
		Phase I	Phase II	Phase III	Crab/Clam	SQT
Metals	Thallium	247	281	193	18	43
	Titanium	272	281	193	18	43
	Vanadium	272	281	193	18	43
	Zinc	272	281	193	18	43
Misc Chemical	Ammonia Nitrogen	NA	NA	NA	15	43
	Phosphorus	NA	NA	NA	18	43
	Sulfide	NA	NA	NA	17	43
	Total Cyanide	262	281	192	18	43
	Total Kjeldahl Nitrogen (TKN)	NA	NA	NA	17	43
TEPH Alkanes	2,6,10,14-Tetramethyl Pentadecane	NA	NA	193	18	43
	2,6,10,14-Tetramethylhexadecane	NA	NA	193	18	43
	Dotriacontane	NA	NA	193	18	43
	Heneicosane	NA	NA	193	18	43
	Heptacosane	NA	NA	193	18	43
	Heptadecane	NA	NA	193	17	43
	Heptatriacontane, -n	NA	NA	193	18	43
TEPH Alkanes	Hexatriacontane	NA	NA	193	18	43
	Hhentriacontane	NA	NA	193	18	43
	n-Decane	NA	NA	193	18	43
	n-Docosane	NA	NA	193	18	43
	n-Dodecane	NA	NA	193	18	43
	n-Eicosane	NA	NA	193	18	43
	n-Hexacosane	NA	NA	193	18	43
	n-Hexadecane	NA	NA	193	18	43
	n-Nonane	NA	NA	193	18	43
	n-Octacosane	NA	NA	193	18	43
	n-Octadecane	NA	NA	193	18	43
	Nonacosane	NA	NA	193	18	43
	Nonadecane	NA	NA	193	18	43
	Nonatriacontane	NA	NA	193	18	43
	n-Tetracosane	NA	NA	193	18	43
	n-Tetradecane	NA	NA	193	18	43
	n-Triacontane	NA	NA	193	18	43
	n-Tridecane	NA	NA	193	18	43
	n-Undecane	NA	NA	193	18	43
	Octatriacontane	NA	NA	193	18	43
	Pentacosane	NA	NA	193	18	43
	Pentadecane	NA	NA	193	18	43
	Pentatriacontane	NA	NA	193	18	43
	Tetracontane	NA	NA	193	18	43
	Tetratriacontane	NA	NA	193	18	43
	Tricosane	NA	NA	193	18	43
	Tritriacontane	NA	NA	193	18	43
Organotin	Dibutyltin	271	NA	NA	18	43
	Monobutyltin	254	NA	NA	18	43
	Tetrabutyltin	271	NA	NA	18	43
	Tributyltin	271	NA	NA	18	43
PBDE	BDE-1	NA	56	NA	NA	NA
	BDE-10	NA	56	NA	NA	NA
	BDE-100	NA	56	NA	NA	NA
	BDE-105	NA	56	NA	NA	NA
	BDE-116	NA	56	NA	NA	NA
	BDE-118	NA	56	NA	NA	NA
	BDE-119	NA	56	NA	NA	NA
	BDE-12/13	NA	56	NA	NA	NA
	BDE-126	NA	56	NA	NA	NA
	BDE-138	NA	56	NA	NA	NA
	BDE-139	NA	56	NA	NA	NA

Table A-2
Number of Sediment Samples in the NBSA by Analyte and Sampling Program

Parameter Group	Analyte	Number of Samples				
		Phase I	Phase II	Phase III	Crab/Clam	SQT
PBDE	BDE-140	NA	56	NA	NA	NA
	BDE-15	NA	56	NA	NA	NA
	BDE-153	NA	56	NA	NA	NA
	BDE-154	NA	56	NA	NA	NA
	BDE-155	NA	56	NA	NA	NA
	BDE-156/169	NA	56	NA	NA	NA
	BDE-166	NA	56	NA	NA	NA
	BDE-17	NA	56	NA	NA	NA
	BDE-179	NA	56	NA	NA	NA
	BDE-181	NA	56	NA	NA	NA
	BDE-183/176	NA	56	NA	NA	NA
	BDE-188	NA	56	NA	NA	NA
	BDE-190	NA	56	NA	NA	NA
	BDE-191	NA	56	NA	NA	NA
	BDE-196	NA	56	NA	NA	NA
	BDE-197	NA	56	NA	NA	NA
	BDE-2	NA	56	NA	NA	NA
	BDE-202	NA	56	NA	NA	NA
	BDE-203	NA	56	NA	NA	NA
	BDE-205	NA	56	NA	NA	NA
	BDE-207	NA	49	NA	NA	NA
	BDE-208	NA	49	NA	NA	NA
	BDE-209	NA	43	NA	NA	NA
	BDE-25	NA	56	NA	NA	NA
	BDE-28/33	NA	56	NA	NA	NA
	BDE-3	NA	56	NA	NA	NA
	BDE-30	NA	56	NA	NA	NA
	BDE-32	NA	56	NA	NA	NA
	BDE-35	NA	56	NA	NA	NA
	BDE-37	NA	56	NA	NA	NA
	BDE-47	NA	56	NA	NA	NA
	BDE-49	NA	56	NA	NA	NA
	BDE-66	NA	56	NA	NA	NA
	BDE-7	NA	56	NA	NA	NA
	BDE-71	NA	56	NA	NA	NA
	BDE-75	NA	56	NA	NA	NA
	BDE-77	NA	56	NA	NA	NA
	BDE-8/11	NA	56	NA	NA	NA
	BDE-85	NA	56	NA	NA	NA
	BDE-99	NA	56	NA	NA	NA
PCB Aroclors	Aroclor-1016	273	281	193	18	43
	Aroclor-1221	273	281	193	18	43
	Aroclor-1232	273	281	193	18	43
	Aroclor-1242	273	281	193	18	43
	Aroclor-1248	273	281	193	18	43
	Aroclor-1254	273	279	193	18	43
	Aroclor-1260	273	281	193	18	43
	Aroclor-1262	273	281	193	18	43
	Aroclor-1268	273	281	193	18	43
	Total Aroclor PCBs (Sum of 9 Aroclors)	273	281	193	18	43

Table A-2
Number of Sediment Samples in the NBSA by Analyte and Sampling Program

Parameter Group	Analyte	Number of Samples				
		Phase I	Phase II	Phase III	Crab/Clam	SQT
PCB Congeners	PCB-1	273	270	193	18	38
	PCB-10	NA	NA	193	18	43
	PCB-100	272	281	NA	NA	NA
	PCB-103	273	281	193	18	43
	PCB-104	269	281	193	18	43
	PCB-105	273	281	193	18	43
	PCB-106	NA	NA	193	18	43
	PCB-106/118	273	281	NA	NA	NA
	PCB-107	NA	NA	193	18	43
	PCB-107/109	273	281	NA	NA	NA
	PCB-108/112	273	281	NA	NA	NA
	PCB-108/124	NA	NA	193	18	43
	PCB-11	272	281	193	18	43
	PCB-110	273	281	NA	NA	NA
	PCB-110/115	NA	NA	193	18	43
	PCB-111	NA	NA	193	18	43
	PCB-111/115	273	281	NA	NA	NA
	PCB-112	NA	NA	193	18	43
	PCB-113	270	281	NA	NA	NA
	PCB-114	273	281	193	18	43
	PCB-116/117	NA	NA	36	NA	NA
	PCB-118	NA	NA	193	18	43
	PCB-119	273	281	NA	NA	NA
	PCB-12/13	272	281	193	18	43
	PCB-120	269	281	193	18	43
	PCB-121	267	281	193	18	43
	PCB-122	273	281	193	18	43
	PCB-123	273	281	193	18	41
	PCB-124	273	281	NA	NA	NA
	PCB-126	272	281	193	18	41
	PCB-127	267	281	193	18	35
	PCB-128/162	273	281	NA	NA	NA
	PCB-128/166	NA	NA	193	18	43
	PCB-129	273	281	NA	NA	NA
	PCB-129/138/163	NA	NA	193	18	43
	PCB-130	273	281	193	18	39
	PCB-131	268	281	193	18	39
	PCB-132	NA	NA	193	18	43
	PCB-132/161	273	281	NA	NA	NA
	PCB-133	NA	NA	193	18	43
	PCB-133/142	273	281	NA	NA	NA
	PCB-134	NA	NA	193	18	39
	PCB-134/143	273	281	NA	NA	NA
	PCB-135	273	281	NA	NA	NA
	PCB-135/151	NA	NA	193	18	43
	PCB-136	273	281	193	18	43
	PCB-137	273	281	193	18	39
	PCB-138/163/164	273	281	NA	NA	NA
	PCB-139/140	NA	NA	193	18	43
	PCB-139/149	273	281	NA	NA	NA
	PCB-14	266	281	193	18	43
	PCB-140	271	281	NA	NA	NA
	PCB-141	273	281	193	18	38
	PCB-142	NA	NA	193	18	39
	PCB-143	NA	NA	193	18	36
	PCB-144	273	281	193	18	43
	PCB-145	270	281	193	18	43
	PCB-146	NA	NA	193	18	20

Table A-2
Number of Sediment Samples in the NBSA by Analyte and Sampling Program

Parameter Group	Analyte	Number of Samples				
		Phase I	Phase II	Phase III	Crab/Clam	SQT
PCB Congeners	PCB-146/165	273	281	NA	NA	NA
	PCB-147	273	281	NA	NA	NA
	PCB-147/149	NA	NA	193	18	43
	PCB-148	271	281	193	18	43
	PCB-15	273	281	193	18	42
	PCB-150	272	281	193	18	43
	PCB-151	273	281	NA	NA	NA
	PCB-152	271	281	193	18	43
	PCB-153	273	281	NA	NA	NA
	PCB-153/168	NA	NA	193	18	43
	PCB-154	273	281	193	18	43
	PCB-155	271	281	193	18	43
	PCB-156	273	281	NA	NA	NA
	PCB-156/157	NA	NA	193	18	43
	PCB-157	273	281	NA	NA	NA
	PCB-158	NA	NA	193	18	42
	PCB-158/160	273	281	NA	NA	NA
	PCB-159	273	281	193	18	43
	PCB-16	NA	NA	193	18	34
	PCB-16/32	273	281	NA	NA	NA
	PCB-160	NA	NA	193	18	43
	PCB-161	NA	NA	193	18	36
	PCB-162	NA	NA	193	18	36
	PCB-164	NA	NA	193	18	41
	PCB-165	NA	NA	193	18	18
	PCB-166	272	281	NA	NA	NA
	PCB-167	273	281	193	18	34
	PCB-168	271	281	NA	NA	NA
	PCB-169	267	281	193	18	43
	PCB-17	273	281	193	18	43
	PCB-170	273	281	193	18	43
	PCB-171	272	281	NA	NA	NA
	PCB-171/173	NA	NA	193	18	19
	PCB-172	272	281	193	18	43
	PCB-173	272	281	NA	NA	NA
	PCB-174	272	281	193	18	20
	PCB-175	273	281	193	18	18
	PCB-176	272	281	193	18	43
	PCB-177	272	281	193	18	19
	PCB-178	273	281	193	18	28
	PCB-179	273	281	193	18	43
	PCB-18	273	281	NA	NA	NA
	PCB-18/30	NA	NA	193	18	43
	PCB-180	272	281	NA	NA	NA
	PCB-180/193	NA	NA	193	18	43
	PCB-181	270	281	193	18	19
	PCB-182	NA	NA	193	18	19
	PCB-182/187	273	281	NA	NA	NA
	PCB-183	273	281	NA	NA	NA
	PCB-183/185	NA	NA	193	18	25
	PCB-184	269	281	193	18	43
	PCB-185	272	281	NA	NA	NA
	PCB-186	267	281	193	18	43
	PCB-187	NA	NA	193	18	28
	PCB-188	270	281	193	18	43
	PCB-189	272	281	193	18	43
	PCB-19	273	281	193	18	43
	PCB-190	273	281	193	18	43

Table A-2
Number of Sediment Samples in the NBSA by Analyte and Sampling Program

Parameter Group	Analyte	Number of Samples				
		Phase I	Phase II	Phase III	Crab/Clam	SQT
PCB Congeners	PCB-191	272	281	193	18	43
	PCB-192	267	281	193	18	43
	PCB-193	272	281	NA	NA	NA
	PCB-194	273	281	193	18	43
	PCB-195	273	281	193	18	43
	PCB-196	NA	NA	193	18	43
	PCB-196/203	273	281	NA	NA	NA
	PCB-197	273	281	NA	NA	NA
	PCB-197/200	NA	NA	193	18	30
	PCB-198	273	281	NA	NA	NA
	PCB-198/199	NA	NA	193	18	43
	PCB-199	273	281	NA	NA	NA
	PCB-2	273	270	193	18	43
	PCB-20/21/33	273	281	NA	NA	NA
	PCB-20/28	NA	NA	193	18	43
	PCB-200	273	281	NA	NA	NA
	PCB-201	272	281	193	18	43
	PCB-202	273	281	193	18	43
	PCB-203	NA	NA	193	18	43
	PCB-204	268	281	193	18	43
	PCB-205	273	281	193	18	43
	PCB-206	273	281	193	18	43
	PCB-207	273	281	193	18	43
	PCB-208	273	281	193	18	43
	PCB-209	273	281	193	18	39
	PCB-21/33	NA	NA	193	18	43
	PCB-22	273	281	193	18	43
	PCB-23	269	281	193	18	43
	PCB-24	NA	NA	193	18	43
	PCB-24/27	273	281	NA	NA	NA
	PCB-25	273	281	193	18	43
	PCB-26	273	281	NA	NA	NA
	PCB-26/29	NA	NA	193	18	43
	PCB-27	NA	NA	193	18	43
	PCB-28	273	281	NA	NA	NA
	PCB-29	272	281	NA	NA	NA
	PCB-3	273	281	193	18	33
	PCB-30	267	281	NA	NA	NA
	PCB-31	273	281	193	18	43
	PCB-32	NA	NA	193	18	43
	PCB-34	272	281	193	18	43
	PCB-35	272	281	193	18	43
	PCB-36	270	281	193	18	43
	PCB-37	273	281	193	18	43
	PCB-38	271	281	193	18	43
	PCB-39	271	281	193	18	43
	PCB-4	NA	NA	193	18	43
	PCB-4/10	272	281	NA	NA	NA
	PCB-40	271	263	NA	NA	NA
	PCB-40/71	NA	NA	193	18	43
	PCB-41	NA	NA	193	18	43
	PCB-41/64/71/72	246	238	NA	NA	NA
	PCB-42	NA	NA	193	18	43
	PCB-42/59	273	281	NA	NA	NA
	PCB-43	NA	NA	193	18	43
	PCB-43/49	273	281	NA	NA	NA
	PCB-44	273	281	NA	NA	NA
	PCB-44/47/65	NA	NA	193	18	43

Table A-2
Number of Sediment Samples in the NBSA by Analyte and Sampling Program

Parameter Group	Analyte	Number of Samples				
		Phase I	Phase II	Phase III	Crab/Clam	SQT
PCB Congeners	PCB-45	273	281	193	18	43
	PCB-46	273	281	193	18	43
	PCB-47	273	281	NA	NA	NA
	PCB-48	NA	NA	193	18	43
	PCB-48/75	273	281	NA	NA	NA
	PCB-49/69	NA	NA	193	18	43
	PCB-5	NA	NA	193	18	43
	PCB-5/8	273	281	NA	NA	NA
	PCB-50	271	281	NA	NA	NA
	PCB-50/53	NA	NA	193	18	43
	PCB-51	273	281	193	18	43
	PCB-52	NA	NA	193	18	43
	PCB-52/69	273	281	NA	NA	NA
	PCB-53	273	281	NA	NA	NA
	PCB-54	272	281	193	18	43
	PCB-55	273	281	193	18	43
	PCB-56	NA	NA	193	18	43
	PCB-56/60	273	281	NA	NA	NA
	PCB-57	272	281	193	18	43
	PCB-58	271	281	193	18	43
	PCB-59/62/75	NA	NA	193	18	43
	PCB-6	272	281	193	18	43
	PCB-60	NA	NA	193	18	43
	PCB-61/70	273	281	NA	NA	NA
	PCB-61/70/74/76	NA	NA	157	18	43
	PCB-62	267	281	NA	NA	NA
	PCB-63	273	281	193	18	43
	PCB-64	NA	NA	193	18	43
	PCB-65	268	281	NA	NA	NA
	PCB-66	NA	NA	193	18	43
	PCB-66/76	273	281	NA	NA	NA
	PCB-67	272	281	193	18	43
	PCB-68	271	226	193	18	43
	PCB-7	NA	NA	193	18	43
	PCB-7/9	272	281	NA	NA	NA
	PCB-70/74/76	NA	NA	36	NA	NA
	PCB-72	NA	NA	193	18	43
	PCB-73	267	281	193	18	43
	PCB-74	273	281	NA	NA	NA
	PCB-77	273	281	193	18	25
	PCB-78	267	281	193	18	43
	PCB-79	272	281	193	18	43
	PCB-8	NA	NA	193	18	43
	PCB-80	267	281	193	18	43
	PCB-81	273	281	193	18	43
	PCB-82	273	281	193	18	43
	PCB-83	269	281	193	18	43
	PCB-84	NA	NA	193	18	43
	PCB-84/92	273	281	NA	NA	NA
	PCB-85/116	273	281	NA	NA	NA
	PCB-85/116/117	NA	NA	157	18	43
	PCB-86	273	281	NA	NA	NA
	PCB-86/87/97/108/119/125	NA	NA	193	NA	NA
	PCB-86/87/97/109/119/125	NA	NA	NA	18	43
	PCB-87/117/125	273	281	NA	NA	NA
	PCB-88	NA	NA	193	18	43
	PCB-88/91	273	281	NA	NA	NA
	PCB-89	272	281	193	18	43

Table A-2
Number of Sediment Samples in the NBSA by Analyte and Sampling Program

Parameter Group	Analyte	Number of Samples				
		Phase I	Phase II	Phase III	Crab/Clam	SQT
PCB Congeners	PCB-9	NA	NA	193	18	43
	PCB-90/101	273	281	NA	NA	NA
	PCB-90/101/113	NA	NA	193	18	43
	PCB-91	NA	NA	193	18	43
	PCB-92	NA	NA	193	18	43
	PCB-93	267	281	NA	NA	NA
	PCB-93/100	NA	NA	193	18	43
	PCB-94	273	281	193	18	43
	PCB-95	NA	NA	193	18	20
	PCB-95/98/102	273	281	NA	NA	NA
	PCB-96	273	281	193	18	42
	PCB-97	273	281	NA	NA	NA
	PCB-98/102	NA	NA	193	18	43
	PCB-99	273	281	193	18	43
	Total PCB Congeners (209)	273	281	193	18	43
PCN	PCN-1	NA	61	NA	NA	NA
	PCN-10	NA	61	NA	NA	NA
	PCN-12	NA	61	NA	NA	NA
	PCN-13	NA	61	NA	NA	NA
	PCN-2	NA	61	NA	NA	NA
	PCN-27	NA	61	NA	NA	NA
	PCN-28/36	NA	61	NA	NA	NA
	PCN-3	NA	61	NA	NA	NA
	PCN-31	NA	61	NA	NA	NA
	PCN-42	NA	61	NA	NA	NA
	PCN-46	NA	61	NA	NA	NA
	PCN-48	NA	61	NA	NA	NA
	PCN-49	NA	61	NA	NA	NA
	PCN-5	NA	61	NA	NA	NA
	PCN-50	NA	61	NA	NA	NA
	PCN-52	NA	61	NA	NA	NA
	PCN-53	NA	61	NA	NA	NA
	PCN-54	NA	61	NA	NA	NA
	PCN-6	NA	61	NA	NA	NA
	PCN-66/67	NA	61	NA	NA	NA
	PCN-68	NA	61	NA	NA	NA
	PCN-69	NA	61	NA	NA	NA
	PCN-70	NA	61	NA	NA	NA
	PCN-71/72	NA	61	NA	NA	NA
	PCN-73	NA	61	NA	NA	NA
	PCN-74	NA	61	NA	NA	NA
	PCN-75	NA	61	NA	NA	NA
	PCN-9	NA	61	NA	NA	NA

Table A-2
Number of Sediment Samples in the NBSA by Analyte and Sampling Program

Parameter Group	Analyte	Number of Samples				
		Phase I	Phase II	Phase III	Crab/Clam	SQT
Pesticides	2,4'-DDD	NA	273	192	18	43
	2,4'-DDE	NA	273	192	18	43
	2,4'-DDT	NA	280	188	18	42
	4,4'-DDD	273	280	193	18	43
	4,4'-DDE	273	281	192	18	43
	4,4'-DDT	259	277	175	18	43
	Aldrin	273	272	108	18	19
	Alpha-BHC	273	276	191	18	43
	Alpha-Chlordane	273	281	192	18	43
	Beta-BHC	273	251	192	18	43
	Delta-BHC	273	277	192	18	43
	Dieldrin	273	275	192	18	43
	Endosulfan I	273	281	188	18	43
	Endosulfan II	273	281	188	18	42
	Endosulfan Sulfate	273	278	177	18	42
	Endrin	273	280	189	18	43
	Endrin Aldehyde	273	279	102	18	38
	Endrin Ketone	273	281	158	18	37
	Gamma-BHC (Lindane)	273	274	192	18	43
	Gamma-Chlordane	273	244	NA	NA	NA
	Heptachlor	273	268	188	18	43
	Heptachlor Epoxide	273	221	188	18	43
	Hexachlorobenzene	NA	NA	192	18	43
	Methoxychlor	272	281	105	18	28
	Mirex	NA	NA	126	18	37
	Nonachlor, trans-	NA	NA	188	18	43
	Oxychlordane	NA	NA	189	18	43
	Total Alpha + Gamma Chlordane	273	281	193	18	43
	Total DDT (2,4 & 4,4)	NA	281	193	18	43
	Total DDT (2,4)	NA	281	193	18	43
	Total DDT (4,4)	273	281	193	18	43
	Toxaphene	273	281	NA	NA	NA
	cis-Nonachlor	NA	NA	187	18	43
	trans-Chlordane	NA	NA	189	18	43
	trans-Heptachlor Epoxide	NA	NA	192	18	43
Radiochem	BE-7	67	40	NA	NA	NA
	CS-137	376	314	NA	NA	NA
	PB-210	402	314	NA	NA	NA
Semivolatiles	1,2,4,5-Tetrachlorobenzene	NA	280	193	18	36
	1,2,4-Trichlorobenzene	273	NA	NA	NA	NA
	1,2-Dichlorobenzene	273	NA	NA	NA	NA
	1,2-Diphenylhydrazine	NA	NA	193	18	36
	1,3-Dichlorobenzene	273	NA	NA	NA	NA
	1,4-Dichlorobenzene	273	NA	NA	NA	NA
	1-Methylnaphthalene	NA	NA	193	18	43
	2,2'-oxybis(1-Chloropropane)	NA	NA	193	18	36
	2,2-oxybis(1-Chloropropane)	273	280	NA	NA	NA
	2,3,4,6-Tetrachlorophenol	NA	280	193	18	36
	2,4,5-Trichlorophenol	273	280	193	18	36
	2,4,6-Trichlorophenol	273	278	193	18	36
	2,4-Dichlorophenol	273	280	193	18	36
	2,4-Dimethylphenol	273	280	193	18	36
	2,4-Dinitrophenol	273	280	193	18	36
	2,4-Dinitrotoluene	273	280	193	18	36
	2,6-Dinitrotoluene	273	280	193	18	36
	2-Chloronaphthalene	273	280	193	18	36
	2-Chlorophenol	273	280	193	18	36
	2-Methylnaphthalene	273	281	193	18	43

Table A-2
Number of Sediment Samples in the NBSA by Analyte and Sampling Program

Parameter Group	Analyte	Number of Samples				
		Phase I	Phase II	Phase III	Crab/Clam	SQT
Semivolatiles	2-Methylphenol	273	280	193	18	36
	2-Nitroaniline	273	280	193	18	36
	2-Nitrophenol	273	280	193	18	36
	3,3'-Dichlorobenzidine	273	280	193	18	36
	3-Nitroaniline	273	280	193	18	36
	4,6-Dinitro-2-methylphenol	273	280	193	18	36
	4-Bromophenyl phenyl ether	273	280	193	18	36
	4-Chloro-3-Methylphenol	273	280	193	18	36
	4-Chloroaniline	273	280	193	18	36
	4-Chlorophenyl phenyl ether	273	280	193	18	36
	4-Methylphenol	273	280	193	18	38
	4-Nitroaniline	273	280	193	18	36
	4-Nitrophenol	273	280	193	18	36
	Acenaphthene	273	281	193	18	43
	Acenaphthylene	273	281	193	18	43
	Acetophenone	NA	280	193	18	42
	Anthracene	273	280	193	18	43
	Atrazine	NA	280	193	18	36
	BENZO(J,K)FLUORANTHENE	NA	NA	193	18	43
	Benzaldehyde	NA	280	193	18	36
	Benzidine	NA	NA	193	18	36
	Benzo(a)anthracene	273	280	193	18	43
	Benzo(a)pyrene	273	280	193	18	43
	Benzo(b)fluoranthene	273	280	193	18	43
	Benzo(e)pyrene	NA	NA	193	18	43
	Benzo(g,h,i)perylene	273	280	193	18	43
	Benzo(k)fluoranthene	273	280	NA	NA	NA
	Benzoic Acid	NA	NA	193	18	36
	Biphenyl	NA	280	193	18	36
	Butyl benzyl phthalate	273	280	193	18	36
	C1-Chrysenes	NA	NA	193	18	43
	C1-Fluoranthenes/Pyrenes	NA	NA	193	18	43
	C1-Fluorenes	NA	NA	193	18	43
	C1-Naphthalenes	NA	NA	193	18	43
	C1-Phenanthrenes/Anthracenes	NA	NA	193	18	43
	C2-Chrysenes	NA	NA	193	18	43
	C2-Fluoranthenes/Pyrenes	NA	NA	193	18	43
	C2-Fluorenes	NA	NA	193	18	43
	C2-Naphthalenes	NA	NA	193	18	43
	C2-Phenanthrene/anthracenes	NA	NA	193	18	43
	C3-Chrysenes	NA	NA	193	18	43
	C3-Fluoranthenes/Pyrenes	NA	NA	193	18	43
	C3-Fluorenes	NA	NA	193	18	43
	C3-Naphthalene	NA	NA	193	18	43
	C3-Phenanthrene/anthracenes	NA	NA	193	18	43
	C4-Chrysenes	NA	NA	193	18	43
	C4-Naphthalene	NA	NA	193	18	43
	C4-Phenanthrenes/anthracenes	NA	NA	193	18	43
	Caprolactam	NA	280	193	18	36
	Carbazole	273	280	193	18	37
	Chrysene	273	280	193	18	43
	Di-n-Butylphthalate	273	280	193	18	36
	Di-n-Octylphthalate	273	234	193	18	36
	Dibenzo(a,h)anthracene	273	280	193	18	43
	Dibenzofuran	273	280	193	18	37
	Diethyl phthalate	273	280	193	18	36
	Dimethylphthalate	273	280	193	18	36
	Fluoranthene	273	280	193	18	43

Table A-2
Number of Sediment Samples in the NBSA by Analyte and Sampling Program

Parameter Group	Analyte	Number of Samples				
		Phase I	Phase II	Phase III	Crab/Clam	SQT
Semivolatiles	Fluorene	273	281	193	18	43
	Hexachlorobenzene	273	281	NA	NA	NA
	Hexachlorobutadiene	273	280	193	18	36
	Hexachlorocyclopentadiene	268	48	193	18	36
	Hexachloroethane	273	280	193	18	36
	Indeno(1,2,3-cd)pyrene	273	280	193	18	43
	Isophorone	273	280	193	18	36
	N-Nitroso-di-n-propylamine	273	280	193	18	36
	N-Nitrosodiphenylamine	273	280	193	18	36
	Naphthalene	273	281	193	18	43
	Nitrobenzene	273	280	193	18	36
	Pentachlorophenol	273	280	193	18	36
	Perylene	NA	NA	193	18	43
	Phenanthrene	273	280	193	18	43
	Phenol	273	280	193	18	36
	Pyrene	273	280	193	18	43
	Pyridine	NA	NA	193	18	36
	bis(2-Chloroethoxy)methane	273	280	193	18	36
	bis(2-Chloroethyl)ether	273	280	193	18	36
	bis(2-Ethylhexyl)phthalate	273	280	193	18	42
	Total HMW PAHs	273	280	193	18	43
	Total LMW PAHs	273	281	193	18	43
	Total PAHs	273	281	193	18	43
TOC	Total Organic Carbon (TOC)	271	281	193	18	43
TPH	PHC AS GASOLINE	NA	NA	193	18	43
	TPH	271	281	193	18	43
Volatiles	1,1,1-Trichloroethane	273	NA	NA	NA	NA
	1,1,2,2-Tetrachloroethane	272	NA	NA	NA	NA
	1,1,2-Trichloroethane	273	NA	NA	NA	NA
	1,1-Dichloroethane	273	NA	NA	NA	NA
	1,1-Dichloroethene	273	NA	NA	NA	NA
	1,2,3-Trichlorobenzene	NA	279	NA	NA	NA
	1,2,4-Trichlorobenzene	NA	279	193	18	43
	1,2-Dichlorobenzene	NA	279	193	18	43
	1,2-Dichloroethane	273	NA	NA	NA	NA
	1,2-Dichloroethene (total)	273	NA	NA	NA	NA
	1,2-Dichloropropane	273	NA	NA	NA	NA
	1,3-Dichlorobenzene	NA	279	193	18	43
	1,4-Dichlorobenzene	NA	280	193	18	43
	2-Butanone	138	NA	NA	NA	NA
	2-Hexanone	273	NA	NA	NA	NA
	4-Methyl-2-pentanone	273	NA	NA	NA	NA
	Acetone	265	NA	NA	NA	NA
	Benzene	273	NA	NA	NA	NA
	Bromodichloromethane	273	NA	NA	NA	NA
	Bromoform	273	NA	NA	NA	NA
	Bromomethane	273	NA	NA	NA	NA
	Carbon Disulfide	273	NA	NA	NA	NA
	Carbon Tetrachloride	273	NA	NA	NA	NA

Table A-2
Number of Sediment Samples in the NBSA by Analyte and Sampling Program

Parameter Group	Analyte	Number of Samples				
		Phase I	Phase II	Phase III	Crab/Clam	SQT
Volatiles	Chlorobenzene	273	280	NA	NA	NA
	Chloroethane	273	NA	NA	NA	NA
	Chloroform	273	NA	NA	NA	NA
	Chloromethane	273	NA	NA	NA	NA
	Dibromochloromethane	273	NA	NA	NA	NA
	Ethylbenzene	273	NA	NA	NA	NA
	Methylene Chloride	273	NA	NA	NA	NA
	Styrene	273	NA	NA	NA	NA
	Tetrachloroethene	273	NA	NA	NA	NA
	Toluene	273	NA	NA	NA	NA
	Trichloroethene	273	NA	NA	NA	NA
	Vinyl Chloride	273	NA	NA	NA	NA
	Xylene (Total)	273	NA	NA	NA	NA
	cis-1,3-Dichloropropene	273	NA	NA	NA	NA
	trans-1,3-Dichloropropene	273	NA	NA	NA	NA

General Notes:

Shading identifies the 18 COIs used in the data evaluation for the Data Evaluation and Analysis Report - Revision 2 (DEAR; Tierra 2014c).

Field duplicates and QC samples (MS/MSD, trip blanks, and field blanks) were excluded from sample counts.

The numbers in each column represent the number of samples with reportable results for the analyte in each program. The number of results may vary because some results were qualified as rejected during the data validation process and therefore were excluded from the sample count.

Acronyms:

NA = not analyzed
COI = contaminant of interest
HMW = high molecular weight
LMW = low molecular weight
PAH = polycyclic aromatic hydrocarbon
PBDE = polybrominated diphenyl ether
PCB = polychlorinated biphenyl
PCN = polychlorinated naphthalene
SEM = Simultaneously Extracted Metals
SQT = Sediment Quality Triad
TCDD = tetrachlorodibenzo-p-dioxin
TEQ = toxic equivalency
TPH = total petroleum hydrocarbon

Table A-3
Summary of Analyte Detections and Detection Limits in NBSA Phase I, II, and III Sediment Samples

Chemical	Units	Analytical Method	Sampling Program	N[1]	Number of Detected Samples	Detection Limit Summary for Non-Detect Data		
						Mean	Minimum	Maximum
AVS/SEMs								
Acid Volatile Sulfide (AVS)	µmol/g	E821/R-91-100	Crab/Clam	16	16	--	--	--
Acid Volatile Sulfide (AVS)	µmol/g	E821/R-91-100	SQT	43	41	6.30E-01	0.63	0.63
Cadmium	µmol/g	SW6010	Crab/Clam	18	18	--	--	--
Cadmium	µmol/g	SW6010	SQT	43	43	--	--	--
Copper	µmol/g	SW6010	Crab/Clam	18	18	--	--	--
Copper	µmol/g	SW6010	SQT	43	42	1.05E-03	0.00105	0.00105
Lead	µmol/g	SW6010	Crab/Clam	18	18	--	--	--
Lead	µmol/g	SW6010	SQT	43	43	--	--	--
Mercury	µmol/g	SW7471A	Crab/Clam	15	1	7.00E-06	7.00E-06	7.00E-06
Mercury	µmol/g	SW7471A	SQT	43	4	7.00E-06	7.00E-06	7.00E-06
Nickel	µmol/g	SW6010	Crab/Clam	18	18	--	--	--
Nickel	µmol/g	SW6010	SQT	43	43	--	--	--
Zinc	µmol/g	SW6010	Crab/Clam	18	18	--	--	--
Zinc	µmol/g	SW6010	SQT	43	43	--	--	--
Dixons/Furans								
1,2,3,4,6,7,8-HpCDD	ppt	USEPA 1613B	Phase I	273	272	4.77E-01	0.477	0.477
1,2,3,4,6,7,8-HpCDD	ppt	USEPA 1613B	Phase II	281	274	5.18E-01	0.166	0.935
1,2,3,4,6,7,8-HpCDD	ppt	USEPA 1613B	Crab/Clam	18	18	--	--	--
1,2,3,4,6,7,8-HpCDD	ppt	USEPA 1613B	SQT	43	43	--	--	--
1,2,3,4,6,7,8-HpCDD	ppt	USEPA 1613B	Phase III	193	193	--	--	--
1,2,3,4,6,7,8-HpCDF	ppt	USEPA 1613B	Phase I	273	266	4.67E+01	0.0522	326
1,2,3,4,6,7,8-HpCDF	ppt	USEPA 1613B	Phase II	281	264	1.88E-01	0.0968	0.427
1,2,3,4,6,7,8-HpCDF	ppt	USEPA 1613B	Crab/Clam	18	18	--	--	--
1,2,3,4,6,7,8-HpCDF	ppt	USEPA 1613B	SQT	43	43	--	--	--
1,2,3,4,6,7,8-HpCDF	ppt	USEPA 1613B	Phase III	193	193	--	--	--
1,2,3,4,7,8,9-HpCDF	ppt	USEPA 1613B	Phase I	273	227	1.77E-01	0.0354	2.01
1,2,3,4,7,8,9-HpCDF	ppt	USEPA 1613B	Phase II	281	235	1.16E-01	0.0461	0.288
1,2,3,4,7,8,9-HpCDF	ppt	USEPA 1613B	Crab/Clam	18	17	3.65E-02	0.0365	0.0365
1,2,3,4,7,8,9-HpCDF	ppt	USEPA 1613B	SQT	43	43	--	--	--
1,2,3,4,7,8,9-HpCDF	ppt	USEPA 1613B	Phase III	193	192	4.95E+00	4.95	4.95
1,2,3,4,7,8-HxCDD	ppt	USEPA 1613B	Phase I	273	246	6.13E-01	0.0746	2.05
1,2,3,4,7,8-HxCDD	ppt	USEPA 1613B	Phase II	281	253	2.41E-01	0.0987	0.483
1,2,3,4,7,8-HxCDD	ppt	USEPA 1613B	Crab/Clam	18	17	5.61E-02	0.0561	0.0561
1,2,3,4,7,8-HxCDD	ppt	USEPA 1613B	SQT	43	43	--	--	--
1,2,3,4,7,8-HxCDD	ppt	USEPA 1613B	Phase III	193	192	4.72E+00	4.72	4.72
1,2,3,4,7,8-HxCDF	ppt	USEPA 1613B	Phase I	273	260	6.79E-02	0.0363	0.14
1,2,3,4,7,8-HxCDF	ppt	USEPA 1613B	Phase II	281	253	1.05E-01	0.0479	0.242
1,2,3,4,7,8-HxCDF	ppt	USEPA 1613B	Crab/Clam	14	14	--	--	--
1,2,3,4,7,8-HxCDF	ppt	USEPA 1613B	SQT	43	43	--	--	--
1,2,3,4,7,8-HxCDF	ppt	USEPA 1613B	Phase III	193	193	--	--	--
1,2,3,6,7,8-HxCDD	ppt	USEPA 1613B	Phase I	273	259	4.01E-01	0.136	1.84
1,2,3,6,7,8-HxCDD	ppt	USEPA 1613B	Phase II	281	258	2.55E-01	0.117	0.53
1,2,3,6,7,8-HxCDD	ppt	USEPA 1613B	Crab/Clam	18	18	--	--	--
1,2,3,6,7,8-HxCDD	ppt	USEPA 1613B	SQT	43	43	--	--	--
1,2,3,6,7,8-HxCDD	ppt	USEPA 1613B	Phase III	193	193	--	--	--

Table A-3
Summary of Analyte Detections and Detection Limits in NBSA Phase I, II, and III Sediment Samples

Chemical	Units	Analytical Method	Sampling Program	N[1]	Number of Detected Samples	Detection Limit Summary for Non-Detect Data		
						Mean	Minimum	Maximum
1,2,3,6,7,8-HxCDF	ppt	USEPA 1613B	Phase I	273	247	6.72E-02	0.0256	0.181
1,2,3,6,7,8-HxCDF	ppt	USEPA 1613B	Phase II	281	240	8.84E-02	0.0229	0.168
1,2,3,6,7,8-HxCDF	ppt	USEPA 1613B	Crab/Clam	18	18	--	--	--
1,2,3,6,7,8-HxCDF	ppt	USEPA 1613B	SQT	43	43	--	--	--
1,2,3,6,7,8-HxCDF	ppt	USEPA 1613B	Phase III	193	193	--	--	--
1,2,3,7,8,9-HxCDD	ppt	USEPA 1613B	Phase I	273	258	4.60E-01	0.126	2.02
1,2,3,7,8,9-HxCDD	ppt	USEPA 1613B	Phase II	281	259	2.33E-01	0.114	0.524
1,2,3,7,8,9-HxCDD	ppt	USEPA 1613B	Crab/Clam	18	18	--	--	--
1,2,3,7,8,9-HxCDD	ppt	USEPA 1613B	SQT	43	43	--	--	--
1,2,3,7,8,9-HxCDD	ppt	USEPA 1613B	Phase III	193	193	--	--	--
1,2,3,7,8,9-HxCDF	ppt	USEPA 1613B	Phase I	273	225	1.08E-01	0.0363	1.29
1,2,3,7,8,9-HxCDF	ppt	USEPA 1613B	Phase II	281	98	2.51E+00	0.0282	25.3
1,2,3,7,8,9-HxCDF	ppt	USEPA 1613B	Crab/Clam	18	9	2.06E-01	0.0429	0.658
1,2,3,7,8,9-HxCDF	ppt	USEPA 1613B	SQT	43	24	2.54E-01	0.0438	1.09
1,2,3,7,8,9-HxCDF	ppt	USEPA 1613B	Phase III	193	121	4.91E+00	3.94	5.13
1,2,3,7,8-PeCDD	ppt	USEPA 1613B	Phase I	273	248	4.31E-01	0.0563	1.35
1,2,3,7,8-PeCDD	ppt	USEPA 1613B	Phase II	281	250	2.10E-01	0.0526	0.512
1,2,3,7,8-PeCDD	ppt	USEPA 1613B	Crab/Clam	18	18	--	--	--
1,2,3,7,8-PeCDD	ppt	USEPA 1613B	SQT	43	43	--	--	--
1,2,3,7,8-PeCDD	ppt	USEPA 1613B	Phase III	193	189	4.88E+00	4.72	4.99
1,2,3,7,8-PeCDF	ppt	USEPA 1613B	Phase I	273	240	1.75E-01	0.0751	0.648
1,2,3,7,8-PeCDF	ppt	USEPA 1613B	Phase II	281	241	1.45E-01	0.0645	0.276
1,2,3,7,8-PeCDF	ppt	USEPA 1613B	Crab/Clam	18	18	--	--	--
1,2,3,7,8-PeCDF	ppt	USEPA 1613B	SQT	43	43	--	--	--
1,2,3,7,8-PeCDF	ppt	USEPA 1613B	Phase III	193	193	--	--	--
2,3,4,6,7,8-HxCDF	ppt	USEPA 1613B	Phase I	273	244	6.74E-02	0.0247	0.141
2,3,4,6,7,8-HxCDF	ppt	USEPA 1613B	Phase II	281	238	1.50E-01	0.025	2.6
2,3,4,6,7,8-HxCDF	ppt	USEPA 1613B	Crab/Clam	17	17	--	--	--
2,3,4,6,7,8-HxCDF	ppt	USEPA 1613B	SQT	43	43	--	--	--
2,3,4,6,7,8-HxCDF	ppt	USEPA 1613B	Phase III	193	193	--	--	--
2,3,4,7,8-PeCDF	ppt	USEPA 1613B	Phase I	273	242	1.44E-01	0.0643	0.334
2,3,4,7,8-PeCDF	ppt	USEPA 1613B	Phase II	281	239	1.84E-01	0.0629	1.44
2,3,4,7,8-PeCDF	ppt	USEPA 1613B	Crab/Clam	18	18	--	--	--
2,3,4,7,8-PeCDF	ppt	USEPA 1613B	SQT	43	43	--	--	--
2,3,4,7,8-PeCDF	ppt	USEPA 1613B	Phase III	193	193	--	--	--
2,3,7,8-TCDD	ppt	USEPA 1613B	Phase I	273	246	3.53E-01	0.0687	2.19
2,3,7,8-TCDD	ppt	USEPA 1613B	Phase II	281	247	1.59E-01	0.0478	0.363
2,3,7,8-TCDD	ppt	USEPA 1613B	Crab/Clam	18	18	--	--	--
2,3,7,8-TCDD	ppt	USEPA 1613B	SQT	43	43	--	--	--
2,3,7,8-TCDD	ppt	USEPA 1613B	Phase III	193	193	--	--	--
2,3,7,8-TCDF	ppt	USEPA 1613B	Phase I	273	247	1.28E-01	0.0472	0.274
2,3,7,8-TCDF	ppt	USEPA 1613B	Phase II	281	244	1.25E-01	0.0587	0.275
2,3,7,8-TCDF	ppt	USEPA 1613B	Crab/Clam	18	18	--	--	--
2,3,7,8-TCDF	ppt	USEPA 1613B	SQT	43	43	--	--	--
2,3,7,8-TCDF	ppt	USEPA 1613B	Phase III	193	192	9.71E-01	0.971	0.971
OCDD	ppt	USEPA 1613B	Phase I	273	273	--	--	--

Table A-3
Summary of Analyte Detections and Detection Limits in NBSA Phase I, II, and III Sediment Samples

Chemical	Units	Analytical Method	Sampling Program	N[1]	Number of Detected Samples	Detection Limit Summary for Non-Detect Data		
						Mean	Minimum	Maximum
OCDD	ppt	USEPA 1613B	Phase II	281	281	--	--	--
OCDD	ppt	USEPA 1613B	Crab/Clam	16	16	--	--	--
OCDD	ppt	USEPA 1613B	SQT	43	43	--	--	--
OCDD	ppt	USEPA 1613B	Phase III	193	193	--	--	--
OCDF	ppt	USEPA 1613B	Phase I	273	258	3.86E-01	0.175	0.664
OCDF	ppt	USEPA 1613B	Phase II	281	262	5.41E-01	0.279	1.36
OCDF	ppt	USEPA 1613B	Crab/Clam	18	18	--	--	--
OCDF	ppt	USEPA 1613B	SQT	43	43	--	--	--
OCDF	ppt	USEPA 1613B	Phase III	193	193	--	--	--
Herbicides								
2,4,5-T	ppb	USEPA 8151A	Phase I	271	12	1.31E+03	110	26000
2,4,5-T	ppb	USEPA 8151A	Phase II	258	115	2.35E+01	11	220
2,4,5-T	ppb	USEPA 8151A	Crab/Clam	18	1	2.96E+00	1	32
2,4,5-T	ppb	USEPA 8151A	SQT	41	12	2.01E+00	1.1	12
2,4,5-T	ppb	USEPA 8151A	Phase III	190	10	5.67E+00	2	40
2,4,5-TP (Silvex)	ppb	USEPA 8151A	Phase I	271	8	1.32E+03	110	26000
2,4,5-TP (Silvex)	ppb	USEPA 8151A	Phase II	187	138	1.06E+01	5.4	120
2,4,5-TP (Silvex)	ppb	USEPA 8151A	Crab/Clam	18	1	2.68E+00	0.91	29
2,4,5-TP (Silvex)	ppb	USEPA 8151A	SQT	43	0	1.59E+00	1	3
2,4,5-TP (Silvex)	ppb	USEPA 8151A	Phase III	190	4	6.34E+00	2	40
2,4-D	ppb	USEPA 8151A	Phase I	271	0	3.16E+03	260	63000
2,4-D	ppb	USEPA 8151A	Phase II	270	149	7.33E+01	43	130
2,4-D	ppb	USEPA 8151A	Crab/Clam	18	3	4.65E+01	15	470
2,4-D	ppb	USEPA 8151A	SQT	43	0	2.49E+01	16	33
2,4-D	ppb	USEPA 8151A	Phase III	191	7	1.35E+02	43	850
2,4-DB	ppb	USEPA 8151A	Phase I	271	11	2.44E+03	190	48000
2,4-DB	ppb	USEPA 8151A	Phase II	129	73	3.44E+01	22	250
2,4-DB	ppb	USEPA 8151A	Crab/Clam	18	3	2.41E+01	7.6	240
2,4-DB	ppb	USEPA 8151A	SQT	43	2	1.48E+01	8.4	45
2,4-DB	ppb	USEPA 8151A	Phase III	192	0	6.27E+01	20	400
Metals								
Aluminum	ppm	USEPA 3050/6010	Phase I	272	272	--	--	--
Aluminum	ppm	USEPA CLP, ILM06.X	Phase II	281	280	1.10E+00	1.1	1.1
Aluminum	ppm	SW6020	Crab/Clam	18	18	--	--	--
Aluminum	ppm	SW6020	SQT	43	43	--	--	--
Aluminum	ppm	SW6020	Phase III	193	193	--	--	--
Antimony	ppm	USEPA 3050/6010	Phase I	259	69	9.52E-01	0.43	3.1
Antimony	ppm	USEPA CLP, ILM06.X	Phase II	264	0	4.97E+00	0.01	7.7
Antimony	ppm	SW6020	Crab/Clam	18	17	1.02E-01	0.102	0.102
Antimony	ppm	SW6020	SQT	43	42	8.77E-02	0.0877	0.0877
Antimony	ppm	SW6020	Phase III	193	171	1.33E-01	0.082	0.218
Arsenic	ppm	USEPA 3050/6010	Phase I	272	267	9.96E-01	0.46	2.9
Arsenic	ppm	USEPA CLP, ILM06.X	Phase II	281	281	--	--	--
Arsenic	ppm	SW6020	Crab/Clam	18	18	--	--	--
Arsenic	ppm	SW6020	SQT	43	43	--	--	--
Arsenic	ppm	SW6020	Phase III	193	193	--	--	--

Table A-3
Summary of Analyte Detections and Detection Limits in NBSA Phase I, II, and III Sediment Samples

Chemical	Units	Analytical Method	Sampling Program	N[1]	Number of Detected Samples	Detection Limit Summary for Non-Detect Data		
						Mean	Minimum	Maximum
Barium	ppm	USEPA 3050/6010	Phase I	272	272	--	--	--
Barium	ppm	USEPA CLP, ILM06.X	Phase II	281	281	--	--	--
Barium	ppm	SW6020	Crab/Clam	18	18	--	--	--
Barium	ppm	SW6020	SQT	43	43	--	--	--
Barium	ppm	SW6020	Phase III	193	193	--	--	--
Beryllium	ppm	USEPA 3050/6010	Phase I	272	272	--	--	--
Beryllium	ppm	USEPA CLP, ILM06.X	Phase II	281	251	1.01E+00	0.59	1.4
Beryllium	ppm	SW6020	Crab/Clam	18	18	--	--	--
Beryllium	ppm	SW6020	SQT	43	43	--	--	--
Beryllium	ppm	SW6020	Phase III	193	193	--	--	--
Cadmium	ppm	USEPA 3050/6010	Phase I	272	230	9.13E-02	0.027	0.39
Cadmium	ppm	USEPA CLP, ILM06.X	Phase II	281	273	8.94E-01	0.71	1.5
Cadmium	ppm	SW6020	Crab/Clam	18	18	--	--	--
Cadmium	ppm	SW6020	SQT	43	43	--	--	--
Cadmium	ppm	SW6020	Phase III	193	191	3.68E-02	0.0336	0.0399
Calcium	ppm	USEPA 3050/6010	Phase I	253	253	--	--	--
Calcium	ppm	USEPA CLP, ILM06.X	Phase II	281	281	--	--	--
Calcium	ppm	SW6020	Crab/Clam	18	18	--	--	--
Calcium	ppm	SW6020	SQT	42	42	--	--	--
Calcium	ppm	SW6020	Phase III	192	192	--	--	--
Chromium	ppm	USEPA 3050/6010	Phase I	272	272	--	--	--
Chromium	ppm	USEPA CLP, ILM06.X	Phase II	281	281	--	--	--
Chromium	ppm	SW6020	Crab/Clam	18	18	--	--	--
Chromium	ppm	SW6020	SQT	43	43	--	--	--
Chromium	ppm	SW6020	Phase III	193	193	--	--	--
Cobalt	ppm	USEPA 3050/6010	Phase I	272	272	--	--	--
Cobalt	ppm	USEPA CLP, ILM06.X	Phase II	281	281	--	--	--
Cobalt	ppm	SW6020	Crab/Clam	18	18	--	--	--
Cobalt	ppm	SW6020	SQT	43	43	--	--	--
Cobalt	ppm	SW6020	Phase III	193	193	--	--	--
Copper	ppm	USEPA 3050/6010	Phase I	267	267	--	--	--
Copper	ppm	USEPA CLP, ILM06.X	Phase II	281	281	--	--	--
Copper	ppm	SW6020	Crab/Clam	18	18	--	--	--
Copper	ppm	SW6020	SQT	43	43	--	--	--
Copper	ppm	SW6020	Phase III	193	193	--	--	--
Hexavalent Chromium	ppm	SW7196A	Crab/Clam	12	2	7.00E-01	0.61	1.1
Hexavalent Chromium	ppm	SW7196A	SQT	43	3	1.05E+00	0.68	1.4
Iron	ppm	USEPA 3050/6010	Phase I	272	272	--	--	--
Iron	ppm	USEPA CLP, ILM06.X	Phase II	281	281	--	--	--
Iron	ppm	SW6020	Crab/Clam	18	18	--	--	--
Iron	ppm	SW6020	SQT	43	43	--	--	--
Iron	ppm	SW6020	Phase III	193	193	--	--	--
Lead	ppm	USEPA 3050/6010	Phase I	272	272	--	--	--
Lead	ppm	USEPA CLP, ILM06.X	Phase II	281	281	--	--	--
Lead	ppm	SW6020	Crab/Clam	18	18	--	--	--
Lead	ppm	SW6020	SQT	43	43	--	--	--

Table A-3
Summary of Analyte Detections and Detection Limits in NBSA Phase I, II, and III Sediment Samples

Chemical	Units	Analytical Method	Sampling Program	N[1]	Number of Detected Samples	Detection Limit Summary for Non-Detect Data		
						Mean	Minimum	Maximum
Lead	ppm	SW6020	Phase III	193	193	--	--	--
Magnesium	ppm	USEPA 3050/6010	Phase I	272	272	--	--	--
Magnesium	ppm	USEPA CLP, ILM06.X	Phase II	281	281	--	--	--
Magnesium	ppm	SW6020	Crab/Clam	18	18	--	--	--
Magnesium	ppm	SW6020	SQT	43	43	--	--	--
Magnesium	ppm	SW6020	Phase III	193	193	--	--	--
Manganese	ppm	USEPA 3050/6010	Phase I	272	272	--	--	--
Manganese	ppm	USEPA CLP, ILM06.X	Phase II	281	281	--	--	--
Manganese	ppm	SW6020	Crab/Clam	18	18	--	--	--
Manganese	ppm	SW6020	SQT	43	43	--	--	--
Manganese	ppm	SW6020	Phase III	193	193	--	--	--
Mercury	ppm	USEPA 7471A	Phase I	272	266	3.28E-03	0.0024	0.0053
Mercury	ppm	USEPA CLP, ILM06.X	Phase II	281	244	1.52E-02	0.0075	0.062
Mercury	ppm	E1631B	Crab/Clam	18	18	--	--	--
Mercury	ppm	E1631B	SQT	43	43	--	--	--
Mercury	ppm	E1631B	Phase III	193	193	--	--	--
Methyl Mercury	ppm	E1630M	Crab/Clam	18	18	--	--	--
Methyl Mercury	ppm	E1630M	SQT	43	43	--	--	--
Methyl Mercury	ppm	E1630M	Phase III	193	192	1.70E-05	0.000017	0.000017
Nickel	ppm	USEPA 3050/6010	Phase I	272	272	--	--	--
Nickel	ppm	USEPA CLP, ILM06.X	Phase II	281	281	--	--	--
Nickel	ppm	SW6020	Crab/Clam	18	18	--	--	--
Nickel	ppm	SW6020	SQT	43	43	--	--	--
Nickel	ppm	SW6020	Phase III	193	193	--	--	--
Potassium	ppm	USEPA 3050/6010	Phase I	235	235	--	--	--
Potassium	ppm	USEPA CLP, ILM06.X	Phase II	281	281	--	--	--
Potassium	ppm	SW6020	Crab/Clam	18	18	--	--	--
Potassium	ppm	SW6020	SQT	43	43	--	--	--
Potassium	ppm	SW6020	Phase III	193	193	--	--	--
Selenium	ppm	USEPA 3050/6010	Phase I	255	123	8.31E-01	0.42	3.6
Selenium	ppm	USEPA CLP, ILM06.X	Phase II	281	237	3.92E+00	0.017	6.3
Selenium	ppm	SW6020	Crab/Clam	18	17	1.21E-01	0.121	0.121
Selenium	ppm	SW6020	SQT	43	43	--	--	--
Selenium	ppm	SW6020	Phase III	192	190	8.29E-02	0.0758	0.0899
Silver	ppm	USEPA 3050/6010	Phase I	272	238	1.70E-01	0.062	0.44
Silver	ppm	USEPA CLP, ILM06.X	Phase II	240	221	1.05E+00	0.003	7.8
Silver	ppm	SW6020	Crab/Clam	18	18	--	--	--
Silver	ppm	SW6020	SQT	43	43	--	--	--
Silver	ppm	SW6020	Phase III	193	192	2.43E-02	0.0243	0.0243
Sodium	ppm	USEPA 3050/6010	Phase I	272	272	--	--	--
Sodium	ppm	USEPA CLP, ILM06.X	Phase II	281	281	--	--	--
Sodium	ppm	SW6020	Crab/Clam	18	18	--	--	--
Sodium	ppm	SW6020	SQT	43	43	--	--	--
Sodium	ppm	SW6020	Phase III	193	193	--	--	--
Thallium	ppm	USEPA 3050/6010	Phase I	247	72	1.75E+00	0.68	19.200001
Thallium	ppm	USEPA CLP, ILM06.X	Phase II	281	218	9.86E-01	0.0042	1.5

Table A-3
Summary of Analyte Detections and Detection Limits in NBSA Phase I, II, and III Sediment Samples

Chemical	Units	Analytical Method	Sampling Program	N[1]	Number of Detected Samples	Detection Limit Summary for Non-Detect Data		
						Mean	Minimum	Maximum
Thallium	ppm	SW6020	Crab/Clam	18	17	3.63E-02	0.0363	0.0363
Thallium	ppm	SW6020	SQT	43	43	--	--	--
Thallium	ppm	SW6020	Phase III	193	190	3.06E-02	0.0242	0.0377
Titanium	ppm	USEPA 3050/6010	Phase I	272	272	--	--	--
Titanium	ppm	USEPA CLP, ILM06.X	Phase II	281	281	--	--	--
Titanium	ppm	SW6020	Crab/Clam	18	18	--	--	--
Titanium	ppm	SW6020	SQT	43	43	--	--	--
Titanium	ppm	SW6020	Phase III	193	193	--	--	--
Vanadium	ppm	USEPA 3050/6010	Phase I	272	272	--	--	--
Vanadium	ppm	USEPA CLP, ILM06.X	Phase II	281	281	--	--	--
Vanadium	ppm	SW6020	Crab/Clam	18	18	--	--	--
Vanadium	ppm	SW6020	SQT	43	43	--	--	--
Vanadium	ppm	SW6020	Phase III	193	193	--	--	--
Zinc	ppm	USEPA 3050/6010	Phase I	272	272	--	--	--
Zinc	ppm	USEPA CLP, ILM06.X	Phase II	281	281	--	--	--
Zinc	ppm	SW6020	Crab/Clam	18	18	--	--	--
Zinc	ppm	SW6020	SQT	43	43	--	--	--
Zinc	ppm	SW6020	Phase III	193	193	--	--	--
Miscellaneous Chemicals								
Ammonia Nitrogen	ppm	E350.2	Crab/Clam	15	1	4.32E+02	105	902
Ammonia Nitrogen	ppm	E350.2	SQT	43	15	1.10E+02	75.199997	140
Phosphorus	ppm	E365.1	Crab/Clam	18	18	--	--	--
Phosphorus	ppm	E365.1	SQT	43	43	--	--	--
Sulfide	ppm	SW9030	Crab/Clam	17	17	--	--	--
Sulfide	ppm	SW9030	SQT	43	43	--	--	--
Total Cyanide	ppm	USEPA 9012A	Phase I	262	40	3.56E-01	0.19	1.2
Total Cyanide	ppm	USEPA CLP, ILM06.XCN	Phase II	281	194	4.31E-01	0.076	8.3
Total Cyanide	ppm	SW9012A	Crab/Clam	18	2	2.41E-01	0.21	0.35
Total Cyanide	ppm	SW9012A	SQT	43	3	3.61E-01	0.24	0.5
Total Cyanide	ppm	SW9012A	Phase III	192	9	3.29E-01	0.2	0.57
Total Kjeldahl Nitrogen (TKN)	ppm	E351.2	Crab/Clam	17	10	6.81E+01	59.7	79.3
Total Kjeldahl Nitrogen (TKN)	ppm	E351.2	SQT	43	43	--	--	--
TEPH Alkanes								
2,6,10,14-Tetramethyl Pentadecane	ppm	8015C	Crab/Clam	18	4	8.73E-02	0.021	0.361
2,6,10,14-Tetramethyl Pentadecane	ppm	8015C	SQT	43	9	6.63E-02	0.0231	0.339
2,6,10,14-Tetramethyl Pentadecane	ppm	8015C	Phase III	193	101	1.57E-01	0.0398	1.64
2,6,10,14-Tetramethylhexadecane	ppm	8015C	Crab/Clam	18	10	7.08E-02	0.0136	0.234
2,6,10,14-Tetramethylhexadecane	ppm	8015C	SQT	43	14	3.94E-02	0.0149	0.129
2,6,10,14-Tetramethylhexadecane	ppm	8015C	Phase III	193	141	9.01E-02	0.0398	0.371
Dotriacontane	ppm	8015C	Crab/Clam	18	16	1.63E-02	0.016	0.0165
Dotriacontane	ppm	8015C	SQT	43	32	4.93E-02	0.019	0.259
Dotriacontane	ppm	8015C	Phase III	193	156	2.33E-01	0.0403	1.64
Heneicosane	ppm	8015C	Crab/Clam	18	10	6.09E-02	0.0269	0.234
Heneicosane	ppm	8015C	SQT	43	25	6.20E-02	0.0149	0.258
Heneicosane	ppm	8015C	Phase III	193	93	2.35E-01	0.0398	1.64
Heptacosane	ppm	8015C	Crab/Clam	18	3	2.50E-01	0.0395	0.913

Table A-3
Summary of Analyte Detections and Detection Limits in NBSA Phase I, II, and III Sediment Samples

Chemical	Units	Analytical Method	Sampling Program	N[1]	Number of Detected Samples	Detection Limit Summary for Non-Detect Data		
						Mean	Minimum	Maximum
Heptacosane	ppm	8015C	SQT	43	8	1.49E-01	0.0434	0.751
Heptacosane	ppm	8015C	Phase III	193	67	6.65E-01	0.115	4.71
Heptadecane	ppm	8015C	Crab/Clam	17	11	1.06E-01	0.0222	0.269
Heptadecane	ppm	8015C	SQT	43	27	9.81E-02	0.0264	0.359
Heptadecane	ppm	8015C	Phase III	193	143	1.85E-01	0.0398	1.64
Heptatriacontane, -n	ppm	8015C	Crab/Clam	18	6	8.17E-02	0.0136	0.314
Heptatriacontane, -n	ppm	8015C	SQT	43	23	6.03E-02	0.0167	0.258
Heptatriacontane, -n	ppm	8015C	Phase III	193	104	2.45E-01	0.0398	1.64
Hexatriacontane	ppm	8015C	Crab/Clam	18	3	8.01E-02	0.0136	0.314
Hexatriacontane	ppm	8015C	SQT	43	19	4.30E-02	0.0149	0.22
Hexatriacontane	ppm	8015C	Phase III	193	69	1.79E-01	0.0398	1.64
Hhentriacontane	ppm	8015C	Crab/Clam	18	13	1.87E-01	0.0397	0.462
Hhentriacontane	ppm	8015C	SQT	43	30	1.23E-01	0.0237	0.38
Hhentriacontane	ppm	8015C	Phase III	193	95	3.60E-01	0.0587	2.41
n-Decane	ppm	8015C	Crab/Clam	18	0	1.03E-01	0.0182	0.422
n-Decane	ppm	8015C	SQT	43	0	6.33E-02	0.0201	0.348
n-Decane	ppm	8015C	Phase III	193	45	2.22E-01	0.0537	2.21
n-Docosane	ppm	8015C	Crab/Clam	18	10	6.11E-02	0.0136	0.165
n-Docosane	ppm	8015C	SQT	43	30	2.68E-02	0.0161	0.0447
n-Docosane	ppm	8015C	Phase III	193	174	1.35E-01	0.0398	0.817
n-Dodecane	ppm	8015C	Crab/Clam	18	4	8.80E-02	0.0136	0.314
n-Dodecane	ppm	8015C	SQT	43	3	4.38E-02	0.0149	0.258
n-Dodecane	ppm	8015C	Phase III	193	105	2.18E-01	0.0398	1.62
n-Eicosane	ppm	8015C	Crab/Clam	18	5	8.12E-02	0.0148	0.342
n-Eicosane	ppm	8015C	SQT	43	12	5.11E-02	0.0163	0.282
n-Eicosane	ppm	8015C	Phase III	193	67	1.86E-01	0.0398	1.64
n-Hexacosane	ppm	8015C	Crab/Clam	18	2	1.14E-01	0.0234	0.403
n-Hexacosane	ppm	8015C	SQT	43	12	8.08E-02	0.0258	0.446
n-Hexacosane	ppm	8015C	Phase III	193	83	2.31E-01	0.0398	1.64
n-Hexadecane	ppm	8015C	Crab/Clam	18	8	7.85E-02	0.0136	0.314
n-Hexadecane	ppm	8015C	SQT	43	19	3.71E-02	0.0149	0.128
n-Hexadecane	ppm	8015C	Phase III	193	32	2.07E-01	0.0398	1.64
n-Nonane	ppm	8015C	Crab/Clam	18	1	8.06E-02	0.0136	0.314
n-Nonane	ppm	8015C	SQT	43	3	4.87E-02	0.0149	0.258
n-Nonane	ppm	8015C	Phase III	193	26	2.04E-01	0.0398	1.64
n-Octacosane	ppm	8015C	Crab/Clam	18	16	7.78E-02	0.0136	0.142
n-Octacosane	ppm	8015C	SQT	43	39	2.81E-02	0.0266	0.0298
n-Octacosane	ppm	8015C	Phase III	193	192	4.03E-02	0.0403	0.0403
n-Octadecane	ppm	8015C	Crab/Clam	18	7	1.25E-01	0.0185	0.428
n-Octadecane	ppm	8015C	SQT	43	20	8.66E-02	0.0204	0.352
n-Octadecane	ppm	8015C	Phase III	193	129	2.69E-01	0.0403	1.64
Nonacosane	ppm	8015C	Crab/Clam	18	17	2.76E-02	0.0276	0.0276
Nonacosane	ppm	8015C	SQT	43	39	1.49E-01	0.0213	0.258
Nonacosane	ppm	8015C	Phase III	193	174	3.73E-01	0.0403	1.64
Nonadecane	ppm	8015C	Crab/Clam	18	8	8.97E-02	0.0197	0.456
Nonadecane	ppm	8015C	SQT	43	5	7.22E-02	0.0217	0.376

Table A-3
Summary of Analyte Detections and Detection Limits in NBSA Phase I, II, and III Sediment Samples

Chemical	Units	Analytical Method	Sampling Program	N[1]	Number of Detected Samples	Detection Limit Summary for Non-Detect Data		
						Mean	Minimum	Maximum
Nonadecane	ppm	8015C	Phase III	193	57	2.11E-01	0.0398	1.64
Nonatriacontane	ppm	8015C	Crab/Clam	18	8	1.66E-01	0.0247	0.571
Nonatriacontane	ppm	8015C	SQT	43	7	8.81E-02	0.0271	0.47
Nonatriacontane	ppm	8015C	Phase III	193	8	3.61E-01	0.0724	2.98
n-Tetracosane	ppm	8015C	Crab/Clam	18	7	9.92E-02	0.0136	0.314
n-Tetracosane	ppm	8015C	SQT	43	26	4.69E-02	0.0149	0.22
n-Tetracosane	ppm	8015C	Phase III	193	144	2.70E-01	0.0403	1.64
n-Tetradecane	ppm	8015C	Crab/Clam	18	1	1.03E-01	0.0173	0.399
n-Tetradecane	ppm	8015C	SQT	43	7	6.60E-02	0.019	0.329
n-Tetradecane	ppm	8015C	Phase III	193	118	3.10E-01	0.0398	1.64
n-Triacontane	ppm	8015C	Crab/Clam	18	7	1.42E-01	0.026	0.576
n-Triacontane	ppm	8015C	SQT	43	30	1.23E-01	0.0334	0.474
n-Triacontane	ppm	8015C	Phase III	193	48	3.71E-01	0.0735	3.01
n-Tridecane	ppm	8015C	Crab/Clam	18	3	7.85E-02	0.0136	0.314
n-Tridecane	ppm	8015C	SQT	43	1	4.75E-02	0.0149	0.258
n-Tridecane	ppm	8015C	Phase III	193	57	1.90E-01	0.0398	1.64
n-Undecane	ppm	8015C	Crab/Clam	18	0	1.41E-01	0.0249	0.576
n-Undecane	ppm	8015C	SQT	43	1	8.74E-02	0.0274	0.474
n-Undecane	ppm	8015C	Phase III	193	14	3.61E-01	0.0733	3.01
Octatriacontane	ppm	8015C	Crab/Clam	18	4	1.24E-01	0.0185	0.428
Octatriacontane	ppm	8015C	SQT	43	8	7.11E-02	0.0204	0.352
Octatriacontane	ppm	8015C	Phase III	193	35	2.05E-01	0.0398	1.64
Pentacosane	ppm	8015C	Crab/Clam	18	9	1.31E-01	0.0285	0.314
Pentacosane	ppm	8015C	SQT	43	24	3.22E-02	0.0149	0.117
Pentacosane	ppm	8015C	Phase III	193	178	3.48E-01	0.0403	0.695
Pentadecane	ppm	8015C	Crab/Clam	18	9	7.56E-02	0.0136	0.314
Pentadecane	ppm	8015C	SQT	43	8	5.12E-02	0.0149	0.258
Pentadecane	ppm	8015C	Phase III	193	114	2.20E-01	0.0398	1.64
Pentatriacontane	ppm	8015C	Crab/Clam	18	10	1.00E-01	0.0136	0.314
Pentatriacontane	ppm	8015C	SQT	43	25	4.68E-02	0.0161	0.258
Pentatriacontane	ppm	8015C	Phase III	193	170	2.27E-01	0.0403	1.64
Tetracontane	ppm	8015C	Crab/Clam	18	14	1.35E-01	0.0295	0.314
Tetracontane	ppm	8015C	SQT	43	20	6.00E-02	0.0149	0.258
Tetracontane	ppm	8015C	Phase III	193	121	2.59E-01	0.0403	1.64
Tetratriacontane	ppm	8015C	Crab/Clam	18	6	1.09E-01	0.016	0.371
Tetratriacontane	ppm	8015C	SQT	43	3	5.77E-02	0.0176	0.305
Tetratriacontane	ppm	8015C	Phase III	193	50	2.07E-01	0.0398	1.64
Tricosane	ppm	8015C	Crab/Clam	18	11	3.73E-02	0.0173	0.0993
Tricosane	ppm	8015C	SQT	43	37	5.27E-02	0.0205	0.149
Tricosane	ppm	8015C	Phase III	193	180	1.36E-01	0.0403	0.405
Tritriacontane	ppm	8015C	Crab/Clam	18	3	1.46E-01	0.0271	0.628
Tritriacontane	ppm	8015C	SQT	43	7	9.89E-02	0.0299	0.517
Tritriacontane	ppm	8015C	Phase III	193	79	2.36E-01	0.0398	1.64
Organotins								
Dibutyltin	ppb	STL LM-GC-ALKYLTIN	Phase I	271	166	3.14E+00	0.94	11
Dibutyltin	ppb	ORGANOTINS_GC	Crab/Clam	18	7	1.66E+00	1.5	1.8

Table A-3
Summary of Analyte Detections and Detection Limits in NBSA Phase I, II, and III Sediment Samples

Chemical	Units	Analytical Method	Sampling Program	N[1]	Number of Detected Samples	Detection Limit Summary for Non-Detect Data		
						Mean	Minimum	Maximum
Dibutyltin	ppb	ORGANOTINS_GC	SQT	43	6	2.69E+00	1.7	3.6
Monobutyltin	ppb	STL LM-GC-ALKYLTIN	Phase I	254	3	3.45E+00	1.9	11
Monobutyltin	ppb	ORGANOTINS_GC	Crab/Clam	18	0	2.86E+01	24	40
Monobutyltin	ppb	ORGANOTINS_GC	SQT	43	0	4.26E+01	27	58
Tetrabutyltin	ppb	STL LM-GC-ALKYLTIN	Phase I	271	30	3.40E+00	1.9	11
Tetrabutyltin	ppb	ORGANOTINS_GC	Crab/Clam	18	1	2.34E+00	2	3.3
Tetrabutyltin	ppb	ORGANOTINS_GC	SQT	43	0	3.50E+00	2.2	4.8
Tributyltin	ppb	STL LM-GC-ALKYLTIN	Phase I	271	159	3.13E+00	1.9	11
Tributyltin	ppb	ORGANOTINS_GC	Crab/Clam	18	5	2.08E+00	1.8	2.9
Tributyltin	ppb	ORGANOTINS_GC	SQT	43	7	3.11E+00	2	4.1
PBDEs								
BDE-1	ppt	PBDE	Phase II	56	30	1.40E+01	0.928	52.1
BDE-10	ppt	PBDE	Phase II	56	2	9.19E-01	0.132	4.68
BDE-100	ppt	PBDE	Phase II	56	21	4.54E+00	0.369	47.7
BDE-105	ppt	PBDE	Phase II	56	0	9.06E+00	0.928	60.1
BDE-116	ppt	PBDE	Phase II	56	2	5.33E+00	0.507	41.2
BDE-118	ppt	PBDE	Phase II	56	1	4.85E+00	0.426	34.6
BDE-119	ppt	PBDE	Phase II	56	5	2.72E+00	0.233	18.9
BDE-12/13	ppt	PBDE	Phase II	56	19	1.05E+00	0.0611	5.15
BDE-126	ppt	PBDE	Phase II	56	0	2.38E+00	0.22	17.9
BDE-138	ppt	PBDE	Phase II	56	3	1.76E+01	1.08	86.8
BDE-139	ppt	PBDE	Phase II	56	1	2.05E+01	1.31	105
BDE-140	ppt	PBDE	Phase II	56	0	2.26E+01	1.4	113
BDE-15	ppt	PBDE	Phase II	56	44	2.11E+00	0.259	7.51
BDE-153	ppt	PBDE	Phase II	56	17	1.61E+01	0.827	64.9
BDE-154	ppt	PBDE	Phase II	56	19	1.09E+01	0.461	46.3
BDE-155	ppt	PBDE	Phase II	56	7	7.83E+00	0.423	42.5
BDE-156/169	ppt	PBDE	Phase II	56	0	3.14E+01	2.02	163
BDE-166	ppt	PBDE	Phase II	56	0	2.75E+01	1.74	140
BDE-17	ppt	PBDE	Phase II	56	20	1.53E+00	0.202	10.1
BDE-179	ppt	PBDE	Phase II	56	9	2.38E+01	2.38	144
BDE-181	ppt	PBDE	Phase II	56	0	1.55E+01	2.12	101
BDE-183/176	ppt	PBDE	Phase II	56	30	1.31E+01	1.99	48.7
BDE-188	ppt	PBDE	Phase II	56	1	1.34E+01	1.6	84.8
BDE-190	ppt	PBDE	Phase II	56	3	2.41E+01	2.95	157
BDE-191	ppt	PBDE	Phase II	56	6	3.12E+01	3.38	200
BDE-196	ppt	PBDE	Phase II	56	20	6.48E+01	7.61	380
BDE-197	ppt	PBDE	Phase II	56	22	1.14E+01	1.46	102
BDE-2	ppt	PBDE	Phase II	56	23	1.03E+01	0.581	77.4
BDE-202	ppt	PBDE	Phase II	56	6	4.15E+01	4.64	277
BDE-203	ppt	PBDE	Phase II	56	14	1.87E+01	2.28	97.7
BDE-205	ppt	PBDE	Phase II	56	0	1.17E+02	16.6	782
BDE-207	ppt	PBDE	Phase II	49	19	6.89E+01	8.12	319
BDE-208	ppt	PBDE	Phase II	49	12	7.95E+01	9.75	352
BDE-209	ppt	PBDE	Phase II	43	28	1.70E+02	37.900002	709
BDE-25	ppt	PBDE	Phase II	56	14	1.70E+00	0.419	6.23

Table A-3
Summary of Analyte Detections and Detection Limits in NBSA Phase I, II, and III Sediment Samples

Chemical	Units	Analytical Method	Sampling Program	N[1]	Number of Detected Samples	Detection Limit Summary for Non-Detect Data		
						Mean	Minimum	Maximum
BDE-28/33	ppt	PBDE	Phase II	56	38	1.57E+00	0.374	2.85
BDE-3	ppt	PBDE	Phase II	56	45	1.01E+01	2.29	32.1
BDE-30	ppt	PBDE	Phase II	56	0	9.51E-01	0.163	3.44
BDE-32	ppt	PBDE	Phase II	56	16	1.37E+00	0.323	5.35
BDE-35	ppt	PBDE	Phase II	56	1	8.52E+00	0.118	80.1
BDE-37	ppt	PBDE	Phase II	56	0	8.71E-01	0.144	2.84
BDE-47	ppt	PBDE	Phase II	56	11	9.71E+00	0.552	31.4
BDE-49	ppt	PBDE	Phase II	56	26	1.75E+00	0.128	16.9
BDE-66	ppt	PBDE	Phase II	56	9	1.45E+00	0.188	6.73
BDE-7	ppt	PBDE	Phase II	56	26	1.49E+00	0.177	7.48
BDE-71	ppt	PBDE	Phase II	56	11	1.08E+00	0.135	4.84
BDE-75	ppt	PBDE	Phase II	56	7	6.29E-01	0.0337	3.01
BDE-77	ppt	PBDE	Phase II	56	0	7.52E-01	0.107	3.82
BDE-8/11	ppt	PBDE	Phase II	56	44	1.31E+00	0.183	7.51
BDE-85	ppt	PBDE	Phase II	56	3	3.20E+00	0.288	23.4
BDE-99	ppt	PBDE	Phase II	56	15	1.02E+01	0.903	51.9
PCB Aroclors								
Aroclor-1016	ppb	USEPA 3550B/8082	Phase I	273	0	2.71E+02	35	2200
Aroclor-1016	ppb	USEPA CLP SOM01.2-PCB	Phase II	281	0	6.83E+01	36	180
Aroclor-1016	ppb	SW8082	Crab/Clam	18	0	6.31E+00	4.4	27
Aroclor-1016	ppb	SW8082	SQT	43	0	1.10E+01	4.9	72
Aroclor-1016	ppb	SW8082	Phase III	193	0	5.00E+01	20	270
Aroclor-1221	ppb	USEPA 3550B/8082	Phase I	273	0	2.71E+02	35	2200
Aroclor-1221	ppb	USEPA CLP SOM01.2-PCB	Phase II	281	0	6.83E+01	36	180
Aroclor-1221	ppb	SW8082	Crab/Clam	18	0	8.04E+00	5.6	34
Aroclor-1221	ppb	SW8082	SQT	43	0	1.40E+01	6.2	92
Aroclor-1221	ppb	SW8082	Phase III	193	0	5.00E+01	20	270
Aroclor-1232	ppb	USEPA 3550B/8082	Phase I	273	0	2.71E+02	35	2200
Aroclor-1232	ppb	USEPA CLP SOM01.2-PCB	Phase II	281	0	6.83E+01	36	180
Aroclor-1232	ppb	SW8082	Crab/Clam	18	0	1.40E+01	9.7	60
Aroclor-1232	ppb	SW8082	SQT	43	0	2.43E+01	11	160
Aroclor-1232	ppb	SW8082	Phase III	193	0	5.00E+01	20	270
Aroclor-1242	ppb	USEPA 3550B/8082	Phase I	273	13	2.60E+02	35	2200
Aroclor-1242	ppb	USEPA CLP SOM01.2-PCB	Phase II	281	178	5.75E+01	36	88
Aroclor-1242	ppb	SW8082	Crab/Clam	18	0	5.79E+00	4	25
Aroclor-1242	ppb	SW8082	SQT	43	1	1.02E+01	4.5	66
Aroclor-1242	ppb	SW8082	Phase III	193	0	5.00E+01	20	270
Aroclor-1248	ppb	USEPA 3550B/8082	Phase I	273	174	2.23E+02	35	2100
Aroclor-1248	ppb	USEPA CLP SOM01.2-PCB	Phase II	281	0	6.83E+01	36	180
Aroclor-1248	ppb	SW8082	Crab/Clam	18	16	4.10E+00	4	4.2
Aroclor-1248	ppb	SW8082	SQT	43	36	1.08E+01	4.8	35
Aroclor-1248	ppb	SW8082	Phase III	193	179	3.07E+01	21	46
Aroclor-1254	ppb	USEPA 3550B/8082	Phase I	273	190	1.63E+02	35	1100
Aroclor-1254	ppb	USEPA CLP SOM01.2-PCB	Phase II	279	198	5.40E+01	36	88
Aroclor-1254	ppb	SW8082	Crab/Clam	18	14	1.20E+01	4.5	25
Aroclor-1254	ppb	SW8082	SQT	43	41	8.15E+00	7.7	8.6

Table A-3
Summary of Analyte Detections and Detection Limits in NBSA Phase I, II, and III Sediment Samples

Chemical	Units	Analytical Method	Sampling Program	N[1]	Number of Detected Samples	Detection Limit Summary for Non-Detect Data		
						Mean	Minimum	Maximum
Aroclor-1254	ppb	SW8082	Phase III	193	176	3.62E+01	21	140
Aroclor-1260	ppb	USEPA 3550B/8082	Phase I	273	177	1.71E+02	35	1400
Aroclor-1260	ppb	USEPACLP SOM01.2-PCB	Phase II	281	198	5.33E+01	36	73
Aroclor-1260	ppb	SW8082	Crab/Clam	18	9	1.06E+01	6	37
Aroclor-1260	ppb	SW8082	SQT	43	24	2.09E+01	6.6	97
Aroclor-1260	ppb	SW8082	Phase III	193	127	3.99E+01	21	210
Aroclor-1262	ppb	USEPA 3550B/8082	Phase I	273	0	2.71E+02	35	2200
Aroclor-1262	ppb	USEPA CLP SOM01.2-PCB	Phase II	281	0	6.83E+01	36	180
Aroclor-1262	ppb	SW8082	Crab/Clam	18	0	5.79E+00	4	25
Aroclor-1262	ppb	SW8082	SQT	43	9	7.98E+00	4.5	35
Aroclor-1262	ppb	SW8082	Phase III	193	0	5.00E+01	20	270
Aroclor-1268	ppb	USEPA 3550B/8082	Phase I	273	12	2.75E+02	35	2200
Aroclor-1268	ppb	USEPA CLP SOM01.2-PCB	Phase II	281	37	6.78E+01	36	180
Aroclor-1268	ppb	SW8082	Crab/Clam	18	0	5.79E+00	4	25
Aroclor-1268	ppb	SW8082	SQT	43	1	1.02E+01	4.5	66
Aroclor-1268	ppb	SW8082	Phase III	193	0	5.00E+01	20	270
PCB Congeners								
PCB 1	ppt	USEPA 1668A	Phase I	273	228	1.19E+01	2.51	48.2
PCB 1	ppt	USEPA 1668A	Phase II	270	226	2.14E+01	2.45	212
PCB 1	ppt	USEPA 1668A	Crab/Clam	18	17	3.66E+01	36.6	36.6
PCB 1	ppt	USEPA 1668A	SQT	43	43	--	--	--
PCB 1	ppt	USEPA 1668A	Phase III	193	171	3.90E+01	36.8	41.4
PCB 10	ppt	USEPA 1668A	Crab/Clam	18	8	1.10E+02	83.1	186
PCB 10	ppt	USEPA 1668A	SQT	43	29	1.47E+02	99.9	252
PCB 10	ppt	USEPA 1668A	Phase III	193	154	1.23E+02	91.9	565
PCB 100	ppt	USEPA 1668A	Phase I	272	193	2.18E+01	2.51	128
PCB 100	ppt	USEPA 1668A	Phase II	281	197	3.71E+01	2.45	212
PCB 103	ppt	USEPA 1668A	Phase I	273	197	2.17E+01	2.51	128
PCB 103	ppt	USEPA 1668A	Phase II	281	203	4.15E+01	2.45	597
PCB 103	ppt	USEPA 1668A	Crab/Clam	18	13	1.01E+02	91.5	116
PCB 103	ppt	USEPA 1668A	SQT	43	35	1.63E+02	119	252
PCB 103	ppt	USEPA 1668A	Phase III	193	159	1.15E+02	94.4	565
PCB 104	ppt	USEPA 1668A	Phase I	269	112	3.30E+01	2.51	209
PCB 104	ppt	USEPA 1668A	Phase II	281	104	6.25E+01	2.45	254
PCB 104	ppt	USEPA 1668A	Crab/Clam	18	1	1.13E+02	83.1	186
PCB 104	ppt	USEPA 1668A	SQT	43	6	1.61E+02	99.9	252
PCB 104	ppt	USEPA 1668A	Phase III	193	41	1.07E+02	75.4	565
PCB 105	ppt	USEPA 1668A	Phase I	273	257	1.23E+01	5.8	44.4
PCB 105	ppt	USEPA 1668A	Phase II	281	251	2.82E+00	0.43	12.4
PCB 105	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--
PCB 105	ppt	USEPA 1668A	SQT	43	42	1.44E+02	144	144
PCB 105	ppt	USEPA 1668A	Phase III	193	183	1.01E+02	94.4	122
PCB 106	ppt	USEPA 1668A	Crab/Clam	18	1	1.13E+02	83.1	186
PCB 106	ppt	USEPA 1668A	SQT	43	0	1.65E+02	99.9	252
PCB 106	ppt	USEPA 1668A	Phase III	193	7	1.06E+02	75.4	565
PCB 106/118	ppt	USEPA 1668A	Phase I	273	263	3.06E+01	5.8	126

Table A-3
Summary of Analyte Detections and Detection Limits in NBSA Phase I, II, and III Sediment Samples

Chemical	Units	Analytical Method	Sampling Program	N[1]	Number of Detected Samples	Detection Limit Summary for Non-Detect Data		
						Mean	Minimum	Maximum
PCB 106/118	ppt	USEPA 1668A	Phase II	281	259	3.94E+00	0.506	15.2
PCB 107	ppt	USEPA 1668A	Crab/Clam	18	17	9.15E+01	91.5	91.5
PCB 107	ppt	USEPA 1668A	SQT	43	43	--	--	--
PCB 107	ppt	USEPA 1668A	Phase III	193	180	1.01E+02	94.4	122
PCB 107/109	ppt	USEPA 1668A	Phase I	273	226	1.45E+01	2.51	121
PCB 107/109	ppt	USEPA 1668A	Phase II	281	222	1.46E+01	2.45	62.4
PCB 108/112	ppt	USEPA 1668A	Phase I	273	221	1.55E+01	2.51	121
PCB 108/112	ppt	USEPA 1668A	Phase II	281	221	1.45E+01	2.45	62.4
PCB 108/124	ppt	USEPA 1668A	Crab/Clam	18	15	1.96E+02	183	215
PCB 108/124	ppt	USEPA 1668A	SQT	43	39	3.02E+02	242	394
PCB 108/124	ppt	USEPA 1668A	Phase III	193	151	2.01E+02	189	289
PCB 11	ppt	USEPA 1668A	Phase I	272	236	4.38E+01	7.57	243
PCB 11	ppt	USEPA 1668A	Phase II	281	229	4.32E+01	2.45	234
PCB 11	ppt	USEPA 1668A	Crab/Clam	18	10	5.02E+02	173	869
PCB 11	ppt	USEPA 1668A	SQT	43	43	--	--	--
PCB 11	ppt	USEPA 1668A	Phase III	193	193	--	--	--
PCB 110	ppt	USEPA 1668A	Phase I	273	259	3.22E+01	5.8	189
PCB 110	ppt	USEPA 1668A	Phase II	281	254	7.76E+00	2.45	42.2
PCB 110/115	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--
PCB 110/115	ppt	USEPA 1668A	SQT	43	43	--	--	--
PCB 110/115	ppt	USEPA 1668A	Phase III	193	183	1.97E+02	151	243
PCB 111	ppt	USEPA 1668A	Crab/Clam	18	1	1.13E+02	83.1	186
PCB 111	ppt	USEPA 1668A	SQT	43	1	1.65E+02	99.9	252
PCB 111	ppt	USEPA 1668A	Phase III	193	5	1.06E+02	75.4	565
PCB 111/115	ppt	USEPA 1668A	Phase I	273	209	1.91E+01	2.51	128
PCB 111/115	ppt	USEPA 1668A	Phase II	281	214	2.29E+01	2.45	210
PCB 112	ppt	USEPA 1668A	Crab/Clam	18	3	1.14E+02	83.1	186
PCB 112	ppt	USEPA 1668A	SQT	42	3	1.67E+02	99.9	252
PCB 112	ppt	USEPA 1668A	Phase III	193	53	1.08E+02	83.6	565
PCB 113	ppt	USEPA 1668A	Phase I	270	131	3.72E+01	2.51	216
PCB 113	ppt	USEPA 1668A	Phase II	281	182	3.69E+01	2.45	212
PCB 114	ppt	USEPA 1668A	Phase I	273	214	1.78E+01	2.51	121
PCB 114	ppt	USEPA 1668A	Phase II	281	217	6.10E+00	0.354	64.8
PCB 114	ppt	USEPA 1668A	Crab/Clam	18	13	1.03E+02	91.5	115
PCB 114	ppt	USEPA 1668A	SQT	43	38	1.31E+02	99.9	164
PCB 114	ppt	USEPA 1668A	Phase III	193	153	9.95E+01	94.4	122
PCB 116/117	ppt	USEPA 1668A	Phase III	36	30	3.97E+02	389	410
PCB 118	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--
PCB 118	ppt	USEPA 1668A	SQT	43	43	--	--	--
PCB 118	ppt	USEPA 1668A	Phase III	193	190	1.95E+02	189	204
PCB 119	ppt	USEPA 1668A	Phase I	273	212	1.91E+01	2.51	128
PCB 119	ppt	USEPA 1668A	Phase II	281	216	1.99E+01	2.45	210
PCB 12/13	ppt	USEPA 1668A	Phase I	272	196	4.60E+01	5.03	256
PCB 12/13	ppt	USEPA 1668A	Phase II	281	196	5.68E+01	2.45	350
PCB 12/13	ppt	USEPA 1668A	Crab/Clam	18	15	1.21E+02	86.6	186
PCB 12/13	ppt	USEPA 1668A	SQT	43	41	1.97E+02	142	252

Table A-3
Summary of Analyte Detections and Detection Limits in NBSA Phase I, II, and III Sediment Samples

Chemical	Units	Analytical Method	Sampling Program	N[1]	Number of Detected Samples	Detection Limit Summary for Non-Detect Data		
						Mean	Minimum	Maximum
PCB 12/13	ppt	USEPA 1668A	Phase III	193	191	9.82E+01	98	98.4
PCB 120	ppt	USEPA 1668A	Phase I	269	158	2.65E+01	2.51	142
PCB 120	ppt	USEPA 1668A	Phase II	281	188	3.84E+01	2.45	212
PCB 120	ppt	USEPA 1668A	Crab/Clam	18	7	1.09E+02	83.1	186
PCB 120	ppt	USEPA 1668A	SQT	43	26	1.58E+02	99.9	252
PCB 120	ppt	USEPA 1668A	Phase III	193	109	1.10E+02	92	565
PCB 121	ppt	USEPA 1668A	Phase I	267	2	3.83E+01	2.51	216
PCB 121	ppt	USEPA 1668A	Phase II	281	0	5.72E+01	2.45	254
PCB 121	ppt	USEPA 1668A	Crab/Clam	18	0	1.13E+02	83.1	186
PCB 121	ppt	USEPA 1668A	SQT	43	0	1.65E+02	99.9	252
PCB 121	ppt	USEPA 1668A	Phase III	193	1	1.06E+02	75.4	565
PCB 122	ppt	USEPA 1668A	Phase I	273	204	1.96E+01	2.51	128
PCB 122	ppt	USEPA 1668A	Phase II	281	205	3.34E+01	2.45	215
PCB 122	ppt	USEPA 1668A	Crab/Clam	18	10	1.03E+02	91.5	115
PCB 122	ppt	USEPA 1668A	SQT	42	28	1.59E+02	99.9	252
PCB 122	ppt	USEPA 1668A	Phase III	193	148	1.11E+02	94.4	565
PCB 123	ppt	USEPA 1668A	Phase I	273	222	1.62E+01	2.51	121
PCB 123	ppt	USEPA 1668A	Phase II	281	215	8.12E+00	0.446	142
PCB 123	ppt	USEPA 1668A	Crab/Clam	18	14	1.02E+02	91.5	115
PCB 123	ppt	USEPA 1668A	SQT	43	36	1.84E+02	121	252
PCB 123	ppt	USEPA 1668A	Phase III	193	150	1.01E+02	94.4	145
PCB 124	ppt	USEPA 1668A	Phase I	273	212	2.03E+01	2.51	131
PCB 124	ppt	USEPA 1668A	Phase II	281	202	2.67E+02	2.45	5600
PCB 126	ppt	USEPA 1668A	Phase I	272	201	2.18E+01	2.51	128
PCB 126	ppt	USEPA 1668A	Phase II	281	201	1.22E+01	0.381	96.4
PCB 126	ppt	USEPA 1668A	Crab/Clam	18	3	1.10E+02	83.1	186
PCB 126	ppt	USEPA 1668A	SQT	43	22	1.69E+02	99.9	252
PCB 126	ppt	USEPA 1668A	Phase III	193	84	1.11E+02	91.9	565
PCB 127	ppt	USEPA 1668A	Phase I	267	2	3.83E+01	2.51	216
PCB 127	ppt	USEPA 1668A	Phase II	281	1	5.73E+01	2.45	254
PCB 127	ppt	USEPA 1668A	Crab/Clam	18	6	1.16E+02	83.1	186
PCB 127	ppt	USEPA 1668A	SQT	43	19	1.68E+02	99.9	252
PCB 127	ppt	USEPA 1668A	Phase III	193	58	1.06E+02	92.4	565
PCB 128/162	ppt	USEPA 1668A	Phase I	273	235	1.29E+01	2.51	121
PCB 128/162	ppt	USEPA 1668A	Phase II	281	228	1.37E+01	2.45	42.2
PCB 128/166	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--
PCB 128/166	ppt	USEPA 1668A	SQT	43	42	3.28E+02	328	328
PCB 128/166	ppt	USEPA 1668A	Phase III	193	174	2.00E+02	189	243
PCB 129	ppt	USEPA 1668A	Phase I	273	212	1.74E+01	2.51	121
PCB 129	ppt	USEPA 1668A	Phase II	281	219	2.06E+01	2.45	210
PCB 129/138/163	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--
PCB 129/138/163	ppt	USEPA 1668A	SQT	43	43	--	--	--
PCB 129/138/163	ppt	USEPA 1668A	Phase III	193	185	4.05E+02	378	486
PCB 130	ppt	USEPA 1668A	Phase I	273	222	1.56E+01	2.51	121
PCB 130	ppt	USEPA 1668A	Phase II	281	221	1.45E+01	2.45	62.4
PCB 130	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--

Table A-3
Summary of Analyte Detections and Detection Limits in NBSA Phase I, II, and III Sediment Samples

Chemical	Units	Analytical Method	Sampling Program	N[1]	Number of Detected Samples	Detection Limit Summary for Non-Detect Data		
						Mean	Minimum	Maximum
PCB 130	ppt	USEPA 1668A	SQT	43	42	1.64E+02	164	164
PCB 130	ppt	USEPA 1668A	Phase III	193	180	9.92E+01	94.4	103
PCB 131	ppt	USEPA 1668A	Phase I	268	32	3.50E+01	2.51	209
PCB 131	ppt	USEPA 1668A	Phase II	281	20	5.48E+01	2.45	254
PCB 131	ppt	USEPA 1668A	Crab/Clam	18	11	1.02E+02	83.1	116
PCB 131	ppt	USEPA 1668A	SQT	43	30	1.60E+02	99.9	252
PCB 131	ppt	USEPA 1668A	Phase III	193	127	1.00E+02	94.4	145
PCB 132	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--
PCB 132	ppt	USEPA 1668A	SQT	43	43	--	--	--
PCB 132	ppt	USEPA 1668A	Phase III	193	181	9.99E+01	94.4	122
PCB 132/161	ppt	USEPA 1668A	Phase I	273	240	1.02E+01	2.51	48.2
PCB 132/161	ppt	USEPA 1668A	Phase II	281	232	1.16E+01	2.45	42.2
PCB 133	ppt	USEPA 1668A	Crab/Clam	18	14	1.02E+02	91.5	116
PCB 133	ppt	USEPA 1668A	SQT	43	39	1.29E+02	99.9	164
PCB 133	ppt	USEPA 1668A	Phase III	193	157	1.01E+02	94.4	145
PCB 133/142	ppt	USEPA 1668A	Phase I	273	211	1.70E+01	2.51	121
PCB 133/142	ppt	USEPA 1668A	Phase II	281	215	2.02E+01	2.45	208
PCB 134	ppt	USEPA 1668A	Crab/Clam	18	15	1.90E+02	173	215
PCB 134	ppt	USEPA 1668A	SQT	43	40	3.21E+02	242	394
PCB 134	ppt	USEPA 1668A	Phase III	193	160	1.99E+02	189	243
PCB 134/143	ppt	USEPA 1668A	Phase I	273	215	1.73E+01	2.51	121
PCB 134/143	ppt	USEPA 1668A	Phase II	281	220	1.76E+01	2.45	199
PCB 135	ppt	USEPA 1668A	Phase I	273	229	1.59E+01	2.51	121
PCB 135	ppt	USEPA 1668A	Phase II	281	225	1.84E+01	2.45	197
PCB 135/151	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--
PCB 135/151	ppt	USEPA 1668A	SQT	43	42	2.43E+02	243	243
PCB 135/151	ppt	USEPA 1668A	Phase III	193	181	1.98E+02	191	207
PCB 136	ppt	USEPA 1668A	Phase I	273	230	1.32E+01	2.51	121
PCB 136	ppt	USEPA 1668A	Phase II	281	227	1.76E+01	2.45	197
PCB 136	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--
PCB 136	ppt	USEPA 1668A	SQT	43	43	--	--	--
PCB 136	ppt	USEPA 1668A	Phase III	193	178	1.20E+02	91.9	422
PCB 137	ppt	USEPA 1668A	Phase I	273	217	1.74E+01	2.51	121
PCB 137	ppt	USEPA 1668A	Phase II	281	219	1.78E+01	2.45	197
PCB 137	ppt	USEPA 1668A	Crab/Clam	18	17	1.07E+02	107	107
PCB 137	ppt	USEPA 1668A	SQT	43	40	1.61E+02	121	197
PCB 137	ppt	USEPA 1668A	Phase III	193	164	1.01E+02	94.4	145
PCB 138/163/164	ppt	USEPA 1668A	Phase I	273	255	8.41E+00	2.51	24.5
PCB 138/163/164	ppt	USEPA 1668A	Phase II	281	248	9.75E+00	2.45	42.2
PCB 139/140	ppt	USEPA 1668A	Crab/Clam	18	10	1.98E+02	166	232
PCB 139/140	ppt	USEPA 1668A	SQT	43	33	2.97E+02	200	504
PCB 139/140	ppt	USEPA 1668A	Phase III	193	124	2.13E+02	189	1130
PCB 139/149	ppt	USEPA 1668A	Phase I	273	254	8.39E+00	2.51	24.5
PCB 139/149	ppt	USEPA 1668A	Phase II	281	243	1.06E+01	2.45	42.2
PCB 14	ppt	USEPA 1668A	Phase I	266	3	7.66E+01	5.03	433
PCB 14	ppt	USEPA 1668A	Phase II	281	18	1.06E+02	2.45	6670

Table A-3
Summary of Analyte Detections and Detection Limits in NBSA Phase I, II, and III Sediment Samples

Chemical	Units	Analytical Method	Sampling Program	N[1]	Number of Detected Samples	Detection Limit Summary for Non-Detect Data		
						Mean	Minimum	Maximum
PCB 14	ppt	USEPA 1668A	Crab/Clam	18	1	4.37E+01	33.2	74.4
PCB 14	ppt	USEPA 1668A	SQT	43	0	6.59E+01	40	101
PCB 14	ppt	USEPA 1668A	Phase III	193	7	4.22E+01	30.2	226
PCB 140	ppt	USEPA 1668A	Phase I	271	186	2.21E+01	2.51	128
PCB 140	ppt	USEPA 1668A	Phase II	281	197	5.23E+01	2.45	1160
PCB 141	ppt	USEPA 1668A	Phase I	273	234	9.90E+00	2.51	48.2
PCB 141	ppt	USEPA 1668A	Phase II	281	230	1.27E+01	2.45	42.2
PCB 141	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--
PCB 141	ppt	USEPA 1668A	SQT	43	43	--	--	--
PCB 141	ppt	USEPA 1668A	Phase III	193	185	9.84E+01	95.3	102
PCB 142	ppt	USEPA 1668A	Crab/Clam	18	0	1.13E+02	83.1	186
PCB 142	ppt	USEPA 1668A	SQT	43	0	1.65E+02	99.9	252
PCB 142	ppt	USEPA 1668A	Phase III	193	1	1.06E+02	75.4	565
PCB 143	ppt	USEPA 1668A	Crab/Clam	18	3	2.15E+02	166	372
PCB 143	ppt	USEPA 1668A	SQT	43	2	3.30E+02	200	504
PCB 143	ppt	USEPA 1668A	Phase III	193	8	2.12E+02	151	1130
PCB 144	ppt	USEPA 1668A	Phase I	273	214	1.95E+01	2.51	128
PCB 144	ppt	USEPA 1668A	Phase II	281	218	1.76E+01	2.45	197
PCB 144	ppt	USEPA 1668A	Crab/Clam	18	17	9.15E+01	91.5	91.5
PCB 144	ppt	USEPA 1668A	SQT	43	40	1.36E+02	121	164
PCB 144	ppt	USEPA 1668A	Phase III	193	168	9.99E+01	94.4	122
PCB 145	ppt	USEPA 1668A	Phase I	270	75	3.27E+01	2.51	216
PCB 145	ppt	USEPA 1668A	Phase II	281	127	4.68E+01	2.45	215
PCB 145	ppt	USEPA 1668A	Crab/Clam	18	0	1.13E+02	83.1	186
PCB 145	ppt	USEPA 1668A	SQT	43	0	1.65E+02	99.9	252
PCB 145	ppt	USEPA 1668A	Phase III	193	2	1.06E+02	75.4	565
PCB 146	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--
PCB 146	ppt	USEPA 1668A	SQT	43	43	--	--	--
PCB 146	ppt	USEPA 1668A	Phase III	193	185	9.90E+01	95.3	103
PCB 146/165	ppt	USEPA 1668A	Phase I	273	233	1.27E+01	2.51	121
PCB 146/165	ppt	USEPA 1668A	Phase II	281	228	1.41E+01	2.45	62.4
PCB 147	ppt	USEPA 1668A	Phase I	273	211	1.87E+01	2.51	121
PCB 147	ppt	USEPA 1668A	Phase II	281	212	2.83E+01	2.45	210
PCB 147/149	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--
PCB 147/149	ppt	USEPA 1668A	SQT	43	43	--	--	--
PCB 147/149	ppt	USEPA 1668A	Phase III	193	185	2.03E+02	189	243
PCB 148	ppt	USEPA 1668A	Phase I	271	175	2.36E+01	2.51	128
PCB 148	ppt	USEPA 1668A	Phase II	281	184	4.37E+01	2.45	286
PCB 148	ppt	USEPA 1668A	Crab/Clam	18	4	1.08E+02	83.1	186
PCB 148	ppt	USEPA 1668A	SQT	43	9	1.65E+02	99.9	252
PCB 148	ppt	USEPA 1668A	Phase III	193	71	1.09E+02	92	565
PCB 15	ppt	USEPA 1668A	Phase I	273	246	1.83E+01	5.03	84.2
PCB 15	ppt	USEPA 1668A	Phase II	281	231	4.23E+01	2.45	459
PCB 15	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--
PCB 15	ppt	USEPA 1668A	SQT	43	43	--	--	--
PCB 15	ppt	USEPA 1668A	Phase III	193	191	9.92E+01	95.4	103

Table A-3
Summary of Analyte Detections and Detection Limits in NBSA Phase I, II, and III Sediment Samples

Chemical	Units	Analytical Method	Sampling Program	N[1]	Number of Detected Samples	Detection Limit Summary for Non-Detect Data		
						Mean	Minimum	Maximum
PCB 150	ppt	USEPA 1668A	Phase I	272	179	2.52E+01	2.51	142
PCB 150	ppt	USEPA 1668A	Phase II	281	190	4.51E+01	2.45	347
PCB 150	ppt	USEPA 1668A	Crab/Clam	18	7	1.01E+02	83.1	116
PCB 150	ppt	USEPA 1668A	SQT	43	16	1.62E+02	99.9	252
PCB 150	ppt	USEPA 1668A	Phase III	193	90	1.07E+02	91.9	565
PCB 151	ppt	USEPA 1668A	Phase I	273	237	1.10E+01	2.51	48.2
PCB 151	ppt	USEPA 1668A	Phase II	281	228	1.37E+01	2.45	62.4
PCB 152	ppt	USEPA 1668A	Phase I	271	154	2.68E+01	2.51	142
PCB 152	ppt	USEPA 1668A	Phase II	281	172	4.89E+01	2.45	215
PCB 152	ppt	USEPA 1668A	Crab/Clam	18	3	1.08E+02	83.1	186
PCB 152	ppt	USEPA 1668A	SQT	43	3	1.64E+02	99.9	252
PCB 152	ppt	USEPA 1668A	Phase III	193	36	1.07E+02	75.4	565
PCB 153	ppt	USEPA 1668A	Phase I	273	254	8.62E+00	2.51	24.5
PCB 153	ppt	USEPA 1668A	Phase II	281	248	9.27E+00	2.45	42.2
PCB 153/168	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--
PCB 153/168	ppt	USEPA 1668A	SQT	43	43	--	--	--
PCB 153/168	ppt	USEPA 1668A	Phase III	193	189	1.99E+02	189	207
PCB 154	ppt	USEPA 1668A	Phase I	273	205	1.99E+01	2.51	128
PCB 154	ppt	USEPA 1668A	Phase II	281	217	1.74E+01	2.45	197
PCB 154	ppt	USEPA 1668A	Crab/Clam	18	10	1.96E+02	166	231
PCB 154	ppt	USEPA 1668A	SQT	43	33	2.94E+02	200	504
PCB 154	ppt	USEPA 1668A	Phase III	193	103	2.09E+02	184	1130
PCB 155	ppt	USEPA 1668A	Phase I	271	175	2.58E+01	2.51	128
PCB 155	ppt	USEPA 1668A	Phase II	281	160	5.69E+01	2.45	254
PCB 155	ppt	USEPA 1668A	Crab/Clam	18	10	1.03E+02	86.6	118
PCB 155	ppt	USEPA 1668A	SQT	43	27	1.54E+02	99.9	252
PCB 155	ppt	USEPA 1668A	Phase III	193	101	1.13E+02	83.6	565
PCB 156	ppt	USEPA 1668A	Phase I	273	236	1.08E+01	2.51	48.2
PCB 156	ppt	USEPA 1668A	Phase II	281	228	4.43E+00	0.309	46.2
PCB 156/157	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--
PCB 156/157	ppt	USEPA 1668A	SQT	43	43	--	--	--
PCB 156/157	ppt	USEPA 1668A	Phase III	193	180	2.01E+02	189	243
PCB 157	ppt	USEPA 1668A	Phase I	273	220	1.91E+01	2.51	133
PCB 157	ppt	USEPA 1668A	Phase II	281	216	2.31E+01	0.321	624
PCB 158	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--
PCB 158	ppt	USEPA 1668A	SQT	43	43	--	--	--
PCB 158	ppt	USEPA 1668A	Phase III	193	173	9.96E+01	94.4	122
PCB 158/160	ppt	USEPA 1668A	Phase I	273	229	1.31E+01	2.51	121
PCB 158/160	ppt	USEPA 1668A	Phase II	281	226	1.44E+01	2.45	62.4
PCB 159	ppt	USEPA 1668A	Phase I	273	202	2.08E+01	2.51	128
PCB 159	ppt	USEPA 1668A	Phase II	281	67	5.89E+01	2.45	254
PCB 159	ppt	USEPA 1668A	Crab/Clam	18	2	1.04E+02	83.1	125
PCB 159	ppt	USEPA 1668A	SQT	43	0	1.65E+02	99.9	252
PCB 159	ppt	USEPA 1668A	Phase III	193	8	1.04E+02	75.4	565
PCB 16	ppt	USEPA 1668A	Crab/Clam	18	17	4.29E+01	42.9	42.9
PCB 16	ppt	USEPA 1668A	SQT	43	43	--	--	--

Table A-3
Summary of Analyte Detections and Detection Limits in NBSA Phase I, II, and III Sediment Samples

Chemical	Units	Analytical Method	Sampling Program	N[1]	Number of Detected Samples	Detection Limit Summary for Non-Detect Data		
						Mean	Minimum	Maximum
PCB 16	ppt	USEPA 1668A	Phase III	193	188	3.98E+01	39.1	40.1
PCB 16/32	ppt	USEPA 1668A	Phase I	273	247	1.14E+01	2.51	48.2
PCB 16/32	ppt	USEPA 1668A	Phase II	281	242	1.66E+01	2.45	43
PCB 160	ppt	USEPA 1668A	Crab/Clam	18	0	4.54E+02	332	744
PCB 160	ppt	USEPA 1668A	SQT	43	0	6.59E+02	400	1010
PCB 160	ppt	USEPA 1668A	Phase III	193	0	4.22E+02	302	2260
PCB 161	ppt	USEPA 1668A	Crab/Clam	18	0	1.13E+02	83.1	186
PCB 161	ppt	USEPA 1668A	SQT	43	0	1.65E+02	99.9	252
PCB 161	ppt	USEPA 1668A	Phase III	193	0	1.06E+02	75.4	565
PCB 162	ppt	USEPA 1668A	Crab/Clam	18	4	1.02E+02	83.1	125
PCB 162	ppt	USEPA 1668A	SQT	43	4	1.65E+02	99.9	252
PCB 162	ppt	USEPA 1668A	Phase III	193	18	1.06E+02	75.4	565
PCB 164	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--
PCB 164	ppt	USEPA 1668A	SQT	43	43	--	--	--
PCB 164	ppt	USEPA 1668A	Phase III	193	174	1.00E+02	94.4	122
PCB 165	ppt	USEPA 1668A	Crab/Clam	18	0	1.13E+02	83.1	186
PCB 165	ppt	USEPA 1668A	SQT	43	0	1.65E+02	99.9	252
PCB 165	ppt	USEPA 1668A	Phase III	193	2	1.06E+02	75.4	565
PCB 166	ppt	USEPA 1668A	Phase I	272	185	2.14E+01	2.51	128
PCB 166	ppt	USEPA 1668A	Phase II	281	195	3.85E+01	2.45	212
PCB 167	ppt	USEPA 1668A	Phase I	273	228	1.43E+01	2.51	121
PCB 167	ppt	USEPA 1668A	Phase II	281	224	4.11E+00	0.314	34.9
PCB 167	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--
PCB 167	ppt	USEPA 1668A	SQT	43	41	1.43E+02	121	164
PCB 167	ppt	USEPA 1668A	Phase III	193	174	1.00E+02	94.4	122
PCB 168	ppt	USEPA 1668A	Phase I	271	159	2.67E+01	2.51	142
PCB 168	ppt	USEPA 1668A	Phase II	281	171	4.50E+01	2.45	212
PCB 169	ppt	USEPA 1668A	Phase I	267	40	4.02E+01	1.34	216
PCB 169	ppt	USEPA 1668A	Phase II	281	26	2.10E+01	0.363	123
PCB 169	ppt	USEPA 1668A	Crab/Clam	18	0	1.13E+02	83.1	186
PCB 169	ppt	USEPA 1668A	SQT	43	0	1.65E+02	99.9	252
PCB 169	ppt	USEPA 1668A	Phase III	193	1	1.06E+02	75.4	565
PCB 17	ppt	USEPA 1668A	Phase I	273	241	1.08E+01	2.51	48.2
PCB 17	ppt	USEPA 1668A	Phase II	281	229	1.51E+01	2.45	62.4
PCB 17	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--
PCB 17	ppt	USEPA 1668A	SQT	43	43	--	--	--
PCB 17	ppt	USEPA 1668A	Phase III	193	187	3.98E+01	39.1	40.1
PCB 170	ppt	USEPA 1668A	Phase I	273	238	1.01E+01	2.51	48.2
PCB 170	ppt	USEPA 1668A	Phase II	281	230	1.27E+01	2.45	42.2
PCB 170	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--
PCB 170	ppt	USEPA 1668A	SQT	43	43	--	--	--
PCB 170	ppt	USEPA 1668A	Phase III	193	187	9.75E+01	94.4	102
PCB 171	ppt	USEPA 1668A	Phase I	272	219	1.83E+01	2.51	128
PCB 171	ppt	USEPA 1668A	Phase II	281	223	1.40E+01	2.45	62.4
PCB 171/173	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--
PCB 171/173	ppt	USEPA 1668A	SQT	43	41	2.85E+02	242	328

Table A-3
Summary of Analyte Detections and Detection Limits in NBSA Phase I, II, and III Sediment Samples

Chemical	Units	Analytical Method	Sampling Program	N[1]	Number of Detected Samples	Detection Limit Summary for Non-Detect Data		
						Mean	Minimum	Maximum
PCB 171/173	ppt	USEPA 1668A	Phase III	193	167	2.00E+02	189	243
PCB 172	ppt	USEPA 1668A	Phase I	272	212	1.73E+01	2.51	121
PCB 172	ppt	USEPA 1668A	Phase II	281	219	1.66E+01	2.45	197
PCB 172	ppt	USEPA 1668A	Crab/Clam	18	17	9.15E+01	91.5	91.5
PCB 172	ppt	USEPA 1668A	SQT	43	42	1.64E+02	164	164
PCB 172	ppt	USEPA 1668A	Phase III	193	174	1.00E+02	94.4	122
PCB 173	ppt	USEPA 1668A	Phase I	272	186	2.24E+01	2.51	128
PCB 173	ppt	USEPA 1668A	Phase II	281	202	3.02E+01	2.45	210
PCB 174	ppt	USEPA 1668A	Phase I	272	239	8.98E+00	2.51	24.6
PCB 174	ppt	USEPA 1668A	Phase II	281	233	1.14E+01	2.45	44.4
PCB 174	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--
PCB 174	ppt	USEPA 1668A	SQT	43	43	--	--	--
PCB 174	ppt	USEPA 1668A	Phase III	193	186	9.73E+01	94.4	102
PCB 175	ppt	USEPA 1668A	Phase I	273	201	2.10E+01	2.51	128
PCB 175	ppt	USEPA 1668A	Phase II	281	218	1.70E+01	2.45	197
PCB 175	ppt	USEPA 1668A	Crab/Clam	18	13	1.03E+02	83.1	116
PCB 175	ppt	USEPA 1668A	SQT	43	36	1.55E+02	99.9	252
PCB 175	ppt	USEPA 1668A	Phase III	193	132	9.99E+01	94.4	145
PCB 176	ppt	USEPA 1668A	Phase I	272	213	1.69E+01	2.51	121
PCB 176	ppt	USEPA 1668A	Phase II	281	222	1.39E+01	2.45	62.4
PCB 176	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--
PCB 176	ppt	USEPA 1668A	SQT	43	38	1.41E+02	99.9	197
PCB 176	ppt	USEPA 1668A	Phase III	193	168	1.00E+02	94.4	122
PCB 177	ppt	USEPA 1668A	Phase I	272	233	1.44E+01	2.51	121
PCB 177	ppt	USEPA 1668A	Phase II	281	230	1.28E+01	2.45	42.2
PCB 177	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--
PCB 177	ppt	USEPA 1668A	SQT	43	42	1.64E+02	164	164
PCB 177	ppt	USEPA 1668A	Phase III	193	187	9.79E+01	95.3	102
PCB 178	ppt	USEPA 1668A	Phase I	273	221	1.55E+01	2.51	121
PCB 178	ppt	USEPA 1668A	Phase II	281	222	1.61E+01	2.45	197
PCB 178	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--
PCB 178	ppt	USEPA 1668A	SQT	43	41	1.54E+02	144	164
PCB 178	ppt	USEPA 1668A	Phase III	193	179	9.88E+01	94.4	103
PCB 179	ppt	USEPA 1668A	Phase I	273	235	1.19E+01	2.51	121
PCB 179	ppt	USEPA 1668A	Phase II	281	229	1.69E+01	2.45	197
PCB 179	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--
PCB 179	ppt	USEPA 1668A	SQT	43	43	--	--	--
PCB 179	ppt	USEPA 1668A	Phase III	193	185	9.90E+01	95.3	103
PCB 18	ppt	USEPA 1668A	Phase I	273	253	1.10E+01	5.8	48.2
PCB 18	ppt	USEPA 1668A	Phase II	281	249	1.45E+01	2.45	62.4
PCB 18/30	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--
PCB 18/30	ppt	USEPA 1668A	SQT	43	43	--	--	--
PCB 18/30	ppt	USEPA 1668A	Phase III	193	189	2.16E+02	97.9	565
PCB 180	ppt	USEPA 1668A	Phase I	272	250	8.41E+00	2.51	24.5
PCB 180	ppt	USEPA 1668A	Phase II	281	244	9.68E+00	2.45	77.1
PCB 180/193	ppt	USEPA 1668A	Crab/Clam	18	17	3.67E+02	367	367

Table A-3
Summary of Analyte Detections and Detection Limits in NBSA Phase I, II, and III Sediment Samples

Chemical	Units	Analytical Method	Sampling Program	N[1]	Number of Detected Samples	Detection Limit Summary for Non-Detect Data		
						Mean	Minimum	Maximum
PCB 180/193	ppt	USEPA 1668A	SQT	43	42	3.51E+02	351	351
PCB 180/193	ppt	USEPA 1668A	Phase III	193	185	1.96E+02	189	204
PCB 181	ppt	USEPA 1668A	Phase I	270	174	2.37E+01	2.51	128
PCB 181	ppt	USEPA 1668A	Phase II	281	193	3.16E+01	2.45	215
PCB 181	ppt	USEPA 1668A	Crab/Clam	18	5	1.08E+02	83.1	186
PCB 181	ppt	USEPA 1668A	SQT	43	10	1.65E+02	99.9	252
PCB 181	ppt	USEPA 1668A	Phase III	193	56	1.05E+02	91.9	565
PCB 182	ppt	USEPA 1668A	Crab/Clam	18	1	1.09E+02	83.1	186
PCB 182	ppt	USEPA 1668A	SQT	43	3	1.65E+02	99.9	252
PCB 182	ppt	USEPA 1668A	Phase III	193	46	1.08E+02	92	565
PCB 182/187	ppt	USEPA 1668A	Phase I	273	245	1.00E+01	2.51	48.4
PCB 182/187	ppt	USEPA 1668A	Phase II	281	240	1.02E+01	2.45	82.9
PCB 183	ppt	USEPA 1668A	Phase I	273	236	1.20E+01	2.51	121
PCB 183	ppt	USEPA 1668A	Phase II	281	229	1.29E+01	2.45	42.2
PCB 183/185	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--
PCB 183/185	ppt	USEPA 1668A	SQT	43	43	--	--	--
PCB 183/185	ppt	USEPA 1668A	Phase III	193	183	1.97E+02	189	207
PCB 184	ppt	USEPA 1668A	Phase I	269	159	2.66E+01	2.51	142
PCB 184	ppt	USEPA 1668A	Phase II	281	182	4.12E+01	2.45	212
PCB 184	ppt	USEPA 1668A	Crab/Clam	18	1	1.14E+02	83.1	186
PCB 184	ppt	USEPA 1668A	SQT	43	1	1.64E+02	99.9	252
PCB 184	ppt	USEPA 1668A	Phase III	193	11	1.06E+02	75.4	565
PCB 185	ppt	USEPA 1668A	Phase I	272	212	1.73E+01	2.51	121
PCB 185	ppt	USEPA 1668A	Phase II	281	219	1.66E+01	2.45	197
PCB 186	ppt	USEPA 1668A	Phase I	267	3	3.84E+01	2.51	216
PCB 186	ppt	USEPA 1668A	Phase II	281	3	5.75E+01	2.45	254
PCB 186	ppt	USEPA 1668A	Crab/Clam	18	0	1.13E+02	83.1	186
PCB 186	ppt	USEPA 1668A	SQT	43	0	1.65E+02	99.9	252
PCB 186	ppt	USEPA 1668A	Phase III	193	0	1.06E+02	75.4	565
PCB 187	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--
PCB 187	ppt	USEPA 1668A	SQT	43	43	--	--	--
PCB 187	ppt	USEPA 1668A	Phase III	193	188	9.87E+01	96.9	102
PCB 188	ppt	USEPA 1668A	Phase I	270	168	2.51E+01	2.51	142
PCB 188	ppt	USEPA 1668A	Phase II	281	195	3.21E+01	2.45	211
PCB 188	ppt	USEPA 1668A	Crab/Clam	18	3	1.04E+02	83.1	125
PCB 188	ppt	USEPA 1668A	SQT	43	20	1.59E+02	99.9	232
PCB 188	ppt	USEPA 1668A	Phase III	193	43	1.08E+02	75.4	565
PCB 189	ppt	USEPA 1668A	Phase I	272	209	1.96E+01	2.51	128
PCB 189	ppt	USEPA 1668A	Phase II	281	217	2.62E+00	0.149	36.8
PCB 189	ppt	USEPA 1668A	Crab/Clam	18	13	9.93E+01	86.6	116
PCB 189	ppt	USEPA 1668A	SQT	43	34	1.60E+02	99.9	252
PCB 189	ppt	USEPA 1668A	Phase III	193	139	1.00E+02	94.4	145
PCB 19	ppt	USEPA 1668A	Phase I	273	210	1.93E+01	2.51	121
PCB 19	ppt	USEPA 1668A	Phase II	281	206	4.03E+01	2.45	215
PCB 19	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--
PCB 19	ppt	USEPA 1668A	SQT	43	41	4.85E+01	48.4	48.6

Table A-3
Summary of Analyte Detections and Detection Limits in NBSA Phase I, II, and III Sediment Samples

Chemical	Units	Analytical Method	Sampling Program	N[1]	Number of Detected Samples	Detection Limit Summary for Non-Detect Data		
						Mean	Minimum	Maximum
PCB 19	ppt	USEPA 1668A	Phase III	193	188	7.69E+01	39.2	226
PCB 190	ppt	USEPA 1668A	Phase I	273	214	1.71E+01	2.51	121
PCB 190	ppt	USEPA 1668A	Phase II	281	221	1.69E+01	2.45	197
PCB 190	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--
PCB 190	ppt	USEPA 1668A	SQT	43	42	1.64E+02	164	164
PCB 190	ppt	USEPA 1668A	Phase III	193	172	1.00E+02	94.4	122
PCB 191	ppt	USEPA 1668A	Phase I	272	201	1.97E+01	2.51	128
PCB 191	ppt	USEPA 1668A	Phase II	281	213	2.36E+01	2.45	277
PCB 191	ppt	USEPA 1668A	Crab/Clam	18	11	9.89E+01	83.1	116
PCB 191	ppt	USEPA 1668A	SQT	43	30	1.56E+02	99.9	252
PCB 191	ppt	USEPA 1668A	Phase III	193	136	1.00E+02	94.4	145
PCB 192	ppt	USEPA 1668A	Phase I	267	4	3.83E+01	2.51	216
PCB 192	ppt	USEPA 1668A	Phase II	281	1	5.73E+01	2.45	254
PCB 192	ppt	USEPA 1668A	Crab/Clam	18	0	1.13E+02	83.1	186
PCB 192	ppt	USEPA 1668A	SQT	43	0	1.65E+02	99.9	252
PCB 192	ppt	USEPA 1668A	Phase III	193	1	1.06E+02	75.4	565
PCB 193	ppt	USEPA 1668A	Phase I	272	211	1.72E+01	2.51	121
PCB 193	ppt	USEPA 1668A	Phase II	281	219	1.66E+01	2.45	197
PCB 194	ppt	USEPA 1668A	Phase I	273	238	1.22E+01	2.51	121
PCB 194	ppt	USEPA 1668A	Phase II	281	232	1.27E+01	2.45	62.4
PCB 194	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--
PCB 194	ppt	USEPA 1668A	SQT	43	43	--	--	--
PCB 194	ppt	USEPA 1668A	Phase III	193	186	9.77E+01	94.4	102
PCB 195	ppt	USEPA 1668A	Phase I	273	217	1.68E+01	2.51	121
PCB 195	ppt	USEPA 1668A	Phase II	281	222	1.34E+01	2.45	62.4
PCB 195	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--
PCB 195	ppt	USEPA 1668A	SQT	43	42	1.64E+02	164	164
PCB 195	ppt	USEPA 1668A	Phase III	193	164	9.96E+01	94.4	122
PCB 196	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--
PCB 196	ppt	USEPA 1668A	SQT	43	42	1.19E+02	119	119
PCB 196	ppt	USEPA 1668A	Phase III	193	176	9.96E+01	94.4	122
PCB 196/203	ppt	USEPA 1668A	Phase I	273	242	1.23E+01	2.51	121
PCB 196/203	ppt	USEPA 1668A	Phase II	281	239	9.14E+00	2.45	42.2
PCB 197	ppt	USEPA 1668A	Phase I	273	199	2.05E+01	2.51	128
PCB 197	ppt	USEPA 1668A	Phase II	281	215	1.71E+01	2.45	197
PCB 197/200	ppt	USEPA 1668A	Crab/Clam	18	8	1.98E+02	166	232
PCB 197/200	ppt	USEPA 1668A	SQT	42	31	3.18E+02	200	504
PCB 197/200	ppt	USEPA 1668A	Phase III	193	123	2.00E+02	189	289
PCB 198	ppt	USEPA 1668A	Phase I	273	205	1.94E+01	2.51	128
PCB 198	ppt	USEPA 1668A	Phase II	281	218	2.02E+01	2.45	243
PCB 198/199	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--
PCB 198/199	ppt	USEPA 1668A	SQT	43	43	--	--	--
PCB 198/199	ppt	USEPA 1668A	Phase III	193	182	1.97E+02	189	207
PCB 199	ppt	USEPA 1668A	Phase I	273	243	1.28E+01	2.51	121
PCB 199	ppt	USEPA 1668A	Phase II	281	237	1.03E+01	2.45	62.4
PCB 2	ppt	USEPA 1668A	Phase I	273	252	1.15E+01	5.8	42.1

Table A-3
Summary of Analyte Detections and Detection Limits in NBSA Phase I, II, and III Sediment Samples

Chemical	Units	Analytical Method	Sampling Program	N[1]	Number of Detected Samples	Detection Limit Summary for Non-Detect Data		
						Mean	Minimum	Maximum
PCB 2	ppt	USEPA 1668A	Phase II	270	246	1.39E+01	2.45	212
PCB 2	ppt	USEPA 1668A	Crab/Clam	18	17	3.66E+01	36.6	36.6
PCB 2	ppt	USEPA 1668A	SQT	43	41	7.44E+01	47.7	101
PCB 2	ppt	USEPA 1668A	Phase III	193	187	3.89E+01	36.8	39.8
PCB 20/21/33	ppt	USEPA 1668A	Phase I	273	246	1.06E+01	2.51	48.2
PCB 20/21/33	ppt	USEPA 1668A	Phase II	281	239	2.06E+01	2.45	199
PCB 20/28	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--
PCB 20/28	ppt	USEPA 1668A	SQT	43	43	--	--	--
PCB 20/28	ppt	USEPA 1668A	Phase III	193	193	--	--	--
PCB 200	ppt	USEPA 1668A	Phase I	273	208	1.95E+01	2.51	128
PCB 200	ppt	USEPA 1668A	Phase II	281	222	1.59E+01	2.45	197
PCB 201	ppt	USEPA 1668A	Phase I	272	213	1.77E+01	2.51	128
PCB 201	ppt	USEPA 1668A	Phase II	281	222	1.59E+01	2.45	197
PCB 201	ppt	USEPA 1668A	Crab/Clam	18	17	9.15E+01	91.5	91.5
PCB 201	ppt	USEPA 1668A	SQT	43	42	1.64E+02	164	164
PCB 201	ppt	USEPA 1668A	Phase III	193	141	9.90E+01	92.7	122
PCB 202	ppt	USEPA 1668A	Phase I	273	230	1.66E+01	2.51	128
PCB 202	ppt	USEPA 1668A	Phase II	281	228	1.56E+01	2.45	197
PCB 202	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--
PCB 202	ppt	USEPA 1668A	SQT	43	42	3.28E+02	328	328
PCB 202	ppt	USEPA 1668A	Phase III	193	171	1.99E+02	189	243
PCB 203	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--
PCB 203	ppt	USEPA 1668A	SQT	43	43	--	--	--
PCB 203	ppt	USEPA 1668A	Phase III	193	181	9.84E+01	94.4	103
PCB 204	ppt	USEPA 1668A	Phase I	268	28	3.75E+01	2.51	216
PCB 204	ppt	USEPA 1668A	Phase II	281	34	5.53E+01	2.45	254
PCB 204	ppt	USEPA 1668A	Crab/Clam	18	0	1.13E+02	83.1	186
PCB 204	ppt	USEPA 1668A	SQT	43	0	1.65E+02	99.9	252
PCB 204	ppt	USEPA 1668A	Phase III	193	0	1.06E+02	75.4	565
PCB 205	ppt	USEPA 1668A	Phase I	273	202	1.95E+01	2.51	128
PCB 205	ppt	USEPA 1668A	Phase II	281	215	1.64E+01	2.45	183
PCB 205	ppt	USEPA 1668A	Crab/Clam	18	11	9.92E+01	83.1	116
PCB 205	ppt	USEPA 1668A	SQT	43	30	1.52E+02	99.9	252
PCB 205	ppt	USEPA 1668A	Phase III	193	124	1.00E+02	94.4	145
PCB 206	ppt	USEPA 1668A	Phase I	273	244	8.35E+00	2.51	18.7
PCB 206	ppt	USEPA 1668A	Phase II	281	239	1.06E+01	2.45	62.4
PCB 206	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--
PCB 206	ppt	USEPA 1668A	SQT	43	42	1.21E+02	121	121
PCB 206	ppt	USEPA 1668A	Phase III	193	184	9.77E+01	94.4	102
PCB 207	ppt	USEPA 1668A	Phase I	273	211	1.85E+01	2.51	121
PCB 207	ppt	USEPA 1668A	Phase II	281	224	1.52E+01	2.45	197
PCB 207	ppt	USEPA 1668A	Crab/Clam	18	15	1.05E+02	91.5	116
PCB 207	ppt	USEPA 1668A	SQT	43	37	1.61E+02	99.9	252
PCB 207	ppt	USEPA 1668A	Phase III	193	142	9.93E+01	92	122
PCB 208	ppt	USEPA 1668A	Phase I	273	232	1.33E+01	2.51	121
PCB 208	ppt	USEPA 1668A	Phase II	281	234	1.11E+01	2.45	42.2

Table A-3
Summary of Analyte Detections and Detection Limits in NBSA Phase I, II, and III Sediment Samples

Chemical	Units	Analytical Method	Sampling Program	N[1]	Number of Detected Samples	Detection Limit Summary for Non-Detect Data		
						Mean	Minimum	Maximum
PCB 208	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--
PCB 208	ppt	USEPA 1668A	SQT	43	43	--	--	--
PCB 208	ppt	USEPA 1668A	Phase III	193	179	9.88E+01	94.4	103
PCB 209	ppt	USEPA 1668A	Phase I	273	244	8.00E+00	2.51	13
PCB 209	ppt	USEPA 1668A	Phase II	281	244	5.77E+00	2.45	42.2
PCB 209	ppt	USEPA 1668A	Crab/Clam	18	10	4.14E+02	127	638
PCB 209	ppt	USEPA 1668A	SQT	43	42	3.90E+02	390	390
PCB 209	ppt	USEPA 1668A	Phase III	193	182	9.79E+01	94.4	103
PCB 21/33	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--
PCB 21/33	ppt	USEPA 1668A	SQT	43	43	--	--	--
PCB 21/33	ppt	USEPA 1668A	Phase III	193	193	--	--	--
PCB 22	ppt	USEPA 1668A	Phase I	273	244	1.01E+01	2.51	48.2
PCB 22	ppt	USEPA 1668A	Phase II	281	230	8.72E+01	2.45	3486
PCB 22	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--
PCB 22	ppt	USEPA 1668A	SQT	43	43	--	--	--
PCB 22	ppt	USEPA 1668A	Phase III	193	192	3.93E+01	39.3	39.3
PCB 23	ppt	USEPA 1668A	Phase I	269	117	2.94E+01	2.51	128
PCB 23	ppt	USEPA 1668A	Phase II	281	149	4.97E+01	2.45	215
PCB 23	ppt	USEPA 1668A	Crab/Clam	18	2	4.57E+01	33.2	74.4
PCB 23	ppt	USEPA 1668A	SQT	43	1	6.58E+01	40	101
PCB 23	ppt	USEPA 1668A	Phase III	193	53	4.13E+01	37.1	226
PCB 24	ppt	USEPA 1668A	Crab/Clam	18	4	4.51E+01	33.2	74.4
PCB 24	ppt	USEPA 1668A	SQT	43	27	6.52E+01	40	101
PCB 24	ppt	USEPA 1668A	Phase III	193	130	4.30E+01	37.8	226
PCB 24/27	ppt	USEPA 1668A	Phase I	273	216	1.79E+01	2.51	121
PCB 24/27	ppt	USEPA 1668A	Phase II	281	208	4.00E+01	2.45	215
PCB 25	ppt	USEPA 1668A	Phase I	273	226	1.73E+01	2.51	121
PCB 25	ppt	USEPA 1668A	Phase II	281	213	3.08E+01	2.45	210
PCB 25	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--
PCB 25	ppt	USEPA 1668A	SQT	43	43	--	--	--
PCB 25	ppt	USEPA 1668A	Phase III	193	192	3.89E+01	38.9	38.9
PCB 26	ppt	USEPA 1668A	Phase I	273	238	1.41E+01	2.51	129
PCB 26	ppt	USEPA 1668A	Phase II	281	225	2.15E+01	2.45	210
PCB 26/29	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--
PCB 26/29	ppt	USEPA 1668A	SQT	43	43	--	--	--
PCB 26/29	ppt	USEPA 1668A	Phase III	193	180	9.88E+01	94.5	102
PCB 27	ppt	USEPA 1668A	Crab/Clam	18	17	4.29E+01	42.9	42.9
PCB 27	ppt	USEPA 1668A	SQT	43	43	--	--	--
PCB 27	ppt	USEPA 1668A	Phase III	193	187	3.98E+01	39.1	40.1
PCB 28	ppt	USEPA 1668A	Phase I	273	262	9.32E+00	5.8	24.5
PCB 28	ppt	USEPA 1668A	Phase II	281	254	1.62E+01	2.45	96.5
PCB 29	ppt	USEPA 1668A	Phase I	272	168	2.50E+01	2.51	128
PCB 29	ppt	USEPA 1668A	Phase II	281	171	5.48E+01	2.45	384
PCB 3	ppt	USEPA 1668A	Phase I	273	235	9.89E+00	5.8	42.1
PCB 3	ppt	USEPA 1668A	Phase II	281	245	6.29E+00	2.45	42.2
PCB 3	ppt	USEPA 1668A	Crab/Clam	18	17	9.15E+01	91.5	91.5

Table A-3
Summary of Analyte Detections and Detection Limits in NBSA Phase I, II, and III Sediment Samples

Chemical	Units	Analytical Method	Sampling Program	N[1]	Number of Detected Samples	Detection Limit Summary for Non-Detect Data		
						Mean	Minimum	Maximum
PCB 3	ppt	USEPA 1668A	SQT	43	43	--	--	--
PCB 3	ppt	USEPA 1668A	Phase III	193	193	--	--	--
PCB 30	ppt	USEPA 1668A	Phase I	267	41	3.33E+01	2.51	177
PCB 30	ppt	USEPA 1668A	Phase II	281	97	5.55E+01	2.45	254
PCB 31	ppt	USEPA 1668A	Phase I	273	261	7.86E+00	5.8	12.3
PCB 31	ppt	USEPA 1668A	Phase II	281	250	1.60E+01	2.45	81
PCB 31	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--
PCB 31	ppt	USEPA 1668A	SQT	43	43	--	--	--
PCB 31	ppt	USEPA 1668A	Phase III	193	193	--	--	--
PCB 32	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--
PCB 32	ppt	USEPA 1668A	SQT	43	43	--	--	--
PCB 32	ppt	USEPA 1668A	Phase III	193	193	--	--	--
PCB 34	ppt	USEPA 1668A	Phase I	272	180	2.37E+01	2.51	128
PCB 34	ppt	USEPA 1668A	Phase II	281	171	5.46E+01	2.45	215
PCB 34	ppt	USEPA 1668A	Crab/Clam	18	9	4.44E+01	34.6	74.4
PCB 34	ppt	USEPA 1668A	SQT	43	34	6.51E+01	48.4	101
PCB 34	ppt	USEPA 1668A	Phase III	193	144	4.43E+01	37.8	226
PCB 35	ppt	USEPA 1668A	Phase I	272	202	2.17E+01	2.51	121
PCB 35	ppt	USEPA 1668A	Phase II	281	205	3.46E+01	2.45	212
PCB 35	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--
PCB 35	ppt	USEPA 1668A	SQT	43	42	4.00E+01	40	40
PCB 35	ppt	USEPA 1668A	Phase III	193	180	3.93E+01	37.8	41
PCB 36	ppt	USEPA 1668A	Phase I	270	144	2.82E+01	2.51	177
PCB 36	ppt	USEPA 1668A	Phase II	281	124	6.39E+01	2.45	254
PCB 36	ppt	USEPA 1668A	Crab/Clam	18	0	4.54E+01	33.2	74.4
PCB 36	ppt	USEPA 1668A	SQT	43	9	6.54E+01	40	101
PCB 36	ppt	USEPA 1668A	Phase III	193	69	4.38E+01	30.2	226
PCB 37	ppt	USEPA 1668A	Phase I	273	244	1.11E+01	2.51	48.2
PCB 37	ppt	USEPA 1668A	Phase II	281	229	1.58E+01	2.45	62.4
PCB 37	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--
PCB 37	ppt	USEPA 1668A	SQT	43	43	--	--	--
PCB 37	ppt	USEPA 1668A	Phase III	193	193	--	--	--
PCB 38	ppt	USEPA 1668A	Phase I	271	178	2.42E+01	2.51	128
PCB 38	ppt	USEPA 1668A	Phase II	281	168	5.67E+01	2.45	215
PCB 38	ppt	USEPA 1668A	Crab/Clam	18	4	4.34E+01	33.2	74.4
PCB 38	ppt	USEPA 1668A	SQT	43	2	6.54E+01	40	101
PCB 38	ppt	USEPA 1668A	Phase III	193	45	4.31E+01	33.4	226
PCB 39	ppt	USEPA 1668A	Phase I	271	167	3.03E+01	2.51	450
PCB 39	ppt	USEPA 1668A	Phase II	281	164	6.93E+01	2.45	1180
PCB 39	ppt	USEPA 1668A	Crab/Clam	18	10	4.07E+01	34.6	46.4
PCB 39	ppt	USEPA 1668A	SQT	43	34	6.44E+01	40	101
PCB 39	ppt	USEPA 1668A	Phase III	193	148	4.43E+01	37.8	226
PCB 4	ppt	USEPA 1668A	Crab/Clam	18	15	9.69E+01	83.1	116
PCB 4	ppt	USEPA 1668A	SQT	43	41	1.87E+02	121	252
PCB 4	ppt	USEPA 1668A	Phase III	193	192	1.03E+02	103	103
PCB 4/10	ppt	USEPA 1668A	Phase I	272	195	5.00E+01	5	261

Table A-3
Summary of Analyte Detections and Detection Limits in NBSA Phase I, II, and III Sediment Samples

Chemical	Units	Analytical Method	Sampling Program	N[1]	Number of Detected Samples	Detection Limit Summary for Non-Detect Data		
						Mean	Minimum	Maximum
PCB 4/10	ppt	USEPA 1668A	Phase II	281	194	5.62E+01	2.45	454
PCB 40	ppt	USEPA 1668A	Phase I	271	231	1.07E+01	2.51	48.2
PCB 40	ppt	USEPA 1668A	Phase II	263	205	2.78E+01	2.45	212
PCB 40/71	ppt	USEPA 1668A	Crab/Clam	18	17	3.72E+02	372	372
PCB 40/71	ppt	USEPA 1668A	SQT	43	43	--	--	--
PCB 40/71	ppt	USEPA 1668A	Phase III	193	188	1.98E+02	194	204
PCB 41	ppt	USEPA 1668A	Crab/Clam	18	8	2.19E+02	173	372
PCB 41	ppt	USEPA 1668A	SQT	43	29	3.26E+02	200	504
PCB 41	ppt	USEPA 1668A	Phase III	193	147	2.21E+02	189	1130
PCB 41/64/71/72	ppt	USEPA 1668A	Phase I	246	230	1.10E+01	5.8	41.1
PCB 41/64/71/72	ppt	USEPA 1668A	Phase II	238	211	1.47E+01	2.45	43
PCB 42	ppt	USEPA 1668A	Crab/Clam	18	17	1.86E+02	186	186
PCB 42	ppt	USEPA 1668A	SQT	43	43	--	--	--
PCB 42	ppt	USEPA 1668A	Phase III	193	190	9.93E+01	96.9	102
PCB 42/59	ppt	USEPA 1668A	Phase I	273	242	1.03E+01	2.51	48.2
PCB 42/59	ppt	USEPA 1668A	Phase II	281	233	1.23E+01	2.45	43
PCB 43	ppt	USEPA 1668A	Crab/Clam	18	11	1.11E+02	86.6	186
PCB 43	ppt	USEPA 1668A	SQT	42	14	1.61E+02	99.9	252
PCB 43	ppt	USEPA 1668A	Phase III	193	169	1.33E+02	94.4	565
PCB 43/49	ppt	USEPA 1668A	Phase I	273	254	3.07E+01	2.51	392
PCB 43/49	ppt	USEPA 1668A	Phase II	281	246	1.24E+01	2.45	43
PCB 44	ppt	USEPA 1668A	Phase I	273	261	6.20E+01	5.8	644
PCB 44	ppt	USEPA 1668A	Phase II	281	251	1.40E+01	2.45	43
PCB 44/47/65	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--
PCB 44/47/65	ppt	USEPA 1668A	SQT	43	43	--	--	--
PCB 44/47/65	ppt	USEPA 1668A	Phase III	193	193	--	--	--
PCB 45	ppt	USEPA 1668A	Phase I	273	231	1.14E+01	2.51	48.2
PCB 45	ppt	USEPA 1668A	Phase II	281	225	1.41E+01	2.45	43
PCB 45	ppt	USEPA 1668A	Crab/Clam	18	17	1.86E+02	186	186
PCB 45	ppt	USEPA 1668A	SQT	43	42	1.27E+02	127	127
PCB 45	ppt	USEPA 1668A	Phase III	193	179	1.01E+02	94.4	122
PCB 46	ppt	USEPA 1668A	Phase I	273	219	1.53E+01	2.51	121
PCB 46	ppt	USEPA 1668A	Phase II	281	216	2.34E+01	2.45	210
PCB 46	ppt	USEPA 1668A	Crab/Clam	18	17	7.44E+01	74.4	74.4
PCB 46	ppt	USEPA 1668A	SQT	43	42	7.88E+01	78.8	78.8
PCB 46	ppt	USEPA 1668A	Phase III	193	176	4.01E+01	37.8	48.6
PCB 47	ppt	USEPA 1668A	Phase I	273	248	1.02E+01	5.8	48.2
PCB 47	ppt	USEPA 1668A	Phase II	281	230	1.44E+01	2.45	62.4
PCB 48	ppt	USEPA 1668A	Crab/Clam	18	17	1.86E+02	186	186
PCB 48	ppt	USEPA 1668A	SQT	43	42	1.64E+02	164	164
PCB 48	ppt	USEPA 1668A	Phase III	193	187	9.89E+01	96.9	102
PCB 48/75	ppt	USEPA 1668A	Phase I	273	239	1.01E+01	2.51	48.2
PCB 48/75	ppt	USEPA 1668A	Phase II	281	226	1.81E+01	2.45	199
PCB 49/69	ppt	USEPA 1668A	Crab/Clam	18	17	3.72E+02	372	372
PCB 49/69	ppt	USEPA 1668A	SQT	43	43	--	--	--
PCB 49/69	ppt	USEPA 1668A	Phase III	193	192	2.04E+02	204	204

Table A-3
Summary of Analyte Detections and Detection Limits in NBSA Phase I, II, and III Sediment Samples

Chemical	Units	Analytical Method	Sampling Program	N[1]	Number of Detected Samples	Detection Limit Summary for Non-Detect Data		
						Mean	Minimum	Maximum
PCB 5	ppt	USEPA 1668A	Crab/Clam	18	4	1.08E+02	83.1	186
PCB 5	ppt	USEPA 1668A	SQT	43	5	1.64E+02	99.9	252
PCB 5	ppt	USEPA 1668A	Phase III	193	108	1.05E+02	91.9	565
PCB 5/8	ppt	USEPA 1668A	Phase I	273	219	4.20E+01	5	243
PCB 5/8	ppt	USEPA 1668A	Phase II	281	216	4.60E+01	2.45	346
PCB 50	ppt	USEPA 1668A	Phase I	271	176	2.34E+01	2.51	128
PCB 50	ppt	USEPA 1668A	Phase II	281	173	4.89E+01	2.45	215
PCB 50/53	ppt	USEPA 1668A	Crab/Clam	18	17	3.72E+02	372	372
PCB 50/53	ppt	USEPA 1668A	SQT	43	43	--	--	--
PCB 50/53	ppt	USEPA 1668A	Phase III	193	165	1.99E+02	189	243
PCB 51	ppt	USEPA 1668A	Phase I	273	220	1.60E+01	2.51	121
PCB 51	ppt	USEPA 1668A	Phase II	281	215	2.40E+01	2.45	210
PCB 51	ppt	USEPA 1668A	Crab/Clam	18	16	1.41E+02	95.4	186
PCB 51	ppt	USEPA 1668A	SQT	43	41	1.43E+02	121	164
PCB 51	ppt	USEPA 1668A	Phase III	193	171	1.23E+02	94.4	565
PCB 52	ppt	USEPA 1668A	Crab/Clam	18	17	1.86E+02	186	186
PCB 52	ppt	USEPA 1668A	SQT	43	43	--	--	--
PCB 52	ppt	USEPA 1668A	Phase III	193	189	9.79E+01	94.4	102
PCB 52/69	ppt	USEPA 1668A	Phase I	273	266	7.50E+00	5.8	12.3
PCB 52/69	ppt	USEPA 1668A	Phase II	281	263	8.14E+00	2.45	41.1
PCB 53	ppt	USEPA 1668A	Phase I	273	233	1.07E+01	2.51	48.2
PCB 53	ppt	USEPA 1668A	Phase II	281	226	1.71E+01	2.45	197
PCB 54	ppt	USEPA 1668A	Phase I	272	176	2.38E+01	2.51	128
PCB 54	ppt	USEPA 1668A	Phase II	281	170	5.32E+01	2.45	215
PCB 54	ppt	USEPA 1668A	Crab/Clam	18	9	1.01E+02	86.6	116
PCB 54	ppt	USEPA 1668A	SQT	43	28	1.53E+02	99.9	252
PCB 54	ppt	USEPA 1668A	Phase III	193	101	1.13E+02	83.6	565
PCB 55	ppt	USEPA 1668A	Phase I	273	201	2.08E+01	2.51	128
PCB 55	ppt	USEPA 1668A	Phase II	281	207	3.11E+01	2.45	212
PCB 55	ppt	USEPA 1668A	Crab/Clam	18	8	1.10E+02	86.6	186
PCB 55	ppt	USEPA 1668A	SQT	43	25	1.72E+02	99.9	252
PCB 55	ppt	USEPA 1668A	Phase III	193	140	1.09E+02	92	565
PCB 56	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--
PCB 56	ppt	USEPA 1668A	SQT	43	43	--	--	--
PCB 56	ppt	USEPA 1668A	Phase III	193	178	1.52E+02	94.5	503
PCB 56/60	ppt	USEPA 1668A	Phase I	273	253	8.52E+00	2.51	24.5
PCB 56/60	ppt	USEPA 1668A	Phase II	281	246	1.09E+01	2.45	42.2
PCB 57	ppt	USEPA 1668A	Phase I	272	185	2.21E+01	2.51	128
PCB 57	ppt	USEPA 1668A	Phase II	281	187	4.96E+01	2.45	215
PCB 57	ppt	USEPA 1668A	Crab/Clam	18	5	1.07E+02	83.1	186
PCB 57	ppt	USEPA 1668A	SQT	43	26	1.57E+02	99.9	252
PCB 57	ppt	USEPA 1668A	Phase III	193	129	1.12E+02	83.6	565
PCB 58	ppt	USEPA 1668A	Phase I	271	180	2.35E+01	2.51	128
PCB 58	ppt	USEPA 1668A	Phase II	281	184	4.58E+01	2.45	212
PCB 58	ppt	USEPA 1668A	Crab/Clam	18	4	1.08E+02	83.1	186
PCB 58	ppt	USEPA 1668A	SQT	43	24	1.58E+02	99.9	252

Table A-3
Summary of Analyte Detections and Detection Limits in NBSA Phase I, II, and III Sediment Samples

Chemical	Units	Analytical Method	Sampling Program	N[1]	Number of Detected Samples	Detection Limit Summary for Non-Detect Data		
						Mean	Minimum	Maximum
PCB 58	ppt	USEPA 1668A	Phase III	193	108	1.14E+02	83.6	565
PCB 59/62/75	ppt	USEPA 1668A	Crab/Clam	18	15	5.13E+02	366	744
PCB 59/62/75	ppt	USEPA 1668A	SQT	43	40	7.16E+02	484	1010
PCB 59/62/75	ppt	USEPA 1668A	Phase III	193	172	4.88E+02	378	2260
PCB 6	ppt	USEPA 1668A	Phase I	272	192	4.60E+01	5.03	256
PCB 6	ppt	USEPA 1668A	Phase II	281	193	4.79E+01	2.45	215
PCB 6	ppt	USEPA 1668A	Crab/Clam	18	15	4.20E+01	36.6	46.4
PCB 6	ppt	USEPA 1668A	SQT	43	41	7.48E+01	48.6	101
PCB 6	ppt	USEPA 1668A	Phase III	193	187	7.07E+01	39.1	226
PCB 60	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--
PCB 60	ppt	USEPA 1668A	SQT	43	43	--	--	--
PCB 60	ppt	USEPA 1668A	Phase III	193	190	9.93E+01	96.9	102
PCB 61/70	ppt	USEPA 1668A	Phase I	273	257	1.05E+01	2.51	36.4
PCB 61/70	ppt	USEPA 1668A	Phase II	281	257	8.47E+00	2.45	41.1
PCB 61/70/74/76	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--
PCB 61/70/74/76	ppt	USEPA 1668A	SQT	43	43	--	--	--
PCB 61/70/74/76	ppt	USEPA 1668A	Phase III	157	154	3.91E+02	378	407
PCB 62	ppt	USEPA 1668A	Phase I	267	4	3.83E+01	2.51	216
PCB 62	ppt	USEPA 1668A	Phase II	281	6	5.68E+01	2.45	254
PCB 63	ppt	USEPA 1668A	Phase I	273	215	1.59E+01	2.51	121
PCB 63	ppt	USEPA 1668A	Phase II	281	213	2.36E+01	2.45	210
PCB 63	ppt	USEPA 1668A	Crab/Clam	18	16	9.93E+01	91.5	107
PCB 63	ppt	USEPA 1668A	SQT	43	41	1.43E+02	121	164
PCB 63	ppt	USEPA 1668A	Phase III	193	178	1.00E+02	94.4	122
PCB 64	ppt	USEPA 1668A	Crab/Clam	18	17	1.86E+02	186	186
PCB 64	ppt	USEPA 1668A	SQT	43	43	--	--	--
PCB 64	ppt	USEPA 1668A	Phase III	193	190	9.91E+01	96.9	102
PCB 65	ppt	USEPA 1668A	Phase I	268	37	3.88E+01	2.51	216
PCB 65	ppt	USEPA 1668A	Phase II	281	50	5.80E+01	2.45	254
PCB 66	ppt	USEPA 1668A	Crab/Clam	18	17	1.86E+02	186	186
PCB 66	ppt	USEPA 1668A	SQT	43	43	--	--	--
PCB 66	ppt	USEPA 1668A	Phase III	193	191	9.95E+01	96.9	102
PCB 66/76	ppt	USEPA 1668A	Phase I	273	256	3.26E+01	2.51	416
PCB 66/76	ppt	USEPA 1668A	Phase II	281	254	7.95E+00	2.45	42.2
PCB 67	ppt	USEPA 1668A	Phase I	272	210	1.80E+01	2.51	121
PCB 67	ppt	USEPA 1668A	Phase II	281	213	2.61E+01	2.45	210
PCB 67	ppt	USEPA 1668A	Crab/Clam	18	16	9.93E+01	91.5	107
PCB 67	ppt	USEPA 1668A	SQT	43	39	1.67E+02	121	252
PCB 67	ppt	USEPA 1668A	Phase III	193	171	1.23E+02	94.4	565
PCB 68	ppt	USEPA 1668A	Phase I	271	188	2.19E+01	2.51	128
PCB 68	ppt	USEPA 1668A	Phase II	226	143	3.34E+01	2.45	212
PCB 68	ppt	USEPA 1668A	Crab/Clam	18	10	9.88E+01	83.1	116
PCB 68	ppt	USEPA 1668A	SQT	43	36	1.46E+02	99.9	252
PCB 68	ppt	USEPA 1668A	Phase III	193	148	1.11E+02	94.4	565
PCB 7	ppt	USEPA 1668A	Crab/Clam	18	8	4.45E+01	33.2	74.4
PCB 7	ppt	USEPA 1668A	SQT	43	13	9.24E+01	40	315

Table A-3
Summary of Analyte Detections and Detection Limits in NBSA Phase I, II, and III Sediment Samples

Chemical	Units	Analytical Method	Sampling Program	N[1]	Number of Detected Samples	Detection Limit Summary for Non-Detect Data		
						Mean	Minimum	Maximum
PCB 7	ppt	USEPA 1668A	Phase III	193	123	4.47E+01	30.2	226
PCB 7/9	ppt	USEPA 1668A	Phase I	272	181	4.83E+01	5.03	256
PCB 7/9	ppt	USEPA 1668A	Phase II	281	191	5.62E+01	2.45	410
PCB 70/74/76	ppt	USEPA 1668A	Phase III	36	36	--	--	--
PCB 72	ppt	USEPA 1668A	Crab/Clam	18	12	1.03E+02	91.5	116
PCB 72	ppt	USEPA 1668A	SQT	43	38	1.52E+02	99.9	252
PCB 72	ppt	USEPA 1668A	Phase III	193	154	1.12E+02	94.4	565
PCB 73	ppt	USEPA 1668A	Phase I	267	5	3.84E+01	2.51	216
PCB 73	ppt	USEPA 1668A	Phase II	281	27	5.64E+01	2.45	254
PCB 73	ppt	USEPA 1668A	Crab/Clam	18	4	1.13E+02	83.1	186
PCB 73	ppt	USEPA 1668A	SQT	43	2	1.62E+02	99.9	252
PCB 73	ppt	USEPA 1668A	Phase III	193	12	1.06E+02	75.4	565
PCB 74	ppt	USEPA 1668A	Phase I	273	247	9.90E+00	2.51	48.2
PCB 74	ppt	USEPA 1668A	Phase II	281	241	1.06E+01	2.45	82.4
PCB 77	ppt	USEPA 1668A	Phase I	273	251	1.37E+01	5.8	48.2
PCB 77	ppt	USEPA 1668A	Phase II	281	258	6.79E+00	0.421	89.3
PCB 77	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--
PCB 77	ppt	USEPA 1668A	SQT	43	43	--	--	--
PCB 77	ppt	USEPA 1668A	Phase III	193	189	9.88E+01	96.9	102
PCB 78	ppt	USEPA 1668A	Phase I	267	62	3.17E+01	2.51	128
PCB 78	ppt	USEPA 1668A	Phase II	281	4	5.62E+01	2.45	254
PCB 78	ppt	USEPA 1668A	Crab/Clam	18	0	1.13E+02	83.1	186
PCB 78	ppt	USEPA 1668A	SQT	43	0	1.65E+02	99.9	252
PCB 78	ppt	USEPA 1668A	Phase III	193	2	1.06E+02	75.4	565
PCB 79	ppt	USEPA 1668A	Phase I	272	185	6.05E+01	2.51	747
PCB 79	ppt	USEPA 1668A	Phase II	281	149	2.55E+02	2.45	3360
PCB 79	ppt	USEPA 1668A	Crab/Clam	18	9	1.02E+02	83.1	125
PCB 79	ppt	USEPA 1668A	SQT	43	24	1.66E+02	99.9	252
PCB 79	ppt	USEPA 1668A	Phase III	193	142	1.09E+02	92.7	565
PCB 8	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--
PCB 8	ppt	USEPA 1668A	SQT	43	43	--	--	--
PCB 8	ppt	USEPA 1668A	Phase III	193	193	--	--	--
PCB 80	ppt	USEPA 1668A	Phase I	267	0	3.84E+01	2.51	216
PCB 80	ppt	USEPA 1668A	Phase II	281	0	5.73E+01	2.45	254
PCB 80	ppt	USEPA 1668A	Crab/Clam	18	0	1.13E+02	83.1	186
PCB 80	ppt	USEPA 1668A	SQT	43	0	1.65E+02	99.9	252
PCB 80	ppt	USEPA 1668A	Phase III	193	0	1.06E+02	75.4	565
PCB 81	ppt	USEPA 1668A	Phase I	273	206	1.87E+01	2.51	128
PCB 81	ppt	USEPA 1668A	Phase II	281	209	5.99E+00	0.225	72.6
PCB 81	ppt	USEPA 1668A	Crab/Clam	18	6	1.09E+02	83.1	186
PCB 81	ppt	USEPA 1668A	SQT	43	15	1.60E+02	99.9	252
PCB 81	ppt	USEPA 1668A	Phase III	193	84	1.07E+02	83.6	565
PCB 82	ppt	USEPA 1668A	Phase I	273	230	1.47E+01	2.51	121
PCB 82	ppt	USEPA 1668A	Phase II	281	225	1.41E+01	2.45	43
PCB 82	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--
PCB 82	ppt	USEPA 1668A	SQT	43	43	--	--	--

Table A-3
Summary of Analyte Detections and Detection Limits in NBSA Phase I, II, and III Sediment Samples

Chemical	Units	Analytical Method	Sampling Program	N[1]	Number of Detected Samples	Detection Limit Summary for Non-Detect Data		
						Mean	Minimum	Maximum
PCB 82	ppt	USEPA 1668A	Phase III	193	182	9.86E+01	95.3	102
PCB 83	ppt	USEPA 1668A	Phase I	269	113	3.11E+01	2.51	177
PCB 83	ppt	USEPA 1668A	Phase II	281	128	5.27E+01	2.45	215
PCB 83	ppt	USEPA 1668A	Crab/Clam	18	15	2.15E+02	183	247
PCB 83	ppt	USEPA 1668A	SQT	43	35	3.08E+02	200	504
PCB 83	ppt	USEPA 1668A	Phase III	193	157	2.25E+02	189	1130
PCB 84	ppt	USEPA 1668A	Crab/Clam	18	17	7.44E+01	74.4	74.4
PCB 84	ppt	USEPA 1668A	SQT	43	43	--	--	--
PCB 84	ppt	USEPA 1668A	Phase III	193	184	4.06E+01	37.8	48.6
PCB 84/92	ppt	USEPA 1668A	Phase I	273	250	8.39E+00	2.51	24.5
PCB 84/92	ppt	USEPA 1668A	Phase II	281	243	9.54E+00	2.45	42.2
PCB 85/116	ppt	USEPA 1668A	Phase I	273	240	1.02E+01	2.51	48.2
PCB 85/116	ppt	USEPA 1668A	Phase II	281	228	1.41E+01	2.45	62.4
PCB 85/116/117	ppt	USEPA 1668A	Crab/Clam	18	17	3.66E+02	366	366
PCB 85/116/117	ppt	USEPA 1668A	SQT	43	43	--	--	--
PCB 85/116/117	ppt	USEPA 1668A	Phase III	157	150	4.07E+02	378	486
PCB 86	ppt	USEPA 1668A	Phase I	273	192	2.20E+01	2.51	128
PCB 86	ppt	USEPA 1668A	Phase II	281	190	4.33E+01	2.45	215
PCB 86/87/97/108/119/125	ppt	USEPA 1668A	Phase III	193	174	4.96E+02	378	2260
PCB 86/87/97/109/119/125	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--
PCB 86/87/97/109/119/125	ppt	USEPA 1668A	SQT	43	43	--	--	--
PCB 87/117/125	ppt	USEPA 1668A	Phase I	273	247	8.36E+00	2.51	24.5
PCB 87/117/125	ppt	USEPA 1668A	Phase II	281	235	1.23E+01	2.45	62.4
PCB 88	ppt	USEPA 1668A	Crab/Clam	18	1	1.13E+02	83.1	186
PCB 88	ppt	USEPA 1668A	SQT	43	2	1.64E+02	99.9	252
PCB 88	ppt	USEPA 1668A	Phase III	193	3	1.06E+02	75.4	565
PCB 88/91	ppt	USEPA 1668A	Phase I	273	238	1.01E+01	2.51	48.2
PCB 88/91	ppt	USEPA 1668A	Phase II	281	226	1.37E+01	2.45	43
PCB 89	ppt	USEPA 1668A	Phase I	272	201	2.00E+01	2.51	128
PCB 89	ppt	USEPA 1668A	Phase II	281	200	3.82E+01	2.45	212
PCB 89	ppt	USEPA 1668A	Crab/Clam	18	14	1.02E+02	91.5	116
PCB 89	ppt	USEPA 1668A	SQT	43	34	1.50E+02	99.9	252
PCB 89	ppt	USEPA 1668A	Phase III	193	140	1.09E+02	94.4	565
PCB 9	ppt	USEPA 1668A	Crab/Clam	18	14	4.23E+01	36.6	46.4
PCB 9	ppt	USEPA 1668A	SQT	43	15	1.13E+02	40	325
PCB 9	ppt	USEPA 1668A	Phase III	193	181	6.68E+01	36.8	226
PCB 90/101	ppt	USEPA 1668A	Phase I	273	263	7.73E+00	5.8	12.3
PCB 90/101	ppt	USEPA 1668A	Phase II	281	256	8.38E+00	2.45	41.1
PCB 90/101/113	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--
PCB 90/101/113	ppt	USEPA 1668A	SQT	43	43	--	--	--
PCB 90/101/113	ppt	USEPA 1668A	Phase III	193	184	4.04E+02	378	486
PCB 91	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--
PCB 91	ppt	USEPA 1668A	SQT	43	43	--	--	--
PCB 91	ppt	USEPA 1668A	Phase III	193	183	9.81E+01	94.4	102
PCB 92	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--
PCB 92	ppt	USEPA 1668A	SQT	43	42	1.21E+02	121	121

Table A-3
Summary of Analyte Detections and Detection Limits in NBSA Phase I, II, and III Sediment Samples

Chemical	Units	Analytical Method	Sampling Program	N[1]	Number of Detected Samples	Detection Limit Summary for Non-Detect Data		
						Mean	Minimum	Maximum
PCB 92	ppt	USEPA 1668A	Phase III	193	167	1.28E+02	91.9	503
PCB 93	ppt	USEPA 1668A	Phase I	267	6	3.77E+01	2.51	216
PCB 93	ppt	USEPA 1668A	Phase II	281	0	5.72E+01	2.45	254
PCB 93/100	ppt	USEPA 1668A	Crab/Clam	18	5	4.30E+02	332	744
PCB 93/100	ppt	USEPA 1668A	SQT	43	31	6.34E+02	400	1010
PCB 93/100	ppt	USEPA 1668A	Phase III	193	102	4.53E+02	334	2260
PCB 94	ppt	USEPA 1668A	Phase I	273	191	2.18E+01	2.51	128
PCB 94	ppt	USEPA 1668A	Phase II	281	198	3.71E+01	2.45	212
PCB 94	ppt	USEPA 1668A	Crab/Clam	18	8	1.02E+02	86.6	116
PCB 94	ppt	USEPA 1668A	SQT	43	24	1.56E+02	99.9	252
PCB 94	ppt	USEPA 1668A	Phase III	193	131	1.08E+02	94.4	565
PCB 95	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--
PCB 95	ppt	USEPA 1668A	SQT	43	43	--	--	--
PCB 95	ppt	USEPA 1668A	Phase III	193	182	4.03E+02	378	486
PCB 95/98/102	ppt	USEPA 1668A	Phase I	273	258	8.56E+00	2.51	24.5
PCB 95/98/102	ppt	USEPA 1668A	Phase II	281	251	8.67E+00	2.45	42.2
PCB 96	ppt	USEPA 1668A	Phase I	273	195	2.26E+01	2.51	128
PCB 96	ppt	USEPA 1668A	Phase II	281	200	3.30E+01	2.45	212
PCB 96	ppt	USEPA 1668A	Crab/Clam	18	9	9.98E+01	83.1	116
PCB 96	ppt	USEPA 1668A	SQT	43	30	1.63E+02	99.9	252
PCB 96	ppt	USEPA 1668A	Phase III	193	123	1.11E+02	83.6	565
PCB 97	ppt	USEPA 1668A	Phase I	273	243	8.56E+00	2.51	24.5
PCB 97	ppt	USEPA 1668A	Phase II	281	231	1.32E+01	2.45	62.4
PCB 98/102	ppt	USEPA 1668A	Crab/Clam	18	10	3.95E+02	332	464
PCB 98/102	ppt	USEPA 1668A	SQT	43	33	6.00E+02	400	1010
PCB 98/102	ppt	USEPA 1668A	Phase III	193	134	4.31E+02	378	2260
PCB 99	ppt	USEPA 1668A	Phase I	273	249	9.75E+00	2.51	41.1
PCB 99	ppt	USEPA 1668A	Phase II	281	240	1.09E+01	2.45	62.4
PCB 99	ppt	USEPA 1668A	Crab/Clam	18	18	--	--	--
PCB 99	ppt	USEPA 1668A	SQT	43	43	--	--	--
PCB 99	ppt	USEPA 1668A	Phase III	193	189	1.96E+02	189	204
PCNs								
PCN-1	ppt	PCN	Phase II	61	61	--	--	--
PCN-10	ppt	PCN	Phase II	61	32	5.54E+01	9.93	134
PCN-12	ppt	PCN	Phase II	61	57	9.97E+00	9.93	10
PCN-13	ppt	PCN	Phase II	61	35	3.03E+01	9.76	100
PCN-2	ppt	PCN	Phase II	61	59	9.97E+00	9.96	9.98
PCN-27	ppt	PCN	Phase II	61	54	2.47E+01	9.93	49.8
PCN-28/36	ppt	PCN	Phase II	61	53	3.97E+01	19.5	99.5
PCN-3	ppt	PCN	Phase II	61	54	3.42E+01	9.93	100
PCN-31	ppt	PCN	Phase II	61	57	9.97E+00	9.93	10
PCN-42	ppt	PCN	Phase II	61	56	1.79E+01	9.93	49.8
PCN-46	ppt	PCN	Phase II	61	17	4.12E+01	9.76	100
PCN-48	ppt	PCN	Phase II	61	18	3.34E+01	9.76	100
PCN-49	ppt	PCN	Phase II	61	43	2.04E+01	9.87	100
PCN-5	ppt	PCN	Phase II	61	59	2.53E+02	13.3	492

Table A-3
Summary of Analyte Detections and Detection Limits in NBSA Phase I, II, and III Sediment Samples

Chemical	Units	Analytical Method	Sampling Program	N[1]	Number of Detected Samples	Detection Limit Summary for Non-Detect Data		
						Mean	Minimum	Maximum
PCN-50	ppt	PCN	Phase II	61	54	1.56E+01	9.92	49.4
PCN-52	ppt	PCN	Phase II	61	55	9.94E+00	9.86	10
PCN-53	ppt	PCN	Phase II	61	48	2.15E+01	9.77	100
PCN-54	ppt	PCN	Phase II	61	35	3.14E+01	9.84	100
PCN-6	ppt	PCN	Phase II	61	57	9.97E+00	9.93	10
PCN-66/67	ppt	PCN	Phase II	61	55	4.65E+01	19.9	99.8
PCN-68	ppt	PCN	Phase II	61	54	2.14E+01	9.92	49.9
PCN-69	ppt	PCN	Phase II	61	56	9.96E+00	9.92	10
PCN-70	ppt	PCN	Phase II	61	24	3.29E+01	9.84	100
PCN-71/72	ppt	PCN	Phase II	61	55	1.99E+01	19.8	20.1
PCN-73	ppt	PCN	Phase II	61	55	1.66E+01	9.85	49.8
PCN-74	ppt	PCN	Phase II	61	57	9.97E+00	9.93	10
PCN-75	ppt	PCN	Phase II	61	50	3.55E+01	9.85	85.3
PCN-9	ppt	PCN	Phase II	61	38	4.51E+01	9.76	100
Pesticides								
2,4'-DDD	ppb	USEPACLP SOM01.2Pest	Phase II	273	105	6.25E+00	3.6	10
2,4'-DDD	ppb	USEPA 1699	Crab/Clam	18	18	--	--	--
2,4'-DDD	ppb	USEPA 1699	SQT	43	43	--	--	--
2,4'-DDD	ppb	USEPA 1699	Phase III	192	190	5.01E-03	0.00501	0.00501
2,4'-DDE	ppb	USEPACLP SOM01.2Pest	Phase II	273	147	5.94E+00	3.6	10
2,4'-DDE	ppb	USEPA 1699	Crab/Clam	18	18	--	--	--
2,4'-DDE	ppb	USEPA 1699	SQT	43	43	--	--	--
2,4'-DDE	ppb	USEPA 1699	Phase III	192	192	--	--	--
2,4'-DDT	ppb	USEPACLP SOM01.2Pest	Phase II	280	34	6.77E+00	3.6	33
2,4'-DDT	ppb	USEPA 1699	Crab/Clam	18	11	3.73E-02	0.0242	0.0708
2,4'-DDT	ppb	USEPA 1699	SQT	42	39	6.10E-03	0.0061	0.0061
2,4'-DDT	ppb	USEPA 1699	Phase III	188	81	6.10E-03	0.0061	0.0061
4,4'-DDD	ppb	USEPA 3550B/8081	Phase I	273	43	4.14E+01	3.5	460
4,4'-DDD	ppb	USEPACLP SOM01.2Pest	Phase II	280	185	5.65E+00	3.6	8.5
4,4'-DDD	ppb	USEPA 1699	Crab/Clam	18	18	--	--	--
4,4'-DDD	ppb	USEPA 1699	SQT	43	43	--	--	--
4,4'-DDD	ppb	USEPA 1699	Phase III	193	193	--	--	--
4,4'-DDE	ppb	USEPA 3550B/8081	Phase I	273	172	3.49E+01	3.5	240
4,4'-DDE	ppb	USEPACLP SOM01.2Pest	Phase II	281	213	5.19E+00	3.6	7.4
4,4'-DDE	ppb	USEPA 1699	Crab/Clam	18	18	--	--	--
4,4'-DDE	ppb	USEPA 1699	SQT	43	43	--	--	--
4,4'-DDE	ppb	USEPA 1699	Phase III	192	192	--	--	--
4,4'-DDT	ppb	USEPA 3550B/8081	Phase I	259	44	4.24E+01	3.5	460
4,4'-DDT	ppb	USEPACLP SOM01.2Pest	Phase II	277	154	6.07E+00	3.6	10
4,4'-DDT	ppb	USEPA 1699	Crab/Clam	18	17	3.00E-02	0.03	0.03
4,4'-DDT	ppb	USEPA 1699	SQT	43	43	--	--	--
4,4'-DDT	ppb	USEPA 1699	Phase III	175	143	9.18E-03	0.00918	0.00918
Aldrin	ppb	USEPA 3550B/8081	Phase I	273	0	2.36E+01	1.8	230
Aldrin	ppb	USEPACLP SOM01.2Pest	Phase II	272	30	4.04E+00	1.8	76
Aldrin	ppb	USEPA 1699	Crab/Clam	18	1	9.48E-02	0.0101	0.771
Aldrin	ppb	USEPA 1699	SQT	19	0	5.37E-03	0.00537	0.00537

Table A-3
Summary of Analyte Detections and Detection Limits in NBSA Phase I, II, and III Sediment Samples

Chemical	Units	Analytical Method	Sampling Program	N[1]	Number of Detected Samples	Detection Limit Summary for Non-Detect Data		
						Mean	Minimum	Maximum
Aldrin	ppb	USEPA 1699	Phase III	108	3	5.37E-03	0.00537	0.00537
Alpha-BHC	ppb	USEPA 3550B/8081	Phase I	273	24	2.38E+01	1.8	230
Alpha-BHC	ppb	USEPACLP SOM01.2Pest	Phase II	276	89	4.53E+00	1.8	79
Alpha-BHC	ppb	USEPA 1699	Crab/Clam	18	11	7.68E-03	0.00768	0.00768
Alpha-BHC	ppb	USEPA 1699	SQT	43	43	--	--	--
Alpha-BHC	ppb	USEPA 1699	Phase III	191	118	7.88E-03	0.00788	0.00788
Alpha-Chlordane	ppb	USEPA 3550B/8081	Phase I	273	0	2.37E+01	1.8	230
Alpha-Chlordane	ppb	USEPACLP SOM01.2Pest	Phase II	281	133	3.44E+00	1.8	38
Alpha-Chlordane	ppb	USEPA 1699	Crab/Clam	18	18	--	--	--
Alpha-Chlordane	ppb	USEPA 1699	SQT	43	42	9.59E-03	0.00959	0.00959
Alpha-Chlordane	ppb	USEPA 1699	Phase III	192	178	9.59E-03	0.00959	0.00959
Beta-BHC	ppb	USEPA 3550B/8081	Phase I	273	27	2.43E+01	1.8	230
Beta-BHC	ppb	USEPACLP SOM01.2Pest	Phase II	251	67	4.86E+00	1.8	79
Beta-BHC	ppb	USEPA 1699	Crab/Clam	18	8	1.62E-02	0.0142	0.0346
Beta-BHC	ppb	USEPA 1699	SQT	43	35	1.26E-02	0.0126	0.0126
Beta-BHC	ppb	USEPA 1699	Phase III	192	105	1.26E-02	0.0126	0.0126
cis-Nonachlor	ppb	USEPA 1699	Crab/Clam	18	15	2.14E-02	0.0214	0.0214
cis-Nonachlor	ppb	USEPA 1699	SQT	43	41	1.01E-02	0.0101	0.0101
cis-Nonachlor	ppb	USEPA 1699	Phase III	187	146	1.01E-02	0.0101	0.0101
Delta-BHC	ppb	USEPA 3550B/8081	Phase I	273	20	2.44E+01	1.8	230
Delta-BHC	ppb	USEPACLP SOM01.2Pest	Phase II	277	23	4.15E+00	1.8	45
Delta-BHC	ppb	USEPA 1699	Crab/Clam	18	1	1.51E-02	0.0122	0.0386
Delta-BHC	ppb	USEPA 1699	SQT	43	8	7.34E-03	0.00734	0.00734
Delta-BHC	ppb	USEPA 1699	Phase III	192	29	7.34E-03	0.00734	0.00734
Dieldrin	ppb	USEPA 3550B/8081	Phase I	273	0	4.61E+01	3.5	460
Dieldrin	ppb	USEPACLP SOM01.2Pest	Phase II	275	139	6.50E+00	2.6	42
Dieldrin	ppb	USEPA 1699	Crab/Clam	18	16	8.62E-03	0.00862	0.00862
Dieldrin	ppb	USEPA 1699	SQT	43	42	1.05E-02	0.0105	0.0105
Dieldrin	ppb	USEPA 1699	Phase III	192	182	1.05E-02	0.0105	0.0105
Endosulfan I	ppb	USEPA 3550B/8081	Phase I	273	1	2.36E+01	1.8	230
Endosulfan I	ppb	USEPACLP SOM01.2Pest	Phase II	281	13	5.37E+00	1.8	88
Endosulfan I	ppb	USEPA 1699	Crab/Clam	18	0	1.07E-01	0.056	0.386
Endosulfan I	ppb	USEPA 1699	SQT	43	3	2.05E-02	0.0205	0.0205
Endosulfan I	ppb	USEPA 1699	Phase III	188	1	2.05E-02	0.0205	0.0205
Endosulfan II	ppb	USEPA 3550B/8081	Phase I	273	0	4.59E+01	3.5	460
Endosulfan II	ppb	USEPACLP SOM01.2Pest	Phase II	281	22	7.39E+00	3.1	90
Endosulfan II	ppb	USEPA 1699	Crab/Clam	18	2	1.65E-01	0.12	0.386
Endosulfan II	ppb	USEPA 1699	SQT	42	0	4.26E-02	0.0426	0.0426
Endosulfan II	ppb	USEPA 1699	Phase III	188	1	4.26E-02	0.0426	0.0426
Endosulfan Sulfate	ppb	USEPA 3550B/8081	Phase I	273	5	4.62E+01	3.5	460
Endosulfan Sulfate	ppb	USEPACLP SOM01.2Pest	Phase II	278	77	6.84E+00	3.6	23
Endosulfan Sulfate	ppb	USEPA 1699	Crab/Clam	18	0	1.30E-01	0.0831	0.386
Endosulfan Sulfate	ppb	USEPA 1699	SQT	42	0	4.47E-02	0.0447	0.0447
Endosulfan Sulfate	ppb	USEPA 1699	Phase III	177	0	4.47E-02	0.0447	0.0447
Endrin	ppb	USEPA 3550B/8081	Phase I	273	5	4.63E+01	3.5	460
Endrin	ppb	USEPACLP SOM01.2Pest	Phase II	280	24	7.99E+00	3.6	150

Table A-3
Summary of Analyte Detections and Detection Limits in NBSA Phase I, II, and III Sediment Samples

Chemical	Units	Analytical Method	Sampling Program	N[1]	Number of Detected Samples	Detection Limit Summary for Non-Detect Data		
						Mean	Minimum	Maximum
Endrin	ppb	USEPA 1699	Crab/Clam	18	0	2.44E-02	0.0148	0.0771
Endrin	ppb	USEPA 1699	SQT	43	0	1.04E-02	0.0104	0.0104
Endrin	ppb	USEPA 1699	Phase III	189	1	1.04E-02	0.0104	0.0104
Endrin Aldehyde	ppb	USEPA 3550B/8081	Phase I	273	2	4.61E+01	3.5	460
Endrin Aldehyde	ppb	USEPACLP SOM01.2Pest	Phase II	279	94	7.83E+00	3.6	150
Endrin Aldehyde	ppb	USEPA 1699	Crab/Clam	18	0	2.52E-01	0.23	0.386
Endrin Aldehyde	ppb	USEPA 1699	SQT	38	0	4.06E-02	0.0406	0.0406
Endrin Aldehyde	ppb	USEPA 1699	Phase III	102	0	4.06E-02	0.0406	0.0406
Endrin Ketone	ppb	USEPA 3550B/8081	Phase I	273	0	4.59E+01	3.5	460
Endrin Ketone	ppb	USEPACLP SOM01.2Pest	Phase II	281	19	6.86E+00	3.6	16
Endrin Ketone	ppb	USEPA 1699	Crab/Clam	18	0	1.70E-01	0.132	0.386
Endrin Ketone	ppb	USEPA 1699	SQT	37	0	2.58E-02	0.0258	0.0258
Endrin Ketone	ppb	USEPA 1699	Phase III	158	2	2.58E-02	0.0258	0.0258
Gamma-BHC (Lindane)	ppb	USEPA 3550B/8081	Phase I	273	7	2.37E+01	1.8	230
Gamma-BHC (Lindane)	ppb	USEPACLP SOM01.2Pest	Phase II	274	25	4.05E+00	1.8	45
Gamma-BHC (Lindane)	ppb	USEPA 1699	Crab/Clam	18	3	9.48E-03	0.00769	0.0346
Gamma-BHC (Lindane)	ppb	USEPA 1699	SQT	43	20	7.30E-03	0.0073	0.0073
Gamma-BHC (Lindane)	ppb	USEPA 1699	Phase III	192	38	7.30E-03	0.0073	0.0073
Gamma-Chlordane	ppb	USEPA 3550B/8081	Phase I	273	2	2.39E+01	1.8	230
Gamma-Chlordane	ppb	USEPACLP SOM01.2Pest	Phase II	244	89	6.70E+00	1.8	76
Heptachlor	ppb	USEPA 3550B/8081	Phase I	273	1	2.36E+01	1.8	230
Heptachlor	ppb	USEPACLP SOM01.2Pest	Phase II	268	84	3.89E+00	1.8	79
Heptachlor	ppb	USEPA 1699	Crab/Clam	18	2	2.81E-01	0.022	3.86
Heptachlor	ppb	USEPA 1699	SQT	43	7	1.04E-02	0.0104	0.0104
Heptachlor	ppb	USEPA 1699	Phase III	188	9	1.04E-02	0.0104	0.0104
Heptachlor Epoxide	ppb	USEPA 3550B/8081	Phase I	273	16	2.43E+01	1.8	230
Heptachlor Epoxide	ppb	USEPACLP SOM01.2Pest	Phase II	221	94	5.94E+00	1.8	79
Heptachlor Epoxide	ppb	USEPA 1699	Crab/Clam	18	12	2.44E-02	0.0191	0.0354
Heptachlor Epoxide	ppb	USEPA 1699	SQT	43	26	9.35E-03	0.00935	0.00935
Heptachlor Epoxide	ppb	USEPA 1699	Phase III	188	43	9.35E-03	0.00935	0.00935
Hexachlorobenzene	ppb	USEPA 1699	Crab/Clam	18	18	--	--	--
Hexachlorobenzene	ppb	USEPA 1699	SQT	43	43	--	--	--
Hexachlorobenzene	ppb	USEPA 1699	Phase III	192	191	5.26E-03	0.00526	0.00526
Methoxychlor	ppb	USEPA 3550B/8081	Phase I	272	6	2.35E+02	18	2300
Methoxychlor	ppb	USEPACLP SOM01.2Pest	Phase II	281	17	3.41E+01	18	79
Methoxychlor	ppb	USEPA 1699	Crab/Clam	18	0	3.22E-01	0.0829	3.86
Methoxychlor	ppb	USEPA 1699	SQT	28	1	1.18E-02	0.0118	0.0118
Methoxychlor	ppb	USEPA 1699	Phase III	105	7	1.18E-02	0.0118	0.0118
Mirex	ppb	USEPA 1699	Crab/Clam	18	1	1.45E-02	0.00987	0.0386
Mirex	ppb	USEPA 1699	SQT	37	5	4.91E-03	0.00491	0.00491
Mirex	ppb	USEPA 1699	Phase III	126	31	4.91E-03	0.00491	0.00491
Nonachlor, trans-	ppb	USEPA 1699	Crab/Clam	18	15	1.75E-02	0.0175	0.0175
Nonachlor, trans-	ppb	USEPA 1699	SQT	43	42	7.60E-03	0.0076	0.0076
Nonachlor, trans-	ppb	USEPA 1699	Phase III	188	170	7.60E-03	0.0076	0.0076
Oxychlordane	ppb	USEPA 1699	Crab/Clam	18	2	1.38E-02	0.00866	0.0386
Oxychlordane	ppb	USEPA 1699	SQT	43	4	1.14E-02	0.0114	0.0114

Table A-3
Summary of Analyte Detections and Detection Limits in NBSA Phase I, II, and III Sediment Samples

Chemical	Units	Analytical Method	Sampling Program	N[1]	Number of Detected Samples	Detection Limit Summary for Non-Detect Data		
						Mean	Minimum	Maximum
Oxychlordane	ppb	USEPA 1699	Phase III	189	1	1.14E-02	0.0114	0.0114
Toxaphene	ppb	USEPA 3550B/8081	Phase I	273	0	2.36E+03	180	23000
Toxaphene	ppb	USEPACLP SOM01.2Pest	Phase II	281	0	3.44E+02	180	790
trans-Chlordane	ppb	USEPA 1699	Crab/Clam	18	18	--	--	--
trans-Chlordane	ppb	USEPA 1699	SQT	43	42	1.14E-02	0.0114	0.0114
trans-Chlordane	ppb	USEPA 1699	Phase III	189	182	1.14E-02	0.0114	0.0114
trans-Heptachlor Epoxide	ppb	USEPA 1699	Crab/Clam	18	6	5.77E-02	0.0567	0.0692
trans-Heptachlor Epoxide	ppb	USEPA 1699	SQT	43	24	1.29E-02	0.0129	0.0129
trans-Heptachlor Epoxide	ppb	USEPA 1699	Phase III	192	22	1.29E-02	0.0129	0.0129
Radiochem								
BE-7	pCi/g	PA SOP 739 R8/713 R8	Phase I	67	59	8.75E-02	-0.14	0.18
BE-7	pCi/g	PA SOP 739 R9/713 R9	Phase II	40	39	1.10E-01	0.11	0.11
CS-137	pCi/g	PA SOP 739 R8/713 R8	Phase I	376	195	-1.31E-02	-0.09	0.045
CS-137	pCi/g	PA SOP 739 R9/713 R9	Phase II	314	176	-1.14E-02	-0.088	0.044
PB-210	pCi/g	PA SOP 726 R4/704 R7	Phase I	402	402	--	--	--
PB-210	pCi/g	PA SOP 726 R6/704 R9	Phase II	314	314	--	--	--
Semivolatiles								
1,2,4,5-Tetrachlorobenzene	ppb	USEPACLP SOM01.2SVOC	Phase II	280	1	5.96E+02	180	2300
1,2,4,5-Tetrachlorobenzene	ppb	SW8270D	Crab/Clam	18	0	2.37E+01	20	35
1,2,4,5-Tetrachlorobenzene	ppb	SW8270D	SQT	36	0	3.40E+01	23	44
1,2,4,5-Tetrachlorobenzene	ppb	SW8270D	Phase III	193	0	6.38E+01	40	230
1,2,4-Trichlorobenzene	ppb	USEPA 3550B/8270C	Phase I	273	16	1.62E+03	180	9800
1,2-Dichlorobenzene	ppb	USEPA 3550B/8270C	Phase I	273	3	1.67E+03	180	9800
1,2-Diphenylhydrazine	ppb	SW8270D	Crab/Clam	18	0	2.37E+01	20	35
1,2-Diphenylhydrazine	ppb	SW8270D	SQT	36	0	3.40E+01	23	44
1,2-Diphenylhydrazine	ppb	SW8270D	Phase III	193	0	6.38E+01	40	230
1,3-Dichlorobenzene	ppb	USEPA 3550B/8270C	Phase I	273	5	1.61E+03	180	8900
1,4-Dichlorobenzene	ppb	USEPA 3550B/8270C	Phase I	273	74	1.46E+03	180	8900
2,2'-oxybis(1-Chloropropane)	ppb	SW8270D	Crab/Clam	18	0	2.37E+01	20	35
2,2'-oxybis(1-Chloropropane)	ppb	SW8270D	SQT	36	0	3.40E+01	23	44
2,2'-oxybis(1-Chloropropane)	ppb	SW8270D	Phase III	193	1	6.38E+01	40	230
2,2-oxybis(1-Chloropropane)	ppb	USEPA 3550B/8270C	Phase I	273	0	1.66E+03	180	9800
2,2-oxybis(1-Chloropropane)	ppb	USEPACLP SOM01.2SVOC	Phase II	280	0	5.98E+02	180	2300
2,3,4,6-Tetrachlorophenol	ppb	USEPACLP SOM01.2SVOC	Phase II	280	0	5.98E+02	180	2300
2,3,4,6-Tetrachlorophenol	ppb	SW8270D	Crab/Clam	18	0	9.44E+01	82	140
2,3,4,6-Tetrachlorophenol	ppb	SW8270D	SQT	36	0	1.36E+02	90	180
2,3,4,6-Tetrachlorophenol	ppb	SW8270D	Phase III	193	0	3.19E+02	200	1100
2,4,5-Trichlorophenol	ppb	USEPA 3550B/8270C	Phase I	273	0	1.66E+03	180	9800
2,4,5-Trichlorophenol	ppb	USEPACLP SOM01.2SVOC	Phase II	280	0	5.98E+02	180	2300
2,4,5-Trichlorophenol	ppb	SW8270D	Crab/Clam	18	0	2.37E+01	20	35
2,4,5-Trichlorophenol	ppb	SW8270D	SQT	36	0	3.40E+01	23	44
2,4,5-Trichlorophenol	ppb	SW8270D	Phase III	193	0	6.38E+01	40	230
2,4,6-Trichlorophenol	ppb	USEPA 3550B/8270C	Phase I	273	0	1.66E+03	180	9800
2,4,6-Trichlorophenol	ppb	USEPACLP SOM01.2SVOC	Phase II	278	0	5.98E+02	180	2300
2,4,6-Trichlorophenol	ppb	SW8270D	Crab/Clam	18	0	2.37E+01	20	35
2,4,6-Trichlorophenol	ppb	SW8270D	SQT	36	0	3.40E+01	23	44

Table A-3
Summary of Analyte Detections and Detection Limits in NBSA Phase I, II, and III Sediment Samples

Chemical	Units	Analytical Method	Sampling Program	N[1]	Number of Detected Samples	Detection Limit Summary for Non-Detect Data		
						Mean	Minimum	Maximum
2,4,6-Trichlorophenol	ppb	SW8270D	Phase III	193	0	6.38E+01	40	230
2,4-Dichlorophenol	ppb	USEPA 3550B/8270C	Phase I	273	0	1.66E+03	180	9800
2,4-Dichlorophenol	ppb	USEPACLP SOM01.2SVOC	Phase II	280	0	5.98E+02	180	2300
2,4-Dichlorophenol	ppb	SW8270D	Crab/Clam	18	0	2.37E+01	20	35
2,4-Dichlorophenol	ppb	SW8270D	SQT	36	0	3.40E+01	23	44
2,4-Dichlorophenol	ppb	SW8270D	Phase III	193	0	6.38E+01	40	230
2,4-Dimethylphenol	ppb	USEPA 3550B/8270C	Phase I	273	4	1.67E+03	180	9800
2,4-Dimethylphenol	ppb	USEPACLP SOM01.2SVOC	Phase II	280	0	5.98E+02	180	2300
2,4-Dimethylphenol	ppb	SW8270D	Crab/Clam	18	0	2.37E+01	20	35
2,4-Dimethylphenol	ppb	SW8270D	SQT	36	2	3.37E+01	23	44
2,4-Dimethylphenol	ppb	SW8270D	Phase III	193	0	6.38E+01	40	230
2,4-Dinitrophenol	ppb	USEPA 3550B/8270C	Phase I	273	0	8.42E+03	880	49000
2,4-Dinitrophenol	ppb	USEPACLP SOM01.2SVOC	Phase II	280	0	1.16E+03	350	4500
2,4-Dinitrophenol	ppb	SW8270D	Crab/Clam	18	0	4.27E+02	370	640
2,4-Dinitrophenol	ppb	SW8270D	SQT	36	0	6.12E+02	410	800
2,4-Dinitrophenol	ppb	SW8270D	Phase III	193	0	1.92E+03	1200	6900
2,4-Dinitrotoluene	ppb	USEPA 3550B/8270C	Phase I	273	0	1.66E+03	180	9800
2,4-Dinitrotoluene	ppb	USEPACLP SOM01.2SVOC	Phase II	280	0	5.98E+02	180	2300
2,4-Dinitrotoluene	ppb	SW8270D	Crab/Clam	18	0	9.44E+01	82	140
2,4-Dinitrotoluene	ppb	SW8270D	SQT	36	0	1.36E+02	90	180
2,4-Dinitrotoluene	ppb	SW8270D	Phase III	193	0	3.19E+02	200	1100
2,6-Dinitrotoluene	ppb	USEPA 3550B/8270C	Phase I	273	0	1.66E+03	180	9800
2,6-Dinitrotoluene	ppb	USEPACLP SOM01.2SVOC	Phase II	280	0	5.98E+02	180	2300
2,6-Dinitrotoluene	ppb	SW8270D	Crab/Clam	18	0	2.37E+01	20	35
2,6-Dinitrotoluene	ppb	SW8270D	SQT	36	0	3.40E+01	23	44
2,6-Dinitrotoluene	ppb	SW8270D	Phase III	193	1	6.39E+01	40	230
2-Chloronaphthalene	ppb	USEPA 3550B/8270C	Phase I	273	0	1.66E+03	180	9800
2-Chloronaphthalene	ppb	USEPACLP SOM01.2SVOC	Phase II	280	0	5.98E+02	180	2300
2-Chloronaphthalene	ppb	SW8270D	Crab/Clam	18	0	1.00E+01	9	15
2-Chloronaphthalene	ppb	SW8270D	SQT	36	0	1.36E+01	9	18
2-Chloronaphthalene	ppb	SW8270D	Phase III	193	0	6.32E+01	40	230
2-Chlorophenol	ppb	USEPA 3550B/8270C	Phase I	273	0	1.66E+03	180	9800
2-Chlorophenol	ppb	USEPACLP SOM01.2SVOC	Phase II	280	0	5.98E+02	180	2300
2-Chlorophenol	ppb	SW8270D	Crab/Clam	18	0	2.37E+01	20	35
2-Chlorophenol	ppb	SW8270D	SQT	36	0	3.40E+01	23	44
2-Chlorophenol	ppb	SW8270D	Phase III	193	0	6.38E+01	40	230
2-Methylnaphthalene	ppb	USEPA 3550B/8270C	Phase I	273	99	1.49E+03	180	9800
2-Methylnaphthalene	ppb	USEPACLP SOM01.2SVOC	Phase II	281	240	6.78E+01	3.5	1700
2-Methylphenol	ppb	USEPA 3550B/8270C	Phase I	273	0	1.66E+03	180	9800
2-Methylphenol	ppb	USEPACLP SOM01.2SVOC	Phase II	280	0	5.98E+02	180	2300
2-Methylphenol	ppb	SW8270D	Crab/Clam	18	0	2.37E+01	20	35
2-Methylphenol	ppb	SW8270D	SQT	36	0	3.40E+01	23	44
2-Methylphenol	ppb	SW8270D	Phase III	193	0	6.38E+01	40	230
2-Nitroaniline	ppb	USEPA 3550B/8270C	Phase I	273	0	1.66E+03	180	9800
2-Nitroaniline	ppb	USEPACLP SOM01.2SVOC	Phase II	280	0	1.16E+03	350	4500
2-Nitroaniline	ppb	SW8270D	Crab/Clam	18	0	2.37E+01	20	35

Table A-3
Summary of Analyte Detections and Detection Limits in NBSA Phase I, II, and III Sediment Samples

Chemical	Units	Analytical Method	Sampling Program	N[1]	Number of Detected Samples	Detection Limit Summary for Non-Detect Data		
						Mean	Minimum	Maximum
2-Nitroaniline	ppb	SW8270D	SQT	36	1	3.41E+01	23	44
2-Nitroaniline	ppb	SW8270D	Phase III	193	0	6.38E+01	40	230
2-Nitrophenol	ppb	USEPA 3550B/8270C	Phase I	273	0	1.66E+03	180	9800
2-Nitrophenol	ppb	USEPACLP SOM01.2SVOC	Phase II	280	0	5.98E+02	180	2300
2-Nitrophenol	ppb	SW8270D	Crab/Clam	18	0	2.37E+01	20	35
2-Nitrophenol	ppb	SW8270D	SQT	36	0	3.40E+01	23	44
2-Nitrophenol	ppb	SW8270D	Phase III	193	0	6.38E+01	40	230
3,3'-Dichlorobenzidine	ppb	USEPA 3550B/8270C	Phase I	273	0	3.32E+03	350	19000
3,3'-Dichlorobenzidine	ppb	USEPACLP SOM01.2SVOC	Phase II	280	0	5.98E+02	180	2300
3,3'-Dichlorobenzidine	ppb	SW8270D	Crab/Clam	18	0	1.42E+02	120	210
3,3'-Dichlorobenzidine	ppb	SW8270D	SQT	36	0	2.04E+02	140	270
3,3'-Dichlorobenzidine	ppb	SW8270D	Phase III	193	0	6.38E+02	400	2300
3-Nitroaniline	ppb	USEPA 3550B/8270C	Phase I	273	0	3.32E+03	350	19000
3-Nitroaniline	ppb	USEPACLP SOM01.2SVOC	Phase II	280	0	1.16E+03	350	4500
3-Nitroaniline	ppb	SW8270D	Crab/Clam	18	0	9.44E+01	82	140
3-Nitroaniline	ppb	SW8270D	SQT	36	0	1.36E+02	90	180
3-Nitroaniline	ppb	SW8270D	Phase III	193	0	3.19E+02	200	1100
4,6-Dinitro-2-methylphenol	ppb	USEPA 3550B/8270C	Phase I	273	0	4.98E+03	530	30000
4,6-Dinitro-2-methylphenol	ppb	USEPACLP SOM01.2SVOC	Phase II	280	0	1.24E+03	350	22000
4,6-Dinitro-2-methylphenol	ppb	SW8270D	Crab/Clam	18	0	2.37E+02	200	350
4,6-Dinitro-2-methylphenol	ppb	SW8270D	SQT	36	0	3.40E+02	230	440
4,6-Dinitro-2-methylphenol	ppb	SW8270D	Phase III	193	0	9.55E+02	600	3400
4-Bromophenyl phenyl ether	ppb	USEPA 3550B/8270C	Phase I	273	0	1.66E+03	180	9800
4-Bromophenyl phenyl ether	ppb	USEPACLP SOM01.2SVOC	Phase II	280	0	5.98E+02	180	2300
4-Bromophenyl phenyl ether	ppb	SW8270D	Crab/Clam	18	0	2.37E+01	20	35
4-Bromophenyl phenyl ether	ppb	SW8270D	SQT	36	0	3.40E+01	23	44
4-Bromophenyl phenyl ether	ppb	SW8270D	Phase III	193	0	6.38E+01	40	230
4-Chloro-3-Methylphenol	ppb	USEPA 3550B/8270C	Phase I	273	0	1.66E+03	180	9800
4-Chloro-3-Methylphenol	ppb	USEPACLP SOM01.2SVOC	Phase II	280	0	5.98E+02	180	2300
4-Chloro-3-Methylphenol	ppb	SW8270D	Crab/Clam	18	0	2.37E+01	20	35
4-Chloro-3-Methylphenol	ppb	SW8270D	SQT	36	0	3.40E+01	23	44
4-Chloro-3-Methylphenol	ppb	SW8270D	Phase III	193	1	6.39E+01	40	230
4-Chloroaniline	ppb	USEPA 3550B/8270C	Phase I	273	53	1.56E+03	180	9800
4-Chloroaniline	ppb	USEPACLP SOM01.2SVOC	Phase II	280	93	5.54E+02	3.8	2300
4-Chloroaniline	ppb	SW8270D	Crab/Clam	18	1	2.31E+01	20	35
4-Chloroaniline	ppb	SW8270D	SQT	36	0	6.79E+01	45	89
4-Chloroaniline	ppb	SW8270D	Phase III	193	0	1.28E+02	80	460
4-Chlorophenyl phenyl ether	ppb	USEPA 3550B/8270C	Phase I	273	0	1.66E+03	180	9800
4-Chlorophenyl phenyl ether	ppb	USEPACLP SOM01.2SVOC	Phase II	280	0	5.98E+02	180	2300
4-Chlorophenyl phenyl ether	ppb	SW8270D	Crab/Clam	18	0	2.37E+01	20	35
4-Chlorophenyl phenyl ether	ppb	SW8270D	SQT	36	0	3.40E+01	23	44
4-Chlorophenyl phenyl ether	ppb	SW8270D	Phase III	193	0	6.38E+01	40	230
4-Methylphenol	ppb	USEPA 3550B/8270C	Phase I	273	1	1.66E+03	180	9800
4-Methylphenol	ppb	USEPACLP SOM01.2SVOC	Phase II	280	36	5.93E+02	180	2300
4-Methylphenol	ppb	SW8270D	Crab/Clam	18	14	2.08E+01	20	21
4-Methylphenol	ppb	SW8270D	SQT	38	24	3.29E+01	23	44

Table A-3
Summary of Analyte Detections and Detection Limits in NBSA Phase I, II, and III Sediment Samples

Chemical	Units	Analytical Method	Sampling Program	N[1]	Number of Detected Samples	Detection Limit Summary for Non-Detect Data		
						Mean	Minimum	Maximum
4-Methylphenol	ppb	SW8270D	Phase III	193	123	6.53E+01	40	200
4-Nitroaniline	ppb	USEPA 3550B/8270C	Phase I	273	0	3.32E+03	350	19000
4-Nitroaniline	ppb	USEPACLP SOM01.2SVOC	Phase II	280	0	1.16E+03	350	4500
4-Nitroaniline	ppb	SW8270D	Crab/Clam	18	0	9.44E+01	82	140
4-Nitroaniline	ppb	SW8270D	SQT	36	0	1.36E+02	90	180
4-Nitroaniline	ppb	SW8270D	Phase III	193	0	3.19E+02	200	1100
4-Nitrophenol	ppb	USEPA 3550B/8270C	Phase I	273	0	4.98E+03	530	30000
4-Nitrophenol	ppb	USEPACLP SOM01.2SVOC	Phase II	280	0	1.16E+03	350	4500
4-Nitrophenol	ppb	SW8270D	Crab/Clam	18	0	2.37E+02	200	350
4-Nitrophenol	ppb	SW8270D	SQT	36	0	3.40E+02	230	440
4-Nitrophenol	ppb	SW8270D	Phase III	193	0	9.55E+02	600	3400
Acenaphthene	ppb	USEPA 3550B/8270C	Phase I	273	103	1.45E+03	180	9800
Acenaphthene	ppb	USEPACLP SOM01.2SVOC	Phase II	281	242	1.98E+01	3.5	590
Acenaphthylene	ppb	USEPA 3550B/8270C	Phase I	273	193	1.06E+03	180	6000
Acenaphthylene	ppb	USEPACLP SOM01.2SVOC	Phase II	281	241	5.69E+01	3.5	2100
Acetophenone	ppb	USEPACLP SOM01.2SVOC	Phase II	280	27	6.25E+02	180	2300
Acetophenone	ppb	SW8270D	Crab/Clam	18	5	2.22E+01	20	25
Acetophenone	ppb	SW8270D	SQT	42	22	3.56E+01	23	44
Acetophenone	ppb	SW8270D	Phase III	193	53	6.50E+01	40	230
Anthracene	ppb	USEPA 3550B/8270C	Phase I	273	207	8.38E+02	180	4200
Anthracene	ppb	USEPACLP SOM01.2SVOC	Phase II	280	252	2.18E+02	3.5	6000
Atrazine	ppb	USEPACLP SOM01.2SVOC	Phase II	280	0	5.96E+02	46	2300
Atrazine	ppb	SW8270D	Crab/Clam	18	0	4.73E+01	41	71
Atrazine	ppb	SW8270D	SQT	36	0	6.79E+01	45	89
Atrazine	ppb	SW8270D	Phase III	193	0	3.19E+02	200	1100
Benzaldehyde	ppb	USEPACLP SOM01.2SVOC	Phase II	280	64	6.29E+02	36	2300
Benzaldehyde	ppb	SW8270D	Crab/Clam	18	2	9.19E+01	82	140
Benzaldehyde	ppb	SW8270D	SQT	36	0	1.36E+02	90	180
Benzaldehyde	ppb	SW8270D	Phase III	193	1	3.19E+02	200	1100
Benzidine	ppb	SW8270D	Crab/Clam	18	0	9.89E+02	860	1500
Benzidine	ppb	SW8270D	SQT	36	0	1.43E+03	950	1900
Benzidine	ppb	SW8270D	Phase III	193	0	9.55E+02	600	3400
Benzo(a)anthracene	ppb	USEPA 3550B/8270C	Phase I	273	228	5.08E+02	180	3300
Benzo(a)anthracene	ppb	USEPACLP SOM01.2SVOC	Phase II	280	254	1.20E+01	3.5	200
Benzo(a)pyrene	ppb	USEPA 3550B/8270C	Phase I	273	229	5.03E+02	180	3300
Benzo(a)pyrene	ppb	USEPACLP SOM01.2SVOC	Phase II	280	236	1.31E+01	1.9	210
Benzo(b)fluoranthene	ppb	USEPA 3550B/8270C	Phase I	273	228	5.08E+02	180	3300
Benzo(b)fluoranthene	ppb	USEPACLP SOM01.2SVOC	Phase II	280	255	4.32E+00	3.5	5.7
Benzo(g,h,i)perylene	ppb	USEPA 3550B/8270C	Phase I	273	224	5.11E+02	180	3300
Benzo(g,h,i)perylene	ppb	USEPACLP SOM01.2SVOC	Phase II	280	250	2.86E+01	3.5	730
Benzo(k)fluoranthene	ppb	USEPA 3550B/8270C	Phase I	273	220	6.02E+02	180	4100
Benzo(k)fluoranthene	ppb	USEPACLP SOM01.2SVOC	Phase II	280	253	4.37E+00	3.5	5.7
Benzoic Acid	ppb	SW8270D	Crab/Clam	18	3	2.30E+02	200	330
Benzoic Acid	ppb	SW8270D	SQT	36	0	3.40E+02	230	440
Benzoic Acid	ppb	SW8270D	Phase III	193	14	9.53E+02	600	3400
Biphenyl	ppb	USEPACLP SOM01.2SVOC	Phase II	280	59	5.53E+02	180	2000

Table A-3
Summary of Analyte Detections and Detection Limits in NBSA Phase I, II, and III Sediment Samples

Chemical	Units	Analytical Method	Sampling Program	N[1]	Number of Detected Samples	Detection Limit Summary for Non-Detect Data		
						Mean	Minimum	Maximum
Biphenyl	ppb	SW8270D	Crab/Clam	18	8	2.17E+01	20	24
Biphenyl	ppb	SW8270D	SQT	36	5	3.43E+01	23	44
Biphenyl	ppb	SW8270D	Phase III	193	28	6.42E+01	40	230
bis(2-Chloroethoxy)methane	ppb	USEPA 3550B/8270C	Phase I	273	0	1.66E+03	180	9800
bis(2-Chloroethoxy)methane	ppb	USEPACLP SOM01.2SVOC	Phase II	280	0	5.98E+02	180	2300
bis(2-Chloroethoxy)methane	ppb	SW8270D	Crab/Clam	18	0	2.37E+01	20	35
bis(2-Chloroethoxy)methane	ppb	SW8270D	SQT	36	0	3.40E+01	23	44
bis(2-Chloroethoxy)methane	ppb	SW8270D	Phase III	193	0	6.38E+01	40	230
bis(2-Chloroethyl)ether	ppb	USEPA 3550B/8270C	Phase I	273	0	1.66E+03	180	9800
bis(2-Chloroethyl)ether	ppb	USEPACLP SOM01.2SVOC	Phase II	280	0	5.98E+02	180	2300
bis(2-Chloroethyl)ether	ppb	SW8270D	Crab/Clam	18	0	2.37E+01	20	35
bis(2-Chloroethyl)ether	ppb	SW8270D	SQT	36	0	3.40E+01	23	44
bis(2-Chloroethyl)ether	ppb	SW8270D	Phase III	193	0	6.38E+01	40	230
bis(2-Ethylhexyl)phthalate	ppb	USEPA 3550B/8270C	Phase I	273	209	2.71E+03	350	12000
bis(2-Ethylhexyl)phthalate	ppb	USEPACLP SOM01.2SVOC	Phase II	280	187	4.40E+02	180	2300
bis(2-Ethylhexyl)phthalate	ppb	SW8270D	Crab/Clam	18	17	8.20E+01	82	82
bis(2-Ethylhexyl)phthalate	ppb	SW8270D	SQT	42	36	1.37E+02	90	170
bis(2-Ethylhexyl)phthalate	ppb	SW8270D	Phase III	193	145	2.86E+02	210	460
Butyl benzyl phthalate	ppb	USEPA 3550B/8270C	Phase I	273	10	1.64E+03	180	9800
Butyl benzyl phthalate	ppb	USEPACLP SOM01.2SVOC	Phase II	280	96	6.79E+02	180	2300
Butyl benzyl phthalate	ppb	SW8270D	Crab/Clam	18	1	9.42E+01	82	140
Butyl benzyl phthalate	ppb	SW8270D	SQT	36	0	1.36E+02	90	180
Butyl benzyl phthalate	ppb	SW8270D	Phase III	193	1	3.19E+02	200	1100
Caprolactam	ppb	USEPACLP SOM01.2SVOC	Phase II	280	1	5.99E+02	180	2300
Caprolactam	ppb	SW8270D	Crab/Clam	18	0	4.73E+01	41	71
Caprolactam	ppb	SW8270D	SQT	36	0	6.79E+01	45	89
Caprolactam	ppb	SW8270D	Phase III	193	0	3.19E+02	200	1100
Carbazole	ppb	USEPA 3550B/8270C	Phase I	273	50	1.57E+03	180	9800
Carbazole	ppb	USEPACLP SOM01.2SVOC	Phase II	280	173	4.61E+02	180	1700
Carbazole	ppb	SW8270D	Crab/Clam	18	10	2.23E+01	21	24
Carbazole	ppb	SW8270D	SQT	37	15	3.41E+01	23	44
Carbazole	ppb	SW8270D	Phase III	193	37	6.51E+01	40	230
Chrysene	ppb	USEPA 3550B/8270C	Phase I	273	228	5.08E+02	180	3300
Chrysene	ppb	USEPACLP SOM01.2SVOC	Phase II	280	257	4.30E+00	3.5	5.7
Dibenzo(a,h)anthracene	ppb	USEPA 3550B/8270C	Phase I	273	177	1.13E+03	180	6100
Dibenzo(a,h)anthracene	ppb	USEPACLP SOM01.2SVOC	Phase II	280	182	5.20E+02	3.5	2100
Dibenzofuran	ppb	USEPA 3550B/8270C	Phase I	273	55	1.64E+03	180	9800
Dibenzofuran	ppb	USEPACLP SOM01.2SVOC	Phase II	280	157	4.91E+02	160	1900
Dibenzofuran	ppb	SW8270D	Crab/Clam	18	11	2.19E+01	21	23
Dibenzofuran	ppb	SW8270D	SQT	37	15	3.43E+01	23	44
Dibenzofuran	ppb	SW8270D	Phase III	193	69	6.41E+01	40	230
Diethyl phthalate	ppb	USEPA 3550B/8270C	Phase I	273	0	1.66E+03	180	9800
Diethyl phthalate	ppb	USEPACLP SOM01.2SVOC	Phase II	280	1	5.94E+02	180	2300
Diethyl phthalate	ppb	SW8270D	Crab/Clam	18	0	9.44E+01	82	140
Diethyl phthalate	ppb	SW8270D	SQT	36	0	1.36E+02	90	180
Diethyl phthalate	ppb	SW8270D	Phase III	193	0	3.19E+02	200	1100

Table A-3
Summary of Analyte Detections and Detection Limits in NBSA Phase I, II, and III Sediment Samples

Chemical	Units	Analytical Method	Sampling Program	N[1]	Number of Detected Samples	Detection Limit Summary for Non-Detect Data		
						Mean	Minimum	Maximum
Dimethylphthalate	ppb	USEPA 3550B/8270C	Phase I	273	0	1.66E+03	180	9800
Dimethylphthalate	ppb	USEPACLP SOM01.2SVOC	Phase II	280	0	5.98E+02	180	2300
Dimethylphthalate	ppb	SW8270D	Crab/Clam	18	0	9.44E+01	82	140
Dimethylphthalate	ppb	SW8270D	SQT	36	0	1.36E+02	90	180
Dimethylphthalate	ppb	SW8270D	Phase III	193	0	3.19E+02	200	1100
Di-n-Butylphthalate	ppb	USEPA 3550B/8270C	Phase I	273	34	1.69E+03	180	9800
Di-n-Butylphthalate	ppb	USEPACLP SOM01.2SVOC	Phase II	280	33	6.18E+02	180	2300
Di-n-Butylphthalate	ppb	SW8270D	Crab/Clam	18	0	9.44E+01	82	140
Di-n-Butylphthalate	ppb	SW8270D	SQT	36	1	1.36E+02	90	180
Di-n-Butylphthalate	ppb	SW8270D	Phase III	193	0	3.19E+02	200	1100
Di-n-Octylphthalate	ppb	USEPA 3550B/8270C	Phase I	273	53	1.62E+03	180	9800
Di-n-Octylphthalate	ppb	USEPACLP SOM01.2SVOC	Phase II	234	84	1.15E+03	180	15000
Di-n-Octylphthalate	ppb	SW8270D	Crab/Clam	18	0	9.44E+01	82	140
Di-n-Octylphthalate	ppb	SW8270D	SQT	36	1	1.37E+02	90	180
Di-n-Octylphthalate	ppb	SW8270D	Phase III	193	0	3.19E+02	200	1100
Fluoranthene	ppb	USEPA 3550B/8270C	Phase I	273	228	5.19E+02	180	3300
Fluoranthene	ppb	USEPACLP SOM01.2SVOC	Phase II	280	266	4.44E+02	3.5	5600
Fluorene	ppb	USEPA 3550B/8270C	Phase I	273	134	1.33E+03	180	9800
Fluorene	ppb	USEPACLP SOM01.2SVOC	Phase II	281	242	1.12E+02	3.5	1800
Hexachlorobenzene	ppb	USEPA 3550B/8270C	Phase I	273	0	1.66E+03	180	9800
Hexachlorobenzene	ppb	USEPACLP SOM01.2SVOC	Phase II	281	71	2.97E+01	3.5	490
Hexachlorobutadiene	ppb	USEPA 3550B/8270C	Phase I	273	0	1.66E+03	180	9800
Hexachlorobutadiene	ppb	USEPACLP SOM01.2SVOC	Phase II	280	0	5.98E+02	180	2300
Hexachlorobutadiene	ppb	SW8270D	Crab/Clam	18	0	2.37E+01	20	35
Hexachlorobutadiene	ppb	SW8270D	SQT	36	0	3.40E+01	23	44
Hexachlorobutadiene	ppb	SW8270D	Phase III	193	0	6.38E+01	40	230
Hexachlorocyclopentadiene	ppb	USEPA 3550B/8270C	Phase I	268	0	4.99E+03	530	30000
Hexachlorocyclopentadiene	ppb	USEPACLP SOM01.2SVOC	Phase II	48	0	1.52E+03	180	15000
Hexachlorocyclopentadiene	ppb	SW8270D	Crab/Clam	18	0	2.37E+02	200	350
Hexachlorocyclopentadiene	ppb	SW8270D	SQT	36	0	3.40E+02	230	440
Hexachlorocyclopentadiene	ppb	SW8270D	Phase III	193	0	9.55E+02	600	3400
Hexachloroethane	ppb	USEPA 3550B/8270C	Phase I	273	0	1.66E+03	180	9800
Hexachloroethane	ppb	USEPACLP SOM01.2SVOC	Phase II	280	0	5.98E+02	180	2300
Hexachloroethane	ppb	SW8270D	Crab/Clam	18	0	4.73E+01	41	71
Hexachloroethane	ppb	SW8270D	SQT	36	0	6.79E+01	45	89
Hexachloroethane	ppb	SW8270D	Phase III	193	0	3.19E+02	200	1100
Indeno(1,2,3-cd)pyrene	ppb	USEPA 3550B/8270C	Phase I	273	219	7.32E+02	180	6000
Indeno(1,2,3-cd)pyrene	ppb	USEPACLP SOM01.2SVOC	Phase II	280	251	4.06E+01	3.5	290
Isophorone	ppb	USEPA 3550B/8270C	Phase I	273	0	1.66E+03	180	9800
Isophorone	ppb	USEPACLP SOM01.2SVOC	Phase II	280	1	5.98E+02	180	2300
Isophorone	ppb	SW8270D	Crab/Clam	18	0	2.37E+01	20	35
Isophorone	ppb	SW8270D	SQT	36	0	3.40E+01	23	44
Isophorone	ppb	SW8270D	Phase III	193	0	6.38E+01	40	230
Naphthalene	ppb	USEPA 3550B/8270C	Phase I	273	150	1.34E+03	180	8900
Naphthalene	ppb	USEPACLP SOM01.2SVOC	Phase II	281	231	1.84E+02	3.5	4200
Nitrobenzene	ppb	USEPA 3550B/8270C	Phase I	273	0	1.66E+03	180	9800

Table A-3
Summary of Analyte Detections and Detection Limits in NBSA Phase I, II, and III Sediment Samples

Chemical	Units	Analytical Method	Sampling Program	N[1]	Number of Detected Samples	Detection Limit Summary for Non-Detect Data		
						Mean	Minimum	Maximum
Nitrobenzene	ppb	USEPACLP SOM01.2SVOC	Phase II	280	0	5.98E+02	180	2300
Nitrobenzene	ppb	SW8270D	Crab/Clam	18	0	2.37E+01	20	35
Nitrobenzene	ppb	SW8270D	SQT	36	0	3.40E+01	23	44
Nitrobenzene	ppb	SW8270D	Phase III	193	1	6.39E+01	40	230
N-Nitroso-di-n-propylamine	ppb	USEPA 3550B/8270C	Phase I	273	0	1.66E+03	180	9800
N-Nitroso-di-n-propylamine	ppb	USEPACLP SOM01.2SVOC	Phase II	280	0	5.98E+02	180	2300
N-Nitroso-di-n-propylamine	ppb	SW8270D	Crab/Clam	18	0	2.37E+01	20	35
N-Nitroso-di-n-propylamine	ppb	SW8270D	SQT	36	0	3.40E+01	23	44
N-Nitroso-di-n-propylamine	ppb	SW8270D	Phase III	193	0	6.38E+01	40	230
N-Nitrosodiphenylamine	ppb	USEPA 3550B/8270C	Phase I	273	13	1.63E+03	180	9800
N-Nitrosodiphenylamine	ppb	USEPACLP SOM01.2SVOC	Phase II	280	55	5.73E+02	180	11000
N-Nitrosodiphenylamine	ppb	SW8270D	Crab/Clam	18	0	2.37E+01	20	35
N-Nitrosodiphenylamine	ppb	SW8270D	SQT	36	0	3.40E+01	23	44
N-Nitrosodiphenylamine	ppb	SW8270D	Phase III	193	0	6.38E+01	40	230
Pentachlorophenol	ppb	USEPA 3550B/8270C	Phase I	273	0	4.98E+03	530	30000
Pentachlorophenol	ppb	USEPACLP SOM01.2SVOC	Phase II	280	2	3.11E+02	7.2	21000
Pentachlorophenol	ppb	SW8270D	Crab/Clam	18	0	4.73E+01	41	71
Pentachlorophenol	ppb	SW8270D	SQT	36	0	6.79E+01	45	89
Pentachlorophenol	ppb	SW8270D	Phase III	193	0	3.26E+02	200	1200
Phenanthrene	ppb	USEPA 3550B/8270C	Phase I	273	214	8.36E+02	180	6000
Phenanthrene	ppb	USEPACLP SOM01.2SVOC	Phase II	280	259	1.90E+02	3.5	3900
Phenol	ppb	USEPA 3550B/8270C	Phase I	273	20	1.55E+03	180	8900
Phenol	ppb	USEPACLP SOM01.2SVOC	Phase II	280	12	6.12E+02	180	2300
Phenol	ppb	SW8270D	Crab/Clam	18	4	2.32E+01	21	33
Phenol	ppb	SW8270D	SQT	36	5	3.43E+01	23	44
Phenol	ppb	SW8270D	Phase III	193	33	6.44E+01	40	230
Pyrene	ppb	USEPA 3550B/8270C	Phase I	273	231	5.16E+02	180	3300
Pyrene	ppb	USEPACLP SOM01.2SVOC	Phase II	280	245	1.30E+02	3.5	4000
Pyridine	ppb	SW8270D	Crab/Clam	18	0	9.44E+01	82	140
Pyridine	ppb	SW8270D	SQT	36	0	1.36E+02	90	180
Pyridine	ppb	SW8270D	Phase III	193	0	3.19E+02	200	1100
TOCs								
TOC	ppm	Lloyd Kahn	Phase I	271	270	1.10E+02	110	110
TOC	ppm	Lloyd Kahn	Phase II	281	278	4.54E+02	337	521
TOC	ppm	Lloyd Kahn	Crab/Clam	18	18	--	--	--
TOC	ppm	Lloyd Kahn	SQT	43	43	--	--	--
TOC	ppm	Lloyd Kahn	Phase III	193	191	2.27E+02	223	230
TPHs								
PHC AS GASOLINE	ppm	SW8015B	Crab/Clam	18	5	2.43E+00	0.3	3
PHC AS GASOLINE	ppm	SW8015B	SQT	43	5	5.46E+00	2.8	8.8
PHC AS GASOLINE	ppm	SW8015B	Phase III	193	65	8.00E+00	0.6	54
TPH	ppm	NJ-TPH-QAM-025 R5	Phase I	271	263	2.20E+01	4.3	52
TPH	ppm	NJ-TPH-QAM-025 R6	Phase II	281	251	2.66E+01	20	40
TPH	ppm	8015C	Crab/Clam	18	18	--	--	--
TPH	ppm	8015C	SQT	43	42	1.04E+01	10.4	10.4
TPH	ppm	8015C	Phase III	193	186	3.48E+01	14.6	135

Table A-3
Summary of Analyte Detections and Detection Limits in NBSA Phase I, II, and III Sediment Samples

Chemical	Units	Analytical Method	Sampling Program	N[1]	Number of Detected Samples	Detection Limit Summary for Non-Detect Data		
						Mean	Minimum	Maximum
Volatiles								
1,1,1-Trichloroethane	ppb	USEPA 5035/8260B	Phase I	273	0	3.41E+01	5	1100
1,1,2,2-Tetrachloroethane	ppb	USEPA 5035/8260B	Phase I	272	0	3.41E+01	5	1100
1,1,2-Trichloroethane	ppb	USEPA 5035/8260B	Phase I	273	0	3.41E+01	5	1100
1,1-Dichloroethane	ppb	USEPA 5035/8260B	Phase I	273	0	3.41E+01	5	1100
1,1-Dichloroethene	ppb	USEPA 5035/8260B	Phase I	273	0	3.41E+01	5	1100
1,2,3-Trichlorobenzene	ppb	USEPACLP SOM01.2-VOC	Phase II	279	0	1.38E+02	4.3	1700
1,2,4-Trichlorobenzene	ppb	USEPACLP SOM01.2-VOC	Phase II	279	0	1.38E+02	4.3	1700
1,2,4-Trichlorobenzene	ppb	SW8260B	Crab/Clam	18	0	1.22E+00	1	3
1,2,4-Trichlorobenzene	ppb	SW8260B	SQT	43	0	1.30E+01	1	250
1,2,4-Trichlorobenzene	ppb	SW8260B	Phase III	193	2	3.38E+01	4	870
1,2-Dichlorobenzene	ppb	USEPACLP SOM01.2-VOC	Phase II	279	28	1.33E+02	4.3	1700
1,2-Dichlorobenzene	ppb	SW8260B	Crab/Clam	18	0	1.22E+00	1	3
1,2-Dichlorobenzene	ppb	SW8260B	SQT	43	0	1.30E+01	1	250
1,2-Dichlorobenzene	ppb	SW8260B	Phase III	193	0	4.20E+01	5	1100
1,2-Dichloroethane	ppb	USEPA 5035/8260B	Phase I	273	0	3.41E+01	5	1100
1,2-Dichloroethene (total)	ppb	USEPA 5035/8260B	Phase I	273	1	3.41E+01	5	1100
1,2-Dichloropropane	ppb	USEPA 5035/8260B	Phase I	273	0	3.41E+01	5	1100
1,3-Dichlorobenzene	ppb	USEPACLP SOM01.2-VOC	Phase II	279	26	1.35E+02	4.3	1700
1,3-Dichlorobenzene	ppb	SW8260B	Crab/Clam	18	0	1.22E+00	1	3
1,3-Dichlorobenzene	ppb	SW8260B	SQT	43	0	1.30E+01	1	250
1,3-Dichlorobenzene	ppb	SW8260B	Phase III	193	0	4.20E+01	5	1100
1,4-Dichlorobenzene	ppb	USEPACLP SOM01.2-VOC	Phase II	280	53	1.04E+02	4.3	1400
1,4-Dichlorobenzene	ppb	SW8260B	Crab/Clam	18	0	1.22E+00	1	3
1,4-Dichlorobenzene	ppb	SW8260B	SQT	43	1	1.32E+01	1	250
1,4-Dichlorobenzene	ppb	SW8260B	Phase III	193	2	4.22E+01	5	1100
2-Butanone	ppb	USEPA 5035/8260B	Phase I	138	76	2.03E+02	11	2100
2-Hexanone	ppb	USEPA 5035/8260B	Phase I	273	0	6.73E+01	10	2100
4-Methyl-2-pentanone	ppb	USEPA 5035/8260B	Phase I	273	0	6.73E+01	10	2100
Acetone	ppb	USEPA 5035/8260B	Phase I	265	264	1.10E+01	11	11
Benzene	ppb	USEPA 5035/8260B	Phase I	273	75	3.75E+01	5	1100
Bromodichloromethane	ppb	USEPA 5035/8260B	Phase I	273	0	3.41E+01	5	1100
Bromoform	ppb	USEPA 5035/8260B	Phase I	273	0	3.41E+01	5	1100
Bromomethane	ppb	USEPA 5035/8260B	Phase I	273	0	3.41E+01	5	1100
Carbon Disulfide	ppb	USEPA 5035/8260B	Phase I	273	177	4.35E+01	5	900
Carbon Tetrachloride	ppb	USEPA 5035/8260B	Phase I	273	0	3.41E+01	5	1100
Chlorobenzene	ppb	USEPA 5035/8260B	Phase I	273	58	3.85E+01	5	1100
Chlorobenzene	ppb	USEPACLP SOM01.2-VOC	Phase II	280	25	8.89E+01	4.3	1500
Chloroethane	ppb	USEPA 5035/8260B	Phase I	273	0	3.41E+01	5	1100
Chloroform	ppb	USEPA 5035/8260B	Phase I	273	0	3.41E+01	5	1100
Chloromethane	ppb	USEPA 5035/8260B	Phase I	273	0	3.41E+01	5	1100
cis-1,3-Dichloropropene	ppb	USEPA 5035/8260B	Phase I	273	0	3.41E+01	5	1100
Dibromochloromethane	ppb	USEPA 5035/8260B	Phase I	273	0	3.41E+01	5	1100
Ethylbenzene	ppb	USEPA 5035/8260B	Phase I	273	17	3.14E+01	5	1100
Methylene Chloride	ppb	USEPA 5035/8260B	Phase I	273	1	3.42E+01	5	1100
Styrene	ppb	USEPA 5035/8260B	Phase I	273	0	3.41E+01	5	1100

Table A-3
Summary of Analyte Detections and Detection Limits in NBSA Phase I, II, and III Sediment Samples

Chemical	Units	Analytical Method	Sampling Program	N[1]	Number of Detected Samples	Detection Limit Summary for Non-Detect Data		
						Mean	Minimum	Maximum
Tetrachloroethene	ppb	USEPA 5035/8260B	Phase I	273	1	3.41E+01	5	1100
Toluene	ppb	USEPA 5035/8260B	Phase I	273	46	3.74E+01	5	1100
trans-1,3-Dichloropropene	ppb	USEPA 5035/8260B	Phase I	273	0	3.41E+01	5	1100
Trichloroethene	ppb	USEPA 5035/8260B	Phase I	273	0	3.41E+01	5	1100
Vinyl Chloride	ppb	USEPA 5035/8260B	Phase I	273	0	3.41E+01	5	1100
Xylene (Total)	ppb	USEPA 5035/8260B	Phase I	273	61	2.69E+01	5	900

Notes:

[1]The number of samples with reportable results for the analyte in each program. The number of results may vary because some results were qualified as rejected during the data validation process and therefore were excluded from the sample count. Field duplicates and QC samples (MS/MSD, trip blanks, and field blanks) were excluded from sample counts.

Crab/clam, SQT and Phase III sediment samples are being reanalyzed for polycyclic aromatic hydrocarbons (PAHs) due to analytical bias and therefore PAHs were excluded from the table.

-- = analyte detected in all samples
AVS/SEM = acid volatile sulfide/simultaneously extracted metals
CLP = Contract Laboratory Program
N = total number of samples
PBDE = polybrominated diphenyl ethers
PCB = polychlorinated biphenyl
pCi/g = picocuries per gram
PCN = polychlorinated naphthalene
ppb = parts per billion
ppm = parts per million
ppt = parts per trillion
SQT = sediment quality triad
TOC = total organic carbon
TPH = total petroleum hydrocarbons
µmol/g = micromoles per gram
USEPA = U.S. Environmental Protection Agency

Table A-4
Number of Tissue Samples in the NBSA by Analyte, Species Group and Tissue Type

Parameter Group	Analyte	Total Number of Samples[1]						
		Crab/Clam Sampling Program				Fish Sampling Program		
		Hepato-pancreas	Edible Muscle	Carcass	Clams	Whole Body	Fillet	Livers
Dioxins/ Furans	1,2,3,4,6,7,8-HpCDD	37	37	37	18	89	90	11
	1,2,3,4,6,7,8-HpCDF	37	37	37	18	89	90	11
	1,2,3,4,7,8,9-HpCDF	37	37	37	18	89	90	11
	1,2,3,4,7,8-HxCDD	37	37	37	18	89	90	11
	1,2,3,4,7,8-HxCDF	37	37	37	18	89	90	11
	1,2,3,6,7,8-HxCDD	37	37	37	18	89	90	11
	1,2,3,6,7,8-HxCDF	37	37	37	18	89	90	11
	1,2,3,7,8,9-HxCDD	37	37	37	18	89	90	11
	1,2,3,7,8,9-HxCDF	37	37	37	18	89	90	11
	1,2,3,7,8-PeCDD	37	37	37	18	89	90	11
	1,2,3,7,8-PeCDF	37	37	37	18	89	90	11
	2,3,4,6,7,8-HxCDF	37	37	37	18	89	90	11
	2,3,4,7,8-PeCDF	37	37	37	18	89	90	11
	2,3,7,8-TCDD	37	37	37	18	89	90	11
	2,3,7,8-TCDF	37	37	37	18	89	90	11
	OCDD	37	37	37	18	89	90	11
	OCDF	37	37	37	18	89	90	11
	Percent Lipids	37	37	37	18	89	90	11
Metals	Aluminum	37	36	37	18	89	90	10
	Antimony	37	36	37	18	89	90	10
	Arsenic	37	36	37	18	89	90	10
	Barium	37	36	37	18	89	90	10
	Beryllium	37	36	37	18	89	90	10
	Cadmium	37	36	37	18	89	90	10
	Calcium	37	36	37	18	89	90	10
	Chromium	37	36	37	18	89	90	10
	Cobalt	37	36	37	18	89	90	10
	Copper	37	36	37	18	89	90	10
	Iron	37	36	37	18	89	90	10
	Lead	37	36	37	18	89	90	10
	Magnesium	37	36	37	18	89	90	10
	Manganese	37	36	37	18	89	90	10
	Mercury	37	37	37	18	89	90	10
	Methyl Mercury	37	37	37	18	89	90	10
	Nickel	37	36	37	18	89	90	10
	Potassium	37	36	37	18	89	90	10
	Selenium	37	36	37	18	89	90	10
	Silver	37	36	37	18	89	90	10
	Sodium	37	36	37	18	89	90	10
	Thallium	37	36	37	18	89	90	10
	Titanium	37	36	37	18	89	90	10
	Vanadium	37	36	37	18	89	90	10
	Zinc	37	36	37	18	89	90	10
Butyltins	Dibutyltin	37	37	37	18	89	90	11
	Monobutyltin	37	37	37	18	89	90	11
	Tetrabutyltin	37	37	37	18	89	90	11
	Tributyltin	37	37	37	18	89	90	11
PCB Congeners	PCB-1	37	37	37	18	89	90	11
	PCB-2	37	37	37	18	89	90	11
	PCB-3	37	37	37	18	89	90	11
	PCB-4	37	37	37	18	89	90	11
	PCB-5	37	37	37	18	89	90	11
	PCB-6	37	37	37	18	89	90	11
	PCB-7	37	37	37	18	89	90	11
	PCB-8	37	37	37	18	89	90	11
	PCB-9	37	37	37	18	89	90	11
	PCB-10	37	37	37	18	89	90	11
	PCB-11	37	37	37	18	89	90	11
	PCB-12/13	37	37	37	18	89	90	11
	PCB-14	37	37	37	18	89	90	11
	PCB-15	37	37	37	18	89	90	11
	PCB-16	37	37	37	18	89	90	11

Table A-4
Number of Tissue Samples in the NBSA by Analyte, Species Group and Tissue Type

Parameter Group	Analyte	Total Number of Samples[1]						
		Crab/Clam Sampling Program				Fish Sampling Program		
		Hepato-pancreas	Edible Muscle	Carcass	Clams	Whole Body	Fillet	Livers
PCB Congeners	PCB-17	37	37	37	18	89	90	11
	PCB-18/30	37	37	37	18	89	90	11
	PCB-19	37	37	37	18	89	90	11
	PCB-20/28	37	37	37	18	89	90	11
	PCB-21/33	37	37	37	18	89	90	11
	PCB-22	37	37	37	18	89	90	11
	PCB-23	37	37	37	18	89	90	11
	PCB-24	37	37	37	18	89	90	11
	PCB-25	37	37	37	18	89	90	11
	PCB-26/29	37	37	37	18	89	90	11
	PCB-27	37	37	37	18	89	90	11
	PCB-31	37	37	37	18	89	90	11
	PCB-32	37	37	37	18	89	90	11
	PCB-34	37	37	37	18	89	90	11
	PCB-35	37	37	37	18	89	90	11
	PCB-36	37	37	37	18	89	90	11
	PCB-37	37	37	37	18	89	90	11
	PCB-38	37	37	37	18	89	90	11
	PCB-39	37	37	37	18	89	90	11
	PCB-40/71	37	37	37	18	89	90	11
	PCB-41	37	37	37	18	89	90	11
	PCB-42	37	37	37	18	89	90	11
	PCB-43	37	37	37	18	89	90	11
	PCB-44/47/65	37	37	37	18	89	90	11
	PCB-45	37	37	37	18	89	90	11
	PCB-46	37	37	37	18	89	90	11
	PCB-48	37	37	37	18	89	90	11
	PCB-49/69	37	37	37	18	89	90	11
	PCB-50/53	37	37	37	18	89	90	11
	PCB-51	37	37	37	18	89	90	11
	PCB-52	37	37	37	18	89	90	11
	PCB-54	37	37	37	18	89	90	11
	PCB-55	37	37	37	18	89	90	11
	PCB-56	37	37	37	18	89	90	11
	PCB-57	37	37	37	18	89	90	11
	PCB-58	37	37	37	18	89	90	11
	PCB-60	37	37	37	18	89	90	11
	PCB-61/70/74/76	37	37	37	18	89	90	11
	PCB-62/75	37	37	37	18	89	90	11
	PCB-63	37	37	37	18	89	90	11
	PCB-64	37	37	37	18	89	90	11
	PCB-66	37	37	37	18	89	90	11
	PCB-67	37	37	37	18	89	90	11
	PCB-68	37	37	37	18	89	90	11
	PCB-72	37	37	37	18	89	90	11
	PCB-73	37	37	37	18	89	90	11
	PCB-77	37	37	37	18	89	90	11
	PCB-78	37	37	37	18	89	90	11
	PCB-79	37	37	37	18	89	90	11
	PCB-80	37	37	37	18	89	90	11
	PCB-81	37	37	37	18	89	90	11
	PCB-82	37	37	37	18	89	90	11
	PCB-83	37	37	37	18	89	90	11
	PCB-84	37	37	37	18	89	90	11
	PCB-85/116/117	37	37	37	18	89	90	11
	PCB-86/87/97/109/119/125	37	37	37	18	89	90	11
	PCB-88	37	37	37	18	89	90	11
	PCB-89	37	37	37	18	89	90	11
	PCB-90/101/113	37	37	37	18	89	90	11
	PCB-91	37	37	37	18	89	90	11
	PCB-92	37	37	37	18	89	90	11
	PCB-93/100	37	37	37	18	89	90	11

Table A-4
Number of Tissue Samples in the NBSA by Analyte, Species Group and Tissue Type

Parameter Group	Analyte	Total Number of Samples[1]						
		Crab/Clam Sampling Program				Fish Sampling Program		
		Hepato-pancreas	Edible Muscle	Carcass	Clams	Whole Body	Fillet	Livers
PCB Congeners	PCB-94	37	37	37	18	89	90	11
	PCB-95	37	37	37	18	89	90	11
	PCB-96	37	37	37	18	89	90	11
	PCB-98/102	37	37	37	18	89	90	11
	PCB-99	37	37	37	18	89	90	11
	PCB-103	37	37	37	18	89	90	11
	PCB-104	37	37	37	18	89	90	11
	PCB-105	37	37	37	18	89	90	11
	PCB-106	37	37	37	18	89	90	11
	PCB-107	37	37	37	18	89	90	11
	PCB-108/124	37	37	37	18	89	90	11
	PCB-110/115	37	37	37	18	89	90	11
	PCB-111	37	37	37	18	89	90	11
	PCB-112	37	37	37	18	89	90	11
	PCB-114	37	37	37	18	89	90	11
	PCB-118	37	37	37	18	89	90	11
	PCB-120	37	37	37	18	89	90	11
	PCB-121	37	37	37	18	89	90	11
	PCB-122	37	37	37	18	89	90	11
	PCB-123	37	37	37	18	89	90	11
	PCB-126	37	37	37	18	89	90	11
	PCB-127	37	37	37	18	89	90	11
	PCB-128/166	37	37	37	18	89	90	11
	PCB-129/138/163	37	37	37	18	89	90	11
	PCB-130	37	37	37	18	89	90	11
	PCB-131	37	37	37	18	89	90	11
	PCB-132	37	37	37	18	89	90	11
	PCB-133	37	37	37	18	89	90	11
	PCB-134	37	37	37	18	89	90	11
	PCB-135/151	37	37	37	18	89	90	11
	PCB-136	37	37	37	18	89	90	11
	PCB-137	37	37	37	18	89	90	11
	PCB-139/140	37	37	37	18	89	90	11
	PCB-141	37	37	37	18	89	90	11
	PCB-142	37	37	37	18	89	90	11
	PCB-143	37	37	37	18	89	90	11
	PCB-144	37	37	37	18	89	90	11
	PCB-145	37	37	37	18	89	90	11
	PCB-146	37	37	37	18	89	90	11
	PCB-147/149	37	37	37	18	89	90	11
	PCB-148	37	37	37	18	89	90	11
	PCB-150	37	37	37	18	89	90	11
	PCB-152	37	37	37	18	89	90	11
	PCB-153/168	37	37	37	18	89	90	11
	PCB-154	37	37	37	18	89	90	11
	PCB-155	37	37	37	18	89	90	11
	PCB-156/157	37	37	37	18	89	90	11
	PCB-158	37	37	37	18	89	90	11
	PCB-159	37	37	37	18	89	90	11
	PCB-160	37	37	37	18	89	90	11
	PCB-161	37	37	37	18	89	90	11
	PCB-162	37	37	37	18	89	90	11
	PCB-164	37	37	37	18	89	90	11
	PCB-165	37	37	37	18	89	90	11
	PCB-167	37	37	37	18	89	90	11
	PCB-169	37	37	37	18	89	90	11
	PCB-170	37	37	37	18	89	90	11
	PCB-171/173	37	37	37	18	89	90	11
	PCB-172	37	37	37	18	89	90	11
	PCB-174	37	37	37	18	89	90	11
	PCB-175	37	37	37	18	89	90	11
	PCB-176	37	37	37	18	89	90	11

Table A-4
Number of Tissue Samples in the NBSA by Analyte, Species Group and Tissue Type

Parameter Group	Analyte	Total Number of Samples[1]						
		Crab/Clam Sampling Program				Fish Sampling Program		
		Hepato-pancreas	Edible Muscle	Carcass	Clams	Whole Body	Fillet	Livers
PCB Congeners	PCB-177	37	37	37	18	89	90	11
	PCB-178	37	37	37	18	89	90	11
	PCB-179	37	37	37	18	89	90	11
	PCB-180/193	37	37	37	18	89	90	11
	PCB-181	37	37	37	18	89	90	11
	PCB-182	37	37	37	18	89	90	11
	PCB-183/185	37	37	37	18	89	90	11
	PCB-184	37	37	37	18	89	90	11
	PCB-186	37	37	37	18	89	90	11
	PCB-187	37	37	37	18	89	90	11
	PCB-188	37	37	37	18	89	90	11
	PCB-189	37	37	37	18	89	90	11
	PCB-190	37	37	37	18	89	90	11
	PCB-191	37	37	37	18	89	90	11
	PCB-192	37	37	37	18	89	90	11
	PCB-194	37	37	37	18	89	90	11
	PCB-195	37	37	37	18	89	90	11
	PCB-196	37	37	37	18	89	90	11
	PCB-197/200	37	37	37	18	89	90	11
	PCB-198/199	37	37	37	18	89	90	11
	PCB-201	37	37	37	18	89	90	11
	PCB-202	37	37	37	18	89	90	11
	PCB-203	37	37	37	18	89	90	11
	PCB-204	37	37	37	18	89	90	11
	PCB-205	37	37	37	18	89	90	11
	PCB-206	37	37	37	18	89	90	11
	PCB-207	37	37	37	18	89	90	11
	PCB-208	37	37	37	18	89	90	11
	PCB-209	37	37	37	18	89	90	11
	Total PCB Congeners (209)	37	37	37	18	89	90	11
Aroclor PCBs	Aroclor-1016	37	37	37	18	85	90	4
	Aroclor-1221	37	37	37	18	85	90	4
	Aroclor-1232	37	37	37	18	85	90	4
	Aroclor-1242	37	37	37	18	85	90	4
	Aroclor-1248	37	37	37	18	85	90	4
	Aroclor-1254	37	37	37	18	85	90	4
	Aroclor-1260	37	37	37	18	85	90	4
	Aroclor-1262	37	37	37	18	85	90	4
	Aroclor-1268	37	37	37	18	85	90	4
	Total Aroclor PCBs (Sum of 7 Aroclors)	37	37	37	18	85	90	4
	Total Aroclor PCBs (Sum of 9 Aroclors)	37	37	37	18	85	90	4
Pesticides	2,4'-DDD	37	37	37	18	89	90	11
	2,4'-DDE	37	37	37	18	89	90	11
	2,4'-DDT	37	37	37	18	89	90	11
	4,4'-DDD	37	37	37	18	89	90	11
	4,4'-DDE	37	37	37	18	89	90	11
	4,4'-DDT	37	37	37	18	89	90	11
	Aldrin	37	37	37	18	89	90	11
	Alpha-BHC	37	37	37	18	89	90	11
	Alpha-Chlordane	37	37	37	18	89	90	11
	Beta-BHC	37	37	37	18	89	90	11
	cis-Nonachlor	37	37	37	18	89	90	11
	Delta-BHC	37	37	37	18	89	90	11
	Dieldrin	37	37	37	18	89	90	11
	Endosulfan I	37	37	37	18	89	90	11
	Endosulfan II	37	37	37	18	89	90	11
	Endosulfan Sulfate	37	37	37	18	89	90	11
	Endrin	37	37	37	18	89	90	11
	Endrin Aldehyde	37	37	37	18	89	90	11
	Endrin Ketone	37	37	37	18	89	90	11
	Gamma-BHC (Lindane)	37	37	37	18	89	90	11
	Heptachlor	37	37	37	18	89	90	11

Table A-4
Number of Tissue Samples in the NBSA by Analyte, Species Group and Tissue Type

Parameter Group	Analyte	Total Number of Samples[1]						
		Crab/Clam Sampling Program				Fish Sampling Program		
		Hepato-pancreas	Edible Muscle	Carcass	Clams	Whole Body	Fillet	Livers
Pesticides	Heptachlor Epoxide	37	37	37	18	89	90	11
	Hexachlorobenzene	37	37	37	18	89	90	11
	Methoxychlor	37	37	37	18	89	90	11
	Mirex	37	37	37	18	89	90	11
	Nonachlor, trans-	37	37	37	18	89	90	11
	Oxychlordane	37	37	37	18	89	90	11
	trans-Chlordane	37	37	37	18	89	90	11
	trans-Heptachlor Epoxide	37	37	37	18	89	90	11
	Total Alpha + Gamma Chlordane	37	37	37	18	89	90	11
	Total DDT (2,4)	37	37	37	18	89	90	11
	Total DDT (4,4)	37	37	37	18	89	90	11
	Total DDT (2,4 & 4,4)	37	37	37	18	89	90	11
Semivolatiles	1,2,4,5-Tetrachlorobenzene	37	37	37	18	89	90	11
	1,2-Diphenylhydrazine	37	37	37	18	89	90	11
	1-Methylnaphthalene	37	37	37	18	89	90	11
	2,2'-oxybis(1-Chloropropane)	37	37	37	18	89	90	11
	2,3,4,6-Tetrachlorophenol	37	37	37	18	89	90	11
	2,4,5-Trichlorophenol	37	37	37	18	89	90	11
	2,4,6-Trichlorophenol	37	37	37	18	89	90	11
	2,4-Dichlorophenol	37	37	37	18	89	90	11
	2,4-Dimethylphenol	37	37	37	18	89	90	11
	2,4-Dinitrophenol	37	37	37	18	89	90	11
	2,4-Dinitrotoluene	37	37	37	18	89	90	11
	2,6-Dinitrotoluene	37	37	37	18	89	90	11
	2-Chloronaphthalene	37	37	37	18	89	90	11
	2-Chlorophenol	37	37	37	18	89	90	11
	2-Methylnaphthalene	37	37	37	18	89	90	11
	2-Methylphenol	37	37	37	18	89	90	11
	2-Nitroaniline	37	37	37	18	89	90	11
	2-Nitrophenol	37	37	37	18	89	90	11
	3,3'-Dichlorobenzidine	37	37	37	18	89	90	11
	3-Nitroaniline	37	37	37	18	89	90	11
	4,6-Dinitro-2-methylphenol	37	37	37	18	89	90	11
	4-Bromophenyl phenyl ether	37	37	37	18	89	90	11
	4-Chloro-3-Methylphenol	37	37	37	18	89	90	11
	4-Chloroaniline	37	37	37	18	89	90	11
	4-Chlorophenyl phenyl ether	37	37	37	18	89	90	11
	4-Methylphenol	37	37	37	18	89	90	11
	4-Nitroaniline	37	37	37	18	89	90	11
	4-Nitrophenol	37	37	37	18	89	90	11
	Acenaphthene	37	37	37	18	89	90	11
	Acenaphthylene	37	37	37	18	89	90	11
	Acetophenone	37	37	37	18	89	90	11
	Anthracene	37	37	37	18	89	90	11
	Atrazine	37	37	37	18	89	90	11
	Benzaldehyde	37	37	37	18	89	90	11
	Benzidine	37	37	37	18	89	90	11
	Benzo(a)anthracene	37	37	37	18	89	90	11
	Benzo(a)pyrene	37	37	37	18	89	90	11
	Benzo(b)fluoranthene	37	37	37	18	89	90	11
	Benzo(e)pyrene	37	37	37	18	89	90	11
	Benzo(g,h,i)perylene	37	37	37	18	89	90	11
	Benzo(j,k)fluoranthene	37	37	37	18	89	90	11
	Benzoic Acid	37	37	37	18	89	90	11
	Biphenyl	37	37	37	18	89	90	11
	bis(2-Chloroethoxy)methane	37	37	37	18	89	90	11
	bis(2-Chloroethyl)ether	37	37	37	18	89	90	11
	bis(2-Ethylhexyl)phthalate	37	37	37	18	89	90	11
	Butyl benzyl phthalate	37	37	37	18	89	90	11
	C1-Chrysenes	37	37	37	18	89	90	11
	C1-Fluoranthenes/Pyrenes	37	37	37	18	89	90	11
	C1-Fluorenes	37	37	37	18	89	90	11

Table A-4
Number of Tissue Samples in the NBSA by Analyte, Species Group and Tissue Type

Parameter Group	Analyte	Total Number of Samples[1]						
		Crab/Clam Sampling Program				Fish Sampling Program		
		Hepato-pancreas	Edible Muscle	Carcass	Clams	Whole Body	Fillet	Livers
Semivolatiles	C1-Naphthalenes	37	37	37	18	89	90	11
	C1-Phenanthrenes/Anthracenes	37	37	37	18	89	90	11
	C2-Chrysenes	37	37	37	18	89	90	11
	C2-Fluoranthenes/Pyrenes	37	37	37	18	89	90	11
	C2-Fluorenes	37	37	37	18	89	90	11
	C2-Naphthalenes	37	37	37	18	89	90	11
	C2-Phenanthrene/anthracenes	37	37	37	18	89	90	11
	C3-Chrysenes	37	37	37	18	89	90	11
	C3-Fluoranthenes/Pyrenes	37	37	37	18	89	90	11
	C3-Fluorenes	37	37	37	18	89	90	11
	C3-Naphthalene	37	37	37	18	89	90	11
	C3-Phenanthrene/anthracenes	37	37	37	18	89	90	11
	C4-Chrysenes	37	37	37	18	89	90	11
	C4-Naphthalene	37	37	37	18	89	90	11
	C4-Phenanthrenes/anthracenes	37	37	37	18	89	90	11
	Caprolactam	37	37	37	18	89	90	11
	Carbazole	37	37	37	18	89	90	11
	Chrysene	37	37	37	18	89	90	11
	Dibenzo(a,h)anthracene	37	37	37	18	89	90	11
	Dibenzofuran	37	37	37	18	89	90	11
	Diethyl phthalate	37	37	37	18	89	90	11
	Dimethylphthalate	37	37	37	18	89	90	11
	Di-n-Butylphthalate	37	37	37	18	89	90	11
	Di-n-Octylphthalate	37	37	37	18	89	90	11
	Fluoranthene	37	37	37	18	89	90	11
	Fluorene	37	37	37	18	89	90	11
	Hexachlorobutadiene	37	37	37	18	89	90	11
	Hexachlorocyclopentadiene	37	37	37	18	89	90	11
	Hexachloroethane	37	37	37	18	89	90	11
	Indeno(1,2,3-cd)pyrene	37	37	37	18	89	90	11
	Isophorone	37	37	37	18	89	90	11
	Naphthalene	37	37	37	18	89	90	11
	Nitrobenzene	37	37	37	18	89	90	11
	N-Nitroso-di-n-propylamine	37	37	37	18	89	90	11
	N-Nitrosodiphenylamine	37	37	37	18	89	90	11
	Pentachlorophenol	37	37	37	18	89	90	11
	Perylene	37	37	37	18	89	90	11
	Phenanthrene	37	37	37	18	89	90	11
	Phenol	37	37	37	18	89	90	11
	Pyrene	37	37	37	18	89	90	11
	Pyridine	37	37	37	18	89	90	11
	Total HMW PAHs	37	37	37	18	89	90	11
	Total LMW PAHs	37	37	37	18	89	90	11
	TOTAL PAHs	37	37	37	18	89	90	11
Physical Properties	Percent Moisture	37	37	37	18	89	90	11
	Water Content ASTM D2216	37	37	37	18	89	90	11

Notes:

Shading identifies the 18 contaminants of interest used in the data evaluation for the Data Evaluation and Analysis Report - Revision 2 (DEAR; Tierra 2014c). Please note that one of the 18 contaminants, total petroleum hydrocarbons, was not analyzed in crab, clam, or fish tissue. Therefore, only 17 contaminants of interest are shaded in the table.

Tissue samples were collected as part of the Crab/Clam and Fish Sampling Programs conducted by Tierra (GSH 2017a, Tierra 2017).

[1]The numbers in each column represent the number of samples with reportable results for the analyte in each tissue type. The number of results may vary because some results were qualified as rejected during the data validation process and therefore were excluded from the sample count. Field duplicates and QC samples (MS/MSD, trip blanks, and field blanks) were excluded from sample counts.

Acronyms:

DDD = dichlorodiphenyldichloroethane
DDE = dichlorodiphenyldichloroethylene
DDT = dichlorodiphenyltrichloroethane
HMW = high molecular weight
LMW = low molecular weight
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
TCDD = tetrachlorodibenzo-p-dioxin

Table A-5
Summary of Analytes Not Detected in NBSA Tissue Samples

Parameter Group	Analyte
Aroclor PCBs	Aroclor-1016
	Aroclor-1221
	Aroclor-1232
	Aroclor-1242
Butyltins	Monobutyltin
Metals	Thallium
Pesticides	Endrin Aldehyde
Semivolatiles	1,2-Diphenylhydrazine
	2,3,4,6-Tetrachlorophenol
	2,4,5-Trichlorophenol
	2,4,6-Trichlorophenol
	2,4-Dichlorophenol
	2,4-Dimethylphenol
	2,4-Dinitrophenol
	2,4-Dinitrotoluene
	2-Chloronaphthalene
	2-Chlorophenol
	2-Nitroaniline
	2-Nitrophenol
	3,3'-Dichlorobenzidine
	3-Nitroaniline
	4,6-Dinitro-2-methylphenol
	4-Bromophenyl phenyl ether
	4-Chloro-3-Methylphenol
	4-Chloroaniline
	4-Chlorophenyl phenyl ether
	4-Nitroaniline
	4-Nitrophenol
	Benzidine
	Biphenyl
	bis(2-Chloroethoxy)methane
	bis(2-Chloroethyl)ether
	C3-Fluorenes
	C4-Chrysenes
	Caprolactam
	Carbazole
	Dibenzofuran
	Diethyl phthalate
	Dimethylphthalate
	Di-n-Octylphthalate
	Hexachlorobutadiene
	Hexachlorocyclopentadiene
	Hexachloroethane
	Nitrobenzene
	N-Nitroso-di-n-propylamine
	N-Nitrosodiphenylamine
	Pentachlorophenol

Acronyms:
PCB = polychlorinated biphenyl

Table A-6
Number of Porewater Samples in the NBSA by Analyte

Parameter Group	Analyte	Total Number of Samples[1]	Detected?
Dioxins/ Furans	1,2,3,4,6,7,8-HpCDD	30	Yes
	1,2,3,4,6,7,8-HpCDF	30	Yes
	1,2,3,4,7,8,9-HpCDF	30	Yes
	1,2,3,4,7,8-HxCDD	30	Yes
	1,2,3,4,7,8-HxCDF	30	Yes
	1,2,3,6,7,8-HxCDD	30	Yes
	1,2,3,6,7,8-HxCDF	30	Yes
	1,2,3,7,8,9-HxCDD	30	Yes
	1,2,3,7,8,9-HxCDF	30	Yes
	1,2,3,7,8-PeCDD	30	Yes
	1,2,3,7,8-PeCDF	30	Yes
	2,3,4,6,7,8-HxCDF	30	Yes
	2,3,4,7,8-PeCDF	30	Yes
	2,3,7,8-TCDD	30	Yes
	2,3,7,8-TCDF	30	Yes
	OCDD	30	Yes
	OCDF	30	Yes
Metals	Aluminum	29	Yes
	Antimony	29	Yes
	Arsenic	29	Yes
	Barium	29	No
	Beryllium	29	Yes
	Cadmium	29	No
	Calcium	29	Yes
	Chromium	29	Yes
	Cobalt	29	No
	Copper	29	Yes
	Iron	29	Yes
	Lead	29	Yes
	Magnesium	29	Yes
	Manganese	29	Yes
	Mercury	30	Yes
	Methyl Mercury	30	Yes
	Nickel	29	No
	Potassium	29	Yes
	Selenium	29	Yes
	Silver	29	No
	Sodium	29	Yes
	Thallium	29	No
	Titanium	28	Yes
	Vanadium	29	Yes
	Zinc	29	Yes
Pesticides	2,4'-DDD	30	Yes
	2,4'-DDE	30	Yes
	2,4'-DDT	30	Yes
	4,4'-DDD	30	Yes
	4,4'-DDE	30	Yes
	4,4'-DDT	30	Yes
	Aldrin	30	Yes
	Alpha BHC	30	Yes
	Alpha Endosulfan	30	Yes
	Beta BHC	30	No
	Beta Endosulfan	30	No
	Cis-Chlordane	30	Yes
	Cis-Nonachlor	30	Yes

Table A-6
Number of Porewater Samples in the NBSA by Analyte

Parameter Group	Analyte	Total Number of Samples[1]	Detected?
Pesticides	Delta BHC	30	No
	Dieldrin	30	Yes
	Endosulfan Sulfate	30	No
	Endrin	30	No
	Endrin Aldehyde	30	Yes
	Endrin Ketone	30	Yes
	Gamma BHC (Lindane)	30	No
	Heptachlor	30	Yes
	Heptachlor Epoxide	30	Yes
	Hexachlorobenzene	30	Yes
	Methoxychlor	30	No
	Mirex	30	Yes
	Oxychlordane	30	Yes
	Trans-Chlordane	30	Yes
	Trans-Heptachlor Epoxide	30	Yes
	Trans-Nonachlor	30	Yes
	Total Alpha + Gamma Chlordane	30	Yes
	Total DDT (2,4 & 4,4)	30	Yes
	Total DDT (2,4)	30	Yes
	Total DDT (4,4)	30	Yes
PCB Congeners	PCB-1	30	Yes
	PCB-2	30	Yes
	PCB-3	30	Yes
	PCB-4	30	Yes
	PCB-5	30	Yes
	PCB-6	30	Yes
	PCB-7	30	Yes
	PCB-8	30	Yes
	PCB-9	30	Yes
	PCB-10	30	Yes
	PCB-11	30	Yes
	PCB-12/13	30	Yes
	PCB-14	30	Yes
	PCB-15	30	Yes
	PCB-16	30	Yes
	PCB-17	30	Yes
	PCB-18/30	30	Yes
	PCB-19	30	Yes
	PCB-20/28	30	Yes
	PCB-21/33	30	Yes
	PCB-22	30	Yes
	PCB-23	30	Yes
	PCB-24	30	Yes
	PCB-25	30	Yes
	PCB-26/29	30	Yes
	PCB-27	30	Yes
	PCB-31	30	Yes
	PCB-32	30	Yes
	PCB-34	30	Yes
	PCB-35	30	Yes
	PCB-36	30	Yes
	PCB-37	30	Yes
	PCB-38	30	Yes
	PCB-39	30	Yes
	PCB-40/71	30	Yes

Table A-6
Number of Porewater Samples in the NBSA by Analyte

Parameter Group	Analyte	Total Number of Samples[1]	Detected?
PCB Congeners	PCB-41	30	Yes
	PCB-42	30	Yes
	PCB-43	30	Yes
	PCB-44/47/65	30	Yes
	PCB-45	30	Yes
	PCB-46	30	Yes
	PCB-48	30	Yes
	PCB-49/69	30	Yes
	PCB-50/53	30	Yes
	PCB-51	30	Yes
	PCB-52	30	Yes
	PCB-54	30	Yes
	PCB-55	30	Yes
	PCB-56	30	Yes
	PCB-57	30	Yes
	PCB-58	30	Yes
	PCB-60	30	Yes
	PCB-61/70/74/76	30	Yes
	PCB-62/75	30	Yes
	PCB-63	30	Yes
	PCB-64	30	Yes
	PCB-66	30	Yes
	PCB-67	30	Yes
	PCB-68	30	Yes
	PCB-72	30	Yes
	PCB-73	30	Yes
	PCB-77	30	Yes
	PCB-78	30	No
	PCB-79	30	Yes
	PCB-80	30	No
	PCB-81	30	Yes
	PCB-82	30	Yes
	PCB-83	30	Yes
	PCB-84	30	Yes
	PCB-85/116/117	30	Yes
	PCB-86/87/97/109/119/125	30	Yes
	PCB-88	30	Yes
	PCB-89	30	Yes
	PCB-90/101/113	30	Yes
	PCB-91	30	Yes
	PCB-92	30	Yes
	PCB-93/100	30	Yes
	PCB-94	30	Yes
	PCB-95	30	Yes
	PCB-96	30	Yes
	PCB-98/102	30	Yes
	PCB-99	30	Yes
	PCB-103	30	Yes
	PCB-104	30	Yes
	PCB-105	30	Yes
	PCB-106	30	Yes
	PCB-107	30	Yes
	PCB-108/124	30	Yes
	PCB-110/115	30	Yes
	PCB-111	30	Yes

Table A-6
Number of Porewater Samples in the NBSA by Analyte

Parameter Group	Analyte	Total Number of Samples[1]	Detected?
PCB Congeners	PCB-112	30	Yes
	PCB-114	30	Yes
	PCB-118	30	Yes
	PCB-120	30	Yes
	PCB-121	30	Yes
	PCB-122	30	Yes
	PCB-123	30	Yes
	PCB-126	30	Yes
	PCB-127	30	Yes
	PCB-128/166	30	Yes
	PCB-129/138/163	30	Yes
	PCB-130	30	Yes
	PCB-131	30	Yes
	PCB-132	30	Yes
	PCB-133	30	Yes
	PCB-134	30	Yes
	PCB-135/151	30	Yes
	PCB-136	30	Yes
	PCB-137	30	Yes
	PCB-139/140	30	Yes
	PCB-141	30	Yes
	PCB-142	30	No
	PCB-143	30	Yes
	PCB-144	30	Yes
	PCB-145	30	Yes
	PCB-146	30	Yes
	PCB-147/149	30	Yes
	PCB-148	30	Yes
	PCB-150	30	Yes
	PCB-152	30	Yes
	PCB-153/168	30	Yes
	PCB-154	30	Yes
	PCB-155	30	Yes
	PCB-156/157	30	Yes
	PCB-158	30	Yes
	PCB-159	30	No
	PCB-160	30	No
	PCB-161	30	Yes
	PCB-162	30	Yes
	PCB-164	30	Yes
	PCB-165	30	Yes
	PCB-167	30	Yes
	PCB-169	30	Yes
	PCB-170	30	Yes
	PCB-171/173	30	Yes
	PCB-172	30	Yes
	PCB-174	30	Yes
	PCB-175	30	Yes
	PCB-176	30	Yes
	PCB-177	30	Yes
	PCB-178	30	Yes
	PCB-179	30	Yes
	PCB-180/193	30	Yes
	PCB-181	30	Yes
	PCB-182	30	Yes

Table A-6
Number of Porewater Samples in the NBSA by Analyte

Parameter Group	Analyte	Total Number of Samples[1]	Detected?
PCB Congeners	PCB-183/185	30	Yes
	PCB-184	30	Yes
	PCB-186	30	No
	PCB-187	30	Yes
	PCB-188	30	Yes
	PCB-189	30	Yes
	PCB-190	30	Yes
	PCB-191	30	No
	PCB-192	30	Yes
	PCB-194	30	Yes
	PCB-195	30	Yes
	PCB-196	30	Yes
	PCB-197/200	30	Yes
	PCB-198/199	30	Yes
	PCB-201	30	Yes
	PCB-202	30	Yes
	PCB-203	30	Yes
	PCB-204	30	No
	PCB-205	30	Yes
	PCB-206	30	Yes
	PCB-207	30	Yes
	PCB-208	30	Yes
	PCB-209	30	Yes
	Total PCB Congeners (209)	30	Yes
PAHs	1-Methylnaphthalene	30	No
	2-Methylnaphthalene	30	Yes
	Acenaphthene	30	Yes
	Acenaphthylene	30	Yes
	Anthracene	30	Yes
	Benzo(a)anthracene	30	Yes
	Benzo(a)pyrene	30	Yes
	Benzo(b)fluoranthene	30	Yes
	Benzo(g,h,i)perylene	30	Yes
	Benzo(j)+(k)fluoranthene	30	Yes
	Benzo[e]pyrene	30	Yes
	C1-Chrysenes	30	Yes
	C1-Fluoranthenes/Pyrenes	30	Yes
	C1-Fluorenes	30	Yes
	C1-Naphthalenes	30	No
	C1-Phenanthrene/Anthracene	30	Yes
	C2-Chrysene	30	Yes
	C2-Fluoranthenes/Pyrene	30	Yes
	C2-Fluorenes	30	Yes
	C2-Naphthalenes	30	Yes
PAHs	C2-Phenanthrene/Anthracene	30	Yes
	C3-Chrysene	30	Yes
	C3-Fluoranthenes/Pyrene	30	Yes
	C3-Fluorenes	30	Yes
	C3-Naphthalenes	30	Yes
	C3-Phenanthrene/Anthracene	30	Yes
	C4-Chrysene	30	Yes
	C4-Naphthalenes	30	Yes
	C4-Phenanthrene/Anthracene	30	Yes
	Chrysene	30	Yes
	Dibenz(a,h)anthracene	30	Yes

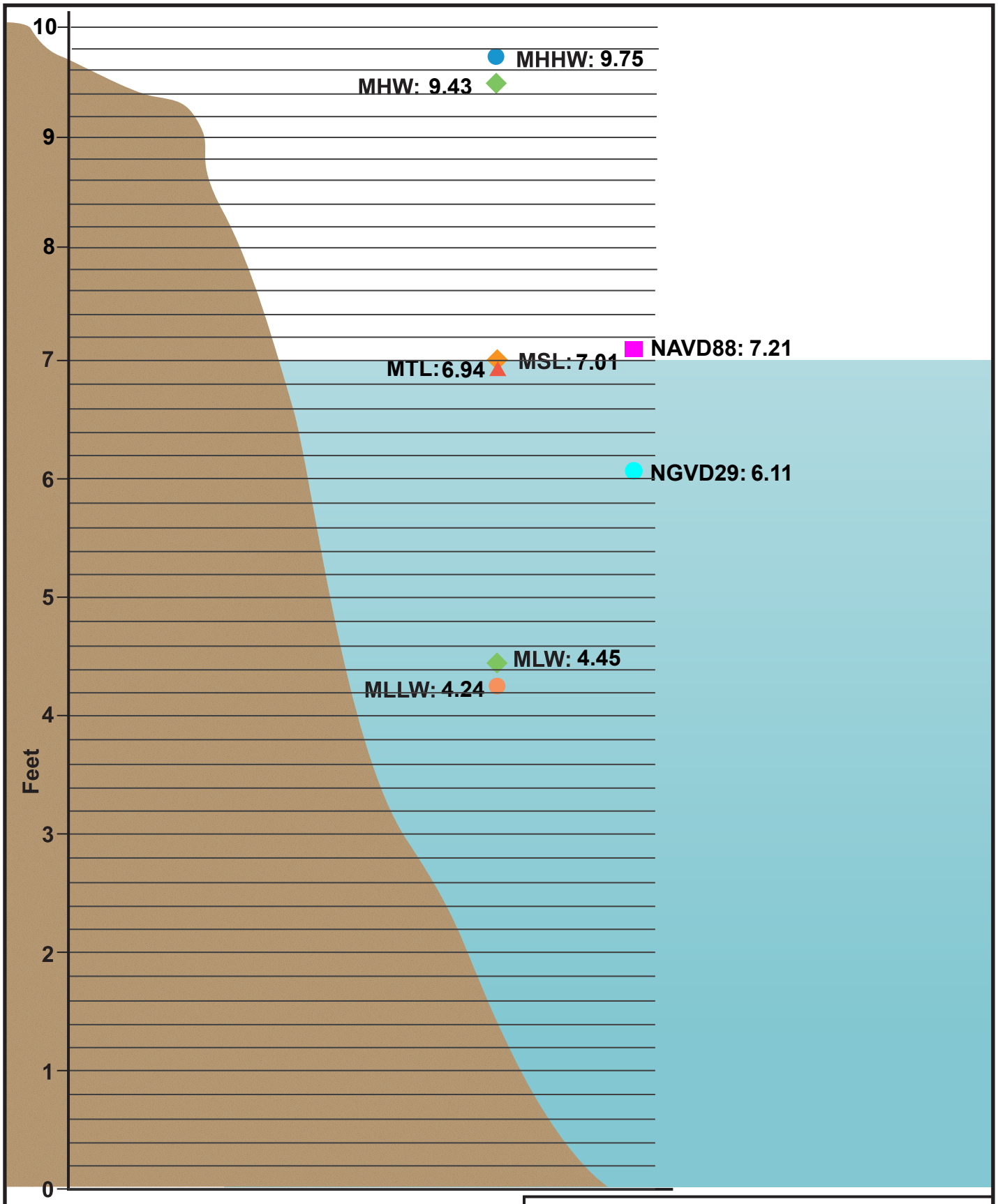
Table A-6
Number of Porewater Samples in the NBSA by Analyte

Parameter Group	Analyte	Total Number of Samples[1]	Detected?
	Fluoranthene	30	Yes
	Fluorene	30	Yes
	Indeno(1,2,3-c,d)pyrene	30	Yes
	Naphthalene	30	Yes
	Perylene	30	Yes
	Phenanthrene	30	Yes
	Pyrene	30	Yes
	Total HMW PAHs	30	Yes
	Total LMW PAHs	30	Yes
	Total PAHs	30	Yes

[1]The number of samples with reportable results for the analyte. The number of results may vary because some results were qualified as rejected during the data validation process and therefore were excluded from the sample count. Field duplicates and QC samples (MS/MSD, trip blanks, and field blanks) were excluded from sample counts.

Acronyms:
DDD = dichlorodiphenyldichloroethane
DDE = dichlorodiphenyldichloroethylene
DDT = dichlorodiphenyltrichloroethane
HMW = high molecular weight
LMW = low molecular weight
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
TCDD = tetrachlorodibenzo-p-dioxin

Appendix B



Datums

(Elevations in feet relative to station datum)

Reference:
https://tidesandcurrents.noaa.gov/datums.html?id=8519483

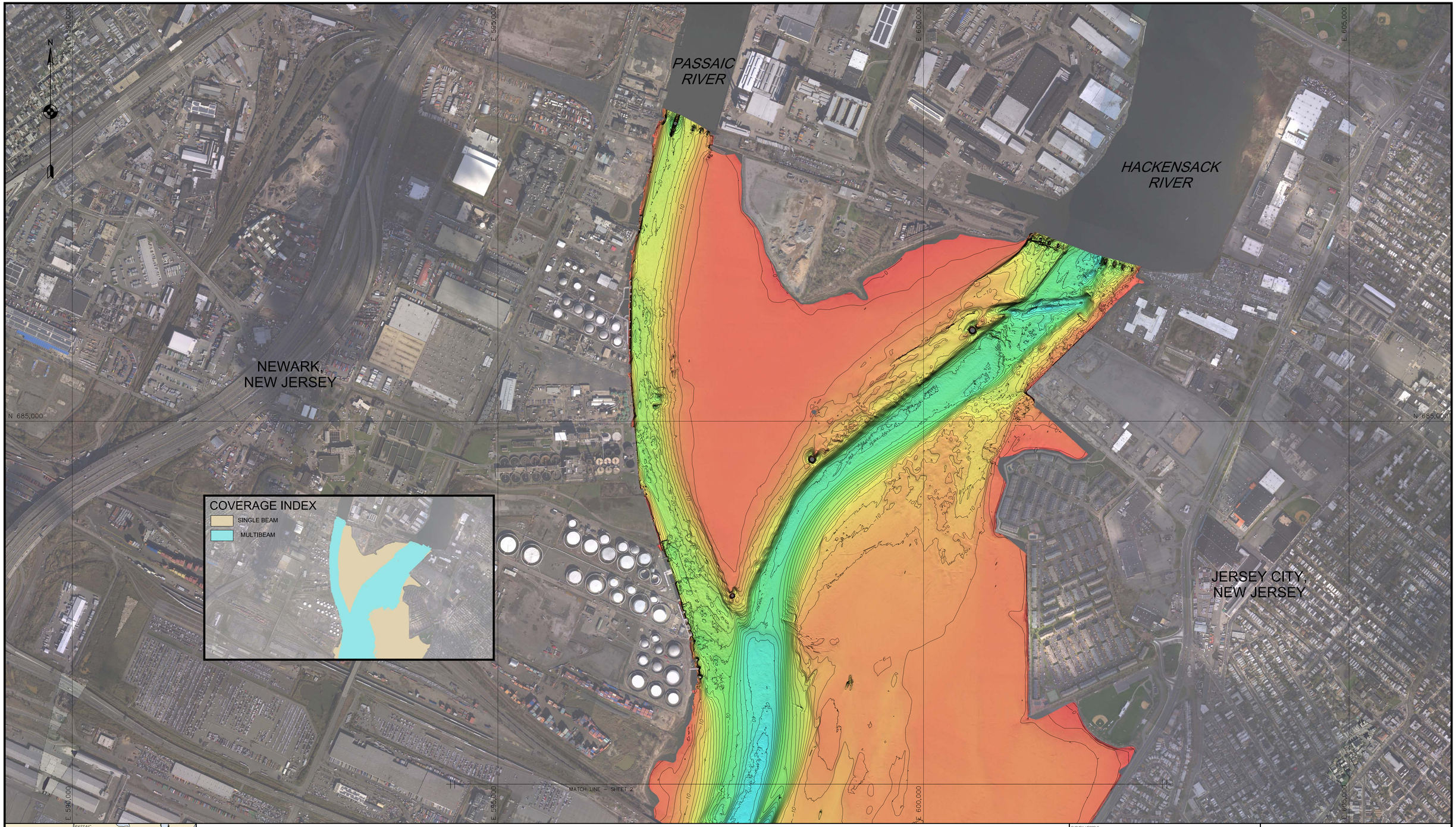
NEWARK BAY STUDY AREA

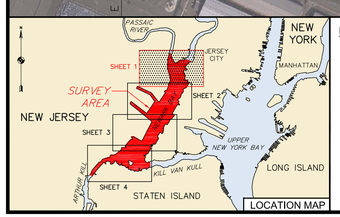
CONCEPTUAL SITE MODEL

DATUM FOR 8519483, BERGEN POINT, NY

January 2019

FIGURE
B-1





LOCATION MAP

LEGEND

—10— MAJOR CONTOUR

—8— MINOR CONTOUR

SHADED RELIEF INFORMATION:

SUN POSITION
ALTITUDE: 45°
AZIMUTH: 15°

ELEVATIONS (NGVD 29)

FEET: 0, −10, −20, −30, −40, −50, −60

NOTES

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SURVEY ACQUISITION SOFTWARE: HYPACK VERSION 2010

SURVEY PROCESSING SOFTWARE: HYPACK MULTIBEAM AND SINGLE BEAM EDITORS VERSION 2012A, CARIS HIPS & SIPS 7.1.2

SCALE: 1"=500'

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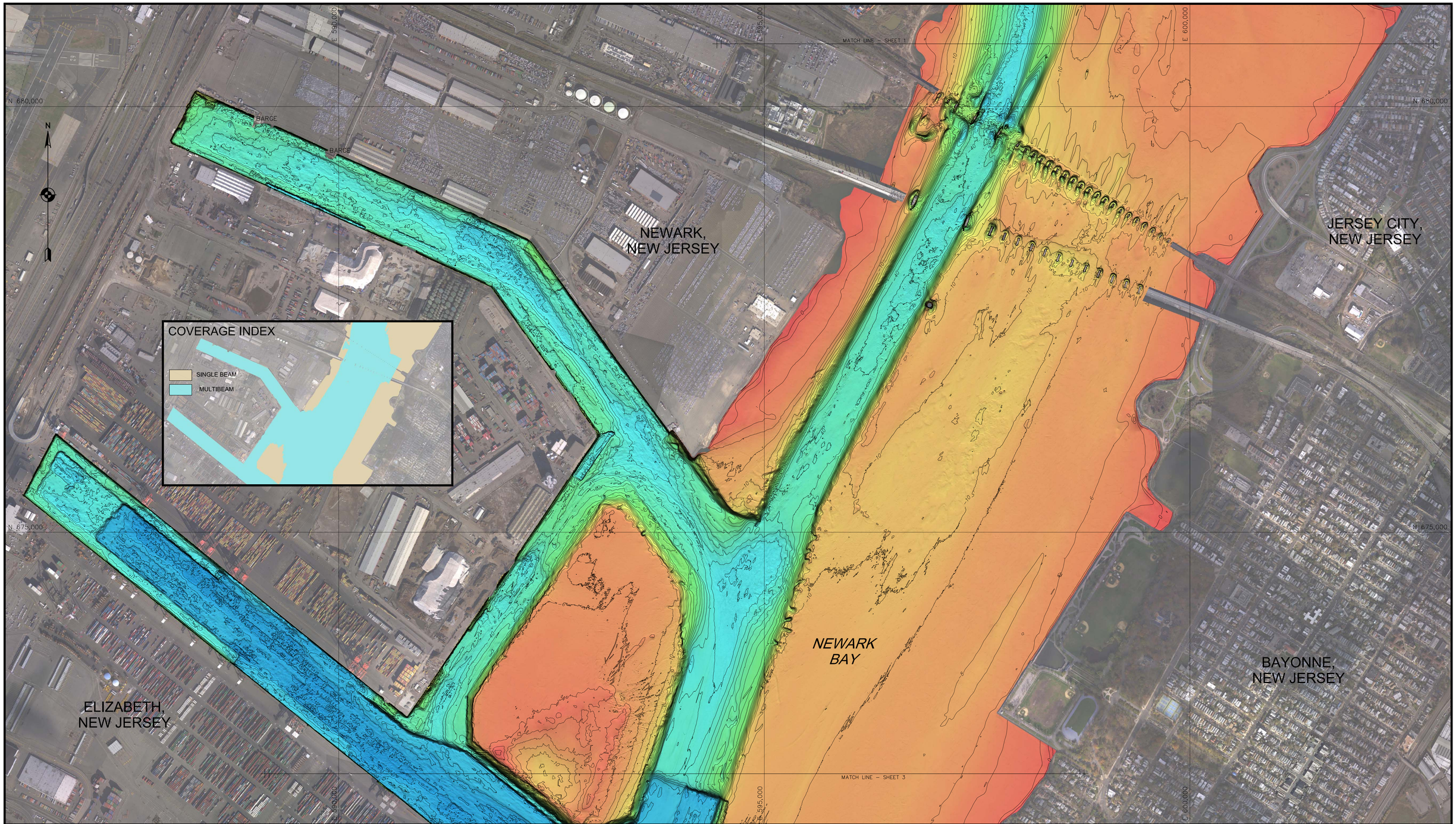
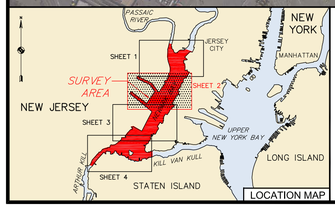
DRAFTED BY: A. RIZZO	DATE: 30 APRIL 2013	DRAWING: 2	SHEET: 1 OF 4





LEGEND

—10— MAJOR CONTOUR

—8— MINOR CONTOUR

SHADED RELIEF INFORMATION:

SUN POSITION
ALTITUDE: 45°
AZIMUTH: 15°

ELEVATIONS (NGVD 29)

FEET: 0, −10, −20, −30, −40, −50, −60

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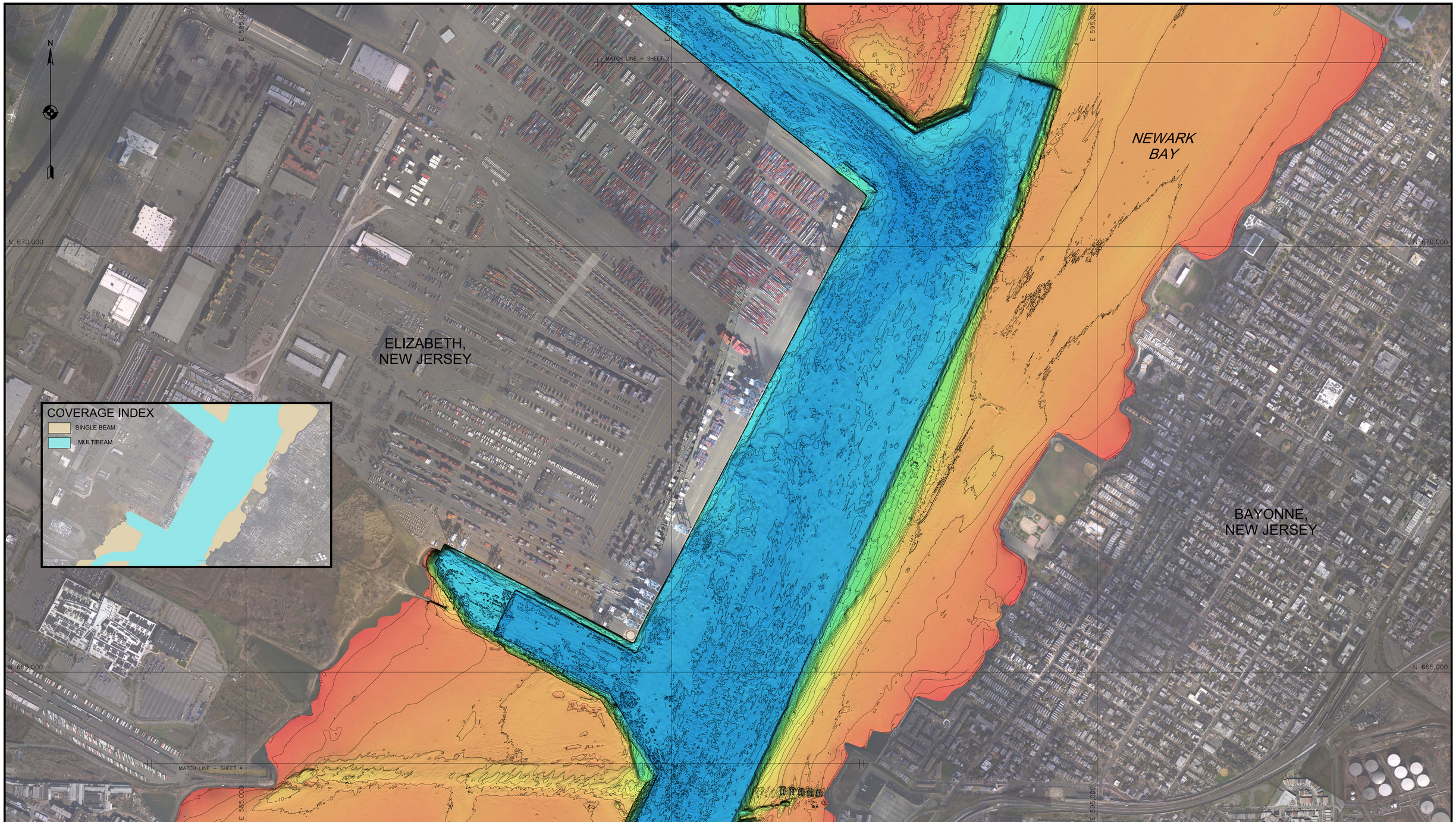
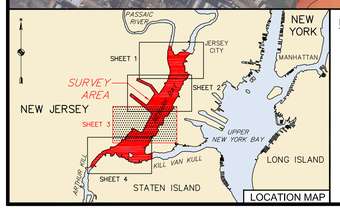
DRAFTED BY: A. RIZZO	DATE: 30 APRIL 2013	DRAWING: 2 / SHEET: 2 OF 4





LOCATION MAP

LEGEND

—10— MAJOR CONTOUR

—8— MINOR CONTOUR

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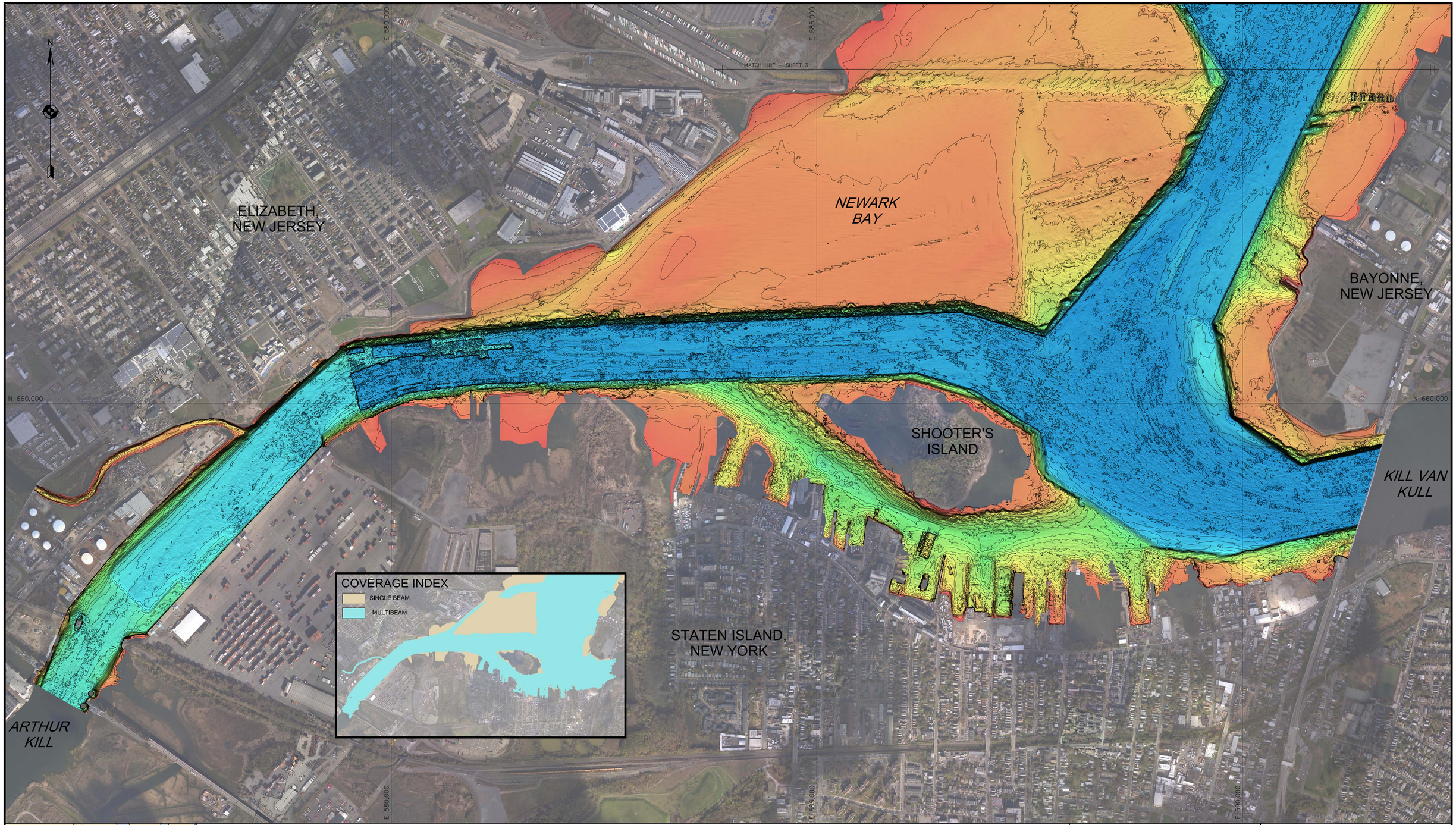

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DRAFTED BY: A. RIZZO	DATE: 30 APRIL 2013	DRAWING: 2	SHEET: 4 OF 4

Appendix C

Table C-1
Newark Bay Waterfront Sources Inventory

Parcel #	Name of PRP	Street Address	City	Years of Operation	Products, Operations and/or Processes	Subject Waterway	Proximity to Waterway	Known Discharge Mechanisms (Direct/CSO/Storm)	Documented Discharge to Newark Bay and/or Tributary	Other Documented Discharges	Site Contamination if Known	Notes
NEWARK												
BAY29	Center Terminal Co Motiva Enterprises Ironbound International Industries	352 Doremus Ave	Newark	Present	Trucking operations.	Newark Bay						Windshield survey
BAY30	Unknown - confirmed car lot; no visible signage or identification		Newark	Present	Automobile storage	Newark Bay						Windshield survey
BAY31	Unknown - warehouse		Newark	Present		Newark Bay						Windshield survey
BAY34	Newark Industrial Complex Toys R Us Tomae Const. Corp. Conrail Auto Terminal Firmenich Rockrete Recycling Chem Fleur International	Doremus Ave	Newark	Present	Multi-tenant commercial and industrial operations complex	Newark Bay					Three USTs were removed from Conrail Auto Terminal as per CPIP Report.	Windshield survey Regulatory file
BAY35	Airborne Freight		Newark	Present	Freight operations	Newark Bay						Windshield survey
BAY36	Unknown - warehouse		Newark	Present		Newark Bay						Windshield survey
BAY37	Donjon Marine Warehousing	Doremus Ave	Newark	Present	Warehouse. Operating in Berth 5.	Newark Bay						Windshield survey
BAY40	Toyota Logistical Service & Toyota Motor Sales USA	390 Port Street	Newark	Present	Automobile storage	Newark Bay						Windshield survey
BAY41	BP Oil BP North America Petroleum, Inc. BP Marine Americas, Inc. (a/k/a "Coastal Oil")	350 Coastal Street	Newark	1983 - Present Coastal Oil Company, Division of BP, sold to COC Corporation 4/1/83. BP North America merged into BP Exploration & Oil Inc 1/1/93.	Onsite storage and transfer terminal for #2 fuel oil, bunker oil, and kerosene and diesel products. BP Oil leases property from the PANJ, which it operates its marine fuels terminal and docking facility.	Newark Bay	Less than 0.5 mile to Newark Bay. Less than 0.4 mile to the Port Newark Channel.	NJPDES Permit #NJ 0034231 Surface water discharge via storm sewer outfalls to Newark Bay.	1984 – U.S. Coast Guard reported that 44,000 gallons of bunker oil spilled due to a tank rupture. USEPA noted in 1985 Preliminary Assessment Report that oil leaking into the Port Newark Channel could harm aquatic life.	In 1970, spill at BP site located at 350 Coastal Ave in Newark: spill may be responsible for high levels of TPHC found at Naparano site. Circa 1980 timeframe: the City of Newark was aware of a spill of approximately 4M gallons from the rupture of Tank #108, into an un-lined containment basin, at the BP Oil Newark site. In 1983, 40,000 gallons of #6 fuel oil spilled into drainage ditches and earthen dike area due to a rupture in a storage tank. In 1992, the Port Authority found evidence in soil and groundwater of a petroleum release that occurred most likely from the 1979-80 oil spill. Also in 1992, 300 gallons of #6 fuel oil was discharged to Newark Bay. In 1995, during the removal of a 2,000-gallon UST, a sheen was noticed on the groundwater. In January 1999, approximately 300 gallons of #6 fuel oil spilled onto paved surface roads. In 2005, due to a leak in a pipe, approximately 200 gallons of #2 fuel oil spilled onto facility grounds.	USEPA noted in 1985 that soil, groundwater, and surface waters were contaminated due to leaking and spilled fuel and waste oils. Soil samples taken in 1992 revealed the presence of TPHCs, VOCs, BNAs, and lead. The following contaminants have been identified in site soils: TPHC, lead, VOC, BNA, acenapthene, fluorene, phenanthrene, anthracene, fluoranthene, pyrene, benzo(a)anthracene, and chrysene. The following contaminants were identified in site groundwaters: arsenic, lead, cadmium, chromium, benzene, toluene, ethylbenzene, and xylenes. Three USTs were removed; two USTs were closed in place - per CPIP Report.	Regulatory file
BAY42	U.S. Navy Shipyards (same site as BP Oil/Coastal Oil)	Port Street and Navy Street	Newark	1930-1963. Port Authority leased 33 acres of the former Federal Shipyard property, now owned by the Navy Dept, for 10 years starting 9/1/48.	U.S. Navy disassembled ships on this site from 1930-1963.	Newark Bay	Less than 0.5 mile to Newark Bay. Less than 0.4 mile to the Port Newark Channel.	Surface water discharge via storm sewer outfalls to Newark Bay.				Regulatory file
BAY42	Submarine Boat Corp.	On former property for U.S. Navy Shipyards	Newark	Circa 1918-early 1930s	Manufactured submarines for Great Britain. The company leased property from the Federal Government.	Newark Bay						Media reports
BAY42	Kent Steel, Building #304	Navy Street	Newark			Newark Bay					Per CPIP Report, two USTs for gasoline storage were removed.	Regulatory file

Table C-1
Newark Bay Waterfront Sources Inventory

Parcel #	Name of PRP	Street Address	City	Years of Operation	Products, Operations and/or Processes	Subject Waterway	Proximity to Waterway	Known Discharge Mechanisms (Direct/CSO/Storm)	Documented Discharge to Newark Bay and/or Tributary	Other Documented Discharges	Site Contamination if Known	Notes
BAY42	FAPS Inc.	371 Craneway St. Also, facility on former property for U.S. Navy Shipyards.	Newark	Present	One of several locations for company. Vehicle importing and distribution.	Newark Bay						Windshield survey
BAY43	Belgian Block Sales Co	Marsh St	Newark	Present	Stone. Construction materials.	Newark Bay						Windshield survey
BAY44	Container Services and Marine Transport Depot	Marsh St	Newark	Present	Distribution, warehousing and trucking.	Newark Bay						Windshield survey
BAY45	Amrod	305A Craneway Street / On former property for US Navy Shipyards	Newark	Present	Metal products and distribution.	Newark Bay						Windshield survey
BAY45	FAPS Inc.	Suez & Marsh Ave	Newark	Present	One of several locations for company. Vehicle importing and distribution.	Newark Bay						Windshield survey
BAY46	M.J. Rudolph, a Kinder Morgan Co.	181 Marsh St	Newark	Present	Petroleum bulk storage operations.	Newark Bay						Windshield survey
BAY47	Naporano	Berth 10-12	Newark	Present	Scrap metal recycling. Now operated by NMI.	Newark Bay						Regulatory file
BAY48	Tarheels Enterprises	Marsh St	Newark	Present	Construction. Road and transportation improvements contractor.	Newark Bay						Windshield survey
BAY49	American Steve Doring Inc	Marsh St	Newark	Present	Cargo operations	Newark Bay						Windshield survey
BAY50	Seaport Auto Services, Inc.	151 Corbin Street	Newark	Present		Newark Bay						Windshield survey
BAY52	BB Granite	148 Marsh St	Newark	Present	Granite block sales	Newark Bay						Windshield survey
BAY53	Gulf Gas Station	Marsh Street	Newark	Present	Retail gas station	Newark Bay						Windshield survey
BAY53	Port Authority Treatment Works	Corbin St	Newark	Present	Pumping station. Wastewater treatment.	Newark Bay						Windshield survey
BAY54	Cargill Salt	150 Marsh St	Newark	Present	Multiple locations for this company. Salt and salt products distribution.	Newark Bay						Windshield survey
BAY55	Koppers Inc.	Maritime & Tyler Street	Newark	Koppers from 1954-1988; BNS Acquisitions (sub. of Beazer PLC) acquired at least 90% of Koppers common stock in 11/88. 12/88 - assets were sold to KII. In 1989, name was changed to Beazer Materials & Services. In 1990, the name was changed to Beazer East, Inc.	This is an 8-acre site. Koppers leased site from City of Newark and later from PANYNJ. The company was involved in wood treating operations and utilized creosote, chromated copper arsenate, and a Koppers trademark chemical named NCX. NCX contained formaldehyde, phosphoric acid, and melamine.	Newark Bay	Within 1,000 feet of Newark Channel, which is part of Newark Bay	Two different outfalls; storm sewers discharged to Newark Bay.		7/11/84 - 50 gallons of effluent from the creosote/water separator spilled to the ground. 3/16/89 - NJDEP noted that spills of hydraulic fluids, #2 fuel oil, and creosote were found in various areas of the site. 8/10/90 - An oily sheen was observed in stormwater runoff and a $500 penalty was assessed against the site.	Arsenic, chromium, and copper are present in tank farm area site soils. Several violations were noted from the hazardous and regulated materials database listings per the CPIP Report 2005 - most recent in 1989. Site was contaminated with creosote and later remediated and capped. Groundwater is being monitored in association with DNAPL removal.	Regulatory file
BAY56	Shimazki	Tyler St	Newark	Present	Transportation of imported Honda vehicles	Newark Bay						Windshield survey

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BAY57	Aarhus United, J.J. Pease Warehouse	Marsh Street	Newark	Present	Warehousing and distribution	Newark Bay						Windshield survey
BAY58	Port of New York and New Jersey		Newark	Present	Warehousing and overseas distribution	Newark Bay						Windshield survey
BAY62	Hudson Tank Terminals	173 Export St	Newark	Present	Liquid deepwater bulk storage and distribution. Vegetable, animal, and marine oils and fats.	Newark Bay						Windshield survey
BAY63	Port Newark Refrigerated Warehouse	Tyler St	Newark	Present	Refrigerated warehousing and distribution	Newark Bay						Windshield survey
BAY64	PNCT	Corbin St	Newark	Present	Container terminal and distribution	Newark Bay						Windshield survey
BAY65	Cargrill Salt	Marsh Street	Newark	Present	One of several locations for company. Salt and salt products distribution.	Newark Bay						Windshield survey
BAY66	Essex Cement Company	Marsh St	Newark	Present	Under construction	Newark Bay						Windshield survey
BAY67	Maher Warehouse Corp.	Fleet Street and Tripoli Street	Newark	Present	Multiple locations in Port Newark. Container warehousing and distribution operations.	Newark Bay					Per CPIP Report: three USTs removed, three are still active.	Windshield survey Regulatory file
BAY68	Judge Organization Amex Shipping Agent P Judge & Sons Trucking	201A Export & Calcutta Streets	Newark	Present	Warehousing, distribution, and trucking operations.	Newark Bay						Windshield survey
BAY69	Naparano Iron & Metal Company	Multiple locations in Port Newark. Primary locations include Berth 10-12, Berth 30 & 32, and Berth 63.	Newark	Site is on 19.25 acres of land. Land owned by City of Newark, leased to Port Authority; subleased by Naparano since 1979. Company operating in Newark since 1907; from 1907-1979 not exactly sure where in Port Newark Terminal operations were. 1998 Metal Management purchased Naparano. Nimco Shredding Co of 252 Doremus Ave, also owned by Naparano.	From 1983-1990, primarily used Berth 63; 1990-1994 used Berths 10, 12, and 14; 1994 ceased using 10, 12, and 14, continued using 63, 28, and 30. As of 1998, using 30, 32, 34, 61, and 63. Also operates an 8- acre shredding center a couple of berths away with Newark Bay access and locomotive recycling. F61	Newark Bay		In 1993, applied for permit for two storm outfalls that discharge to Newark Bay. Mention of a permit application for a stormwater outfall discharging into Elizabeth Channel. Stormwater flows directly into the channel due to lack of onsite collection system. Historical maps show several sewer outfalls onsite.		In 1970, spill at BP site located at 350 Coastal Ave in Newark: spill may be responsible for high levels of TPHC found at Naparano site.	Low levels of contamination discovered on non-contiguous portion of site, 4/1995. NJ Marine Terminal report from 10/13/95 indicates historically high levels of metal contamination onsite; due to salvage operations. NJDEP sampling from 9/1994 show primary contaminants associated with onsite operations. Elevated PCB levels found in Newark Bay and channel sediment near site. Soil samples show elevated levels of one SVOC.	Regulatory file
BAY69	Metal Management Inc.	Located off of Export Street. Operating in the former Naparano Iron & Metal site. Berths 30 & 32.	Newark	Present		Newark Bay						Regulatory file

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BAY70	Port Newark / Newark Port Authority Marine Terminal	Includes the following streets: Distribution, East Port, Kellogg, Viking, Neptune, Marsh, Tyler, Suez, Calcutta, and Export.	Newark	Present		Newark Bay					Several violations were noted from the hazardous and regulated materials database listings per the CPIP Report 2005 - most recent in 1995. Onsite sources of contamination exist.	Regulatory file
BAY71	Naporano Iron & Metal Company	Multiple Locations in Port Newark. Primary locations include Berths 10 to 12, Berths 30 and 32, and Berth 63.	Newark	Mid-1990s	Scrap metal recycling	Newark Bay						Regulatory file
ELIZABETH												
BAY72	Port Jersey Logistics	1400 Polaris	Elizabeth	Present	Distribution, warehousing and trucking	Newark Bay						Windshield survey
BAY72	Tyler Distribution FTZ	1400 Polaris	Elizabeth	Present	Distribution, warehousing and trucking	Newark Bay						Windshield survey
BAY73	Cargill Salt	Off Polaris Street	Elizabeth	Present	Multiple locations for this company. Salt and salt products distribution.	Newark Bay						Windshield survey
BAY74	LMD Integrated Logistics	Off Polaris Street	Elizabeth	Present	Warehousing and distribution	Newark Bay						Windshield survey
BAY75	ASA Apple	Bay Ave/193 Maraciabo Street	Elizabeth	Present	Warehousing and distribution	Newark Bay						
BAY76	Unidentified Truck Terminal	Off McClester Street. Indicator on spreadsheet shows facility entrance and truck scale area only.	Elizabeth	Present	Warehousing and distribution	Newark Bay						Windshield survey
BAY77	Maher Chassis Depot	Multiple locations	Elizabeth	Present	Multiple locations for this company. Vehicle auto body parts storage.	Newark Bay						Windshield survey
BAY78	East Coast Warehouse	1150 Polaris St	Elizabeth	Present	Warehousing and distribution	Newark Bay						Windshield survey
BAY79	IKEA	1000 Ikea Drive	Elizabeth	Present	Retail furniture and households complex	Newark Bay						Windshield survey Media reports
BAY80	Select Cargo Services Inc. (a/k/a "Contem")	5130 McClester Street	Elizabeth	Present		Newark Bay					One violation was noted from the hazardous and regulated materials database listings per the CPIP Report 2005 - most recent in 2000.	Windshield survey

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BAY81	Kapkowski Landfill Site	Kapkowski Road and McClester Street	Elizabeth	Early 1950s to early 1970s	From early 1950s to the early 1970s, approximately 133 acres of the site west of Kapkowski Road was utilized as an uncontrolled municipal dump	Newark Bay	Within 5,000 feet of Newark Bay. Bordered by ditch to Elizabeth Channel.	Underdrains west of Kapkowski Road discharged groundwater to ditch to the Elizabeth Channel. Underdrains east of Kapkowski Road discharge into a culvert under McLester Street and ultimately discharges into Newark Bay.	Contaminated oil in groundwater - an estimated 3M gallons of oil is in the groundwater/water table. Oil is contaminated with high levels of PCBs and metals. In November 1976, samples of water from the drainage ditch identified heavy metals.			Regulatory file
BAY82	Rexplex Sports Plaza	Ikea Drive	Elizabeth	Present	Sports entertainment complex	Newark Bay						Windshield survey
BAY85	Port Elizabeth/Elizabeth Port Authority Marine Terminal	Off McClester Street	Elizabeth	Early 1900s to Present	Multi-tenant commercial, industrial, warehousing, and distribution operations. Integrated marine terminal and cargo operations. 2,100-acre facility.	Newark Bay	Waterfront to Newark Bay					Windshield survey USACE maps
BAY86	Toys R Us	Ikea Drive	Elizabeth	Present	Retail toys	Newark Bay						Windshield survey
BAY87	Performance Food Group/ PFG-AFI Food Services	1 Center Drive/ 1 Ikea Drive	Elizabeth	Present	Fish and shellfish warehousing and distribution	Newark Bay						Windshield survey
BAY88	Seaport International	228 North Avenue E.	Elizabeth	Present		Newark Bay						Windshield survey
BAY89	New England Motor Freight	1-71 North Avenue East	Elizabeth	Present	Trucking operations	Newark Bay					Six violations were noted from the hazardous and regulated materials database listings per the CPIP Report 2005 - most recent in 2003. Onsite restrictions. Four USTs/diesel/gasoline removed.	Windshield survey
BAY90	Maersk	Berths 88 - 89.	Elizabeth	Present	Distribution, warehousing and trucking	Newark Bay						Windshield survey
BAY91	APM Terminals - Maersk Sealand Horizonlines TMM Lines Lykes Lines Seastar Line Evergreen Yang Ming Lallanca PNO & Ned Lloyd Nor Asia UASC Hamburg SCD American President Lines Cosco North America Hanjin Shipping Co. Universal Maritime	5080 McLester Ave	Elizabeth	Present	Multi-tenant commercial and industrial operations complex	Newark Bay					Several violations were noted from the hazardous and regulated materials database listings per the CPIP Report 2005 against Universal Maritime - most recent in 2000.	Windshield survey
BAY92	Expressport Plaza 1180 Paragon Federal Credit Union B121 Swissray America Elizabeth Fire Dept Training Center Mid America Overseas Inc Sambonet	1180 McLester Ave	Elizabeth	Present	Multi-tenant commercial and industrial operations complex	Newark Bay						Windshield survey

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BAY92	Expressport Plaza 1160 PA of NY Testing & Training U Ocean USA Corp. Best Transportation Durfy EJE Rail MMMCA-PTTI-ECC Hudson News	1160 McLester Ave	Elizabeth	Present	Multi-tenant commercial and industrial operations complex	Newark Bay						Windshield survey
BAY92	Expressport Plaza 1170 Consotech Industries Pertech Corp K & E Printing Wayfarer Transit Systems Tokyo Kaneku International The PA of NY & NJ	1170 McLester Ave	Elizabeth	Present	Multi-tenant commercial and industrial operations complex	Newark Bay						Windshield survey
BAY93	New England Motor Freight	North Avenue	Elizabeth	Present	Trucking operations	Newark Bay						Windshield survey
BAY95	Allied Chemical	100 North Avenue East	Elizabeth	Site purchased in 1954 by Esso Standard Oil; 1956 Allied purchased site. Began developing sulfuric acid plant that operated until 1981. Sold to Ausimont on 1/22/86. Repurchased plant in 1989. City of Newark took ownership 10/1/93. Cleanup responsibility transferred to Continental Airlines in 9/1999 when they purchased the site (see file for more detail).	Acid production and distribution	Newark Bay	Within 2,000 feet of Newark Bay	Drainage ditch system surrounds plant; post-treatment acid transferred to public ditch before discharge to Newark Bay. Lagoon onsite used for storage of wastewater and strong acid waste. 1993, unpermitted overflow pipe bypassing treatment system. 5/26/76, industrial waste ditch approximately 1,000 feet from discharge point. Two outfalls reported onsite. Surface water lines discharge directly onto North Ave. Former effluent ditch receives runoff from adjacent ACOE site, several industrial sites, stormwater runoff, City of Elizabeth dump site. Two onsite settling ponds eventually discharged to public ditch, 1977.	4/19/68 inspection reveals wastewater discharging into the Passaic River Basin, including Newark Bay. 12/1/71, wastewater effluent discharged into Newark Bay. 7/1971, NJDEP cited company for not meeting water quality standards in discharges to Newark Bay.	Discharges from 1957-1971 were not permitted. Various oil spills reported in mid to late 1980s. 1981, sulfur trioxide spill from ruptured tank release valve. Explosion in 1987 may have discharged contaminants into groundwater. 7/20/87 truck leaks 25 lbs of perchloroethylene. 3/11/68, noted discharge to Newark Bay of a highly polluted effluent. Through 1960s, "weak" acid discharged to onsite chemical lagoon.	2/2/99, high levels of radioactivity detected in groundwater. Site soils have reportedly been contaminated with VOCs, BNAs, cadmium, copper, lead, zinc, antimony, petroleum hydrocarbons and 1,1,2,2-tetrachloroethane. Groundwater is reported to have been contaminated with VOCs, acetone, carbon tetrachloride, chloroform, 1,2-dichloroethane, freon TF, methylene chloride, methyl isobutyl ketone, napthalene, 1,1,2,2-tetrachloroethane, tetrachloroethene, trichloroethene, trichlorofluoromethane, trichlorotrifluoromethane, trichlorotrifluoroethane, and chloroform.	Regulatory file
BAY95	Catellus Commercial Group	10 North Avenue	Elizabeth	Present	177-acre site to be developed into 1.2M square foot warehouse on 69 acres. The site is a registered brownfield.	Newark Bay	Within 2,000 feet of Newark Bay					Windshield survey

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BAY100	OENJ Elizabeth	Kapkowski Road	Elizabeth	1992	OENJ acquired this site in 1992 for redevelopment. After remediation, the site was eventually developed, and is the current home of the Jersey Gardens Mall, a retail shopping outlet. Dredge spoil dumping occurred onsite in the late 1930s/early 1940s, and between 1960 and 1972 the site was operated by unnamed private waste haulers who disposed municipal, commercial, and residential waste with no controls in place regarding dumping location. Wastes were dumped directly into streams and the Great Ditch.	Newark Bay	Within 2,000 feet of Newark Bay	NPDES permit #NJ0107841 authorized five outfalls to Newark Bay that conveyed stormwater runoff. The permit was revoked in 2002 due to cessation of industrial activity. The Great Ditch ran across the site and discharged to Newark Bay until 1998.	From 1960 to 1998, contaminated leachate had been discharging into Newark Bay via the Great Ditch. In June 1998, NJDEP issued a Notice of Violation against OENJ for the unpermitted discharge associated with dewatering a pond at the north end of the site directly to Newark Bay. Also in June 1998, NJDEP observed discharge of landfill leachate from the perimeter of the property to Newark Bay. On June 5, 1998, OENJ was cited for assembling pipes and pumps for the direct discharge of groundwater/landfill leachate from accumulation around the Great Ditch to Newark Bay.		The following constituents of concern have been identified onsite: VOCs, lead, TPHCs, PCBs, lead, methylene chloride, 2-butanone, 1,2-dichloroethane, 2-heaxanone, toluene, ethylbenzene, and xylenes. Leachate samples from the site contained lead, arsenic, chromium, mercury, nickel, silver, zinc, cyanide benzene, and bis(2-ethylhexyl)phthalate. In 1984, Great Ditch surface water onsite contained tetrachloroethylene, mercury, lead, and cyanide.	Windshield survey Regulatory file
BAY101 A	Nuodex Incorporated	830 Magnolia Avenue	Elizabeth	1940-1985	This 20-acre site was developed for the production of metallic napthenates for paint and varnish drying; mercury-based fungicides, and other various metal soaps that were used as driers for paints, catalysts, fuel oil additives, vinyl stabilizers, and fungicides. Among these products was tetrachlorophenol, a Class I compound associated with dioxin.	Newark Bay		The Nuodex facility is located within the Trumbull Street CSO district that discharges to the Newark Bay.	Site catch basins and sumps were shown to be contaminated with numerous hazardous substances, including elevated levels of 2,4,6-trichlorophenol and 2,4-dichlorophenol, both Class I compounds associated with dioxins. Site drains discharge to the Trumbull Street CSO, which overflows to Newark Bay in wet weather.	Numerous plant exceedances of applicable limitations for cadmium, copper, nickel, lead, zinc, mercury, and pH were reported in 1980. On June 20, 1980 an unidentified person opened various valves in the East Tank Farm resulting in the release of approximately 7,000 lbs of Nuoplaz 850, a plasticizer, 2,400 lbs of Texanol Isobutyrate, 5,100 lbs of Neodol 25, and 1,800 gallons of #6 fuel oil to the ground; an unknown quantity of these materials reached the sewer drain and discharged to the Joint Meeting Sewer. On January 15, 1981, approximately 275 gallons of kerosene reached the Joint Meeting Sewer after an accidental spill. In June 1982, approximately 200 gallons of crude napthenic acid overflowed from a tank during refilling; approximately 60 gallons drained to a laboratory sump and discharged to the Joint Meeting Sewer.	Site soils have been shown to contain cadmium, barium, zinc, mercury, lead, benzene, ethylbenzene, tetrachloroethene, toluene, bis(2-ethylhexyl)phthalate, petroleum hydrocarbons, PCB 1248, and dieldrin. Site groundwater has been shown to contain benzene, chlorobenzene, trichloroethene, ethylbenzene, toluene, 1,4-dichlorobenzene, 1,2-dichlorobenzene, chloromethane, chloroethane, PCB 1248, xylenes, base neutral compounds, arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc.	Regulatory file

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BAY102	Conrail Terminal Rail Yards (old Central Railroad of New Jersey property) - adjoins BAY103	123 Dowd Avenue - Situated north of Trumbull Street/Puleo Plaza, to the east of the NJ Turnpike. Bounded by Newark Bay on the east and Schiller Street/NJ Turnpike on its western boundary.	Elizabeth	1901-1988	85-acre inactive train yard site utilized for railroad maintenance and service operations. A larger Conrail Elizabethport yard consisted of several hundred acres. Site used for repair/cleaning of railroad cars/engines. CNJ ceased operating as a business in 1976; it became federally owned/operated by the Consolidated Rail Corporation (Conrail). Other tenants leased parts of site: Armin Polyfilm Co., Kawasaki Kisen, Kaisha, Ltd., (aka "K- Line).	Newark Bay Peripheral Ditch	Waterfront to Newark Bay	Surface water runoff to Newark Bay	Drainage and spills from the yard were reportedly channeled into a nearby tidal marsh adjacent to Newark Bay.	A drainage ditch originating from a former oil-water separator discharged to an unknown location.	Contaminants present in site soils include benzene 4,6-dinitro-2-methylphenol, 2,6-dinitrotoluene, fluoranthene, fluorene, naphthalene, N-nitrosodiphenylaminie, pentachlorophenol, phenanthrene, pyrene, tetrahloroethylene, 1,1,1-trichloroethane, toluene, dibromochloromethane, dichlorobromoethane, heptane, octane, nonane, cumene, butylbenzylphthalate, and #6 fuel oil.	Regulatory file Sanborn Maps, 1950, 1963 Internet databases Library research Windshield survey
BAY103	Central Railroad of New Jersey - CNJ (a/k/a "Elizabethport train station and rail yard; aka "Conrail") - adjoins BAY102	At Trumbull Street, to the west of the NJ Turnpike. Bounded by York and Division Streets.	Elizabeth	1901-1988	At least 100+ acres. Site used for passenger and freight rail and switching operations. Train station was located near York and Division Streets. Many freight tracks were also located north and east of Trumbull Streets to the east of the NJ Turnpike (BAY102). Many rails lead into the adjacent Singer property and other waterfront industrial areas.	Newark Bay Peripheral Ditch						Regulatory file Library research Windshield survey
BAY104	Elizabethtown Gas Company - South Street Coal Gas Site	406 South Street	Elizabeth	Operations conducted circa 1855-1901 (company chartered in 1855)	MGP. Former facility buildings still present in 1991. Involved in gas manufacturing and distribution. Approximately ½-acre of site adjacent to river was modified by USACE for City of Elizabeth flood control.	Elizabeth River Arthur Kill Newark Bay	Waterfront to Elizabeth River				Soil contaminants: phenolic compounds, coal tar and coal tar residuals, VOCs, metals and PAHs. Groundwater contaminants: phenolic compounds, VOCs, metals and PAHs.	SSR 1992 KCS - 2001 Media reports

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BAY105	The Singer Company. Corporate successors/ assigns to Singer are: Singer Company N.V.; SSMC, Inc. N.V.and Semi-Tech Global Corp. This site was also used as a multi-tenant facility after Singer sold the property in 1984. See site file for listing of site occupants post 1984. Also, see listing immediately below.	321 First Avenue (this site is also listed as "107 Trumball Street")	Elizabeth	1873-1982	Sewing machine manufacturing and operations consisted of cast iron and aluminum casting, machining, heat treating, tumbling, plating, painting, and parts cleaning. Hydraulic fluids containing PCBs were used at the site.	Arthur Kill Newark Bay	Waterfront - Arthur Kill is adjacent to the site east and south	Six outfalls to Newark Bay: 60-inch City of Elizabeth CSO; an 18-inch combined storm and sanitary outfall; and 36-inch combined storm, sanitary, and industrial waste outfall; a 30-inch combined storm, sanitary, and industrial waste outfall; a 36-inch combined storm, sanitary, and industrial waste outfall; a 24-inch storm sewer outfall.	Prior to 1965, all wastewater discharged directly to Newark Bay through three outfalls. As of 1965, Singer continued to discharge untreated sewage to the AK at the foot of Trumball Street. Post-1967, some process wastewater discharged to the City of Elizabeth Joint Meeting Wastewater Treatment Plant. For approximately 10 years until 1978/9, Singer approved nighttime dumping allegedly occurred. Th waste was conveyed via a large pipe to a concrete "holding tank" behind building W-3 to Arthur Kill and consisted of plating wastes.	Site runoff to Newark Bay; floor drains from site discharged process rinsewater to a neutralizing pit that discharged to a 36-inch sewer to Newark Bay.	**Soil:** Heavy metals and PCBs **Groundwater:** Heavy metals	Sanborn Maps, 1950, 1963, 1980 Regulatory file Industrial directories
BAY105	Consolidated Plastechs, Inc.	28-36 Slater Drive	Elizabeth	Circa 1999-2001		Arthur Kill & Newark Bay	Waterfront					KCS - 2001
BAY106	Moore Brothers Company - Machine Shop & Foundry	225 Front Street (this business also operated out of the 47 Bond Street address)	Elizabeth	Circa 1950s-1960s	Machine shop, iron foundry	Arthur Kill Newark Bay	Waterfront - adjacent to the Arthur Kill - separated by RR tracks					Sanborn Maps, 1950, 1963, 1980 Industrial directories
BAY107	Dragon Cement Co.	So. Front Street and Court St	Elizabeth	Circa 1963 through possibly 1980	Cement products	Arthur Kill Newark Bay	Waterfront - bordered on east by Arthur Kill					Sanborn Maps, 1963, 1980 ACOE Map No. 50 dated June-October 1965.
BAY107	Marina Village Development Project	144 Front Street and Broadway	Elizabeth	Circa 2000	Housing	Arthur Kill Newark Bay	Waterfront					KCS - 2001
BAY107	Marina Village Development Project	70 to 80 South Park Street	Elizabeth	Circa 2000	Housing	Arthur Kill Newark Bay	Waterfront					KCS - 2001
BAY107	Marina Village Development Project	80 to 84South Park Street	Elizabeth	Circa 2000	Housing	Arthur Kill Newark Bay	Waterfront					KCS - 2001
BAY108	RO/Son Inc.	217-231 Front Street	Elizabeth	Circa 1970s	Residential lighting fixtures	Arthur Kill Newark Bay	Waterfront					Industrial directories
BAY109	Elizabeth Marina (Note: properties located at ID Numbers "BAY109 through BAY111", "BAY113" and portions of "BAY115" are presently occupied by the City of Elizabeth and the Elizabeth Marina).	71-155 Front Street	Elizabeth	Circa 1997	Marina	Arthur Kill Newark Bay	Waterfront					KCS - 2001
BAY109	Pittsburgh Plate Glass (PPG) Chemical Division (a/k/a American Chrome & Chemicals)	South Front Street and Court Street (AC&C at 155 Front Street)	Elizabeth	Circa 1963	Chromium chemicals	Arthur Kill Newark Bay	Waterfront - bordered on east by Arthur Kill					Sanborn Maps 1963, 1980 ACOE Map #50 dated June-October 1965
BAY110	Iron Oxide Corp.	125 Front Street	Elizabeth	1958 Iron Oxide purchased the site; 1966-1982 red iron oxide production; Sept. 1982, City of Elizabeth purchased the site	Production of inorganic pigments and oxides; chrome pigments; lead pigments; zinc oxide pigments; and inorganic salts of chromium, nickel, and silver used.	Arthur Kill Newark Bay	Waterfront	Pipes discharged wastewater directly to Arthur Kill; groundwater flow to Arthur Kill	Site owners pleaded guilty to charges related to dumping an alleged 40M gallons of acid waste into Arthur Kill; tank trucks discharged unknown chemicals into pipes at site that discharged directly to Arthur Kill.	Waste lime slurry stored in unlined pit; surface runoff from areas with spills on site was observed in 1979.	**Soil:** VOCs, PAHs, BNA compounds, heavy metals	Sanborn Maps, 1950, 1963, 1980 ACOE Map No. 50 dated June-October 1965. Regulatory file KCS - 2001 Industrial directories
BAY111	City of Elizabeth		Elizabeth	City-owned property	Recreational	Arthur Kill Newark Bay	Waterfront					ACOE Map No. 50 dated June-October 1965

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BAY112	Waterfront Home Sites	100 - 114 Front Street	Elizabeth	Circa 1999-2001	Housing	Arthur Kill Newark Bay	Waterfront					KCS - 2001
BAY113	Empire Petroleum Co.	So. Front Street and Fulton St	Elizabeth	Circa 1965	Oil storage and distribution facility	Arthur Kill Newark Bay	Waterfront - bordered on east by Arthur Kill					ACOE Map No. 50 dated June-October 1965.
BAY113	Hartol Terminal Corporation	Intersection of Front Street and Fulton Street	Elizabeth	Circa 1950s-1960s	Oil storage and distribution facility	Arthur Kill Newark Bay	Waterfront					Sanborn Maps, 1950, 1963, 1980
BAY114	Imperial Weld Ring, Corp.	80 Front Street	Elizabeth	Circa 1975	General industrial machinery and equipment	Arthur Kill Newark Bay	Facility is located within 1 city block west of Arthur Kill					Industrial directories
BAY114	Johnson Process Co.	80 Front Street	Elizabeth	Circa 1955-1970	Reclaimers of used x-ray photo film; transparent plastics	Arthur Kill Newark Bay	Located within 1 city block west of Arthur Kill					Industrial directories
BAY115	Bethlehem Steel Co.	So. Front Street and Marshall St (also listed at 51 First Street as per Ind. Directory) 71-155 Front Street. The facility was located on both sides of So. Front Street.	Elizabeth	Circa 1950	Manufacturers of steel	Arthur Kill Newark Bay	Waterfront - eastern section of facility is bordered by Arthur Kill					Sanborn Maps, 1950, 1963, 1980 ACOE Map No. 50 dated June-October 1965. Industrial directories
BAY116	T.E. Barrett (Division of Allied Chemical & Dye Corp.)	86 Elizabeth Avenue	Elizabeth	Circa 1950-1960	Manufacturers of roofing paper	Arthur Kill Newark Bay	Waterfront					Sanborn Maps, 1950 Industrial directories
BAY117	J. Kerzman & Son	3 Front Street	Elizabeth	Circa 1955	Scrap iron dealer	Arthur Kill Newark Bay	Located within 1 city block west of Arthur Kill					Industrial directories
BAY118	Thomas & Betts Company	36 Butler Street	Elizabeth	1917-1995	Machine shop; electrical fittings, conduit, cable	Arthur Kill Newark Bay	Within 450 feet of the Elizabeth River and within 850 feet of Arthur Kill	Wastewater from the site was discharged via CSO to Arthur Kill and Elizabeth River at the confluence of Arthur Kill. Onsite catch basin sediments are contaminated with TCE, cis-1,2-dichloroethene, xylenes, benzo(a)pyrene, benzo(a)anthracene, benzo(k)fluoranthene, dibenz(ah)anthracene, idenol(1,2,3-cd)pyrene, antimony, arsenic, cadmium, copper, lead, and zinc.		Free product oil in basement of Building One seeped into site soils. A degreaser drain in the area of Pit 25 discharged to the ground surface near the former drum storage area.	Site soil is contaminated with TCE, cadmium, zinc, TPHC, PAHs, antimony, copper, lead, zinc, benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, and VOCs. Onsite catch basin sediments are contaminated with TCE, cis-1,2-dichloroethene, xylenes, benzo(a)pyrene, benzo(a)anthracene, benzo(k)fluoranthene, dibenz(ah)anthracene, idenol(1,2,3-cd)pyrene, antimony, arsenic, cadmium, copper, lead, and zinc. Site groundwater is contaminated with TCE, cis-1, 2-dichloroethene, PCE, chloride, 1,1-dichloroethene, vinyl chloride, cadmium, arsenic, antimony, and lead.	Sanborn Maps, 1950, 1963 NJPDES database Regulatory file Industrial directories
BAY119	Monarch Fuel Oil Co.	So. Front Street and Elizabeth Ave.	Elizabeth	Circa 1946		Arthur Kill Newark Bay	Waterfront - bordered on east by Arthur Kill					ACOE Map No. 50 dated June-October 1965.

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BAY120	General Steel & Supply Co.	So. First Street and Elizabeth Ave.	Elizabeth	Circa 1965		Elizabeth River	Waterfront - bordered on southeast by confluence of Elizabeth River and Arthur Kill					ACOE Map No. 50 dated June-October 1965
BAY121	Richfield Oil Co. (a/k/a "Arco")	intersection of South Front Street and Elizabeth Avenues	Elizabeth	Circa 1960s-1980s	Oil storage and distribution facility	Elizabeth River Arthur Kill Newark Bay	Waterfront					Sanborn Maps, 1950, 1963
BAY122	P. Feldman & Sons, Inc. (occupied a portion of Cycle Chem Co. prior to Cycle Chem's operations)	211 South First Street	Elizabeth	Circa 1955	Scrap iron and metals	Elizabeth River Arthur Kill Newark Bay	The facility is located within 1 block of the Elizabeth River					Industrial directories
BAY123	Mark All Ink Co., Inc.	11 So. Front Street	Elizabeth	Circa 1965	Chemical products	Arthur Kill Newark Bay	Waterfront to the Elizabeth River and within 1 city block or less to the west of Arthur Kill					Industrial directories
BAY124	Apex Chemical Corp	200 South First Street	Elizabeth	1917-1994	Manufacturing of specialty chemicals for the textile industry. Principal products produced: surface active agents and flame-retardant chemicals. Company was also listed as a manufacturer of paradichlorobenzene and pyrethrins. This facility utilized antimony compounds certain glycol ethers, decabromodiphenyl oxide, and benzyl chloride.	Elizabeth River Arthur Kill Newark Bay	Waterfront to Elizabeth River	NJPDES Permit #NJ0122424 Process waters were neutralized before entering the sanitary sewer on South First Street via CSO to the Joint Meeting of Essex and Union Counties POTW, circa 1957. Prior discharge mechanisms unknown. Bordered on east by Elizabeth River. CSO overflows to Elizabeth River during wet weather.		ERNS report from 4/90 noted that drain pipes for the chemical mixing tanks were broken and were not repaired.		Sanborn Maps, 1950, 1963 NJPDES database Regulatory file Industrial directories Database records ACOE Map No. 50 dated June-October 1965 KCS - 2001
BAY125	Albemarle Lumber Co. (previous owner/operator at the Chemical Control site)	South Front Street	Elizabeth	Circa 1950s	Lumber supply	Elizabeth River Arthur Kill Newark Bay	This company backs up to the Elizabeth River and is in within 200-300 yards of the Arthur Kill					Sanborn Maps, 1950
BAY126	Cycle Chem, Inc. (This company is affiliated with Perk Chemical, which was its corporate predecessor.) Clean-Venture Inc. is the parent company of Cycle-Chem.	217 South First Street	Elizabeth	Cycle Chem. operated at this site circa 1987-present. Perk Chemical operated at this address circa 1965-1987.	This company is a hazardous waste treatment storage disposal facility. This facility used or generated metals, benzene, chlorinated solvents, and waste solvents for recycling/disposal. File information indicates that Perk Chemical received drums from Chemical Control, after Chemical Control ceased operations.	Elizabeth River Arthur Kill Newark Bay	The facility is located within 1 block of the Elizabeth River	NJPDES Permit #NJ0122637		4/21/94 - A hazardous waste spill, (not classified), discharged from a trailer and was reported to NJDEP.		NJPDES Database Regulatory File Industrial Directories Database Records

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BAY126	Elizabeth Steel Baling Corp. - occupied same site previous to Cycle- Chem operations.	217 South First Street	Elizabeth	Circa 1950	Junkyard	Elizabeth River Arthur Kill Newark Bay	Within one block west of the Elizabeth River and is also located approximately 1,000 feet west of Arthur Kill					Sanborn Maps, 1950 Industrial directories
BAY127	Martin Dickson Inc.	12 South Front Street	Elizabeth	Circa 1950	Lumber, piles creosoted and untreated, and tiles	Elizabeth River Arthur Kill Newark Bay	Waterfront location to both Elizabeth River and Arthur Kill					Sanborn Maps, 1950 Industrial directories
BAY128	Elizabethtown Gas Company - Erie Street Coal Gas (ETG) (a/k/a "Elizabeth Consolidated Gas Company")	Erie Street & Third Ave & Florida Street. (was also listed at 200 - 234 Third Avenue)	Elizabeth	Operations conducted circa 1892-1976. Buildings demolished in 1976; site appeared on the KCS list in 1992.	Producers of illuminating gas	Elizabeth River Arthur Kill Newark Bay	This facility backs up to the Elizabeth River and is several blocks away from Arthur Kill	NJPDES Permit #NJ0063746				KCS - 2001 NJPDES database Industrial directories Media reports
BAY129	Clean Ventures, Inc. (this company is affiliated with Cycle- Chem)	226-304 S. First Street	Elizabeth	Present		Elizabeth River Arthur Kill Newark Bay	Waterfront to Elizabeth River	NJPDES Permit #NJ0136841 NJPDES Permit #NJ0122637				NJPDES database
BAY129	Heidritter Lumber Co. (previous occupier of Clean Venture Site)	South First Street	Elizabeth	Circa 1950s		Elizabeth River Arthur Kill Newark Bay	This company backs up to the Elizabeth River and is within 800 feet west of Arthur Kill					Sanborn Maps, 1950
BAY130	D&M Trucking	491 South First Street	Elizabeth	Circa 1999	Trucking	Elizabeth River Arthur Kill Newark Bay	Waterfront to Elizabeth River					KCS - 2001
BAY131	Loizeaux Builders Supply Co.	There were several different locations: one parcel was located at 2 - 74 South Front Street. Loizeaux purchased property formerly occupied by Martin Dickson Inc. Another separate parcel was located at South First Street (yet another listing, further inland, indicates a 140 Third Street location).	Elizabeth	Circa 1950	Lumber supply	Elizabeth River Arthur Kill Newark Bay	The South Front Street properties are located on the waterfront of Arthur Kill. The other property on South First Street backs up to the Elizabeth River.	NJPDES Permit #NJ0124036				ACOE Map No. 50 dated June-October 1965 NJPDES database Sanborn Maps, 1950, 1963, 1980 Industrial directories

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BAY132	Chemical Control Corp. (CCC)	23 South Front Street	Elizabeth	1972-1979	CCC accepted various chemicals for storage and disposal, including acid, bases, arsenic, cyanides, flammable solvents, PCBs, compressed gases, biological agents, shock-sensitive chemicals pyrophoric materials, and pesticides.	Elizabeth River Arthur Kill Newark Bay	Site backs up to the Elizabeth River. It is within 200-300 yards of Arthur Kill.	Direct discharge via hidden pipe to river and discharge to river via sewer system due to cross-connection between sanitary sewer line and storm sewer system.	Waste drums ruptured and blown into river during explosion/fire in 1980; runoff from fire-fighting activities during fire/explosion 1980; runoff from leaking drums to river. A 1978 inspection indicated thirty 50,000-gallon drums adjacent to the Elizabeth River. Many drums were severely deteriorated, leaking, and discharges migrated to the river.	Discharge of waste solvents to ground and subsequent sit flooding, which allowed transport to river.	**Soil:** pesticides, VOCs, metals, PCBs. **Groundwater:** pesticides, VOCs, metals. Cleanup of the site under Superfund was completed 12/14/93.	Regulatory File KCS - 2001 SSR 1992
BAY132	Northeast Pollution Control Corp.	23 South Front Street	Elizabeth	Circa 1975	Manufacturers of air pollution control equipment	Elizabeth River Arthur Kill Newark Bay	This company backs up to the Elizabeth River. It is within 200-300 yards of Arthur Kill.					Industrial directories
BAY132	Chemical Waste Disposal	30 South Front Street	Elizabeth	Not known. Known to be in operation 7/71.		Elizabeth River Arthur Kill Newark Bay		Reports of alleged discharges directly to the Elizabeth River and into sewers on South Front Street.	Reports of alleged discharges directly to the Elizabeth River and into sewers on South Front Street.			Regulatory file
BAY133	Russo Salvage Yard	South Front Street	Elizabeth	Circa 1980	Salvage yard	Elizabeth River Arthur Kill Newark Bay	Waterfront to the Elizabeth River and within 1 city block west of Arthur Kill.					Regulatory file
BAY133	Abbott Steel Drum & Barrel Works (located on same site as Russo Salvage)	25 South Front Street	Elizabeth	Circa 1965	Steel drum manufacturers	Elizabeth River Arthur Kill Newark Bay	Waterfront to the Elizabeth River and within 1 city block west of Arthur Kill.					Industrial directories
BAY134	Chevron USA, Inc.	330 South Front Street and 666 South Front Street	Elizabeth	Circa 1965	Large quantity generator of oils and greases	Arthur Kill Newark Bay	Waterfront - bordered on east by Arthur Kill.	NJPDES Permit #NJ000264 and #NJ0104973	7/7/90 - "Heavy globs of oil sighted on the Arthur Kill." In 12/82, Chevron personnel noticed an oil sheen, adjacent to the west yard storage area, on the Elizabeth River and notified the U.S. Coast Guard and NJDEP. Containment booms were deployed.			ACOE Map No. 50 dated June-October 1965. NJPDES database Regulatory File Industrial directories KCS - 2001 Windshield survey
BAY134	New York Lubricating Oil Company	330 South Front Street and 666 South Front Street	Elizabeth	Circa 1950	Large quantity generator of oils and greases heating oil, fuel oil asphalt	Arthur Kill Newark Bay	Waterfront - bordered on east by Arthur Kill.					Sanborn Map, 1950 Industrial directories
BAY134	California Oil Company	330 South Front Street	Elizabeth	Circa 1960s-1980	Lubricating oils and greases, heating oil, fuel oil, asphalt	Arthur Kill Newark Bay		Bordered on east by Arthur Kill				Sanborn Maps, 1963, 1980 Industrial directories
BAY135	New York Oil Company (note - this is a different site than the "New York Lubricating Oil Co." site listed above). The present occupant at this site was noted as "Allchem".	534 South Front Street	Elizabeth	Circa 1946 through 1956. Former owners and operators at this site were: H.C. Cooke & C.O. McCord - 1879 1940.	Storage, canning, barreling, vegetable oils, and tallow	Arthur Kill Newark Bay	Waterfront - bordered on east by Arthur Kill.			Discharge to site soil: 1983: oil spills; 1984: paramins; 1986: tertiary dodecyl mercaptan; 1986: heptanoic acid; and 1989: lube oil	**Soil:** TPHC greater than 10,000 ppm; PCE; TCE; 2,4-dimethylphenol; methylene chloride; cis-1,2-dichloroethane; 2-chlorophenol; phenol; PCE; benzene; xylenes; n-nitroso-di-npropylamine	Sanborn Maps, 1950 Industrial directories Windshield survey

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BAY135	The Midland Storage Co. (also called the "Croda Storage Inc." site).	534 South Front Street	Elizabeth	Circa 1956-1990s. (also, Mary Gadek, circa 1968, - at block 4, lot 39)	Warehousing facility for the storage of industrial, custom, and exotic chemicals and oils. Croda was involved in wholesales of tar products and chemicals.	Arthur Kill Newark Bay	Waterfront	Stormwater, non-contact cooling water, and collected blow down discharged via sump and storm sewer line to Arthur Kill. NJPDES Permit #NJ0056707		Discharge to site soil:1983: oil spills; 1984: paramins; 1986: tertiary dodecyl mercaptan; 1986: heptanoic acid; and 1989: lube oil	**Soil:** TPHC greater than 10,000 ppm; PCE; trichloroethane;2,4-dimethylphenol; methylene chloride; cis-1,2-dichloroethane; 2- chlorophenol; phenol; benzene; xylenes; n-nitroso-di-npropylamine	Regulatory file NJPDES database KCS - 2001 Sanborn Maps, 1963, 1980 ACOE Map No. 50 dated June-October 1965
BAY135	Archer Daniels Midland Co. (Werner G. Smith Company Division)	554 South Front Street	Elizabeth	Circa 1950- through possibly 1980	Refiner of marine and vegetable oils	Arthur Kill Newark Bay	Waterfront - bordered on east by Arthur Kill					Sanborn Maps, 1950, 1963, 1980 ACOE Map No. 50 dated June-October 1965. Industrial directories
BAY136	Joint Meeting Essex - Union Sewage Treatment Plant	500 South First Street	Elizabeth	The Joint Meeting Essex Union Counties (JMEUC) was created in 1901. A brick trunk sewer line extending from Summit and West Orange to Arthur Kill was completed and began operating in 1904. The original outfall of the system was at the foot of Bayway Avenue. By 1937, the actual sewage treatment plant was built. The JMEUC then used an outfall at Clifton Street, which is situated north of the Goethals Bridge. The City of Elizabeth continued to use the Bayway Avenue outfall.	This POTW handles up to 75 mgd of sewage per day. Its effluent discharges mainly through Outfall #001, which is located north of the Goethal's Bridge at Clifton Street. This sewage treatment facility has at least 30 CSO points that discharge to the Elizabeth River and five CSOs that discharge to Arthur Kill. This plant services 11 municipalities that are located in Essex and Union Counties.	Elizabeth River Arthur Kill Newark Bays	The facility is located along the Elizabeth River and is within approximately 1,500 feet of Arthur Kill	NJPDES Permit #NJ0024741, #NJ0108740, and #NJ0122696	Bypasses to Arthur Kill have been documented by NJDEP primarily due to high flow caused by rain events. Other bypass events were caused by equipment malfunctions and operator error. The facility was cited for violating permitted standards for floatable solids in their effluent in 1979. The facility was also cited for exceeding permitted standards for BOD and TSS in 1992. Contaminants detected in facility effluents between 1984-1992 included metals, VOCs, and SVOCs.	A leaking chlorination system was reported in 1981 that resulted in high concentrations of non-floating solids visible in the effluent.		NJPDES database Regulatory file KCS - 2001
BAY137	J & J Recycling Company	At or near 647 South Front Street. The other side of this facility may also be located near 636 Amboy Avenue. (Note: this company also operated at another separate location at 833 Flora Street - which is situated further inland.)	Elizabeth	Circa 1997 for the South Front Street location. Also known to be in operation between 11/88 -1/89 at the Flora Street location.	Recycling	Arthur Kill Newark Bay	Facility is located within 1 city block west of Arthur Kill					Regulatory file

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BAY138	Crown Central Petroleum Co.	450 Front Street	Elizabeth	Circa 1950-Present	Facility located on both sides of South Front Street	Arthur Kill Newark Bay	Waterfront - eastern section of facility is bordered on east by Arthur Kill. Western section of facility is bordered on northwest by Elizabeth River.					Sanborn Maps, 1950, 1963, 1980 ACOE Map No. 50 dated June-October 1965. KCS - 2001 Industrial directories
BAY138	LORCO Federal Terminal	450 South Front Street	Elizabeth	Not known. Known to be in operation 6/04-9/04	Petroleum terminal	Arthur Kill Newark Bay	Waterfront	NJPDES Stormwater discharge		NJPDES Discharge to Groundwater (lagoon) - sample J01J taken at the inlet to the lagoon prior to DSN003		NJPDES database Windshield survey
BAY139	Bowker Fertilizer Co.	So.Front Street	Elizabeth	Circa 1889-1922	Fertilizers	Arthur Kill Newark Bay	Waterfront					Regulatory file
BAY139	Borne Chemical Co (a/k/a "Borne- Scrymser Co.")	600 - 616 South Front Street. Mailing address is at 632 South Front Street	Elizabeth	1917-circa 1984	This company was involved with the blending and mixing of petroleum hydrocarbons and additives into lubricants. It was also involved with the mixing of tanning and dye products, and the packaging of chemical-based products that were stored onsite. Facility is divided by train tracks into north and south sections. This facility also generated and utilized the following substances: solvents, benzene, heavy metals cresols, cresylic acid, lindane, and PCBs. The company declared bankruptcy circa 1984-1986.		Waterfront	Surface runoff; one storm sewer to Arthur Kill that may have tied into the 72-inch brick trunk sewer at Bayway; two onsite surface water drainage pipes. There is a sewer outfall operated by Joint Meeting of Essex and Union Counties Sewage Treatment Plant at the end of Clifton Street to Arthur Kill. North and south sections both bordered on east by Arthur Kill. South section bordered at far south by Port Authority and Goethals Bridge.	Circa 3/65 – ISC claimed that Borne was discharging wastes of a "polluting nature" into Arthur Kill. 6/7/67 – Outfall discharge of approximately 5,000 gpd to Arthur Kill with "heavy oil" noted in the discharge. During the remedial investigation in 1991 it was noted that subsequent to release of oil from Tank Farm, the "shore line, tanks, and pipes in the Tank Farm remain contaminated with oil." Oil was analyzed and determined to be characteristic RCRA hazardous for borium and TCE.	Unlined surface impoundment (lagoon) reportedly used for oil-water separation. Two "surface water drainage pipes leaving the Borne site." SWRO circa 12/12/83 – "There exist[s] pooled oily liquids on the ground and there are soils saturated with oil in the vicinity of the tank farm, lagoon, drum storage area, and within an around the process buildings which indicate a release to the environment of these potentially hazardous materials." Circa 12/78 – soils around storage tank "noticeably strained with spillage" of nitrobenzene. Leaking AGSTs, drums, etc: "The hazardous substances contained in the elevated tanks . . . containers. . . are or may be discharging onto the lands and into the grounds and surface waters at the site."	Analysis of surface soil samples: petroleum hydrocarbons; VOCs, base/neutral compounds, and heavy metals In 1989, 19 companies entered into a Consent Decree to clean up the site. Those companies were: AGIP, USA, Inc. of NY, AT&T, Buckeye Pipe Line Co., Chesebrough Pond's Inc., Conrail, E.I duPont; Elf Marine (London) International Services, Exxon Corp., Getty Oil Co., Marisol Inc., Mobil Oil Corp., National Lead Industries, Orange Rockland Utilities, Inc., Phelps Dodge Copper Products Co., Public Service Electric & Gas Co, Texaco Refining & Marketing Inc., Thomas & Betts Corp., and Wakefern Food Corp. RTK records noted that sediments contained PCE, TCE, and vinyl chloride. RTK records noted that soils contained arsenic, barium, and lead.	Sanborn Maps, 1950, 1963, 1980 ACOE Map No. 50 dated June-October 1965 Regulatory file Database records Industrial directories KCS - 2001 SSR - 1992
								KEARNY				
BAY140	Columbia Terminals Inc.	49 Central Avenue	Kearny	Early 1940s-January 2003	Primarily a bulk chemicals storage and transfer facility; there were two affiliated companies at this location: American Chemicals Corporation and Amcol Realty, Incorporated.	Hackensack River Newark Bay		Holder of NJPDES Wastewater Discharger Permit #NJ0025631. Outfall Number #001 discharges to the Hackensack River. The company has admitted, during litigation, (Superior Court - Hudson County), that it did not have safeguards in place to prevent hazardous waste runoff from discharging to the site grounds and/or groundwater.	Columbia has a history of unpermitted and non- compliant discharges of hazardous materials including NJPDES limit excursions for COD, TSS, PHCs, and pH as documented in company discahrg monitoring reports . In 2001, Columbia was charged criminally with violating the New Jersey Water Pollution Control Act by recklessly constructing a system for collection of pollutants in a manner in which those pollutants were not treated by the facility's water treatment plant.	3/86 - Media reports indicate that an explosion of a 110,000-gallon storage tank occurred at the CTI site. The lid of the tank blew off and sent flames 100 feet into the air. The tank was holding approximately 2,000 gallons of a solvent, ethyl acetate - prior to the explosion. 6/99 - Another onsite fire occurred at this facility; details were not reported. The company admitted that it had improperly stored hazardous wastes onsite (circa 1999).		Regulatory file
BAY140 A	Veckridge Chemical Co.		Kearny			Hackensack River Newark Bay						Windshield survey

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BAY141	Town of Kearny Municipal Utilities Authority	Central Avenue	Kearny	Through 1980s	Municipal wastewater treatment. POTW.	Hackensack River Newark Bay	Site is waterfront to the Hackensack River	Former plant outfall - direct to Hackensack/Newark Bay.	Discharges associated with this facility are separately detailed in Section 3 of this report.			Regulatory file
JERSEY CITY												
BAY142	Continental Tile	Route 440	Jersey City	Present		Hackensack River Newark Bay	Site is waterfront to the Hackensack River					Windshield survey
BAY142	Colonial Concrete	Route 440	Jersey City	Present		Hackensack River Newark Bay	Site is waterfront to the Hackensack River					Windshield survey
BAY143	Jersey City Department of Public Works	Route 440	Jersey City	Present		Hackensack River Newark Bay	Site is waterfront to the Hackensack River					Windshield survey
BAY144	Jersey City Municipal Utilities Authority Pump Station (former sewage treatment plant)	555 Route 440	Jersey City	1957 - Present	Formerly operated as the "West Side" sewage treatment plant constructed circa 1957 to service JC's western CSO interceptor system. It was later modified to a "pumping station" circa 1990 and at that time, all sewerage was pumped through pipes situated beneath the Newark Bay for transfer and treatment to the PVSC treatment plant in Newark.	Hackensack River Newark Bay	Site is waterfront to the Hackensack River	NJPDES Permit #NJ0108723.	The ISC identified Jersey City as early as 1943 for discharging untreated sewage into its "District Waters".	Prior to 1957, sewage from Jersey City's west side combined sewer system discharged directly to the Newark Bay. During heavy precipitation events combined sewage prior to treatment is discharged to the Hackensack River/Newark Bay.		Regulatory file
BAY 145	Jersey City Incinerator	501 Route 440	Jersey City	1957 - circa 1997	Large-scale incinerator capable of incinerating 600 tons of refuse per day. This was a 6-acre site. Incineration of industrial wastes, commercial establishment wastes, contractors' debris, and domestic wastes took place here.	Hackensack River Newark Bay	Site is waterfront to the Hackensack River	Contact cooling water discharged to the storm sewers. Surface water runoff.		Incinerator residue and ashes from the furnaces of the incinerator plant were placed on the disposal site in the marshlands at the rear of the plant.	It has been determined by USEPA that CDDs/CDFs are released into the atmosphere from municipal solid waste incineration operations.	Regulatory file

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BAY146	Mallinckrodt Chemical Works Site (a/k/a "M.I. Holdings, Inc." - a wholly owned subsidiary of Avon Products, Inc.)	223 West Side Avenue	Jersey City	1887-late 1980s	This is a 11.65-acre lot comprised of three separate parcels. Company was engaged in the manufacture of food preservatives, diagnostic chemicals, and surfactants. Pre-1940s it produced inorganic chemicals consisting of salts or oxides of iron and mercury. The company worked with the U.S. Government in the 1940s testing uranium trioxide. Post-1940, the company continued to produce mercury compounds and inorganic chemicals, including zinc acetate, potassium sulfate, potassium chloride, ferrous sulfate, ferric chloride, and sodium nitrate.	Newark Bay	Site is 2,000 feet west of the Hackensack River/Newark Bay.				Soils were contaminated with mercury at the eastern portion of this site; soils were excavated as part of remediation work circa 1993 per MOA with NJDEP and disposed offsite. The soils along the southern and western borders are contaminated with chromium. Other contaminants of concern at this site include arsenic, cadmium, chromium, lead, mercury, thallium, antimony, methylene chloride, dichloroethenes, vinyl chloride, TCE, benzene, and xylenes.	Regulatory file Industrial directory
BAY147	Baldwin Steel	West Side Avenue	Jersey City		Metal Processors; formerly operated by Ryerson Steel.	Newark Bay Hackensack River	Site is approximately 3,000 feet east of Hackensack River/Newark Bay.					Windshield survey
BAY148	Allied Chemical/Honeywell Site	Route 440	Jersey City	1905-1954	Mutual Chemical operated from approximately 1905-1954. In 1954, Allied acquired all stock in Mutual Chemical. Site was used for the disposal of chromium processing ore (COPR).	Newark Bay Hackensack River	Site is waterfront to the confluence of the Hackensack River and Newark Bay.	Surface flow occurs overland to storm sewers and ditches leading to the Hackensack River. The site is located within two CSO districts that bypass to the Hackensack River and Newark Bay.			Soils are contaminated with chromium and hexavalent chromium. Groundwater contains elevated levels of chromium, hexavalent chromium, cyanide, heavy metals, and Phenols. Sediment offshore of the site contained heavy metals, SVOCs, pesticides, and PCBs. Analysis conducted on Hackensack River sediments adjacent to the site indicate total chromium at up to 33,500 ppm and hexavalent chromium at up to 56.5 ppm.	Regulatory file
BAY149	Reliable Machinery Service and Truck Repair	Route 440	Jersey City	Present		Newark Bay Hackensack River	Site is waterfront to the Hackensack River/Newark Bay.					Windshield survey
BAY150	Droyers Point/Society Hill	Route 440	Jersey City	Present	Residential housing - townhomes.	Newark Bay Hackensack River	Site is waterfront to the Hackensack River/Newark Bay.					Windshield survey

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BAYONNE												
BAY151	Pharma Chem "Plant 1"	169 West 52nd Street	Bayonne	1918-1957 as Pharma Chem; 1957-1981 Verona Chemical Corp., Bay Chem Corp, Mobay Chem Corp., and Mobay Corp.	Produced textile dyestuffs. DDT was produced for Federal Government during WWII.	Newark Bay	Within 900 feet to Newark Bay	Three outfalls; surface overflow	Correspondence from the ISC in 1954 indicated that this facility had three outfalls that led to the Newark Bay. Studies conducted by the ISC revealed that effluent from these three outfalls contained acids. Additional ISC correspondence in 1955 indicated that Pharma Chem discharged exhausted dyes, vat wastes, and floor washings to Newark Bay.	December 1954: a continuous flow of red waste water was observed emanating from the site to "Interstate Sanitation Commission District Waters"	Site groundwater has been shown to contain chlorobenzene, 1,2-dichlorobenzene, 1,4- dichlorobenzene, ethylbenzene, benzene, 2,4-dichlorophenol,.1,2,4-trichlorobenzene, toluenr. and TCE.	Regulatory file media reports
BAY152	Efka Plastics	163 Avenue A Block 457, Lot 22A	Bayonne	1960-1985	Manufacturer of vinyl tablecloths and related items. Prior owners/operators at this site: Elco Naval Works, Elco Boat Works, Electric Dynamic Works, and Electric Boat Company - engaged in the manufacture of military vessels. The companies were subsidiaries of General Dynamics. Current owner is Baker Residential, the developer of townhomes at the site called; "Boatworks at Bayonne"	Newark Bay	Waterfront to Newark Bay	This facility has an NJPDES permit for seven discharge overflow points. One discharge overflow is for non-contact cooling water and the remaining overflow points for stormwater. Stormwater runoff; floor drains to an unlined area beneath the building. The ISC noted in 1956 that the old Elco plant was not tied into the Bayonne sewer system that tied into the sewage treatment plant.	In 1954, the ISC noted that Electro Dynamic Corp. was discharging sanitary wastes and that their outfalls were not connected to the Bayonne city interceptor. In 1979, NJDEP detected high zinc concentrations and sanitary sewage discharges emanating from the non-contact cooling water outfall at Efka Plastics.	Between 1970-1975, a citizen's group, called "Bayonne Citizens for Clean Water Committee" noted discharges from the Efka plant to the Newark Bay. In 1975, the same citizen's group noted that a clear odorous discharge was detected emitting into Newark Bay from a pipeline coming from the Efka plant grounds. In 1981, the Mayor of Bayonne alleged that Efka Plastics was issued a fine for dumping chemical pollutants into the Newark Bay.	The following substances were identified in site soils: acenaphthene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, fluoranthene, fluorene, phenanthrene, pyrene, ethylbenzene, methylene chloride, toulene, xylene, and lead. The following substances were found in groundwater: benzene, xylenes, toluene, ethylbenzene.	Regulatory file media reports Sanborn maps
BAY152	Polytex	163 Avenue A	Bayonne	At least 1963	Manufacturer of lace plastic tablecloths.	Newark Bay	Waterfront to Newark Bay					Media reports
BAY152	Englander Company (became a subsidiary of Union Carbide Corporation in 1964)	163 Avenue A	Bayonne	1954	Production of mattresses, box springs, and convertible bedding. Operated at the former Efka/Elco site.	Newark Bay	Waterfront to Newark Bay					Media reports Sanborn maps
BAY153	Bergen Point Brass Foundry	179-185 West 5th Street	Bayonne	Circa 1950-Present/Defunct	Brass and bronze assemblies, sub-assemblies and specialty items, including mailboxes and gavels, swimming pool equipment.	Newark Bay	Within 1,000 feet of Newark Bay					Sanborn maps Windshield survey
BAY154	Nacirema Industries	211-217 West 5th Street	Bayonne		Demolition contractors; excavating, recycling, and crushing; hazardous waste management and removal.	Newark Bay	Within 500 feet of the Newark Bay					Database reports
BAY155	Swan Michigan Oil	180 West 5th Street	Bayonne		Manufacture of cutting oils.	Newark Bay	Within 500 feet of Newark Bay					Internet databases
BAY156	Palmer Asphalt	196 West 5th Street	Bayonne		Lube blending and light products terminal.	Newark Bay	Waterfront to Newark Bay				Site is listed under the NJDEP UST Contamination Site database.	Internet databases

Table C-1
Newark Bay Waterfront Sources Inventory

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BAY157	Best Foods (Subsidiary of CPC International) (a/k/a "Nucoa Butter Company" and "Unilever")	99 Avenue A	Bayonne	1906-Present	Food manufacturing, including mayonnaise and vegetable oil, dried and dehydrated fruits, pickled fruits and vegetables, vegetable sauces and seasonings, wet corn meal, bread and other bakery products, shortening, and table oils.	Newark Bay	Waterfront to Newark Bay	Facility has an NJPDES permit identified as #NJ0057673 File information indicates the following chemicals were discharged to the Bayonne Sewage Treatment Plant between 1987 and 1988: phosphoric acid, sodium hydroxide, sulfuric acid. Of those, only phosphoric acid was also discharged to PVSC after 1990.	Letter of violation for non-compliance dated 8/26/87.	1984 – Eight broken and corroded 45-gallon drums were unearthed during an excavation. They were found to contain xylene, toluene, methyl chloride, and TCE, all of which were leaking into site soils.		Media reports Industrial directories Library research
BAY158	Baker Castor Oil/NL INdustries/Caschem/Rutherford Chemicals	35 Avenue A; 40 Avenue A near intersection of Gertrude Street; (Block #s 360, 361, 362 - Lots 1,12, 3)	Bayonne	1978-Present. Baker Castor Oil began operations in 1857; Oil Seeds Co. operated 1900-10; Barclay & Co./John O'Leary operated at site 1900-10; F.W. Fitch Co. operated 1910-15; Baker Castor Oil Co. operated 1910-1975 (1905 National Lead Industries received equity interest), acquire all of Baker in 1970s, CasChem bought National Lead in 1981 and operated through 2003; Rutherford Chemicals 2003-Present.	Manufacturing, refining, storage, and distribution of castor beans/castor oil. It produced approximately 200 castor oil specialty chemicals. These chemicals included polymerized oils, dehydrated oils, fatty acids, etc.; urethane; NL was a supplier of drilling instruments, fluids, and tools used in oil and gas exploration.	Newark Bay	Waterfront to Newark Bay	Floor to drains in oil-water separator area lead to Bayonne Waste Water Treatment Plant. NJDEP inspections from 6/13/86 indicate a series of storm sewers in the rear of facility could allow spillage to flow directly to water body. The facility purportedly contained a 24-inch main discharge pipe to Newark Bay. It also contained a 4-foot pipe for discharge of coolant water and a 3-inch pipe for drainage of the cooling tower. Facility has an NJPDES permit identified as #NJ0000949. Also have a Water Discharge Permit identified as #NJ0131423. File also indicates the following discharge: SW Discharge DSN001. Facility known to have discharged suspended soils, oil and grease, and TOC.	Caustic cleaning oil/castor oil spill/caustic soda/soap spills of various sizes into Newark Bay, 1/27/85, 12/2/85, 6/11/86, 9/5/86, 5/28/87, 3/22/90, 6/21/90, 10/17/90, 11/15/90, 3/15/92, 1/18/93, 9/21/95, and 10/19/95. Outfall 001 samples indicate TOC exceeded permit limitations, 7/24/86. Turbid wastewater discharged, eventually to Newark Bay via Outfall 001, 1/6/88. Violation regarding pollution discharge into Newark Bay via Outfall 001A, 5/18/90 Company cited for TSS discharge to Newark Bay in 1990.	10/82 - Approximately 20,000 lbs of methyl ricinoleate leaked from a line in the yard. Discharges non-contact cooling water and stormwater runoff through outfall DSN001. Broken pipe leads to discharge into storm sewer of 5% caustic soap and 200 gallons of castor oil, 12/4/85. A spill of 25 to 100 gallons of TDI flowed to ground, 6/11/86. Discharge of Caspol 1715 12/16/87. Truck spills 65 gallons of fuel, entered site drains, 11/1/90. NJDEP reports methyl ricmolate found in monitoring well. On 1/5/90 due to overflow of storage tank, 5 gallons of ethylene diamine spilled to ground. USEPA database records indicate that the following chemicals were released into environment: dIIsocyanates, toluene, xylene. The following chemicals listed as being transferred to POTWs: ethylene glycol, methanol, sodium hydroxide, sodium sulfate, sulfuric acid, bis(2-ethylhexyl)adipate, dIIsocyanates, methyl ethyl ketone, methylenebis(phenylisocyanate), N-butyl alcohol, toluene, xylene. Adipate, dIIsocyanates, methyl ethyl ketone, methylenebis(phenylisocyanate), N-butyl alcohol, toluene, xylene.	NJDEP notes poor housekeeping that may lead to contamination of surface waters onsite, 9/11/91. NJDEP issues warning regarding storage of non-palletized drums, 4/9/90. NJDEP reports 7,000 drums onsite, some leaking there for more than 4 years, 11/3/89. 12/91 - Xylene was detected at 2.02 ppm near hazardous waste USTs. Site is listed under the NJDEP UST Contamination Site database.	Regulatory file Media reports Industrial directories
BAY159	John Boyle & Co.	Juliette Street and Avenue A	Bayonne			Newark Bay						Library research
BAY159	**Present Day Tenants:** -Val's Construction - Value Window & Door Co -JP's Plumbing & Heating	54 Juliette Street	Bayonne			Newark Bay						Windshield survey
BAY160	F.W. Fitch Co.	Gertrude Street, off Avenue A	Bayonne									Library research

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BAY161	Texaco/Texas Oil Company	37 Avenue A	Bayonne	1909-1985 (Chevron-Texaco is still the owner of the site, although operations ceased 20 years ago)	Lube blending and light products terminal	Newark Bay Kill Van Kull	Waterfront to Kill Van Kull and Newark Bay. 2 miles from Arthur Kill.	Historically this site had five discharge points and one emergency discharge point. Stormwater runoff from the tank farm and recovery wells was discharged via Outfall 001L to the Bayonne City Sewer System. During periods of heavy rain, stormwater runoff was allowed to discharge directly to Newark Bay via emergency Outfall 001. Discharge points 002, 003, and 004 conveyed stormwater runoff from the Tank Farm area to Newark Bay. Discharge 005 conveyed stormwater runoff from non-Tank Farm areas to Kill Van Kull.	On February 4, 1972, Texaco was convicted of the unlawful discharge of gasoline refuse into Newark Bay on 8/10/70. From July 1975 to December 1981, the U.S. Coast Guard cleaned up at least nine spills from this site to Newark Bay and Kill Van Kull.	In 1954, the ISC reported a violation concerning a 24-inch cast iron outfall leading from this site. The company was ordered to tie the sewer into the Bayonne City sewer system, in which it did comply by 1956.	Site groundwater is known to be contaminated with petroleum hydrocarbons, VOCs, metals, and base neutral extractable compounds. Site soil is known to be contaminated with petroleum hydrocarbons, metals, and VOCs.	Media reports Sanborn Maps 1950, 1979 Library research
BAY162	Texaco/Texas Oil Company	37 Avenue A	Bayonne	1909-1985 (Chevron-Texaco is still the owner of the site, although operations ceased 20 years ago)	Lube blending and light products terminal	Newark Bay Kill Van Kull	Waterfront to Kill Van Kull and Newark Bay. 2 miles from Arthur Kill.		30,000-40,000 gallons of gasoline spilled from a Texaco tanker to Kill Van Kull (date not known). A 1980 incident involving an illegal cross connection at the site almost resulted in salt water contaminating the city water supply.	On July 4, 1900, there was a fire at the site that destroyed 10 oil storage tanks.	In 1993, Texaco was issued an emergency Pollutant Discharge Elimination System permit to add nutrients to the soil to accelerate the site's bioremediation pursuant to an ECRA site cleanup.	Media reports Sanborn Maps 1950, 1979 Library research
BAY163	General Cable (a/k/a Pirelli Cable Co.)	236 West First Street	Bayonne	1886 to 1978 (Originally part of Safety Wire and Cable Co., which merged with other firms to form General Cable in 1927) Pirelli Cable Co-operated onsite from 1978 to 1992.	Manufacturer of electric power cable and other fabricated wire products. Drawing and insulating of non-ferrous wire; manufacture of fabricated wire products.	Newark Bay Kill Van Kull	Waterfront to the Newark Bay and Kill Van Kull	All process, cooling, boiler and storm wastewater is discharged via one 24-inch outfall to the Kill Van Kull. It is also known that historically there were at least four other discharge points from the site to the Kill Van Kull, including two 18-inch sewers one east of the 24-inch drain and one west of the 24-inch drain and two visible outfalls, one near the east property line and shore and the second near the fire pump house and shore. All sanitary wastes, approximately 10,000 gpd, are discharged to the city sewer system.	Criminal charges filed in U.S. District Court related to the unlawful discharge of oil and grease refuse into the Kill Van Kull on five different occasions between 10/24/69 and 8/25/70. On June 4, 1979, 1,000 gallons of wire drawing solution overflowed to the storm sewer and through the wastewater monitoring station creating a discharge to the Kill Van Kull that was white in appearance.	File information indicates that approximately 22 incidences of bypass of the onsite wastewater treatment facility occurred during the period between 7/17/78-7/29/80. In most cases, the bypasses were due to heavy rainfall. In June 1978, it was noted that a facility collection sump design allowed a sluice valve to open automatically during wet weather events. When this valve opened, the entire pump "heavy with oil" drained to the Kill Van Kull. The plant manager was ordered to disable the bypass. In April 1979, Chemical Oxygen Demand exceeded permitted limits at the 24-inch outfall.	Site soil sampling indicates the presence of benzene, TCE, PCE, TPH, lead, beryllium, zinc, copper, nickel, arsenic, PCBs, cadmium, chromium, antimony, and PAHs. Groundwater sampling conducted onsite indicates the presence of lead, arsenic, VOCs, SVOCs, antimony, chromium, zinc, cadmium, copper, mercury, nickel, beryllium, and TCE.	Media reports Sanborn Maps 1942 Library research Database reports Regulatory file

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STATEN ISLAND												
BAY164	Scara Mix Co.	2537 Richmond Terrace	Staten Island	Present		Newark Bay	Waterfront to Newark Bay					Windshield survey
BAY165	Standard T. Chemical Co.	2600 Richmond Terrace (this company also operated another facility at: 1312 Elizabeth Ave, Linden, NJ)	Staten Island	1925-1985	Principal product is the manufacture of paint - up to 4,800 gpd	Newark Bay	Waterfront to Newark Bay	This facility has an NPDES permit allowing for two discharge outfalls. DSN001 for boiler blowdown discharges to an unnamed creek that flows to Kill Van Kull. DSN002 is for domestic sewage discharge that discharges directly to Kill Van Kull.			NYSDEC noted that Standard T utilized polybrominated biphenyls (PPB) as a flame retardant in its paint manufacturing processes. Sampling of air, soil, and water was suggested circa the 1977 time period. Boiler blowdown may have discharged PPBs in the past to local waterways. USEPA noted in a 1977 newsletter that PBBs were found in samples of sediment, soils, water, plants, and human hair taken in close proximity to the Standard T plant.	Regulatory file SSR
BAY166	Great Lekes Dredge and Drydock	Richmond Terrace	Staten Island	Present	Marine ship repair	Newark Bay	Waterfront to Newark Bay					Windshield survey
BAY167	Arlington Rail Yards		Staten Island	Unknown - terminated operations circa 1990	Freight yard rail operations	Newark Bay Arthur Kill Old Place Creek	Within 3,000 feet of Newark Bay					Regulatory file
BAY168	Bethlehem Steel Company Shipbuilding Division.	Richmond Terrace between South Ave and Harbor Road	Staten Island	1938-1965; as of 1965, site operated by J.M.L Trading Corp.	Shipbuilding plant, drydock, marine repair plant, ship hull washing, ion exchange, regeneration, boiler blowdown, cooling waters, and sanitary. No treatment provided. 1965 USACE map indicates that the site is operated by J.M. L. Trading Corporation. It is unclear how long they operated on the site. The occupant of the site in 1997 was Harbor Marina.	Newark Bay Arthur Kill	Waterfront to Arthur Kill					USACE Maps 1942, 1965 1965 Report entitled "New York Harbor Industrial Discharges" by the U.S. Department of Health Regulatory file
BAY169	May Ship Repair	Richmond Terrace	Staten Island	Present	Marine ship repair	Newark Bay	Waterfront to Newark Bay					Windshield survey
BAY170	Unique Coffee	Richmond Terrace	Staten Island	Present	Commercial coffee production	Newark Bay	Waterfront to Newark Bay					Windshield survey
BAY171	Bethlehem Steel Company Shipbuilding Division.	Off Richmond Terrace	Staten Island	1938-1965; as of 1965, site operated by J.M.L Trading Corp.	Facility located 7 blocks inland from Bethlehem Steel waterfront operations	Newark Bay	Waterfront to Arthur Kill					USACE Maps 1942, 1965 1965 Report entitled "New York Harbor Industrial Discharges" by the U.S. Department of Health Regulatory File
BAY172	Clean Water of NY	3249 Richmond Terrace	Staten Island	Present	Hazardous material and waste management	Newark Bay	Waterfront to Newark Bay					Windshield survey
BAY173	Spearin Preston & Barrows	Richmond Terrace	Staten Island	Present	Marine construction	Newark Bay	Waterfront to Newark Bay					Windshield survey
BAY174	City of New York/NYC DOT Bridge Preventative Maintenance	Richmond Terrace	Staten Island	Present	Bridge preventative maintenance. Road and bridge repair depot.	Newark Bay	Waterfront to Newark Bay					Windshield survey

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BAY175	Proctor & Gamble Manufacturing Co.	40 Western Ave. and Richmond Terrace	Staten Island	1907-1991	Manufacturer of detergent, soaps, shortenings, oil, and baking mixes. Also formulator of pesticides.	Newark Bay Arthur Kill	Waterfront - bordered on north by Arthur Kill and on west and south by New Creek Channel.	Cooling water, stormwater, and boiler blowdown discharge to Bridge Creek. Cooling water and stormwater discharged to Arthur Kill. Process wastewater to municipal sewer system.		1983: P&G reported that 1,000 gallons of 5% HCL cleaning solvent was discharged to the sewer. Spill of caustic to sewer system and spill of concentrated perfume cause illnesses to treatment works workers. A memo dated 9/15/86 indicated that during the May-June DMR period, blowdown from the woodboiler scrubber water recirculation system containing high concentrations of woodash overflowed into an outfall sampling station via a railroad track storm drain. In 1989, regulatory agencies discovered a daily discharge of 80 lbs of zinc and 50 lbs of lead prior to discharge to the public sewer system. USEPA's 2005 CPIP Report noted that contamination of the soil and groundwater at the site occurred due to the leakage of petroleum products at this site. The site is presently undergoing remediation as part of New York's "Voluntary Clean-up Program"		Sanborn Maps, 1951, 1981, 1992 ACOE Map No. 50 dated June - October 1965. Regulatory file
BAY176	Howland Hook Marine Terminal	300 Western Avenue	Staten Island	Circa 1960	Bulk shipping container/marine terminal located on a 187-acre site. The terminal was built by American Export Lines and purchased by the City of New York in 1973. The PANYNJ leased the site from the City in 1985. In 1995, the Howland Hook Marine Terminal was leased to Howland Hook Container Terminal, Inc. It is currently operated as the New York Container Terminal.	Newark Bay Arthur Kill	Waterfront - bordered on west by Arthur Kill					Windshield survey Database reports
BAY177	R. Baker & Sons Machinery Dismantlers	250 South Washington Avenue	Staten Island		Dump site – salvager of transformers.	Newark Bay Arthur Kill Old Place Creek	Site is located adjacent to the Goethals Bridge on 3 acres of filled-in wetlands – within 1,500-2,000 feet east of Arthur Kill			Soil samples taken circa 1977 confirmed PCB contamination in the salvage area. Sediments and groundwater were also found to be contaminated with PCBs.		Regulatory file

Note: Information in table is from *Report on Investigation of Sources of Pollutants and Contaminants* (Tierra 2006).

Acronyms and Abbreviations:
ACOE = Army Corps of Engineers
BOD = biological oxygen demand
BNA = base neutral and acid extractables
CDD = polychlorinated dibenzo-*p*-dioxins
CDF = polychlorinated dibenzofurans
CPIP = Comprehensive Port Improvement Plan
CSO = combined sewer overflow
DNAPL = dense non-aqueous phase liquid
DMR = Discharge Monitoring Report
DOT = Department of Transportation
ECRA = Environmental Cleanup Responsibility Act
gpd = gallons per day
HCL = hydrochloric acid
KCS = Known Contaminated Sites
KII = Koppers Industries, Inc.
lbs = pounds
M = million
mgd = million gallons per day
MGP = manufactured gas plant
MOA = memorandum of agreement
NJDEP = New Jersey Department of Environmental Protection
NJPDES = New Jersey Pollutant Discharge Elimination System
NPDES = National Pollutant Discharge Elimination System
PAH = polycyclic aromatic hydrocarbon
PANJ = Port Authority of New Jersey
PCB = polychlorinated biphenyl
PCE = tetrachloroethene
ppm = parts per million
POTW = publicly owned treatment works
PRP = potentially responsible party
PVSC = Passaic Valley Sewerage Commissioners
RCRA = Resource Conservation and Recovery Act
RR = railroad
VOC = volatile organic compound
SVOC = semivolatile organic compound
TCE = trichloroethene
TDI = toluene diisocyante
TOC = total organic carbon
TPH = total petroleum hydrocarbon
TPHC = total petroleum hydrocarbon
TSS = total suspended solid
USACE = U.S. Army Corps of Engineers
USEPA = U.S. Environmental Protection Agency
UST = underground storage tank

Table C-2
CSOs that Discharge to the NBSA

City and State	CSO Identification Number	CSO Name
Newark, NJ	N-022	Roanoke Avenue
	N-023	Adams Street
	N-025	Peddie Street
	N-026	Queen Street
	N-027	Waverly District
	N-030	Avenue A
Jersey City, NJ	JC-002	Manhattan Avenue
	JC-003	St. Paul's Avenue
	JC-004	Howell Street
	JC-005	Broadway
	JC-006	Sip Avenue
	JC-007	Duncan Avenue
	JC-008	Clendenny Avenue
	JC-009	Claremont Avenue
	JC-010	Fisk Street
	JC-011	Cherry Street
	JC-013	Mina Drive
Bayonne, NJ	B-002	5th Street Pumping Station
	B-003	1st Street Pumping Station
	B-004	Lord Avenue
	B-008	East 5th Street
	B-009	Broadway at East 1st Street
	B-010	Avenue C at East 1st Street
	B-011	West 3rd Street
	B-012	West 5th Street
	B-013	Edwards Court
	B-014	West 16th Street
	B-015	West 22nd Street
	B-016	West 24th Street
	B-017	West 25th Street
	B-018	West 30th Street
	B-019	Lincoln Parkway

Table C-2
CSOs that Discharge to the NBSA

City and State	CSO Identification Number	CSO Name
	B-020	West 59th Street
	B-022	Zabriskie Avenue
	B-024	Humphrey's Avenue
	B-026	Veterans Park
	B-028	Lincoln Parkway
	B-029	West 37th Street
	B-030	West 54th Street
	B-034	Bayview Court
Elizabeth, NJ	E-002	Dowd Avenue
	E-003	Westfield Avenue
	E-005	Westfield Avenue
	E-008	Grant Street/Price Street
	E-010	Murray / Cherry Street
	E-012	Rahway Avenue
	E-013	Rahway Avenue/Burnet Street
	E-014	Broad Street / Rahway Avenue
	E-016	Edgar Road / Pearl Street
	E-021	Spring Street / Third Avenue
	E-022	South Street
	E-026	John Street
	E-027	Summer Street / Arnett Street
	E-028	Summer Street / Arnett Street
	E-029	South Front Street
	E-030	East Jersey / Front Street
	E-031	Livingston Street / Front Street
	E-032	Magnolia Avenue / Front Street
	E-034	Atalanta Place
	E-035	Third Avenue / South Front Street
	E-036	Orchard Street / Dod Court
	E-037	Bayway
	E-038	Third Avenue
	E-039	Trunbull Street / Fourth Street

Table C-2
CSOs that Discharge to the NBSA

City and State	CSO Identification Number	CSO Name
	E-040	Pulaski Street / Clifton Street
	E-041	Morris Avenue / Sayre Street
	E-042	Bridge Street / Elizabeth Street
	E-043	Army Flood Control Structure
Staten Island, NY	PR-002	Taylor Street
	PR-003	Broadway
	PR-004	Bard Avenue
	PR-005	Kissel Avenue
	PR-006	Clinton Avenue
	PR-007	Sailor Snug Harbor
	PR-008	Franklin Avenue
	PR-009	Jersey Street
	PR-024	Holland Avenue
	PR-025	South Avenue
	PR-026	Harbor Road
	PR-027	Union Avenue
	PR-028	Houseman Avenue
	PR-029	Nicholas Street
	PR-033	Elizabeth Avenue
	PR-034	Bement Avenue
	PR-035	Bodine Street
	PR-036	Rector Street
	PR-037	Richmond Avenue

Acronyms and Abbreviations:
CSO = combined sewer overflow
NBSA = Newark Bay Study Area

Table C-3
POTW Releases of Untreated Water to the NBSA

Municipality	Year	POTW Release
Newark	1979/1980	PVSC discharged primary effluent[1] into Newark Bay at Outfall # DSN-002 during construction of the PVSC tunnel to New York Harbor (1980 NJDEP ACO). In addition, PVSC was discharging "in excess of 200 million gallons per day (MGD) of primary effluent into Newark Bay through DSN-002." Conditional approval for the discharge was authorized by NJDEP as of August 28, 1979. Sampling results "submitted by the Passaic Valley Sewerage Commissioners" as required by the authorization have shown a "severe degradation of the water quality of Newark Bay (1980 NJDEP ACO)"
	2012	PVSC lost electrical power on October 29, 2012 during Hurricane Sandy and regained power during the weekend of November 3, 2012. During this time, PVSC was discharging approximately 300 to 500 MGD of raw sewage to Newark Bay (Strunsky 2012a; Clunn 2012; WaterWorld 2012). Even as PVSC brought its damaged equipment back on-line in a sequential process, it was still discharging approximately 240 to 250 MGD of partially treated sewage to Newark Bay and New York Harbor until all treatment equipment was restored (Strunsky 2012b; Parry 2012).
Elizabeth	1991 - 2004	Approximately 144 secondary bypass events from the Joint Meeting of Essex-Union County (JMEUC) POTW facility were reported by JMEUC to NJDEP. Bypasses occured due to factors related to high flow rates, storms, equipment malfunction and electrical system power failures/outages. Additional bypassing events at other JMEUC trunk sewer locations were also noted, usually associated with precipitation events (JMEUC 2004).

Notes:
[1] Primary effluent is generally considered by authorities to be effluent in which heavy solids have been allowed to settle in a basin for removal prior to discharge. This level of treatment does not include a biological process to remove dissolved and suspended organic compounds, and the sewage is not disinfected chemically or physically by microfiltration.
POTW = Publicly Owned Treatment Work

References:
Administrative Consent Order (ACO) identified as issued by NJDEP, titled: "In the Matter of the Passaic Valley Sewerage Commissioners."
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Table C-4
Significant Spills that have Occurred in the NBSA

Subject Waterway	Dates	Facility / Vessel	Documented Discharge to Newark Bay and/or Tributary[1]	References
Arthur Kill	1975-1986, 1979, 1984	American Cyanamid	At least 40 documented spills or releases to the facility or adjacent waterways between 1975 and 1986. A majority of those incidents involved sulfuric acid, oleum, caustic soda, acids, acrylamides, malathion, sodium hydroxide or cyanides. 1000 gallons of No. 2 fuel oil was spilled to the Arthur Kill on May 15, 1979. A 1984 spill of dithio phosphorous acid resulted in the release of 8000 lbs. to the Arthur Kill. A 1984 spill resulted in the release of approximately 275 gallons of toluene to the Rahway River. Elevated levels of organic, sulphur, sulfide, phosphorous and pesticides were detected in samples taken from Building 69, which discharged to the Rahway River.	Tierra 2006
Arthur Kill	1978, 1980	Chemical Control Corp. (CCC)	Waste drums ruptured and blown into river during explosion/fire; runoff from firefighting activities during the fire/explosion and runoff from leaking drums to river. A 1978 inspection indicated 30-50,000 drums adjacent to the Elizabeth River. Many drums were severely deteriorated; leaking and discharges migrated to the river.	Tierra 2006
Arthur Kill	1978, 1994	FMC Corp.	Criminal action filed by Sepal regarding phosphoric acid spill to the Arthur Kill - as observed by U.S. Coast Guard - 1978 hydrogen sulfide spill reached local waterway - 1994.	Tierra 2006
Arthur Kill	1983	ExxonMobil	Two barges collided discharging 40,000 gallons of home heating fuel into the Arthur Kill.	Tierra 2006
Arthur Kill	9/12/1988, 09/28/1988	Merck & Co., Inc.	09/12/1988 - discharge of 10,000 gallons of untreated wastewater to Kings Creek from facility process water treatment plant. 09/28/1988 - discharge of 500 gallons of untreated wastewater to Kings Creek from facility process water treatment plant.	Tierra 2006
Arthur Kill	1990	General Motors Corp.	1990 - Tri records indicated 250 lbs. of zinc reportedly released in 1990 to West Brook Creek.	Tierra 2006
Arthur Kill	1995-2000	GATX Terminals Corp.	Reported Gate facility spills between 1995 and 2000 reported to discharge to Arthur Kill and/or adjacent wet lands.	Tierra 2006
Arthur Kill	10/30/2004	Kinder Morgan Liquid Terminals	Media reports indicated that up to 50,000 gallons of sodium hydroxide (lye) spilled into the Arthur Kill due to the collapse of an on-site 450,000-gallon chemical storage tank.	Tierra 2006
Arthur Kill	2/25/2005	Donjon Marine	A hydraulic line from an excavator on the Dredge Jpg Boisseau broke and released oil into the water. Hydraulic oil.	U.S. Coast Guard 2017. Incident # 751066
Arthur Kill	3/18/2005	CJ Murphy Inc.	Driver was pulling up to barge to unload, the truck slid into water after hitting black ice. An 8-ft gash in the truck caused the marine lube oil to enter the Arthur Kill. The capacity of vehicle was 7,500 gallons. Driver escaped without injury. No damage done to barge.	U.S. Coast Guard 2017. Incident # 753029
Arthur Kill	3/21/2005	Reinauer Transportation	Reporting a material release from a vessel due to a tank overflow during transfer procedures. Oil, fuel: No. 2.	U.S. Coast Guard 2017. Incident # 753355
Arthur Kill	10/8/2005	Shelby Weeks (Weeks Marine)	Called stated due to operator error there was a release of materials from a tug boat. Oil, fuel: No. 2-D.	U.S. Coast Guard 2017. Incident # 775433
Arthur Kill	12/15/2005	Buchanan Marine	Diesel fuel released from fuel vent on a tug boat due to unknown causes. Oil: diesel.	U.S. Coast Guard 2017. Incident # 782559
Arthur Kill	3/23/2006	Unknown	Number two oil spilled into the Arthur Kill from a leaking fuel tank on a barge. Oil, fuel: No. 2-D.	U.S. Coast Guard 2017. Incident # 791794

Table C-4
Significant Spills that have Occurred in the NBSA

Subject Waterway	Dates	Facility / Vessel	Documented Discharge to Newark Bay and/or Tributary[1]	References
Arthur Kill	5/30/2006	Great Lakes Dredge & Dock Company	Hydraulic oil spilled into the Arthur Kill from a failed fitting on board a dredge. Hydraulic oil.	U.S. Coast Guard 2017. Incident # 798918
Arthur Kill	9/3/2006	Atlantic Trucking Freight	The caller stated that due to unknown causes, three tractor trailers caught on fire. In the process of extinguishing the fire, the contents of the saddle tanks discharged onto the ground and into a storm drain that leads to the Arthur Kill River. Oil: diesel.	U.S. Coast Guard 2017. Incident # 810174
Arthur Kill	9/16/2006	Unknown	Caller stated there was a release of diesel from a tug boat due to the operator over filling the tank. Oil: diesel.	U.S. Coast Guard 2017. Incident # 811659
Arthur Kill	10/31/2006	Jay Cashman	Caller reporting a machine on a barge ruptured a hydraulic line spilling material into the water.	U.S. Coast Guard 2017. Incident # 816605
Arthur Kill	10/31/2006	New York Terminals	Caller stated while fueling the Ki tug, the motor vessel "Java Sea" discharged oil from their fuel tank onto the deck and into the water due to unknown causes. Oil: diesel.	U.S. Coast Guard 2017. Incident # 816607
Arthur Kill	7/31/2007	Reinauer Transportation Company	Caller reported while M/V Westchester was loading from the dock manifold to the vessel, the dockman removed the hose from the dock before it was done draining and released gasoline into the Arthur Kill River.	U.S. Coast Guard 2017. Incident # 843985
Arthur Kill	11/29/2007	Weeks Marine	Caller stated there was a spill of materials while the vessel was in the process of being fueled. Oil: diesel	U.S. Coast Guard 2017. Incident # 855817
Arthur Kill	12/20/2007	Durocher Marine	Caller stated due to a rigging failure there was a spill of materials into the Arthur Kill. Oil: diesel.	U.S. Coast Guard 2017. Incident # 857719
Arthur Kill	3/25/2008	Morales Trucking	Caller is reporting a material release from two dump trucks due to a transport accident. Caller states there were two vehicles involved in this accident. Oil: diesel.	U.S. Coast Guard 2017. Incident # 865952
Arthur Kill	5/10/2008	Unknown	Diesel fuel has spilled into the Arthur Kill from a transfer hose on board the Barge Ht100. The spill was caused by a failed valve on the transfer hose. Oil: diesel.	U.S. Coast Guard 2017. Incident # 870455
Arthur Kill	9/8/2008	Reinauer Transportation Company	The caller stated that while taking on fuel the barge fuel tank was overfilled spilling into the Arthur Kill. The terminal has started cleanup with absorbents although it appears to be non-recoverable due to the very small quantity.	U.S. Coast Guard 2017. Incident # 883126
Arthur Kill	9/26/2008	American Petroleum	Caller is reporting that Number 2 diesel discharged from the Number 4 tank due to a leak in the tank. As a result, the material is releasing into the water. Oil, fuel: No. 2-D.	U.S. Coast Guard 2017. Incident # 885401
Arthur Kill	11/7/2008	IMTT	Caller is reporting that home heating (# 2) fuel discharged from a hose on the pier due to an operator disconnecting the hose. As a result, the material released into the water.	U.S. Coast Guard 2017. Incident # 889428
Arthur Kill	4/2/2009	USNS Bob Hope	Hydraulic oil discharged from the USNS Bob Hope into Arthur Kill due to a leaky hydraulic cylinder.	U.S. Coast Guard 2017. Incident # 901611
Arthur Kill	6/16/2009	Rogers Surveying PLLC	Caller stated the fuel nozzle on a pump did not stop which caused an overfill on a vessel. Oil: diesel.	U.S. Coast Guard 2017. Incident # 908721
Arthur Kill	6/22/2009	Unknown	Caller is reporting a sheen on the Arthur Kill River from an unknown source. Caller states that the discharge could be up to as much as 100 gallons. Unknown oil.	U.S. Coast Guard 2017. Incident # 909349

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Significant Spills that have Occurred in the NBSA

Subject Waterway	Dates	Facility / Vessel	Documented Discharge to Newark Bay and/or Tributary[1]	References
Arthur Kill	4/1/2011	New York Terminals	While fueling a vessel, the tank burped and fuel discharged from the vent. Oil: diesel.	U.S. Coast Guard 2017. Incident # 971769
Arthur Kill	12/6/2011	Reinauer Transportation Company	Caller stated due to equipment failure there was spill of hydraulic oil from a barge.	U.S. Coast Guard 2017. Incident # 997270
Arthur Kill	2/1/2012	M/V Miss Brielle	Caller stated diesel fuel released onto the deck of the M/V Miss Brielle due to operator error. Oil: diesel	U.S. Coast Guard 2017. Incident # 1001929
Arthur Kill	2/7/2012	Vopak	***web report*** NRC notification of a continuing discharge that was first discovered on Feb 07, 2012. Notification was made to the Coast Guard but NRC report was never filed. The discharge is from oil contaminated soil from a historic discharge from 1990. The suspected responsible party has taken cleanup action since the discovery of the oil to the current date.	U.S. Coast Guard 2017. Incident # 1045674
Arthur Kill	10/29/2012	Bayway Refinery	Storm surge submerged the facility causing oil from the sewage system and retention basin to float to the surface and release to land within the facility and Morses Creek. Oil slop.	NJDEP 2017. Incident # #445779
Arthur Kill	10/29/2012	Conoco Phillips Bayway Refining Company	Oil sheen spotted in waterway. 2 blocks wide.	NJDEP 2017. Incident #446006
Arthur Kill	12/15/2012	Mv Boston 3	Caller reports that a vessel ran aground and discharged oil. Caller reports that a cleanup was conducted, but was improper or incomplete. additional locations that were impacted include: Atlas Yacht Club, Elco Marina (Bayonne), Marina Harbor Yacht Club, Robbins Reef Yacht Club (Bayonne).	U.S. Coast Guard 2017. Incident # 1048825
Arthur Kill	1/10/2013	IMTT	Caller stated terminal connected a barge hose to the dock. Dock personnel told barge personnel to open the manifold which caused oil to spray out of the connection onto the dock side and water.	U.S. Coast Guard 2017. Incident # 1035298
Arthur Kill	4/13/2013	Unknown	Caller is reporting an unknown sheen in the water.	U.S. Coast Guard 2017. Incident # 1043850
Arthur Kill	4/13/2013	New York Terminals	Equipment failure: hose burst causing spill into the water at the dock. Cleanup in progress.	NJDEP 2017. Incident # 467861
Arthur Kill	4/19/2013	Unknown	The caller is reporting an unknown sheen (white resin) on the Arthur Kill river. the source of the sheen is unknown at this time. The caller stated that the sheen is moving with the current.	U.S. Coast Guard 2017. Incident # 1044472
Arthur Kill	4/19/2013	Unknown	Caller reports a white in color sheen in the waterway.	NJDEP 2017. Incident # 468654
Arthur Kill	5/8/2013	Phillips 66	Caller reported that a sump level got to high and discharged waste oil into the Arthur Kill.	U.S. Coast Guard 2017. Incident # 1046379
Arthur Kill	5/8/2013	Phillips 66 Bayway Refinery	Caller reporting sump went out on pier causing overflow.	NJDEP 2017. Incident # 471406
Arthur Kill	5/8/2013	Phillips 66	Caller reporting a sump level got too high and discharged waste oil into the Arthur Kill	NJDEP 2017. Incident # 471409
Arthur Kill	5/16/2013	Unknown	Caller stated that there is an unknown sheen from an unknown source in the Arthur Kill river.	U.S. Coast Guard 2017. Incident # 1047292
Arthur Kill	5/16/2013	Vopak	Caller stated while emptying a pit during pre-construction, produced water was dumped into the Arthur Kill river, causing a sheen.	U.S. Coast Guard 2017. Incident # 1047341

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Significant Spills that have Occurred in the NBSA

Subject Waterway	Dates	Facility / Vessel	Documented Discharge to Newark Bay and/or Tributary[1]	References
Arthur Kill	5/21/2013	Reicon	The caller is reporting a discharge of hydraulic fluid (biodegradable) into Arthur Kill. The caller stated that a hose ruptured on a crane that is working off of a barge (Hughes 776).	U.S. Coast Guard 2017. Incident # 1047830
Arthur Kill	7/4/2013	Unknown	Caller is reporting an unknown sheen that looks like black oil. Boom was put out to contain and clean up the material.	U.S. Coast Guard 2017. Incident # 1052743
Arthur Kill	8/9/2013	Unknown	Caller is reporting an unknown sheen discovered on overflight.	U.S. Coast Guard 2017. Incident # 1056569
Arthur Kill	9/9/2013	Unknown	Report of an unknown sheen in the Arthur Kill.	U.S. Coast Guard 2017. Incident # 1059628
Arthur Kill	9/20/2013	Phillips 66	Caller is reporting a release of 1 quart of heating fuel oil into the Arthur Kill when during a routine barge transfer the drain line on a loading hose released the oil when trying to clear it. Oil stayed in the area of containment placed prior to transfer.	U.S. Coast Guard 2017. Incident # 1060787
Arthur Kill	9/20/2013	Phillips 66	Caller reports spill occurred while draining bleeder valve into barge. Area boomed off and cleanup ongoing	NJDEP 2017. Incident # 492730
Arthur Kill	9/26/2013	Unknown	Caller is reporting an unknown sheen coming from an unknown source on the river.	U.S. Coast Guard 2017. Incident # 1061382
Arthur Kill	10/15/2013	Vane Brothers	Caller is reporting a spill of #2 diesel fuel from a tug boat due to unknown causes.	U.S. Coast Guard 2017. Incident # 1063018
Arthur Kill	11/9/2013	Unknown	A mystery sheen was observed in the Arthur Kill from an unknown source. The caller stated that the sheen is possibly a few hundred gallons of product with a "funny" odor.	U.S. Coast Guard 2017. Incident # 1065293
Arthur Kill	11/16/2013	Unknown	Caller is reporting a sheen from an unknown source following dredging operations in the Arthur Kill.	U.S. Coast Guard 2017. Incident # 1065946
Arthur Kill	11/16/2013	Unknown	Oil sheen from an unknown source following dredging operations in the Arthur Kill. Sheen described as 200 feet long, 50 feet wide. Containment unknown.	NJDEP 2017. Incident # 500045
Arthur Kill	12/1/2013	Motiva Enterprises, Inc.	Caller stated that there was a release of an unknown oil from the facility that entered the water.	U.S. Coast Guard 2017. Incident # 1067208
Arthur Kill	12/2/2013	Phillips 66	Caller reported that a barge discharged an unknown amount of oil into the water.	U.S. Coast Guard 2017. Incident # 1067330
Arthur Kill	12/2/2013	Phillips 66	Spill from back of barge into water body, cleanup pending	NJDEP 2017. Incident # 501949
Arthur Kill	1/11/2014	Phillips 66	Leaking pipe on the pier released oil into Arthur Kill. Contained mostly in the hard boom around the vessel.	NJDEP 2017. Incident # 505062
Arthur Kill	2/1/2014	Bayway Refinery	Unknown sized sheen discovered in number 1 dock with source unknown. Cleanup in progress.	NJDEP 2017. Incident # 506651
Arthur Kill	6/9/2014	Unknown	Diesel fuel discharged from a vessel due to an unknown source while it was being fueled. Booms were applied; cleanup is underway.	NJDEP 2017. Incident # 520044
Arthur Kill	6/13/2014	Unknown	Caller stated that there is an unknown sheen from an unknown source moving south in the Arthur Kill river.	NJDEP 2017. Incident # 520701
Arthur Kill	7/9/2014	Kirby Offshore Marine	NRC # 1088550 report of a vessel leaking from a crack the hull. fuel was transferred out of the tank and absorbent boom was deployed.	NJDEP 2017. Incident # 524057

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Significant Spills that have Occurred in the NBSA

Subject Waterway	Dates	Facility / Vessel	Documented Discharge to Newark Bay and/or Tributary[1]	References
Arthur Kill	1/10/2015	Unknown	Report of unknown sheen in Arthur Kill waterway.	NJDEP 2017. Incident # 544666
Arthur Kill	1/19/2015	Unknown	Sheen was noticed at dock 1a stern of vessel B-210. Sheen size is 15 by 15. Booms have applied and absorbents.	NJDEP 2017. Incident # 545291
Arthur Kill	1/29/2015	Unknown	Caller is reporting via third party of an unknown rainbow sheen in the water from an unknown source.	U.S. Coast Guard 2017. Incident # 1106891
Arthur Kill	2/17/2015	Unknown	A mystery sheen was observed on the Arthur Kill, from an unknown source.	U.S. Coast Guard 2017. Incident # 1108305
Arthur Kill	2/22/2015	Unknown	Unknown sheen sighting. Exact source of the sheen is unknown at this time.	U.S. Coast Guard 2017. Incident # 1108747
Arthur Kill	3/2/2015	KT Marine	Hydraulic fluid discharged from an air compressor that broke on a hydraulic line on the edge of the dock.	U.S. Coast Guard 2017. Incident # 1109442
Arthur Kill	3/11/2015	Unknown	Caller stated that there is an unknown sheen from an unknown source being observed in the Arthur Kill river.	U.S. Coast Guard 2017. Incident # 1110241
Arthur Kill	4/9/2015	Unknown	The caller is reporting an unknown sheen in the Arthur Kill, source is unknown.	U.S. Coast Guard 2017. Incident # 1113143
Arthur Kill	4/10/2015	Unknown	Caller stated he observed a sheen at the incident location, source could not be determined.	U.S. Coast Guard 2017. Incident # 1113191
Arthur Kill	5/7/2015	Weeks Marine	Caller is reporting a discharge of #2 diesel fuel from a vessel while taking on fuel there was a burp in the line.	U.S. Coast Guard 2017. Incident # 1115833
Arthur Kill	5/7/2015	Weeks Marina	Caller is reporting a discharge of #2 diesel fuel from a vessel while taking on fuel; there was a burp in the line.	NJDEP 2017. Incident # 556528
Arthur Kill	5/15/2015	M/V Mari Posa	At approximately 23:40 EDT, the M/V Mari Posa was heading north on the Arthur Kill, when he parted the stern lines on the barge "rtc103." The barge was taking on product, which resulted in a release of ethanol. The caller stated that "whatever was in the line" released into the water (possibly a couple hundred gallons).	U.S. Coast Guard 2017. Incident # 1116675
Arthur Kill	7/9/2015	Unknown	Caller is reporting an unknown sheen of unknown sources.	U.S. Coast Guard 2017. Incident # 1122249
Arthur Kill	7/9/2015	Unknown	Caller is reporting the discovery of an unknown sheen from an unknown source in the water.	U.S. Coast Guard 2017. Incident # 1122247
Arthur Kill	9/22/2015	Kiewit Weeks Massman	Potentially high-pH water over flowed into boat slip next to Arthur Kill. No cleanup is being done.	NJDEP 2017. Incident # 574148
Arthur Kill	11/3/2015	Buckeye Partners	Caller stated while taking in product, a hose between the facility dock and a vessel sprung a leak at a flange. Caller stated this caused a release of gasoline on the dock and into the Arthur Kill river.	U.S. Coast Guard 2017. Incident # 1132460
Arthur Kill	11/10/2015	Great Lakes Dredge and Dock	Caller stated that an unknown sheen from an unknown source appeared after dredging efforts in the vicinity of the Arthur Kill.	U.S. Coast Guard 2017. Incident # 1133055

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Significant Spills that have Occurred in the NBSA

Subject Waterway	Dates	Facility / Vessel	Documented Discharge to Newark Bay and/or Tributary[1]	References
Arthur Kill	12/17/2015	Unknown	Caller stated that they noticed an unknown sheen near the shoreline of their facility. After investigation, they confirmed that it is not coming from their facility.	U.S. Coast Guard 2017. Incident # 1136033
Arthur Kill	12/17/2015	Unknown	Caller stated that they noticed a 6-foot-wide silvery sheen stretching the length of the facility, passing the facility from south to north. The source is unknown.	U.S. Coast Guard 2017. Incident # 1136051
Arthur Kill	12/17/2015	Unknown	Unknown sheen noticed near shoreline of caller's facility. After investigation, they confirmed that it is not coming from the facility. Sheen size is 25 miles by 20 feet.	NJDEP 2017. Incident # 583470
Arthur Kill	12/22/2015	Unknown	Caller is reporting the discovery of an unknown sheen from an unknown source.	U.S. Coast Guard 2017. Incident # 1136402
Arthur Kill	12/29/2015	Unknown	Caller stated that there is an unknown sheen from an unknown source being observed in the Arthur Kill river. Caller also stated that the source may be run off from the parking lots at the salt docks. There are visible puddles of sheen.	U.S. Coast Guard 2017. Incident # 1136867
Arthur Kill	1/28/2016	M/V Torm-Kansas	Caller is reporting a release of an unknown material from a vessel for unknown reasons into the Arthur Kill.	U.S. Coast Guard 2017. Incident # 1139139
Arthur Kill	2/14/2016	New York Terminal	Crude oil discharged from a tram car while it was being unloaded due to an unknown cause at this time. The incident occurred on 14-Feb-2016 and the caller was notified of the incident today at 1620.	U.S. Coast Guard 2017. Incident # 1140615
Arthur Kill	2/16/2016	Kinder Morgan	Caller stated a drain line from a secondary containment had 2 gaskets that failed due to ice buildup. This caused storm water mixed with residual product to release into the Arthur Kill river.	U.S. Coast Guard 2017. Incident # 1140559
Arthur Kill	2/19/2016	Phillips 66	Caller is reporting a rainbow sheen in the waterway due to a saltwater main break that flooded the storm sewers. Cleanup is in progress.	NJDEP 2017. Incident # 589753
Arthur Kill	2/21/2016	Buckeye Partners	Caller is reporting a joint on loading arm experienced a dripping leak. This resulted in a discharge of crude oil.	U.S. Coast Guard 2017. Incident # 1141015
Arthur Kill	2/22/2016	KWM	Caller stated a line burst on a pump truck causing the release of hydraulic oil to the water.	U.S. Coast Guard 2017. Incident # 1141086
Arthur Kill	3/8/2016	Unknown	Caller stated there is an unknown sheen from an unknown source in the vicinity of the dock.	U.S. Coast Guard 2017. Incident # 1142241
Arthur Kill	3/8/2016	Unknown	Caller is reporting an unknown sheen in the Arthur Kill river from an unknown source river coming from the north.	U.S. Coast Guard 2017. Incident # 1142237
Arthur Kill	3/17/2016	Unknown	Caller stated that they discovered a 200' long intermittent rainbow sheen on the waters of the Arthur Kill river near Dock A.	U.S. Coast Guard 2017. Incident # 1143126
Arthur Kill	4/7/2016	Unknown	Diesel fuel discharged from a sounding tube on deck due to an unknown cause at this time.	U.S. Coast Guard 2017. Incident # 1144709
Arthur Kill	4/9/2016	Unknown	The caller is reporting a discharge of an oily water mixture due to secondary containment on the vessel not being capped. Caller stated the product discharged into the Arthur Kill river.	U.S. Coast Guard 2017. Incident # 1144857
Arthur Kill	5/6/2016	Unknown	Caller stated there is an unknown sheen from an unknown source in the vicinity of the dock.	U.S. Coast Guard 2017. Incident # 1147109

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Significant Spills that have Occurred in the NBSA

Subject Waterway	Dates	Facility / Vessel	Documented Discharge to Newark Bay and/or Tributary[1]	References
Arthur Kill	5/6/2016	Unknown	Observed oil sheen near pier. Unknown size. Response team en route.	NJDEP 2017. Incident # 599549
Arthur Kill	5/6/2016	Kinder Morgan	Caller stated there was a leak of an oily-water mixture into the water due to a corroded line in the storm water conveyance piping.	U.S. Coast Guard 2017. Incident # 1147083
Arthur Kill	5/7/2016	Unknown	Caller is reporting the discovery of an unknown sheen from an unknown source in the water.	U.S. Coast Guard 2017. Incident # 1147170
Arthur Kill	5/12/2016	Kinder Morgan	Caller is reporting a release of hydraulic oil into the Arthur Kill from a dockside crane due to equipment failure.	U.S. Coast Guard 2017. Incident # 1147619
Arthur Kill	7/1/2016	Buckeye Partners	The RP is reporting a discharge of gasoline due to a "small" pinhole leak on a hose connected to facility piping. RP stated the spill occurred while the fuel was being transferred from the M/V Fidias. The impact is the Arthur Kill waterway.	U.S. Coast Guard 2017. Incident # 1152171
Arthur Kill	7/19/2016	Unknown	Caller is reporting a fuel sheen on the water from an unknown source.	U.S. Coast Guard 2017. Incident # 1153778
Arthur Kill	7/23/2016	Scabra's Armory Restaurant and Banquette	Caller stated that during the night a company was steam cleaning the building and in the process cooking grease was discharged into the Arthur Kill, creating a sheen around Dock Number 9. This is due to drains in the building not being connected to a drainage system.	U.S. Coast Guard 2017. Incident # 1154181
Arthur Kill	7/28/2016	Buckeye Terminals	Caller reported that diesel fuel was discharged into the Arthur Kill river due to an overpressurization.	U.S. Coast Guard 2017. Incident # 1154698
Arthur Kill	8/30/2016	Buckeye Partners	Gasoline discharged from a flange on a ship hose that was hanging from the dock.	U.S. Coast Guard 2017. Incident # 1157651
Arthur Kill	9/2/2016	K T Marine	Caller is reporting that concrete slurry spilled into the river from a pipe.	U.S. Coast Guard 2017. Incident # 1158009
Arthur Kill	10/10/2016	Kinder Morgan	Number 2 fuel oil discharged from an inactive hose that was over-pressurized on the dock.	U.S. Coast Guard 2017. Incident # 1161257
Arthur Kill	11/28/2016	Unknown	A mystery sheen was observed on Arthur Kill from an unknown source. The sheen is sporadic and also under the dock, sheen size listed is approximate.	U.S. Coast Guard 2017. Incident # 1165068
Arthur Kill	12/21/2016	Kinder Morgan	Caller is reporting a discharge of gasoline from a failed dock hose into the Arthur Kill river.	U.S. Coast Guard 2017. Incident # 1166933
Arthur Kill	1/3/2017	M/V Genises Marine 1115	Caller stated m/v genesis marine was draining their bilge when oil contaminated storm water washed over the deck of the vessel into the Arthur Kill river.	U.S. Coast Guard 2017. Incident # 1167674
Arthur Kill	1/20/2017	Unknown	Caller stated there is an unknown sheen in the Arthur Kill.	U.S. Coast Guard 2017. Incident # 1169059
Arthur Kill	1/20/2017	Unknown	Report of an unknown sheen in the Arthur Kill.	NJDEP 2017. Incident # 628817
Arthur Kill	3/1/2017	Kinder Morgan	The RP is reporting a discharge of gasoline due to a leak on a PSE&G pipeline. RP stated that the cause of the leak is currently unknown. No reported injuries or evacuations at this time. The impact is the Arthur Kill.	U.S. Coast Guard 2017. Incident # 1172176

Table C-4
Significant Spills that have Occurred in the NBSA

Subject Waterway	Dates	Facility / Vessel	Documented Discharge to Newark Bay and/or Tributary[1]	References
Arthur Kill	3/13/2017	Unknown	The RP is reporting a sheen spotted on the waters of the Arthur Kill, source is currently unknown.	U.S. Coast Guard 2017. Incident # 1173153
Arthur Kill	3/13/2017	Unknown	Caller is reporting a black and rainbow in color sheen in the waterway. Unknown size.	NJDEP 2017. Incident # 633279
Arthur Kill	4/5/2017	Unknown	Caller is reporting that as a result of their vessel being hit by a tug on 29 Mar their vessel has been taking on water slowly. While pumping water from the vessel, engine oil mixed with the water and was discharged into the Arthur Kill.	U.S. Coast Guard 2017. Incident # 1174881
Arthur Kill and Kill van Kull	9/13/2013	Clean Waters Of New York	Caller is reporting a release of possibly No. 4 oil onto Bayonne shoreline from Clean Water of New York, which accepts used waste oil causing a sheen and pockets of black oil; already has impacted the shoreline and the containment at local facilities and vessels for 5 miles of shoreline. It is moving with the tide.	U.S. Coast Guard 2017. Incident # 1060060
Arthur Kill and Morses Creek	1984	Phelps Dodge Copper Products Company	1984 Environmental Cleanup Responsibility Act inspection noted spillage from facility collection pit to river and area of oil soaked ground near tank farm which drains to Arthur Kill.	Tierra 2006
Arthur Kill and Morses Creek	1975, 1984	Phelps Dodge Copper Products Company	1984 Environmental Cleanup Responsibility Act inspection noted spillage from facility collection pit to river and area of oil-soaked ground near tank farm which drains to Arthur Kill; effluent from oil/water separator discharged to storm sewer system in 1975; drain in secondary containment system in tank farm drained to storm sewer.	Tierra 2006
Arthur Kill and Rum Creek	5/1/1985, 3/1986	GATX Terminals Corp.	June 1985 NJDEP incident report noted that 50 gal. of # 2 oil spilled to the Arthur Kill as a result of a valve left open. Also noted that in March 1986 approximately 200 gal. of # 2 fuel oil spilled into the Arthur Kill from this facility as a result of a blown gasket in a 14" pipeline.	Tierra 2006
Arthur Kill, Rahway River	1993, 2005	Conoco Phillips Bayway Refining Company	Spills and discharges reported for the Bayway Refinery, including: 1993 - seeps observed south of Morses Creek from the Bayway Refinery facility. 1993 - NJDEP reported spills to land and water from the facility. 2005 - 80,000 gallons of an oil/water mixture spilled to the Rahway River from the Linden Refinery site due to a leaking valve.	Tierra 2006
Elizabeth Channel	10/31/2014	Unknown	Caller is reporting 1 container that is possibly leaking hydraulic oil.	U.S. Coast Guard 2017. Incident # 1099872
Elizabeth River	4/9/2014	City of Elizabeth	Dry weather overflow at a combined sewer going into the Elizabeth River. Repair pending.	NJDEP 2017. Incident # 512151
Elizabeth River	4/7/2016	Unknown	Electrical oil released from an electrical line due to an unknown cause at this time. Caller states the oil got into the Elizabeth River and there is a sheen that covers majority of the river and it appears to be getting outside the booms that were placed.	U.S. Coast Guard 2017. Incident # 1144716
Elizabeth River	6/15/2016	Unknown	Large discharge of black substance coming from under the boardwalk going into the Elizabeth River.	NJDEP 2017. Incident # 604583

Table C-4
Significant Spills that have Occurred in the NBSA

Subject Waterway	Dates	Facility / Vessel	Documented Discharge to Newark Bay and/or Tributary[1]	References
Hackensack River	1970, 1979, 1990, 1991, 1993,1995, 2003, 2005	PSE&G Hudson Generating Station	1970 - Ash disposal lake overflowed into Hackensack River. 1979 - Discharges of boiler feed and condensate were discharged via cracks in the basement foundation to the Hackensack River during periods of high tide. 1990 - 20 gallons of sulfuric acid discharged to the Hackensack River due to a tanker truck transfer malfunction. 1991 - Approximately 200 gallons of lube oil from a 500-gallon spill entered the Hackensack River. 1993 - 25-50 gallons of fly ash material mixed with potable water entered the Hackensack River from a spill from a vac truck. 1995 - Less than 75 gallons of lube oil entered the Hackensack due to a leak in an air compressor lube oil heat exchanger. 2003 - Approximately 15 gallons of hydraulic oil was released to the Hackensack. 2005 - Approximately 1000 gals of partially treated processed waste water discharged to surrounding soils/Hackensack River.	Tierra 2006
Hackensack River	5/1/1976	Wellen Oil	In May 1976, at least 2 million gallons of # 6 fuel oil spilled into the Hackensack River due to an equipment rupture.	Tierra 2006
Hackensack River	1985	Standard Chlorine Chemical Company	NJDEP documented that on-site wastewater lagoons overflowed to Hackensack; sampling of lagoon sediments identified contamination with numerous site-related hazardous substances as well as 2,3,7,8-TCDD.	Tierra 2006
Hackensack River	10/28/2012-11/7/2012	Jersey City MUA	Pump down discharging to river, sewage.	NJDEP 2017. Incident #445957
Hackensack River	12/9/2013	Suspected-Creamer Environmental Co	Observed 2 coffer dam failures at site allowing release into river.	NJDEP 2017. Incident # 502605
Hackensack River	6/12/2014	15 Minute Car Oil Change Business	Caller stated that a business drains crank case oil. Caller also stated that the individual never saw a company come and pick up the used oil. The business is piping the used oil into the Hackensack River immediately behind the property down low into the river bed.	U.S. Coast Guard 2017. Incident # 1085639
Hackensack River	6/8/2015	United Water	Caller stated that an unknown sheen from unknown source was discovered in the river below the dam.	U.S. Coast Guard 2017. Incident # 1119030
Hackensack River	6/11/2015	PSE&G	Oil sheen 4ft by 4ft in excavation pit near Marion Dock inside of sea wall. Cleanup in progress.	NJDEP 2017. Incident # 560988
Hackensack River	1/9/2017	Unknown	Report of a tractor trailer that over turned and spilled. 5000 gallons on board amount unknown currently being transferred to another trailer.	NJDEP 2017. Incident # 627646
Hackensack River	2/3/2017	Unknown	Caller reporting a white sudsy foam on the water along the shoreline near the walkway.	NJDEP 2017. Incident # 630059
Hackensack River	4/14/2017	PSE&G Fossil	PI # 005301. Caller is reporting a historic spill was located during construction. Cleanup is pending.	NJDEP 2017. Incident # 636424
Kill van Kull	unknown	Texaco/Texas Oil Company	30,000 - 40,000 gallons of gasoline spilled from a Texaco tanker to the Kill van Kull. (Date not known).	Tierra 2006
Kill van Kull	10/24/69- 8/25/70, 6/4/1979	General Cable	Criminal charges filed in U.S. District Court related to the unlawful discharge of oil and grease refuse into the Kill van Kull on 5 different occasions between 10/24/69 and 8/25/70. On June 4, 1979, 1000 gallons of wire drawing solution overflowed to the storm sewer and through the wastewater monitoring station creating a discharge to the Kill van Kull that was white in appearance.	Tierra 2006

Table C-4
Significant Spills that have Occurred in the NBSA

Subject Waterway	Dates	Facility / Vessel	Documented Discharge to Newark Bay and/or Tributary[1]	References
Kill van Kull	2/13/70-11/60/70, 7/1980, 1/87, 1987, 1989, 1990	Dow Chemicals Company	Company charged criminally in U.S. District Court for 15 counts of unlawful discharges of acid refuse and alkaline refuse occurring between 2/13/70 and 11/60/70. In January 1987, 547000 gallons of caustic soda were spilled to the ground and to the Kill van Kull. In July of 1980, approximately 360,000 gallons of ethylene glycol and diethylene glycol were discharged to the soil and the Kill van Kull. In 1987, The company was cited for violation of state law by failing to place a dike around a tank, resulting in 500,000 gallons of corrosive lye spilling into the Kill van Kull. In December of 1989, a spill of raw fatty acid to surface water occurred. in 1990, approximately 47,000 gallons of zirconium oxychloride was spilled to the Kill van Kull. In December of 1991, perchloroethylene was spilled from a loading pipe at Tank 16.	Tierra 2006
Kill van Kull	8/10/1970, 1975-1981	Texaco/Texas Oil Company	On February 4, 1972, Texaco was convicted of the unlawful discharge of gasoline refuse into Newark Bay On 8/10/70. From July 1975 to December of 1981, the United States Coast Guard cleaned up at least 9 spills from this site to the Newark Bay and Kill van Kull.	Tierra 2006
Kill van Kull	9/22/1972	ExxonMobil	2,100 gallons of wax (Me Feed) was spilled on Pier 1 Kill van Kull Waterway.	Geraghty & Miller 1994b
Kill van Kull	11/23/1976	ExxonMobil	147 gallons of No. 2 fuel oil were spilt to the Kill van Kull waterway or Upper New York Bay.	Geraghty & Miller 1994b
Kill van Kull	1977, 1980	Kenrich Petrochemical Company	An accidental chemical reaction occurred causing burning chemicals to shoot into the air. A series of small explosions occurred in a mixing vat after petroleum resin flakes were added to a too hot hydrocarbon mixture.	Tierra 2006
Kill van Kull	6/28/1978	ExxonMobil	670 gallons of waste oil spilled to the Kill van Kull waterway	Geraghty & Miller 1994b
Kill van Kull	7/13/1978	ExxonMobil	168 gallons of diesel were spilled to the Kill van Kull waterway or Upper New York Bay.	Geraghty & Miller 1994b
Kill van Kull	10/10/1978	ExxonMobil	630 gallons of asphalt spilt were spilled to the Kill van Kull waterway or Upper New York Bay.	Geraghty & Miller 1994b
Kill van Kull	12/25/1978	ExxonMobil	210 gallons of bunker fuel oil were spilled to the Kill van Kull waterway or Upper New York Bay.	Geraghty & Miller 1994b
Kill van Kull	10/30/1979	ExxonMobil	Between 1,050 to 2,100 gallons of heavy fuel oil were spilled to the Kill van Kull waterway.	Geraghty & Miller 1994b
Kill van Kull	11/15/1979	ExxonMobil	More than 672 gallons of emulsion flux were spilled into the Kill van Kull waterway.	Geraghty & Miller 1994b
Kill van Kull	5/1984, 11/1987	Gordon Terminal Service	May 1984, 4000 gallons of 1,1,1 trichloroethane to Kill van Kull. November 1987, a major fire on site released significant amounts of petroleum hydrocarbons, ethylene glycol, polyethylene, and green dye to the Kill van Kull.	Tierra 2006
Kill van Kull	6/4/1989	ExxonMobil	840 gallons of fuel oil were spilled on Pier 1 Kill van Kull waterway.	Geraghty & Miller 1994b
Kill van Kull	2/9/1990	ExxonMobil	20,000 gallons of No. 2 fuel oil were spilled on Pier 7, Kill van Kull.	Geraghty & Miller 1994b
Kill van Kull	2/28/1990, 3/1/90	ExxonMobil	Barge owned by Eklof leaked 30,000 gal. of intermediate-grade heating oil. Barge was loaded at Exxon's Bayonne storage facility. Spill of 2,400 gal. at facility during unloading of Texaco barge.	Geraghty & Miller 1994b
Kill van Kull	6/8/1990	BT Nautilus - Oil Barge	Tanker spilled more than 260,000 gal. of No. 6 oil into the Kill van Kull. Barge was attempting to dock at Coastal Oil terminal in Bayonne.	Tierra 2006
Kill van Kull	1/7/2006	IMTT	Reporting a release of materials into the Kill van Kull.	U.S. Coast Guard 2017. Incident # 784527

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Significant Spills that have Occurred in the NBSA

Subject Waterway	Dates	Facility / Vessel	Documented Discharge to Newark Bay and/or Tributary[1]	References
Kill van Kull	1/15/2006	IMTT	The caller stated that a cargo transfer hole had a small pinhole leak, resulting in a spill of gasoline	U.S. Coast Guard 2017. Incident # 785236
Kill van Kull	1/17/2006	Unknown	While transferring product from the shore to the ship material released from the hose into the water.	U.S. Coast Guard 2017. Incident # 785454
Kill van Kull	2/13/2006	IMTT	The material released from a hose on the pier due to pressure on the hose.	U.S. Coast Guard 2017. Incident # 787942
Kill van Kull	3/3/2006	Reinauer Transportation Company	Caller reporting a tug boat was transferring fuel on board when due to operator error material was pumped overboard.	U.S. Coast Guard 2017. Incident # 789809
Kill van Kull	3/8/2006	IMTT	Caller is reporting a material release from a hose attached to the pier possibly due to equipment failure. Hose was discovered dripping material.	U.S. Coast Guard 2017. Incident # 790267
Kill van Kull	3/13/2006	IMTT	Caller stated there was a release of materials from a hose that was connected to a slop tank.	U.S. Coast Guard 2017. Incident # 790694
Kill van Kull	3/23/2006	American Petro and Transport	Reporting a release of materials into Kill van Kull from a vessel due to unknown causes. Oil: diesel.	U.S. Coast Guard 2017. Incident # 791793
Kill van Kull	5/8/2006	Moran Towing	Reporting a release of materials into Kill van Kull from a vessel due to equipment failure.	U.S. Coast Guard 2017. Incident # 796513
Kill van Kull	6/15/2006	IMTT	Caller is reporting a release of lubricating oil from a hose on the mobile pier due to the hose failing when bringing it back to shore from a tug.	U.S. Coast Guard 2017. Incident # 800723
Kill van Kull	6/29/2006	IMTT	Caller stated there was a release of materials from a hose due to an operator error. This occurred before a transfer was to take place.	U.S. Coast Guard 2017. Incident # 802430
Kill van Kull	7/11/2006	IMTT	Caller stated there was a release of materials from a hose on a dock due to equipment failure.	U.S. Coast Guard 2017. Incident # 803737
Kill van Kull	7/31/2006	Bouchard Transportation	The caller stated that a heating unit overflowed some product from it. The material went onto the dock and into the water.	U.S. Coast Guard 2017. Incident # 806148
Kill van Kull	8/1/2006	IMTT	Caller stated there was a release of materials from a bonnet on a 12" cargo pipeline due to equipment failure at a port facility.	U.S. Coast Guard 2017. Incident # 806327
Kill van Kull	8/13/2006	K-Sea Transportation Corp.	Reporting a release of materials into the Kill van Kull river from a fuel tank on a vessel due to overfill of the tank.	U.S. Coast Guard 2017. Incident # 807673
Kill van Kull	9/1/2006	IMTT	Caller is reporting a release of # 6 oil from a pipeline due to a leaky flange on a valve.	U.S. Coast Guard 2017. Incident # 809961
Kill van Kull	9/8/2006	IMTT	Caller stated there was a spill of materials from the hose on a vacuum truck due to an equipment failure. Caller stated the materials went into the Kill van Kull.	U.S. Coast Guard 2017. Incident # 810777
Kill van Kull	9/18/2006	Unknown	Caller is reporting a material release from a tug boat due to an overload while taking on fuel. Caller does not know what caused the overload at this time.	U.S. Coast Guard 2017. Incident # 811754

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Significant Spills that have Occurred in the NBSA

Subject Waterway	Dates	Facility / Vessel	Documented Discharge to Newark Bay and/or Tributary[1]	References
Kill van Kull	11/6/2006	Kens Booming and Boat Service	The caller is reporting a potential release of materials into the Kill van Kull river from a vessel due to the vessel sinking.	U.S. Coast Guard 2017. Incident # 817342
Kill van Kull	11/11/2006	IMTT	The caller is reporting a release of materials into the Kill van Kull from a hose due to equipment failure.	U.S. Coast Guard 2017. Incident # 817884
Kill van Kull	1/22/2007	K-Sea Transportation Corp.	Caller is reporting the tug Odin was loading lube oil and oil came out of the vent and in to water. Cause of oil discharge is unknown at this time.	U.S. Coast Guard 2017. Incident # 824315
Kill van Kull	2/20/2007	IMTT	The caller stated that a sheen was found in the water which led to the finding of a leaking transfer line. The cause of the leak is unknown at this time.	U.S. Coast Guard 2017. Incident # 826965
Kill van Kull	2/20/2007	IMTT	The caller states that a leaky flange on a loading arm caused a discharge of Number Six fuel oil onto the dock and into the Kill van Kull waterway.	U.S. Coast Guard 2017. Incident # 827029
Kill van Kull	3/14/2007	IMTT	Caller reported the dockman Discovered Number 2 oil in the containment boom around Pier 7 Berth 4. The material spilled due to a leaking valve on an oil line near the dock.	U.S. Coast Guard 2017. Incident # 829109
Kill van Kull	3/14/2007	Morania Oil Tankers, Inc.	Caller reported while approaching the dock, a sheen was sighted on the water near the bow. After docking material was found on the water again. The sheen dissipated. The vessel was checked for any water in the tanks and in the double bottom. No water was found in either compartment. Soon after, another sheen was found near Bulkhead Number 1 and 2. Caller believes there may be a stress crack in the rub rail (cargo).	U.S. Coast Guard 2017. Incident # 829161
Kill van Kull	3/14/2007	Penn Maritime	Caller stated there is a spill of material from a barge in the Kill van Kull due to equipment failure on the barge.	U.S. Coast Guard 2017. Incident # 829163
Kill van Kull	3/26/2007	IMTT	Caller stated there was a release of materials from the boom crane on the dock due to the hydraulic line leaking.	U.S. Coast Guard 2017. Incident # 830381
Kill van Kull	4/8/2007	Allied Towing	Caller is reporting that a bucket of residual number six fuel oil was accidently knocked over on the Allied barge Erin. It is unknown how much spilled on the deck of the barge, but approximately one pint entered the Kill van Kull waterway.	U.S. Coast Guard 2017. Incident # 831628
Kill van Kull	4/30/2007	IMTT	Caller is reporting that they were taking on lubricating oil and the tank on the tug boat was overfilled.	U.S. Coast Guard 2017. Incident # 833854
Kill van Kull	5/11/2007	Unknown	The caller Is reporting an unknown sheen in the Kill van Kull. The sheen is coming from west of pier #8.	U.S. Coast Guard 2017. Incident # 835021
Kill van Kull	5/31/2007	IMTT	Caller stated there was a release of materials from a slop pan due to there being pressure on the line.	U.S. Coast Guard 2017. Incident # 837037
Kill van Kull	7/31/2007	IMTT	Caller is reporting that hydraulic oil released from a hydraulic arm on Pier One into the water due to equipment problems.	U.S. Coast Guard 2017. Incident # 843966
Kill van Kull	7/31/2007	IMTT	Caller stated there was a spill of materials from hose on the dock that was being disconnected from the barge.	U.S. Coast Guard 2017. Incident # 843982
Kill van Kull	8/11/2007	Moran Towing	The caller is reporting a release of materials into the Kill van Kull from a vessel due to unknown causes.	U.S. Coast Guard 2017. Incident # 845267

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Significant Spills that have Occurred in the NBSA

Subject Waterway	Dates	Facility / Vessel	Documented Discharge to Newark Bay and/or Tributary[1]	References
Kill van Kull	8/22/2007	Unknown	Caller is reporting an unknown sheen in the Kill van Kull waterway. Caller states that the sheen is near an oil tanker, ID # Dbl22Y, and the sheen is on the hull of the vessel.	U.S. Coast Guard 2017. Incident # 846463
Kill van Kull	9/8/2007	K-Sea Transportation Corp.	Caller is reporting a discharge of #6 fuel oil from a barge due to overflow of the tank from unknown causes.	U.S. Coast Guard 2017. Incident # 848200
Kill van Kull	9/18/2007	IMTT	Caller stated due to equipment failure there was a spill of materials from a pier line at the facility.	U.S. Coast Guard 2017. Incident # 849190
Kill van Kull	11/14/2007	Unknown	Caller is reporting a black sheen with beige-colored bilge spots in the Kill van Kull.	U.S. Coast Guard 2017. Incident # 854580
Kill van Kull	12/9/2007	Greater New York	Caller is reporting a discharge of #2 fuel oil from a barge due to overfilling a tank.	U.S. Coast Guard 2017. Incident # 856692
Kill van Kull	12/18/2007	KC Transportation	Caller stated there was a spill of materials from a barge into the water due to unknown causes.	U.S. Coast Guard 2017. Incident # 857522
Kill van Kull	12/18/2007	K-Sea Transportation Corp.	Caller reported that the tank barge "Essex" was loading fuel oil and had a spill on the deck due to oil leaking out of the #1 cargo pump.	U.S. Coast Guard 2017. Incident # 857519
Kill van Kull	1/25/2008	Unknown	Rafinate (a blending stock for mixing gasoline) has spilled into the Kill van Kull from a dock transfer hose.	U.S. Coast Guard 2017. Incident # 860589
Kill van Kull	2/15/2008	Interocean American Shipping Corporation	Caller is reporting a discharge of hydraulic oil due to a leaky fitting caused by vibration.	U.S. Coast Guard 2017. Incident # 862485
Kill van Kull	4/21/2008	IMTT	Caller is reporting that there was high pressure in a hose that was laying on the pier which caused a leak of heptane.	U.S. Coast Guard 2017. Incident # 868621
Kill van Kull	4/24/2008	Hess Corp.	Caller stated due to equipment failure on the oil separator there was a sheen discovered on the facility's outfall which goes to the Kill van Kull. Caller stated the discharge to materials to the outfall is part of the facility's normal operations.	U.S. Coast Guard 2017. Incident # 868911
Kill van Kull	9/8/2008	Unknown	Caller stated there was a spill of materials while fueling a tug boat at the facility. Caller does not know what caused the spill of materials at this time.	U.S. Coast Guard 2017. Incident # 883128
Kill van Kull	9/16/2008	IMTT	Caller is reporting a discharge of diesel fuel from a product hose due to pressure in the hose caused the product to spill out.	U.S. Coast Guard 2017. Incident # 884054
Kill van Kull	11/18/2008	IMTT	Caller reported that the slop line on the pier leaked a mixture of No. 2 and No. 6 oil into the Kill van Kull River.	U.S. Coast Guard 2017. Incident # 890355
Kill van Kull	12/24/2008	IMTT	Caller reported while passing a hose over the water from the facility to a barge heating oil released into the water. This was due to a loose blank on a hose.	U.S. Coast Guard 2017. Incident # 893272
Kill van Kull	1/24/2009	IMTT	Caller reporting a frozen line was being freed up, when there was a spill of material into the Kill van Kull. The spill was in a contained area.	U.S. Coast Guard 2017. Incident # 895738
Kill van Kull	1/26/2009	K-Sea Transportation Corp.	The caller stated that an overfill occurred when fueling the tug vessel "Taurus." Absorbents and booms are being used in cleanup.	U.S. Coast Guard 2017. Incident # 895840

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Significant Spills that have Occurred in the NBSA

Subject Waterway	Dates	Facility / Vessel	Documented Discharge to Newark Bay and/or Tributary[1]	References
Kill van Kull	2/26/2009	IMTT	Number two fuel oil has spilled into the Kill van Kull from a leaking flange on a pier pipeline.	U.S. Coast Guard 2017. Incident # 898527
Kill van Kull	4/21/2009	IMTT	Caller reported that while contractors were changing hoses, a hose discharged paramin (lube oil additive) into a spill pan which overflowed into Kill van Kull.	U.S. Coast Guard 2017. Incident # 903363
Kill van Kull	5/28/2009	Weeks Marine	Caller reported an excavator on a barge broke a hydraulic line and spilled materials into the water.	U.S. Coast Guard 2017. Incident # 906914
Kill van Kull	5/31/2009	IMTT	Caller is reporting a spill of number six fuel oil from a cargo hose due to operator error. Caller states the material was spilled when the hose was disconnected from the station.	U.S. Coast Guard 2017. Incident # 907143
Kill van Kull	6/5/2009	Donjon Marine	Caller is reporting a discharge due to a fuel compartment being overflowed during the fueling of the tug.	U.S. Coast Guard 2017. Incident # 907719
Kill van Kull	6/23/2009	Weeks Marine	Caller stated due to equipment failure there was a spill of materials from a Cat 385 excavator at a construction site. Caller stated hydraulic oil spilled into the Kill van Kull.	U.S. Coast Guard 2017. Incident # 909449
Kill van Kull	9/14/2009	IMTT	Caller is reporting a discharge of #2 oil from an 8-inch steel pipeline due to an equipment failure (leak).	U.S. Coast Guard 2017. Incident # 917745
Kill van Kull	9/24/2009	McAllister Towing	Caller is reporting a discharge of hydraulic oil from the vessel due to equipment failure. Hydraulic oil.	U.S. Coast Guard 2017. Incident # 918723
Kill van Kull	10/31/2009	K-Sea Transportation Corp.	Caller stated due to operator error there was a spill of materials from a tug boat while refueling. The caller stated the tank was overflowed. This resulted in a spill of diesel fuel into the Kill van Kull and a sheen.	U.S. Coast Guard 2017. Incident # 922194
Kill van Kull	11/16/2009	ExxonMobil	Caller is reporting that contaminated land seeped through the head of the pier causing an oil sheen in Kill van Kull.	U.S. Coast Guard 2017. Incident # 923764
Kill van Kull	12/7/2009	Weeks Marine Inc.	Caller is reporting that a diesel pump (weighing approx. 3000 pounds) fell off of a barge into the Kill van Kull. Caller stated the pump was being transferred from one barge to another.	U.S. Coast Guard 2017. Incident # 925509
Kill van Kull	2/24/2010	K-Sea Transportation Corp.	Caller is reporting that while in the process of transferring fuel to the tug "Volunteer" they discovered fuel discharging form the ballast tank due to equipment failure.	U.S. Coast Guard 2017. Incident # 932246
Kill van Kull	4/28/2010	Great Lakes Dredge & Dock Company	Release of material from a vessel due to a hydraulic hose that ruptured.	U.S. Coast Guard 2017. Incident # 938502
Kill van Kull	6/3/2010	IMTT	Caller is reporting a discharge from a slop line that created a sheen on the Kill van Kull.	U.S. Coast Guard 2017. Incident # 942693
Kill van Kull	6/18/2010	IMTT	Caller is reporting the discharge of No 2 oil from a pipeline into the Kill van Kull. Cause is unknown at this time. Cleanup is underway, but source is not secured.	U.S. Coast Guard 2017. Incident # 944580
Kill van Kull	8/21/2010	KT Marine	Caller stated due to a leak in the steering line on a tug boat there was a spill of hydraulic fluid. Caller stated this was a chartered tugboat.	U.S. Coast Guard 2017. Incident # 951653
Kill van Kull	8/29/2010	IMTT	Release of material from a dock crane due to a leaking hydraulic line.	U.S. Coast Guard 2017. Incident # 952407

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Significant Spills that have Occurred in the NBSA

Subject Waterway	Dates	Facility / Vessel	Documented Discharge to Newark Bay and/or Tributary[1]	References
Kill van Kull	9/7/2010	Eletson Corp.	Caller is reporting that up to 1 barrel of fuel oil discharged from the ballast tank due to unknown causes.	U.S. Coast Guard 2017. Incident # 953256
Kill van Kull	9/7/2010	Hess Corp.	Caller is reporting a mystery Sheen. Caller stated that the discharge is possibly from there vessel but that has not been determined at this time.	U.S. Coast Guard 2017. Incident # 953255
Kill van Kull	9/27/2010	Gordon Terminal	Caller is reporting there was a storage tank that was loading a barge and there was a discharge of Number 6 oil near the connection area. Caller stated material went into containment and into the waterway.	U.S. Coast Guard 2017. Incident # 955273
Kill van Kull	9/27/2010	Gordon Terminal Service	Caller stated there is a spill of materials on the water coming from a neighboring business.	U.S. Coast Guard 2017. Incident # 955275
Kill van Kull	9/27/2010	Gordon Terminal Service	Caller stated there is a spill in the water next to their tanker barge vessel in the Kill van Kull.	U.S. Coast Guard 2017. Incident # 955279
Kill van Kull	9/27/2010	K-Sea Transportation Corp.	Caller stated due to equipment failure there was a spill of materials from a tank barge vessel on the Kill van Kull. Caller stated there is a leaky hydraulic valve on the deck of the vessel.	U.S. Coast Guard 2017. Incident # 955242
Kill van Kull	10/4/2010	IMTT	Caller is reporting a discharge of hydraulic oil from an actuator valve.	U.S. Coast Guard 2017. Incident # 956005
Kill van Kull	10/23/2010	ExxonMobil	Remediation work being done on Pier 7 has caused a sheen in the water.	U.S. Coast Guard 2017. Incident # 957840
Kill van Kull	11/16/2010	Unknown	A mystery sheen was discovered in the Kill van Kull near Brady Dock in Bayonne.	U.S. Coast Guard 2017. Incident # 959977
Kill van Kull	11/18/2010	ExxonMobil	Caller stated due to historical seepage unknown oil/product is releasing to the surface of the Kill van Kull.	U.S. Coast Guard 2017. Incident # 960191
Kill van Kull	11/23/2010	KC Transportation	Caller is reporting a discharge of #6 fuel oil from the barge deck due to operator error during a loading operation.	U.S. Coast Guard 2017. Incident # 960615
Kill van Kull	12/7/2010	IMTT	Caller is reporting a discharge of #6 oil from an outfall pipe in their treatment plant due to an equipment failure (leak).	U.S. Coast Guard 2017. Incident # 961603
Kill van Kull	12/21/2010	IMTT	Caller stated while loading a barge, the vapor hose from the pier leaked hydraulic oil onto the barge and into the water.	U.S. Coast Guard 2017. Incident # 962859
Kill van Kull	1/7/2011	IMTT	Caller is reporting a spill hydraulic fluid due to equipment failure of a hose.	U.S. Coast Guard 2017. Incident # 963974
Kill van Kull	3/5/2011	IMTT	Caller states that a disconnected cargo hose released diesel fuel into the water.	U.S. Coast Guard 2017. Incident # 969268
Kill van Kull	10/27/2011	IMTT	Caller stated due to maintenance on a pipeline there was a spill of low sulphur diesel.	U.S. Coast Guard 2017. Incident # 993743
Kill van Kull	11/1/2011	Unknown	The caller stated that the tug Beth McAllister was taking on fuel and a broken flange has caused a spill. It is unknown if any water was impacted.	U.S. Coast Guard 2017. Incident # 994262

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Significant Spills that have Occurred in the NBSA

Subject Waterway	Dates	Facility / Vessel	Documented Discharge to Newark Bay and/or Tributary[1]	References
Kill van Kull	12/16/2011	Unknown	Caller is reporting an unknown sheen in the water. Sheen appears to be originating from ship docks.	U.S. Coast Guard 2017. Incident # 998324
Kill van Kull	5/3/2012	IMTT	Caller stated that there was a release of an unknown amount of a mixture of heating oil and fuel oil from a pipe at the facility, the cause is unknown.	U.S. Coast Guard 2017. Incident # 1010433
Kill van Kull	6/29/2012	Gordon Terminal Service	Caller stated due to operator error while removing a plug on a line there was a spill of residual number six oil into the Kill van Kull.	U.S. Coast Guard 2017. Incident # 1016132
Kill van Kull	8/9/2012	Kirby Offshore Marine	Vessel was taking on fuel in forward fuel tanks. Port forward fuel tank burped and discharged oil in water.	U.S. Coast Guard 2017. Incident # 1020463
Kill van Kull	10/2/2012	IMTT	Caller stated while changing a valve on a piping on the pier there was a spill of number six oil into the Kill van Kull.	U.S. Coast Guard 2017. Incident # 1026227
Kill van Kull	10/5/2012	IMTT	Caller is reporting a discharge of 1 pint of diesel fuel from a hose that was being disconnected from a tug after the fueling operations. Caller Also stated that the fuel had some product in it and may still have been under pressure.	U.S. Coast Guard 2017. Incident # 1026574
Kill van Kull	10/11/2012	IMTT	Caller stated there was a spill of gasoline due to a leaking hose from the dock.	U.S. Coast Guard 2017. Incident # 1026982
Kill van Kull	10/30/2012	Hess Corp.	Caller is reporting a discharge of #2 oil from a 10-inch pipeline (dock line) due to a small bypass plug that failed.	U.S. Coast Guard 2017. Incident # 1028776
Kill van Kull	10/30/2012	IMTT	Caller stated that while a USCG survey was being conducted there was a discovery of an oil pan on Pier 4 that had filled with water, allowing an unknown amount of oil to be discharged into the Kill van Kull.	U.S. Coast Guard 2017. Incident # 1028827
Kill van Kull	12/15/2012	Unknown	Caller is reporting that there was a spill of material overnight and his vessels and docks and shoreline was oiled.	U.S. Coast Guard 2017. Incident # 1033326
Kill van Kull	2/8/2013	Unknown	Caller stated that a 55-gallon drum is dripping into the water and has been punctured. The drum is leaving a small sheen on the surface. The deckhand was able to secure the drum against their barge so that it does not drift away. Caller stated that they placed an oil sweep around it.	U.S. Coast Guard 2017. Incident # 1037927
Kill van Kull	2/28/2013	IMTT	A ship on Pier A had a faulty hose connection resulting in a release of gasoline to the water.	U.S. Coast Guard 2017. Incident # 1039664
Kill van Kull	3/4/2013	IMTT	Caller stated that there was a slop line that let go under the pier and discharged an unknown amount of unknown oil into the water. Caller stated that the line is a mix of different products but did not know what products.	U.S. Coast Guard 2017. Incident # 1040062
Kill van Kull	3/15/2013	Unknown	Caller stated that a barge at Pier 6 had a compartment that overflowed material into the water due to unknown causes.	U.S. Coast Guard 2017. Incident # 1041106
Kill van Kull	4/10/2013	IMTT	Caller is reporting a discharge of slop oil from a leaking 4" pipeline.	U.S. Coast Guard 2017. Incident # 1043567
Kill van Kull	4/10/2013	IT Fuel Storage Facility	Caller is reporting a discharge of slop oil from a leaking 4" pipeline.	U.S. Coast Guard 2017. Incident # 1043567

Table C-4
Significant Spills that have Occurred in the NBSA

Subject Waterway	Dates	Facility / Vessel	Documented Discharge to Newark Bay and/or Tributary[1]	References
Kill van Kull	4/11/2013	Unknown	Caller is reporting an unknown sheen from an unknown source on the Kill van Kull. The sheen is 600 yards across and 50-100 feet wide.	U.S. Coast Guard 2017. Incident # 1043612
Kill van Kull	4/11/2013	Unknown	Caller is reporting an unknown sheen from an unknown source. in the Kill van Kull. Sheen size is 600 yards by 50 to 100 feet wide.	NJDEP 2017. Incident # 467604
Kill van Kull	5/6/2013	Unknown	The caller is reporting a sheen discovered on Kill van Kull river. The caller stated that source is unknown at this time.	U.S. Coast Guard 2017. Incident # 1046168
Kill van Kull	5/6/2013	Unknown	Reporting unknown sheen 500 ft x 100 ft in size.	NJDEP 2017. Incident # 471085
Kill van Kull	6/5/2013	Barge Double Skin 59	Spill due to broken pipe from the cargo heating system onboard the barge Double Skin 59, causing release on board and into water. Miller Environmental en route for cleanup.	NJDEP 2017. Incident # 476530
Kill van Kull	7/1/2013	Unknown	Caller stated an unknown sheen was discovered on the Kill van Kull.	U.S. Coast Guard 2017. Incident # 1052322
Kill van Kull	7/1/2013	Unknown	An unknown sheen was discovered in the Kill van Kull and reported to the NRC.	NJDEP 2017. Incident # 480978
Kill van Kull	7/22/2013	IMTT-Bayonne	Caller stated that a #6 oil line had a leak, allowing approximately .5 pints of #6 diesel oil into the Kill van Kull.	U.S. Coast Guard 2017. Incident # 1054640
Kill van Kull	8/3/2013	IMTT-Bayonne	Report that unk oil sprayed unk quantity from a broken flange on surface of Pier 6. Release is secured. Unk if vessel. Cleanup is in process.	NJDEP 2017. Incident # 485166
Kill van Kull	8/14/2013	IMTT-Bayonne	Caller is reporting a discharge of biodiesel from a leaking hose.	U.S. Coast Guard 2017. Incident # 1057097
Kill van Kull	8/14/2013	IMTT	Barge was being filled and one of the compartments overflowed into the Kill van Kull. Cleanup in progress.	NJDEP 2017. Incident # 487085
Kill van Kull	8/19/2013	Unknown	Caller stated that they discovered an unknown sheen from an unknown source in the Kill van Kull.	U.S. Coast Guard 2017. Incident # 1057587
Kill van Kull	8/19/2013	Unknown	Caller large oil sheen in the water	NJDEP 2017. Incident # 487791
Kill van Kull	8/28/2013	Kirby Offshore Marine	Caller stated that there was a discharge of 42 gallons of number 6 fuel from a barge that had a gasket that blew out on the seal, some of the oil went into the water.	U.S. Coast Guard 2017. Incident # 1058532
Kill van Kull	8/28/2013	Kirby	Caller is reporting while loading a barge the gasket on the barge broke causing a discharge of #6 fuel oil.	U.S. Coast Guard 2017. Incident # 1058530
Kill van Kull	8/28/2013	Kirby Off-Shore Marine	Caller reporting oil spill from a barge due to failure on cargo pump. Remediation is currently underway on cargo pump. All the oil has already been boomed off, but is still in water.	NJDEP 2017. Incident # 489288
Kill van Kull	8/29/2013	Unknown	Caller is reporting an unknown sheen.	U.S. Coast Guard 2017. Incident # 1058566
Kill van Kull	9/13/2013	Unknown	Caller is reporting an unknown sheen from an unknown source. The sheen is visible as far as can be seen and it is rainbow in color and has some areas of product that looks like dirty oil. The material is fairly heavy at side berth at a natural collection point.	U.S. Coast Guard 2017. Incident # 1060047

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Significant Spills that have Occurred in the NBSA

Subject Waterway	Dates	Facility / Vessel	Documented Discharge to Newark Bay and/or Tributary[1]	References
Kill van Kull	9/13/2013	Unknown	Caller is reporting an unknown sheen from an unknown source that is impacting a barge and boom at the location. The materials came into the facility with the tide and it appears to be a heavy #6 oil. The sheen size was described as large.	U.S. Coast Guard 2017. Incident # 1060053
Kill van Kull	10/6/2013	Unknown	Caller reporting an unknown sheen, from unknown source at Pier 7 (facility IMTT).	U.S. Coast Guard 2017. Incident # 1062210
Kill van Kull	10/6/2013	Unknown Source	90 ft long by 5ft wide oil sheen in the water.	NJDEP 2017. Incident # 495288
Kill van Kull	11/26/2013	IMTT-Bayonne	Caller stated that their hydraulic crane on the pier had a fuel drops come out of the seal and discharged into the water.	U.S. Coast Guard 2017. Incident # 1066886
Kill van Kull	12/2/2013	Reinauer Transportation	Caller is reporting a diesel fuel spill from a stripping pipe.	U.S. Coast Guard 2017. Incident # 1067329
Kill van Kull	12/29/2013	Unknown	Caller is reporting an unknown sheen from an unknown source on the Kill van Kull. the sheen is stated to be spotty without a measurable length and width.	U.S. Coast Guard 2017. Incident # 1069637
Kill van Kull	12/29/2013	Unknown	Unknown sheen from an unknown source in the Kill van Kull. The sheen is stated to be spotty without measurable length and width. Clean up pending	NJDEP 2017. Incident # 504030
Kill van Kull	1/8/2014	IMTT	Barge was being filled and one of the compartments overflowed into the Kill van Kull. Cleanup in progress.	NJDEP 2017. Incident # 504675
Kill van Kull	1/16/2014	IMTT-Bayonne	Spill caused by an overflow on containment panel drain hose.	NJDEP 2017. Incident # 545215
Kill van Kull	2/16/2014	IMTT	Spill occurred during discharge of vessel due to leaking connection, cleanup in progress.	NJDEP 2017. Incident # 507546
Kill van Kull	2/27/2014	IMTT	Caller is reporting a release due to a leaking 4" line. Clean up is in progress.	NJDEP 2017. Incident # 508416
Kill van Kull	6/2/2014	IMTT	Fire department calling in spill of gas at least 4000 gals. 100 barrels. R/p filling tank caused overfill came out vent and caused spill in area of tank field.	NJDEP 2017. Incident # 519130
Kill van Kull	6/17/2014	Exxon Mobile	Calling to report spill from remediation system. Underground line leaked. There is an existing case number for area of concern. PI #005822. Cleanup pending.	NJDEP 2017. Incident # 521161
Kill van Kull	7/31/2014	Unknown	Reporting an unknown sheen in the Kill van Kull bay. Source is unknown.	NJDEP 2017. Incident # 526928
Kill van Kull	9/2/2014	Sterling Equipment	Caller reporting a spill of diesel fuel into the Kill van Kull river from RP's tugboat.	NJDEP 2017. Incident # 531056
Kill van Kull	9/25/2014	Vane Brothers	Caller is reporting that while loading a compartment in the barge. Loader failed to stop at a certain level and caused an overflow of oil # 6 to spill into the river. Spill is boomed in. Vessel is the DS 27.	NJDEP 2017. Incident # 534197
Kill van Kull	11/15/2014	Imtt-Bayonne	Reporting a leak from a storage tank. Has leaked 1000 barrels contained to facility. Non-emergent. Moving product to another tank. Cleanup in progress.	NJDEP 2017. Incident # 540217
Kill van Kull	11/22/2014	Unknown	A mystery silvery colored sheen, 2 meters long, was observed on the water from unknown source	NJDEP 2017. Incident # 540876
Kill van Kull	1/15/2015	IMTT	Hose leaked causing spill into Kill van Kull.	NJDEP 2017. Incident # 545043
Kill van Kull	1/22/2015	IMTT-Bayonne	Caller stated that a tug over flowed their compartment and released marine diesel fuel into the Kill van Kull river.	U.S. Coast Guard 2017. Incident # 1106299
Kill van Kull	1/22/2015	Emily Ann	Spill from overfill of vessel during refueling. Cleanup in progress.	NJDEP 2017. Incident # 545622
Kill van Kull	1/22/2015	Donjon Marine	Spill from overfill of refueling of vessel caused spill. Clean up complete. Ref case # 15-01-22-0910-22.	NJDEP 2017. Incident # 545631

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Significant Spills that have Occurred in the NBSA

Subject Waterway	Dates	Facility / Vessel	Documented Discharge to Newark Bay and/or Tributary[1]	References
Kill van Kull	2/26/2015	IMTT	Containment pan of manifold over flowed causing spill into the water. Booms are in place along with absorbents.	NJDEP 2017. Incident # 548379
Kill van Kull	3/9/2015	IMTT-Bayonne	Bio diesel discharged from a hose leak on the pier.	U.S. Coast Guard 2017. Incident # 1110045
Kill van Kull	3/9/2015	IMTT	Hose on pier leaked diesel fuel in the Kill van Kull. Cleanup in progress.	NJDEP 2017. Incident # 549196
Kill van Kull	4/16/2015	Kirby Offshore Marine	Caller is reporting a release of diesel fuel into the Kill van Kull from a towing vessel due to a transfer hose burping while disconnecting.	U.S. Coast Guard 2017. Incident # 1113820
Kill van Kull	4/21/2015	IMTT-Bayonne	Caller is reporting a discharge of methyl ethyl ketone from a loose flange on a line connected to a ship.	U.S. Coast Guard 2017. Incident # 1114313
Kill van Kull	4/21/2015	IMTT-Bayonne	Caller is reporting a discharge of methyl ethyl ketone from a loose flange on a line connected to a ship.	NJDEP 2017. Incident # 554342
Kill van Kull	5/19/2015	Vane Brothers	Caller stated while transferring diesel fuel to the day tank onboard the tug Red Hook, diesel fuel was noticed coming out of the vent of the vessel.	U.S. Coast Guard 2017. Incident # 1116999
Kill van Kull	6/15/2015	IMTT-Bayonne	Caller stated due to a potential rain overflow of a containment barrel at the facility there was a spill of mixture of gasoline and two oil into the water (Kill van Kull).	U.S. Coast Guard 2017. Incident # 1119769
Kill van Kull	6/15/2015	IMTT-Bayonne	Heavy rainwater caused overflow spills from containment area. Clean up in progress.	NJDEP 2017. Incident # 561148
Kill van Kull	6/21/2015	IMTT-Bayonne	Caller stated while discharging coal tar from the pier to a vessel, a leak occurred in a pipe on the pier and discharged material into the water.	U.S. Coast Guard 2017. Incident # 1120510
Kill van Kull	6/25/2015	IMTT-Bayonne	Caller is reporting a release of fuel oil due to a flange leak. Still under investigation.	U.S. Coast Guard 2017. Incident # 1120871
Kill van Kull	6/25/2015	IMTT-Bayonne	Spill due to flange leak. Repair crew en route. Booming in progress.	NJDEP 2017. Incident # 562740
Kill van Kull	7/7/2015	IMTT	Leak in line caused spill from bulk storage container to go into the Kill van Kull. Clean up in progress. Booms have been applied.	NJDEP 2017. Incident # 564257
Kill van Kull	7/30/2015	Unknown	Caller is reporting an unknown sheen from an unknown source in the Kill van Kull coming from the east.	U.S. Coast Guard 2017. Incident # 1124293
Kill van Kull	7/30/2015	Unknown	Caller reports an unknown sheen from an unknown source in the Kill van Kull coming from the east.	NJDEP 2017. Incident # 567139
Kill van Kull	8/1/2015	Vane Brothers	At 21:45 EDT, the barge "ds501" was pulling into the pier; which was missed. the vessel then struck another pier (A), damaging it. This resulted in all the lines breaking, while the c/t Isola Bianca was offloading. An unknown amount of six oil has discharged into Kill van Kull, and possibly #2 oil. No injuries reported. The RP provided limited information.	U.S. Coast Guard 2017. Incident # 1124516
Kill van Kull	8/1/2015	Vane Brothers - Barge DS 501	Report of a continuous spill of six oil due to barge DS501 hitting a pier, where ship 'Isola Bianca' was docked and discharging. The lines disconnected from the ship when the pier was struck. Team out now trying to contain the spill. Caller states a couple of 100 barrels - 24 gal. per barrel.	NJDEP 2017. Incident # 567425
Kill van Kull	9/6/2015	IMTT-Bayonne	Caller stated that a vac truck pipe connection leaked less than 1 pint of No. 2 oil into the Kill van Kull. Caller stated the connection is from the facility to the truck.	U.S. Coast Guard 2017. Incident # 1127724

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Significant Spills that have Occurred in the NBSA

Subject Waterway	Dates	Facility / Vessel	Documented Discharge to Newark Bay and/or Tributary[1]	References
Kill van Kull	10/6/2015	IMTT-Bayonne	Caller stated a fire pump malfunctioned released motor oil into the nearby river.	U.S. Coast Guard 2017. Incident # 1130206
Kill van Kull	10/6/2015	IMTT	Fire pump malfunctioned causing spill of oil into the Kill van Kull. Cleanup in progress.	NJDEP 2017. Incident # 575738
Kill van Kull	11/11/2015	IMTT	A storage tank containing caustic soda released product with in a concrete containment area at the facility. Cleanup pending.	NJDEP 2017. Incident # 579755
Kill van Kull	12/24/2015	Unknown	Caller is reporting an unknown sheen from an unknown source.	U.S. Coast Guard 2017. Incident # 1136598
Kill van Kull	12/24/2015	Unknown	NRC fax # 1136598. report of a 10' x 20' unknown sheen from an unknown source.	NJDEP 2017. Incident # 584110
Kill van Kull	12/29/2015	Unknown	Caller stated there is an unknown sheen from an unknown source in the vicinity of the pier.	U.S. Coast Guard 2017. Incident # 1136847
Kill van Kull	12/29/2015	Unknown	Caller is reporting an unknown sheen in the Kill van Kull river from an unknown source. This is in the vicinity of their piers.	U.S. Coast Guard 2017. Incident # 1136851
Kill van Kull	12/29/2015	Unknown	There is an unknown sheen from an unknown source in the vicinity of the pier.	NJDEP 2017. Incident # 584305
Kill van Kull	1/19/2016	Unknown	Caller is reporting an unknown sheen from an unknown source.	U.S. Coast Guard 2017. Incident # 1138445
Kill van Kull	2/4/2016	EQ	Caller stated that the boom boat was at Pier 4 East when the vessel blew an oil line causing the discharge of drive oil into the water. The discharge caused a sheen on the waters of the Kill van Kull channel.	U.S. Coast Guard 2017. Incident # 1139773
Kill van Kull	2/4/2016	E Q Corp	Boom boat ruptured oil hose at site. Sheen observed 100 ft x 2 ft. Cleanup in progress.	NJDEP 2017. Incident # 588098
Kill van Kull	3/11/2016	Unknown	Caller is reporting an unknown sheen in the Kill van Kull and Hudson River from an unknown source.	U.S. Coast Guard 2017. Incident # 1142518
Kill van Kull	3/11/2016	Unknown	40-foot sheen in area of IMTT. Not coming from facility. Believed to have come in with the tide. Sweeps are being put in place.	NJDEP 2017. Incident # 592443
Kill van Kull	4/4/2016	IMTT Fuel Storage Facility	Hydraulic oil discharged from a capstan (part of the loading arm) on their pier due to an unknown cause at this time.	U.S. Coast Guard 2017. Incident # 1144434
Kill van Kull	4/4/2016	IMTT	Material leaked from capstan on Pier A. Repair and clean up in progress. Sweeps in place.	NJDEP 2017. Incident # 594738
Kill van Kull	4/7/2016	T/V Joan Turecamo- Moran Towning	The caller is reporting a discharge of diesel fuel due to the vessel's captain missing a connection and overflooding the vessel's compartment. The impact is Kill van Kull.	U.S. Coast Guard 2017. Incident # 1144710
Kill van Kull	4/7/2016	IMTT	Diesel fuel spill from a 3-inch hose contained by boom boat clean up in progress. two sheens 10x50 and 20x100. Bayonne Fire Dept. en route	NJDEP 2017. Incident # 595333
Kill van Kull	4/21/2016	Unknown	Unknown sheen sighting. Exact source of the sheen is unknown at this time.	U.S. Coast Guard 2017. Incident # 1145828
Kill van Kull	4/23/2016	Unknown	Caller is reporting the discovery of an unknown sheen from an unknown source in the water.	U.S. Coast Guard 2017. Incident # 1146013
Kill van Kull	4/23/2016	Unknown	Caller is reporting the discovery of an unknown sheen from unknown source.	NJDEP 2017. Incident # 597684

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Significant Spills that have Occurred in the NBSA

Subject Waterway	Dates	Facility / Vessel	Documented Discharge to Newark Bay and/or Tributary[1]	References
Kill van Kull	5/30/2016	Metropolitan Marine Transportation	Caller is reporting during an internal tank transfer on a tug vessel, an overflow occurred. This resulted in a discharge of diesel.	U.S. Coast Guard 2017. Incident # 1149157
Kill van Kull	6/4/2016	Unknown	Caller is reporting an unknown sheen in the Kill van Kull from an unknown source.	U.S. Coast Guard 2017. Incident # 1149728
Kill van Kull	6/4/2016	Unknown	NRC # 1149728 reported an unknown oil sheen from an unknown source.	NJDEP 2017. Incident # 603231
Kill van Kull	6/5/2016	Unknown	Caller is reporting an unknown sheen from an unknown source in the vicinity of their location.	U.S. Coast Guard 2017. Incident # 1149742
Kill van Kull	6/5/2016	Unknown	Sheen in the water.	NJDEP 2017. Incident # 603236
Kill van Kull	6/16/2016	Kirby Offshore Marine	Caller stated while final testing a hydraulic spill occurred from the rudder due to equipment failure.	U.S. Coast Guard 2017. Incident # 1150838
Kill van Kull	7/15/2016	IMTT	Caller reported that a swivel arm on discharge hose at pier 6 north had an equipment failure and leaked an unknown amount of product with 0.5 pints of alkylate into the water.	U.S. Coast Guard 2017. Incident # 1153431
Kill van Kull	8/23/2016	Unknown	Caller is reporting an unknown sheen from an unknown source in vicinity of facility.	U.S. Coast Guard 2017. Incident # 1157061
Kill van Kull	8/23/2016	IMTT	Caller reported a gas hose was not connected and pressure caused some gasoline to spill into the water.	U.S. Coast Guard 2017. Incident # 1157142
Kill van Kull	8/30/2016	Buckeye	An unknown oil discharged from a hose on the dock due to a flange leak.	U.S. Coast Guard 2017. Incident # 1157650
Kill van Kull	9/12/2016	Unknown	Caller stated an unknown sheen was discovered in the Kill van Kull.	U.S. Coast Guard 2017. Incident # 1158838
Kill van Kull	9/12/2016	Unknown	Caller reported a diesel fuel sheen around the tug Joan Moran. Unknown cause. Booms in place. Cleanup in progress.	NJDEP 2017. Incident # 615901
Kill van Kull	9/21/2016	Reinauer Transportation Company	Caller is reporting a spill of fuel from the tank vent of a tug vessel onto the deck and into the water.	U.S. Coast Guard 2017. Incident # 1159626
Kill van Kull	9/21/2016	Reinauer Transportation Company	Caller reporting a spill of fuel from the tank vent of a tug vessel onto the deck and into the water.	NJDEP 2017. Incident # 616908
Kill van Kull	10/17/2016	Unknown	Caller stated that they discovered an unknown sheen from an unknown source come in with the tide on the waters of Kill van Kull.	U.S. Coast Guard 2017. Incident # 1161758
Kill van Kull	10/17/2016	Unknown	Unknown sheen noticed at locations pier 7 cause and source is unknown. Booms applied around Pier 7 and absorbent sweeps are being deployed.	NJDEP 2017. Incident # 619665
Kill van Kull	10/21/2016	Weeks Marine	Caller is reporting while fueling a vessel, a discharge of diesel occurred. incident investigation and cleanup are underway.	U.S. Coast Guard 2017. Incident # 1162151
Kill van Kull	10/24/2016	Unknown	Caller stated that they discovered an unknown sheen from an unknown source on the waters of Kill van Kull that appear to be coming in with the tide.	U.S. Coast Guard 2017. Incident # 1162355
Kill van Kull	10/24/2016	Unknown	Report of an unknown sheen on the water that appears to be coming in with the tide. unknown size. Cleanup unknown.	NJDEP 2017. Incident # 620418

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Significant Spills that have Occurred in the NBSA

Subject Waterway	Dates	Facility / Vessel	Documented Discharge to Newark Bay and/or Tributary[1]	References
Kill van Kull	11/28/2016	Unknown	The RP is reporting a sheen on the waters of the Kill van Kull; source is currently unknown.	U.S. Coast Guard 2017. Incident # 1165070
Kill van Kull	11/28/2016	Unknown	Vessel Histria Gemma was unloading 6 oil and a sheen was noticed in the water next to the ship and outside of the boom. Cleanup in progress.	NJDEP 2017. Incident # 624133
Kill van Kull	11/30/2016	Unknown	Caller is reporting via third party of a sheen in the water. This was discovered during loading operation by a barge.	U.S. Coast Guard 2017. Incident # 1165232
Kill van Kull	12/9/2016	Unknown	Caller is reporting a release of ethyl acetate into the Kill van Kull from a vessel (M/V Sypress) that was offloading to shore when a third-party vessel (MSC Adelaide) created a wake in the channel which caused the disconnection of transfer hoses.	U.S. Coast Guard 2017. Incident # 1165969
Kill van Kull	12/9/2016	Unknown	Caller is reporting a release of ethyl acrylate into the Kill van Kull from a vessel (M/V Sypress) that was offloading to shore when a 3rd party vessel (MSC Adelaide) created a wake in the channel which caused the disconnection of transfer hoses. The material involved has been corrected to ethyl acrylate.	U.S. Coast Guard 2017. Incident # 1165981
Kill van Kull	12/9/2016	Unknown	Vessel MSC Adelaide caused vessel at pier to pull away causing release from broken lines and hoses. Cleanup in progress.	NJDEP 2017. Incident # 625291
Kill van Kull	12/13/2016	Unknown	Sheen noticed in the water no size avail.	NJDEP 2017. Incident # 625691
Kill van Kull	12/24/2016	Unknown	Calling to report small oil sheen in the NY Harbor. Unknown source.	NJDEP 2017. Incident # 626744
Kill van Kull	1/4/2017	IMTT	Caller reporting sheen in water. No information as to size or color available.	NJDEP 2017. Incident # 627364
Kill van Kull	2/5/2017	IMTT-Bayonne	Cargo hose dripped b99 (biodiesel) into waterway. No visible trace in water.	NJDEP 2017. Incident # 630181
Kill van Kull	2/12/2017	Moran Towing - M/V Brendan Turecamo	The RP is reporting a discharge of marine diesel due to a burp during fuel transfer. RP stated that while the engineer was fueling the day tanks aboard the M/V Brendan Turecamo there was a burp. The impact is the Kill van Kull.	U.S. Coast Guard 2017. Incident # 1170845
Kill van Kull	2/16/2017	Unknown	Caller is reporting an unknown sheen in the Kill van Kull from an unknown source in the vicinity of the Bayonne Bridge.	U.S. Coast Guard 2017. Incident # 1171182
Kill van Kull	2/23/2017	Unknown	Caller stated that they discovered an unknown sheen from an unknown source on the waters of Kill van Kull. Caller stated the facility grounds was check as a possible source; however, all possible discharge points on the facility are secure.	U.S. Coast Guard 2017. Incident # 1171742
Kill van Kull	3/9/2017	IMTT-Bayonne	Caller is reporting that a line on a vapor boom burst resulting in the discharge of hydraulic oil into the Kill van Kull.	U.S. Coast Guard 2017. Incident # 1172866
Kill van Kull	3/21/2017	Unknown	Caller reported unknown sheen from unknown source on the water next to Pier 6.	U.S. Coast Guard 2017. Incident # 1173786
Kill van Kull	4/13/2017	Unknown	Caller is reporting while offloading a ship, a leak in a hose was discovered. Leak resulted in a release of capric acid.	U.S. Coast Guard 2017. Incident # 1175664
Kill van Kull	4/13/2017	Unknown	Report of a spill due to a leak in a hose while offloading. clean up underway. Release contained.	NJDEP 2017. Incident # 636259
Morses Creek	5/2/2014	Phillips 66	Caller reported a small hole in the storm water diversion tank return line.	U.S. Coast Guard 2017. Incident # 1081568

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Significant Spills that have Occurred in the NBSA

Subject Waterway	Dates	Facility / Vessel	Documented Discharge to Newark Bay and/or Tributary[1]	References
Morses Creek	9/9/2015	Phillips 66	Caller is reporting a release of slop oil due to a pipe leak within the facility.	U.S. Coast Guard 2017. Incident # 1127950
Morses Creek	2/19/2016	Phillips 66	Caller is reporting the discovery of sheening of an unknown oil in Morses Creek due to a water main break from the process sewer.	U.S. Coast Guard 2017. Incident # 1140838
Morses Creek	6/29/2016	Phillips 66	Caller stated a light oil sheen was discovered beyond the dam of their facility from an unknown source.	U.S. Coast Guard 2017. Incident # 1152049
Morses Creek	6/29/2016	Phillips 66	Report spill of unknown size sheen coming from unknown source. Crews are out investigating area. Sheen has past first dam area, towards Arthur Kill.	NJDEP 2017. Incident # 606548
Newark Bay	1984	BP Oil	U.S. Coast Guard reported that 44,000 gal of bunker oil spilled due to a tank rupture.	Tierra 2006
Newark Bay	1/27/85, 12/2/85, 6/11/86, 9/5/86, 5/28/87, 3/22/90, 6/21/90, 10/17/90, 11/15/90, 3/15/92, 1/18/93, 9/21/95, 10/19/95.	Baker Castor Oil	Caustic cleaning oil / castor oil spill / caustic soda / soap spills of various sizes into Newark Bay.	Tierra 2006
Newark Bay	5/7/2005	Port Newark Container Terminal	Reporting a material release from the hydraulic system of a "spreader" on the shoreside entry crane due to equipment failure. Hydraulic oil.	U.S. Coast Guard 2017. Incident # 758025
Newark Bay	6/11/2005	Maher Terminals	Diesel fuel spilled onto the pavement and into the Elizabeth Channel from an overfilled crane. Oil: diesel.	U.S. Coast Guard 2017. Incident # 761793
Newark Bay	7/15/2005	M/V Goodsky	While preforming cargo operations it was discovered that Cargo Hold #4 had oil that leaked from an unknown source and dripped into the water. Oil, fuel: No. 2-D.	U.S. Coast Guard 2017. Incident # 765628
Newark Bay	7/27/2005	Unknown	Time unknown / caller passing on third hand party information of a HAZMAT spill in the Port of Newark. Unknown oil.	U.S. Coast Guard 2017. Incident # 766986
Newark Bay	7/31/2005	Unknown	Reporting a material release from a vessel due to unknown causes. Number 4 oil.	U.S. Coast Guard 2017. Incident # 767474
Newark Bay	10/2/2005	Mediterranean Shipping Company	The material released from the vessel due to unknown causes at this time. Oil, fuel: No. 2-D.	U.S. Coast Guard 2017. Incident # 774742
Newark Bay	6/8/2006	Unknown	Caller is reporting a material release discovery from a container vessel due to unknown causes. Caller states the vessel is sitting at Berth 60 in Port Elizabeth and continues to release an unknown oil into the water. Unknown oil.	U.S. Coast Guard 2017. Incident # 800012
Newark Bay	6/20/2006	Unknown	Caller stated an unknown sheen was discovered during an overflight. Unknown oil.	U.S. Coast Guard 2017. Incident # 801367
Newark Bay	9/5/2006	M/V Libra Corcovado	Caller states that an unknown sheen is seen around a foreign motor vessel in the Newark Bay, at Berth 51. Unknown oil.	U.S. Coast Guard 2017. Incident # 810298
Newark Bay	11/8/2006	Unknown	Caller stated an unknown sheen was discovered at Port Elizabeth from unknown sources next to their vessel. Unknown oil.	U.S. Coast Guard 2017. Incident # 817521
Newark Bay	12/22/2006	Unknown	The caller Is reporting a green substance that is in the water. Unknown oil.	U.S. Coast Guard 2017. Incident # 821833

Table C-4
Significant Spills that have Occurred in the NBSA

Subject Waterway	Dates	Facility / Vessel	Documented Discharge to Newark Bay and/or Tributary[1]	References
Newark Bay	1/24/2007	Unknown	The caller is reporting that the water in the Port of Newark/Newark Bay is neon green in color. The source of the material is unknown. Unknown material.	U.S. Coast Guard 2017. Incident # 824550
Newark Bay	3/10/2007	M/V Hoegh Berlin	Caller reported a sheen was found near the forward section of the vessel. There is a bow thruster in that area and could possibly be the source of the spill. There are also contractors working in the area. The source is unknown at the time of the call. Caller stated that the crew is investigating to see if they are the source. At the time of the call, the caller had limited information about the location of the incident.	U.S. Coast Guard 2017. Incident # 828753
Newark Bay	3/19/2007	Unknown	Caller stated there was an unknown sheen discovered in the Port of Elizabeth Bay near their vessel, a car carrier, the Hoegh Asia while the vessel was docked. Unknown oil.	U.S. Coast Guard 2017. Incident # 829610
Newark Bay	5/1/2007	Donjon Marine	Caller stated there was a release of materials from a salvaged vessel on a derrick barge due to the vessel shifting. Oil: diesel.	U.S. Coast Guard 2017. Incident # 833981
Newark Bay	5/24/2007	Donjon Marine	Caller reported the starboard pitch system had a hydraulic leak, which resulted in a discharge of material into the water. Hydraulic oil.	U.S. Coast Guard 2017. Incident # 836473
Newark Bay	6/13/2007	Donjon Marine	The caller states that the fuel tank on a tug boat overflowed discharging materials Into Port Newark Channel. The caller is unsure if the discharge occurred as a result of operator or equipment failure. Oil: diesel.	U.S. Coast Guard 2017. Incident # 838465
Newark Bay	6/27/2007	Allied Aviation	Caller is reporting a release of jet fuel from a tanker truck due to equipment failure (the 4-inch sensor line broke during a refueling process).	U.S. Coast Guard 2017. Incident # 840085
Newark Bay	7/25/2007	McAllister Towing	Caller is reporting a release of hydraulic oil from a release valve on a vessel due to a faulty valve. The release went onto the deck and the water. Hydraulic oil.	U.S. Coast Guard 2017. Incident # 843324
Newark Bay	9/6/2007	Moran Towing	Caller stated that he noticed a leak from his steering hose. As a result, material released into the water. It is unknown what caused the leak. Hydraulic oil.	U.S. Coast Guard 2017. Incident # 847992
Newark Bay	9/11/2007	Champion Pioneer	Caller is reporting a discharge of an unknown oil from the ship the Champion Pioneer due to unknown causes. The release went into the Newark Channel. Unknown oil.	U.S. Coast Guard 2017. Incident # 848539
Newark Bay	11/5/2007	Hoegh Autoliners	Caller Is reporting that a vessel (car carrier) had a discharge of hydraulic oil from a hydraulic line on a stern ramp due to unknown causes. Hydraulic oil.	U.S. Coast Guard 2017. Incident # 853602
Newark Bay	12/30/2007	Unknown	Caller is reporting a large unknown sheen from an unknown source. Unknown oil.	U.S. Coast Guard 2017. Incident # 858444
Newark Bay	12/30/2007	Unknown	Caller is reporting an unknown sheen on Newark Bay in Port Elizabeth, NJ. Sheen was discovered when vessel was moving from one berth to another. Unable to determine the source. Unknown oil.	U.S. Coast Guard 2017. Incident # 858436
Newark Bay	1/10/2008	Unknown	Caller stated a dump truck and a commercial truck had an accident at Port Newark. This incident resulted in the dump truck spilling materials onto the pier. Oil: diesel.	U.S. Coast Guard 2017. Incident # 859277
Newark Bay	1/24/2008	Atlantic Ship	Caller is reporting that the ship Orange Sun Vessel was backing out of the dock and backed into the dredge.	U.S. Coast Guard 2017. Incident # 860541
Newark Bay	2/26/2008	Unknown	Caller is reporting an unknown sheen on the surface of Newark Bay in Bayonne, NJ.	U.S. Coast Guard 2017. Incident # 863353

Table C-4
Significant Spills that have Occurred in the NBSA

Subject Waterway	Dates	Facility / Vessel	Documented Discharge to Newark Bay and/or Tributary[1]	References
Newark Bay	3/20/2008	Unknown	Caller stated there is a spill of material from the gas tank of a tractor trailer truck at the Newark Airport. The cause of the spill is unknown at this time. The materials spilled onto the ground and then into the Peripheral Ditch which leads to Newark Bay. Oil: diesel.	U.S. Coast Guard 2017. Incident # 865524
Newark Bay	3/31/2008	APM Terminals	Caller stated there was a release of diesel oil from a ship to shore gantry crane due to unknown causes. They believe that an alarm failed.	U.S. Coast Guard 2017. Incident # 866586
Newark Bay	4/2/2008	Dhonousfa	Caller is reporting a release of ballast water from a vessel due to an overboard discharge which happened by accident. The release went into the Newark Channel and Gilligan Street.	U.S. Coast Guard 2017. Incident # 866804
Newark Bay	5/15/2008	Port Newark Container Terminal	Caller reported while discharging cargo from a vessel a HAZMAT tank container started leaking from the valve onto the shrink piece (area where cargo is unloaded) and into the water. The cause of the leakage is unknown at this time. Dibutylphthalate.	U.S. Coast Guard 2017. Incident # 871031
Newark Bay	7/12/2008	North Star II Fisheries Inc.	Caller is reporting a discharge of material from a fishing vessel that is sitting on top of a barge. A valve to the fuel tank was open which filled the bilge causing a leak through the stern tube. Oil: diesel.	U.S. Coast Guard 2017. Incident # 877039
Newark Bay	7/24/2008	Amerada Hess	The caller reported that while discharging storm water in an unnamed creek, a sheen was noticed. The caller stated that the sheen might be coming from a historic spill. Oil, fuel: No. 2.	U.S. Coast Guard 2017. Incident # 878349
Newark Bay	8/17/2008	Great Lakes Dredge & Dock Company	Caller is reporting a discharge of hydraulic oil from a broken hydraulic hose on the boom of a back hoe dredge.	U.S. Coast Guard 2017. Incident # 880858
Newark Bay	8/27/2008	APM Terminals	A fuel delivery tanker was struck by a ship-to-shore crane. The crane tore a hole in the tanker's hull, resulting in a discharge of marine diesel fuel oil.	U.S. Coast Guard 2017. Incident # 881984
Newark Bay	8/27/2008	Unknown	Caller stated an unknown sheen was discovered during a helicopter overflight of the Newark Bay. Unknown oil.	U.S. Coast Guard 2017. Incident # 881939
Newark Bay	10/22/2008	Great Lakes Dredge & Dock Company	The caller stated that an excavator dredge had a valve leak causing a spill of hydraulic fluid in to the water. The release has been stopped and the material is being contained.	U.S. Coast Guard 2017. Incident # 887862
Newark Bay	2/11/2009	American Presidents Line	Caller is reporting a pinhole leak in the side plating of American Presidents Line, allowing a discharge of ship's fuel oil from the vessel into Newark Channel.	U.S. Coast Guard 2017. Incident # 897162
Newark Bay	2/11/2009	M/V Atl Malasia	The caller is reporting the discovery of a small fuel spill from the reporting party's vessel due to unknown causes. No actions have been taken at this time. Oil: diesel.	U.S. Coast Guard 2017. Incident # 897149
Newark Bay	6/10/2009	Unknown	Caller stated due to unknown causes there was a spill of materials from a barge into Newark Bay. Hydraulic oil.	U.S. Coast Guard 2017. Incident # 908159
Newark Bay	7/6/2009	M/V Stolt Capability	The caller is reporting that during testing of their firefighting equipment, an unknown amount of AFFF (aqueous film forming foam) was released into Newark Ship Channel. AFFF.	U.S. Coast Guard 2017. Incident # 910730
Newark Bay	2/13/2010	Unknown	United States Coast Guard received a report of an unknown sheen of about 1000 feet long in the vicinity of APM Terminal Port Elizabeth Pier 92. Unknown oil.	U.S. Coast Guard 2017. Incident # 931204
Newark Bay	2/24/2010	Unknown	Caller Is reporting an unknown sheen in the Arthur Kill river and Newark Bay from an unknown source. Unknown oil.	U.S. Coast Guard 2017. Incident # 932175

Table C-4
Significant Spills that have Occurred in the NBSA

Subject Waterway	Dates	Facility / Vessel	Documented Discharge to Newark Bay and/or Tributary[1]	References
Newark Bay	3/3/2010	Port Newark Container Terminal	Caller is reporting a discharge of hydraulic fluid from a hydraulic line to a shoreside crane (#9) due to a coupling failure. Hydraulic oil.	U.S. Coast Guard 2017. Incident # 932885
Newark Bay	4/15/2010	Donjon Marine	Caller reported one of the employees was doing maintenance and a pipe hit a valve that caused a spill of materials into the waterway. Oil, fuel: No. 2-D.	U.S. Coast Guard 2017. Incident # 937111
Newark Bay	6/29/2010	Marine Oil Service	A cargo tank on an 82' tanker was overfilled during transfer operation. Oil, misc.: lubricating.	U.S. Coast Guard 2017. Incident # 945949
Newark Bay	2/2/2011	Unknown	Caller states that there was an unknown sheen from an unknown source near the vessel "Champion Trader" Imo 9127667. Unknown oil.	U.S. Coast Guard 2017. Incident # 966392
Newark Bay	3/10/2011	M/V Atlantic Cartier	Caller is reporting there was hydraulic spill on the deck of the vessel at 1825. At 1940, a scupper broke and material was discharged into the water. Hydraulic oil.	U.S. Coast Guard 2017. Incident # 969764
Newark Bay	3/25/2011	Hess Corp.	Caller is reporting a release of diesel fuel during bunkering operations due to equipment failure of a pump. Oil: diesel.	U.S. Coast Guard 2017. Incident # 971195
Newark Bay	8/25/2011	Unknown	Caller is reporting an unknown sheen from an unknown source. Sheen was spotted during an overflight. Caller states the sheen was between green buoy and red buoy 5 and 3 In the Newark Bay. Unknown oil.	U.S. Coast Guard 2017. Incident # 987098
Newark Bay	1/9/2012	Unknown	Caller is reporting an unknown sheen that is possibly coming from a red barge that is anchored in Newark Bay. The sheen is rainbow and more blue-looking around the barge. Coast Guard overflight made initial observation. Unknown oil.	U.S. Coast Guard 2017. Incident # 999912
Newark Bay	3/18/2012	NOCC Atlantic	Caller stated there was a spill of materials from a vessel due to a hydraulic pipe that burst on the vessel. Hydraulic oil.	U.S. Coast Guard 2017. Incident # 1006090
Newark Bay	4/25/2012	Gasoline Delivery Truck	Caller is reporting that the gasoline delivery truck pipe broke and the material was spilling from the tanker truck into the water. The truck has about 2,000 gallons of gasoline as cargo. Gasoline: automotive (unleaded).	U.S. Coast Guard 2017. Incident # 1009602
Newark Bay	6/12/2012	Donjon Marine	Caller stated hydraulic oil released from the vessel into the water due to hose failure. Hydraulic oil.	U.S. Coast Guard 2017. Incident # 1014279
Newark Bay	8/10/2012	Unknown	Report of an unknown sheen in Port Elizabeth, sheen was described as fairly large by the original reporting party. Unknown oil.	U.S. Coast Guard 2017. Incident # 1020589
Newark Bay	10/19/2012	Unknown	Caller is reporting an unknown sheen from an unknown source that was reported by a third party in the area. The sheen was said to be fuel or oil of some kind. The sheen went from IMTT Bayonne to Newark Bay.	U.S. Coast Guard 2017. Incident # 1027776
Newark Bay	2/3/2013	Jay Cashman	Caller stated there is a spill of hydraulic oil coming from a dredging vessel on a daily basis during a dredging operation. Hydraulic oil.	U.S. Coast Guard 2017. Incident # 1037395
Newark Bay	4/17/2013	Unknown	The USCG were notified by third party of yellow fluids in the water. The source was unknown.	U.S. Coast Guard 2017. Incident # 1044228
Newark Bay	5/9/2013	Unknown	A third party reported a rainbow sheen on Newark Bay.	U.S. Coast Guard 2017. Incident # 1046518
Newark Bay	5/22/2013	Unknown	an unknown sheen was sighted in the water between Shooters Island and Staten Island.	U.S. Coast Guard 2017. Incident # 1047938

Table C-4
Significant Spills that have Occurred in the NBSA

Subject Waterway	Dates	Facility / Vessel	Documented Discharge to Newark Bay and/or Tributary[1]	References
Newark Bay	6/25/2013	Unknown	Report of dark black suspected oil sheen approx. 150 ft x 80 ft in north bay.	NJDEP 2017. Incident # 480303
Newark Bay	9/3/2013	McAllister Towing Of NY	The caller reported that #2 diesel discharged from the day tank due to an overfill, releasing product out of the vent and overboard.	U.S. Coast Guard 2017. Incident # 1059095
Newark Bay	9/13/2013	Unknown	Caller is reporting an unknown sheen in Newark Bay from an unknown source. Caller stated there are several freighters in the area and one of them could possibly be the source.	U.S. Coast Guard 2017. Incident # 1060049
Newark Bay	9/13/2013	Marine Harbor	Caller sees an oil sheen on bay from unknown source.	NJDEP 2017. Incident # 491379
Newark Bay	1/20/2014	Unknown	Caller is reporting a sheen sighting in the Port Elizabeth area. The source is unknown; there are two possible sources nearby.	U.S. Coast Guard 2017. Incident # 1071654
Newark Bay	1/20/2014	Unknown	Caller is reporting a sheen from an unknown source.	NJDEP 2017. Incident # 505750
Newark Bay	3/2/2014	Unknown	The caller is reporting an unknown sheen in the Newark channel, source is unknown at this time. This is a third-party report.	U.S. Coast Guard 2017. Incident # 1075549
Newark Bay	3/2/2014	Unknown	Anonymous caller reporting a heavy oil slick and sheen in the Newark Channel that is expanding with incoming tide. Reports it could be coming from a tanker barge near Berth Slip 17.	NJDEP 2017. Incident # 508540
Newark Bay	4/11/2014	Unknown	Reporting unknown rainbow colored sheen 15'x10'.	NJDEP 2017. Incident # 512398
Newark Bay	4/30/2014	United Water	Caller reporting net failure due to heavy rain caused release. Net replaced and spill terminated at this point.	NJDEP 2017. Incident # 515384
Newark Bay	5/9/2014	Donjon	Caller is reporting an unknown amount of diesel fuel being spilled into the water from a vessel.	U.S. Coast Guard 2017. Incident # 1082251
Newark Bay	5/14/2014	Unknown	Caller reported an unknown sheen coming from an unknown source.	U.S. Coast Guard 2017. Incident # 1082806
Newark Bay	5/14/2014	Unk	NRC # 1082806 unknown sheen from an unknown source in the Newark Bay. Sheen is bluish and about 100 yards long.	NJDEP 2017. Incident # 516944
Newark Bay	7/2/2014	BP	Caller reporting 10'x10' sheen, reporting hydrocarbon smell but not much of a rainbow, it is starting to dissipate, unknown source.	NJDEP 2017. Incident # 523122
Newark Bay	7/2/2014	Donjon Marine	USCG advised RP of line leak from a crane aboard vessel 'Dredge Michigan' at dock.	NJDEP 2017. Incident # 523154
Newark Bay	7/10/2014	Unknown	Caller is reporting an unknown sheen from an unknown source. a sheen in the same spot was reported on 03 July 2014.	U.S. Coast Guard 2017. Incident # 1088614
Newark Bay	7/10/2014	Unknown	It was reported to the NRC that there is an unknown sheen coming from an unknown source. A sheen in the same spot was reported on July 03, 2014. Sheen size is 200 yards by 50 yards.	NJDEP 2017. Incident # 524164
Newark Bay	7/11/2014	Unknown	The caller is reporting an unknown sheen in Newark Bay, source is unknown. This is a third-party report.	U.S. Coast Guard 2017. Incident # 1088751
Newark Bay	7/11/2014	Unknown	Caller is reporting an unknown sheen in the Newark Bay from an unknown source.	U.S. Coast Guard 2017. Incident # 1088752
Newark Bay	7/11/2014	Unknown	Unknown sheen observed. Rainbow colored 400 x 5 meters.	NJDEP 2017. Incident # 524399

Table C-4
Significant Spills that have Occurred in the NBSA

Subject Waterway	Dates	Facility / Vessel	Documented Discharge to Newark Bay and/or Tributary[1]	References
Newark Bay	7/21/2014	Unknown	Caller is reporting the discovery of an unknown sheen from an unknown source on the water.	U.S. Coast Guard 2017. Incident # 1089706
Newark Bay	7/21/2014	Unknown	Report of a rainbow-colored sheen from an unknown source. Size is 200' x 80'.	NJDEP 2017. Incident # 525503
Newark Bay	8/2/2014	Unknown	Caller is reporting a sheen from an unknown source in the Port Newark Channel.	U.S. Coast Guard 2017. Incident # 1091033
Newark Bay	8/2/2014	Unknown	NRC fax #1091033 report of 100-yard rainbow sheen of diesel from unknown source in Port Newark Channel.	NJDEP 2017. Incident # 527264
Newark Bay	10/10/2014	Unknown	Caller is reporting an unknown sheen in Newark Bay that was approaching a vessel from an unknown source. the vessel is at Pier 12.	U.S. Coast Guard 2017. Incident # 1097935
Newark Bay	10/10/2014	Unknown	Motor vessel J.S. Missouri reporting a mystery sheen while coming in to Newark Bay. Sheen is approximately 30 meters by 30 meters and silvery in color.	NJDEP 2017. Incident # 536154
Newark Bay	11/17/2014	Unknown	Caller is reporting an unknown sheen from an unknown source in the water.	U.S. Coast Guard 2017. Incident # 1101242
Newark Bay	12/17/2014	Unknown	Caller is reporting an unknown sheen.	U.S. Coast Guard 2017. Incident # 1103675
Newark Bay	12/17/2014	Unknown	Caller is reporting an unknown sheen. Size is 50 feet by 1 foot.	NJDEP 2017. Incident # 542917
Newark Bay	2/25/2015	Stolt Tank Containers	Leaking container on ship caused spill on the ship. Clean up complete. Port Authority PD, Customs and NJDEP on scene.	NJDEP 2017. Incident # 548726
Newark Bay	3/2/2015	Unknown	Caller is reporting the discovery of an unknown sheen from an unknown source in the water. There is another vessel that is bunkering in front of them that may be the potential source.	U.S. Coast Guard 2017. Incident # 1109448
Newark Bay	3/2/2015	Unknown	NRC fax# 1109448 report of 5-meter length sheen. Unknown clean up.	NJDEP 2017. Incident # 548698
Newark Bay	3/16/2015	Unknown	Caller stated there is an unknown sheen on Newark Bay Robbin's Reef Yacht Club.	U.S. Coast Guard 2017. Incident # 1110827
Newark Bay	3/16/2015	Unknown	Caller stated there is an unknown sheen on the Newark Bay at Robbin's Reef Yacht Club. Sheen is dark black 300x100.	NJDEP 2017. Incident # 549956
Newark Bay	3/31/2015	Unknown	Caller stated that they were notified of an unknown sheen from an unknown source in the water by a tug passing through the area.	U.S. Coast Guard 2017. Incident # 1112185
Newark Bay	3/31/2015	Unknown	Coast Guard reported to NRC they received a call in regards to an unknown size sheen from an unknown source in the water. Reported by a tugboat passing area.	NJDEP 2017. Incident # 551633
Newark Bay	5/3/2015	Newark Container	Caller stated that the dock crane started leaking hydraulic oil while loading containers on the (Orca One) container vessel. Caller also stated that the deck of the vessel as well as the Newark Bay were impacted.	U.S. Coast Guard 2017. Incident # 1115392
Newark Bay	7/13/2015	Unknown	Caller reported firefighting water runoff that got into the Elizabeth.	U.S. Coast Guard 2017. Incident # 1122647
Newark Bay	8/18/2015	EIC	Caller is reporting a contractor’s hydraulic tool broke, resulting in a discharge of hydraulic oil.	U.S. Coast Guard 2017. Incident # 1125960

Table C-4
Significant Spills that have Occurred in the NBSA

Subject Waterway	Dates	Facility / Vessel	Documented Discharge to Newark Bay and/or Tributary[1]	References
Newark Bay	11/4/2015	Hachiuma Steamship Co.	Caller stated that a hydraulic hose burst on the stern ramp of the vessel causing material to discharge into the water.	U.S. Coast Guard 2017. Incident # 1132519
Newark Bay	12/30/2015	Unknown	The caller is reporting an unknown sheen in Newark Bay, source is unknown. Caller stated the sheen "smells like oil". This is a third-party report.	U.S. Coast Guard 2017. Incident # 1136989
Newark Bay	12/30/2015	Unk	NRC # 1136989 unknown sheen in the Newark Bay. Smells like oil.	NJDEP 2017. Incident # 584430
Newark Bay	2/23/2016	M/V Sypress	Caller is reporting that they were in the middle of testing the inert gas system trying to achieve a high oxygen alarm, and the fuel was not being ignited due to the system having a flame failure. The scrubber water washed some of the fuel overboard and created a noticeable sheen in the water.	U.S. Coast Guard 2017. Incident # 1141161
Newark Bay	2/23/2016	Joe Tankers	Caller is reporting that they were lighting off the igs system during a coc inspection, and they overpressured the fuel supply and there was a mist spray of diesel fuel into the water.	U.S. Coast Guard 2017. Incident # 1141170
Newark Bay	2/23/2016	M/V Sypress	Caller is reporting that they were in the middle of testing the inert gas system trying to achieve a high oxygen alarm and the fuel was not being ignited due to the system having flame failure. The scrubber water washed some of the fuel overboard creating a noticeable sheen in the water. Sheen size is 40 feet by 20 feet. USCG New York en route.	NJDEP 2017. Incident # 590316
Newark Bay	2/23/2016	Joe Tankers	Caller reporting a diesel fuel spill due to equipment failure during test on board the vessel.	NJDEP 2017. Incident # 590325
Newark Bay	5/30/2016	Unknown	Large sheen on the Newark Bay south of Port Elizabeth.	NJDEP 2017. Incident # 602569
Newark Bay	5/31/2016	Maersk Lines Unlimited	Heavy fuel oil discharged from an apparent crack due to equipment failure.	U.S. Coast Guard 2017. Incident # 1149226
Newark Bay	5/31/2016	Maersk Lines Limited	Report of a minor spill from vessel Mearsk Idaho, due to a crack in the bow.	NJDEP 2017. Incident # 602581
Newark Bay	6/6/2016	NSC Shipping	Malfunction on ship's fitter caused a spill. Repairs are finished. Cleanup finished.	NJDEP 2017. Incident # 603274
Newark Bay	8/9/2016	Unknown	Caller is reporting they saw a sheen from an unknown source come by their terminal, moving with the tide.	U.S. Coast Guard 2017. Incident # 1155715
Newark Bay	8/15/2016	Unknown	Caller reported that there was paint spilled into Newark Bay at the dry dock.	U.S. Coast Guard 2017. Incident # 1156297
Newark Bay	1/4/2017	Unknown	Caller is reporting a vessel at the facility is discharging unknown oil from a point towards the stern. It is unknown where the oil is originating from on the ship.	U.S. Coast Guard 2017. Incident # 1167752
Newark Bay	1/4/2017	Unknown	Report of a vessel discharging oil from the stern.	NJDEP 2017. Incident # 627384
Newark Bay	1/16/2017	Port Newark Container Terminal	Hydraulic oil discharged from a ship-to-shore crane spreader due to damage on the spreader.	U.S. Coast Guard 2017. Incident # 1168753
Newark Bay	1/16/2017	Port Newark Container Terminal	NRC incident # 1168753. Reported hydraulic oil discharged from ship-to-shore crane spreader due to damage on the spreader. Sheen on Port Newark Channel is approx. 50 feet by 6 feet. Sheen is secured.	NJDEP 2017. Incident # 628310

Table C-4
Significant Spills that have Occurred in the NBSA

Subject Waterway	Dates	Facility / Vessel	Documented Discharge to Newark Bay and/or Tributary[1]	References
Newark Bay	4/1/2017	Unknown	Caller stated that they received a report of a partially submerged barge in the waters of Newark Bay. A sheen has been observed coming from the barge. Contents of the barge are unknown. The barge was used for the reconstruction of the berth.	U.S. Coast Guard 2017. Incident # 1174566
Newark Bay	4/1/2017	Unknown	Report of a partially submerged barge in the Newark Bay. A sheen, approximately 200,' has been observed coming from the barge.	NJDEP 2017. Incident # 634887
Pierson's Creek Newark Bay	1975, 3/86 Or 4/86.	Engelhard Corporation	It is known that an overflow from a sump In Building 8 did at one time discharge to Pierson's Creek. Former employees reported spills in drainage ditch area. In 1975, chemical sewer north of Building 8 overflowed 3,000 gallons; spill drained into Pierson's Creek. Wastewater from automotive catalyst operations discharged into Pierson's Creek. Petroleum spill into Pierson's Creek occurred 3/86 or 4/86.	Tierra 2006
Port Elizabeth	4/6/2017	Harley Marine	Caller reported that a vessel hydraulic steering hose ramp discharged fluid on deck and into the water.	U.S. Coast Guard 2017. Incident # 1175004
Rahway River	2/21/2016	Unknown	Sheen found on Rahway River in the area of the Linden maintenance yard. HAZMAT team was able to contain the sheen. HAZMAT believes it was from a spill in the yard on Wed.	NJDEP 2017. Incident # 590018

Notes:
[1] Information reported is quoted from the U.S. Coast Guard National Response Center Database, New Jersey Department of Environmental Protection Spills Hotline database and from other published sources.
NBSA = Newark Bay Study Area

City: Citrix Div/Group: IM/DV Created By: K. Sinsabaugh Last Saved By: ksinsabaugh
Project (B0009989.0045.00002)
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LEGEND:

BAY 1 PARCEL ID AND SITE OUTLINE

NOTES:

1. HORIZONTAL DATUM: NEW JERSEY STATE PLANE COORDINATE SYSTEM, NAD83.
2. ALL LOCATIONS ARE APPROXIMATE; LOCATIONS ARE AS INTERPRETED FROM PUBLICLY AVAILABLE DOCUMENTS.
3. FIGURE TAKEN FROM "REPORT ON INVESTIGATION OF SOURCES OF POLLUTANTS AND CONTAMINANTS", PREPARED BY TIERRA SOLUTIONS, INC., SEPTEMBER 15, 2006.

0 2,000 4,000 Feet

GRAPHIC SCALE

NEWARK BAY STUDY AREA
CONCEPTUAL SITE MODEL

WATERFRONT SOURCES IN THE NEWARK BAY INDUSTRIAL AREA

JANUARY 2019

FIGURE
C-1

Appendix D

Table D-1
Statistical Summary of Phase III Sediment Chemistry Data in the NBSA: Bay-Wide

Parameter Group	Analyte	Units	Number of Samples	Number of Detects	Minimum of Detects	Maximum of Detects	Mean	Standard Deviation	Median
Dioxins/Furans	1,2,3,4,6,7,8-HpCDD	ppt	193	193	0.62	2320	239	295	197
	1,2,3,4,6,7,8-HpCDF	ppt	193	193	0.397	5960	307	536	183
	1,2,3,4,7,8,9-HpCDF	ppt	193	192	0.205	129	13	16.3	8.83
	1,2,3,4,7,8-HxCDD	ppt	193	192	0.024	28.1	3.04	3	2.83
	1,2,3,4,7,8-HxCDF	ppt	193	193	0.124	1570	74.1	144	35.8
	1,2,3,6,7,8-HxCDD	ppt	193	193	0.0439	95	13.4	14.7	10.9
	1,2,3,6,7,8-HxCDF	ppt	193	193	0.0451	246	18	24.8	11.9
	1,2,3,7,8,9-HxCDD	ppt	193	193	0.0238	38.3	7.4	6.77	6.65
	1,2,3,7,8,9-HxCDF	ppt	193	121	0.0447	44.5	3.09	3.98	2.47
	1,2,3,7,8-PeCDD	ppt	193	189	0.0314	25.1	3.46	3.67	2.76
	1,2,3,7,8-PeCDF	ppt	193	193	0.0631	49.6	7.82	7.52	6.38
	2,3,4,6,7,8-HxCDF	ppt	193	193	0.0405	44	8.19	8.17	6.61
	2,3,4,7,8-PeCDF	ppt	193	193	0.0351	80.5	13.5	13.4	10.4
	2,3,7,8-TCDD	ppt	193	193	0.12	1710	93	204	40.7
	2,3,7,8-TCDF	ppt	193	192	0.0924	52.4	11.3	9.32	10.5
	OCDD	ppt	193	193	9.4	32100	2730	3690	2110
	OCDF	ppt	193	193	0.746	6910	528	816	306
Grain Size	0.001 mm	%	193	171	0.5	16	4.2	2.9	3.5
	0.002 mm	%	193	188	0.5	27	7.5	4.5	7.5
	0.02 mm	%	193	192	1.5	68	32	17	34
	0.05 mm	%	193	193	2	85	47	24	51
	0.064 mm	%	193	193	3.5	93	55	26	60
	0.3 mm	%	193	193	24	99	82	18	91
	3.35 mm	%	193	193	52	100	95	9.1	99
	75000 um	%	193	193	100	1000	100	65	100
	HYDROMETER, % FINER THAN 0.0050 mm	%	193	191	0.5	44	14	7.9	13
	SIEVE NO. 200, % PASSING	%	193	193	4.3	97	58	27	64
	SIEVE NO. 4, % PASSING	%	193	193	57	100	97	6.8	100
	SIEVE, 19000 MICRONS, % PASSING	%	193	193	77	100	100	2.6	100
	SIEVE, 37500 MICRONS, % PASSING	%	193	193	100	100	100	0	100
	SIEVE, NO. 100, % PASSING	%	193	193	5.8	98	71	26	80
	SIEVE, NO. 16, % PASSING	%	193	193	44	100	92	12	98
	SIEVE, NO. 30, % PASSING	%	193	193	38	100	89	14	96
	SIEVE, NO. 8, % PASSING	%	193	193	48	100	93	12	99
Herbicides	2,4,5-T	ppb	190	10	2.2	22	3.3	4.9	1.7
	2,4,5-TP (Silvex)	ppb	190	4	4.1	14	3.3	4.7	1.6
	2,4-D	ppb	191	7	22	93	67	98	34
	2,4-DB	ppb	192	0	NA	NA	<62	NA	NA
Metals	Aluminum	ppm	193	193	1650	35000	14300	6030	14600
	Antimony	ppm	193	171	0.126	7.19	0.867	1.08	0.485
	Arsenic	ppm	193	193	1.8	96.8	19.1	16.3	13.9
	Barium	ppm	193	193	5.5	1190	155	155	118
	Beryllium	ppm	193	193	0.0807	4.39	0.885	0.509	0.864
	Cadmium	ppm	193	191	0.0592	24.6	2.15	3.34	0.94
	Calcium	ppm	192	192	416	239000	10700	20200	7080
	Chromium	ppm	193	193	3.95	777	130	127	98.6
	Cobalt	ppm	193	193	1.26	35.7	9.94	4.52	10
	Copper	ppm	193	193	1.5	924	153	159	100
	Iron	ppm	193	193	2910	65900	27000	10700	28300
	Lead	ppm	193	193	2.18	1410	158	177	114
	Magnesium	ppm	193	193	943	16300	7210	2960	7390
	Manganese	ppm	193	193	37.5	646	347	134	367
	Mercury	ppm	193	193	0.00511	22.1	2.56	3.12	1.48
	Methyl Mercury	ppm	193	192	0.000027	0.0048	0.000897	0.000733	0.000785
	Nickel	ppm	193	193	3.83	282	40.3	27.9	39
	Potassium	ppm	193	193	519	9720	3620	1600	3660
	Selenium	ppm	192	190	0.0939	7.58	1.08	1.2	0.727

Table D-1
Statistical Summary of Phase III Sediment Chemistry Data in the NBSA: Bay-Wide

Parameter Group	Analyte	Units	Number of Samples	Number of Detects	Minimum of Detects	Maximum of Detects	Mean	Standard Deviation	Median
Metals	Silver	ppm	193	192	0.0448	12	1.87	1.72	1.5
	Sodium	ppm	193	193	1630	21400	8140	3840	7870
	Thallium	ppm	193	190	0.0358	0.645	0.222	0.104	0.217
	Titanium	ppm	193	193	104	738	436	147	460
	Vanadium	ppm	193	193	4.43	92.4	38.7	16.7	40.1
	Zinc	ppm	193	193	8.18	1860	271	240	220
	Total Cyanide	ppm	192	9	0.31	6.4	0.22	0.46	0.17
TEPH Alkanes	2,6,10,14-Tetramethyl Pentadecane	ppm	193	101	0.027	5.2	0.22	0.46	0.071
	2,6,10,14-Tetramethylhexadecane	ppm	193	141	0.017	1.2	0.17	0.23	0.063
	Dotriacontane	ppm	193	156	0.026	3.9	0.36	0.49	0.19
	Heneicosane	ppm	193	93	0.015	1.2	0.12	0.14	0.071
	Heptacosane	ppm	193	67	0.042	5.7	0.33	0.53	0.16
	Heptadecane	ppm	193	143	0.032	1.6	0.23	0.27	0.14
	Heptatriacontane, -n	ppm	193	104	0.016	2.3	0.13	0.22	0.057
	Hexatriacontane	ppm	193	69	0.031	2.6	0.16	0.26	0.064
	Hhentriacontane	ppm	193	95	0.021	2	0.2	0.23	0.11
	Nonacosane	ppm	193	174	0.018	4.4	0.32	0.55	0.17
	Nonadecane	ppm	193	57	0.028	2.2	0.16	0.25	0.079
	Nonatriacontane	ppm	193	8	0.047	1.6	0.19	0.23	0.1
	Octatriacontane	ppm	193	35	0.028	2	0.11	0.18	0.057
	Pentacosane	ppm	193	178	0.018	2.3	0.21	0.26	0.14
	Pentadecane	ppm	193	114	0.014	1	0.12	0.16	0.061
	Pentatriacontane	ppm	193	170	0.022	2.4	0.18	0.24	0.12
	Tetracontane	ppm	193	121	0.014	1.5	0.12	0.17	0.068
	Tetratriacontane	ppm	193	50	0.02	1.7	0.12	0.18	0.062
	Tricosane	ppm	193	180	0.021	2.8	0.31	0.36	0.2
	Tritriacontane	ppm	193	79	0.035	0.87	0.13	0.14	0.078
	n-Decane	ppm	193	45	0.028	2.8	0.22	0.37	0.081
	n-Docosane	ppm	193	174	0.017	4.7	0.46	0.65	0.21
	n-Dodecane	ppm	193	105	0.017	1	0.16	0.16	0.11
	n-Eicosane	ppm	193	67	0.017	0.75	0.12	0.14	0.061
	n-Hexacosane	ppm	193	83	0.025	0.86	0.13	0.15	0.071
	n-Hexadecane	ppm	193	32	0.014	0.61	0.1	0.12	0.058
	n-Nonane	ppm	193	26	0.015	0.33	0.098	0.11	0.057
	n-Octacosane	ppm	193	192	0.021	9	0.95	1.2	0.55
	n-Octadecane	ppm	193	129	0.022	0.77	0.14	0.14	0.094
	n-Tetracosane	ppm	193	144	0.015	2.4	0.18	0.27	0.099
	n-Tetradecane	ppm	193	118	0.032	1.8	0.23	0.23	0.15
	n-Triacontane	ppm	193	48	0.028	2.2	0.25	0.35	0.12
	n-Tridecane	ppm	193	57	0.014	1.8	0.12	0.2	0.057
	n-Undecane	ppm	193	14	0.045	0.95	0.19	0.22	0.11
PCB Aroclors	Aroclor-1016	ppb	193	0	NA	NA	<50	NA	NA
	Aroclor-1221	ppb	193	0	NA	NA	<50	NA	NA
	Aroclor-1232	ppb	193	0	NA	NA	<50	NA	NA
	Aroclor-1242	ppb	193	0	NA	NA	<50	NA	NA
	Aroclor-1248	ppb	193	179	5.3	1000	100	140	51
	Aroclor-1254	ppb	193	176	6.5	760	93	120	50
	Aroclor-1260	ppb	193	127	10	260	45	47	28
	Aroclor-1262	ppb	193	0	NA	NA	<50	NA	NA
	Aroclor-1268	ppb	193	0	NA	NA	<50	NA	NA
	Total Aroclor PCBs (Sum of 7 Aroclors)	ppb	193	180	6.4	2000	230	300	130
	Total Aroclor PCBs (Sum of 9 Aroclors)	ppb	193	180	6.4	2000	230	300	130
PCB Congeners	PCB-1	ppt	193	171	68	8,720	1,160	1,320	692
	PCB-10	ppt	193	154	28.6	1,070	216	195	158
	PCB-103	ppt	193	159	22.3	1,080	177	167	116
	PCB-104	ppt	193	41	28.2	152	52.8	27	49.1
	PCB-105	ppt	193	183	34.6	51,700	5,520	8,500	2,880

Table D-1
Statistical Summary of Phase III Sediment Chemistry Data in the NBSA: Bay-Wide

Parameter Group	Analyte	Units	Number of Samples	Number of Detects	Minimum of Detects	Maximum of Detects	Mean	Standard Deviation	Median
PCB Congeners	PCB-106	ppt	193	7	35.4	68.2	52.7	25.3	49.2
	PCB-107	ppt	193	180	33.4	8,590	991	1,400	592
	PCB-108/124	ppt	193	151	58	6,320	566	901	277
	PCB-11	ppt	193	193	253	47,700	4,680	7,120	2,640
	PCB-110/115	ppt	193	183	126	190,000	17,100	25,600	9,310
	PCB-111	ppt	193	5	30.1	47.9	52.4	25.3	49.2
	PCB-112	ppt	193	53	27.2	249	57.7	35.8	49.3
	PCB-114	ppt	193	153	33	3,740	364	579	175
	PCB-116/117	ppt	36	30	128	30,200	3,400	6,040	990
	PCB-118	ppt	193	190	66.8	141,000	14,200	21,400	7,830
	PCB-12/13	ppt	193	191	37	10,300	1,470	1,630	1,100
	PCB-120	ppt	193	109	25.9	288	67.1	40.2	49.9
	PCB-121	ppt	193	1	41.6	41.6	52.7	25.2	49.2
	PCB-122	ppt	193	148	24.3	2,200	220	327	107
	PCB-123	ppt	193	150	35.1	2,740	302	448	155
	PCB-126	ppt	193	84	30.5	515	74.6	62.9	49.8
	PCB-127	ppt	193	58	26	553	71	60.1	49.6
	PCB-128/166	ppt	193	174	61.2	20,300	1,950	2,770	1,150
	PCB-129/138/163	ppt	193	185	128	146,000	14,200	20,200	8,130
	PCB-130	ppt	193	180	29.7	8,510	826	1,160	464
	PCB-131	ppt	193	127	33.4	2,060	169	242	84.7
	PCB-132	ppt	193	181	33.5	43,100	3,960	5,960	2,130
	PCB-133	ppt	193	157	23.8	1,800	225	273	141
	PCB-134	ppt	193	160	71.2	8,190	732	1,070	390
	PCB-135/151	ppt	193	181	119	36,800	4,390	5,860	2,350
	PCB-136	ppt	193	178	41	14,000	1,500	2,080	766
	PCB-137	ppt	193	164	33.7	6,710	622	951	304
	PCB-139/140	ppt	193	124	59.6	2,390	244	305	130
	PCB-14	ppt	193	7	23.1	51.9	21.6	10.5	19.7
	PCB-141	ppt	193	185	40.7	24,100	2,210	3,430	1,100
	PCB-142	ppt	193	1	43.8	43.8	52.7	25.2	49.2
	PCB-143	ppt	193	8	74	121	105	50.5	98.5
	PCB-144	ppt	193	168	30.7	6,040	605	868	300
	PCB-145	ppt	193	2	39.9	61.3	52.8	25.2	49.2
	PCB-146	ppt	193	185	43.5	14,500	1,700	2,160	1,070
	PCB-147/149	ppt	193	185	84	89,100	9,400	13,200	5,600
	PCB-148	ppt	193	71	29.1	217	59.4	34.7	49.6
	PCB-15	ppt	193	191	142	49,600	7,650	7,400	6,230
	PCB-150	ppt	193	90	30.1	284	73.8	52.5	50
	PCB-152	ppt	193	36	28.1	121	51.5	26.6	49
	PCB-153/168	ppt	193	189	63.9	99,100	11,400	15,300	6,750
	PCB-154	ppt	193	103	92.1	1,330	258	230	132
	PCB-155	ppt	193	101	28.6	1,510	93.9	134	50.5
	PCB-156/157	ppt	193	180	53.8	16,900	1,650	2,450	878
	PCB-158	ppt	193	173	41.6	12,800	1,230	1,810	650
	PCB-159	ppt	193	8	31	454	56.8	45.1	49.2
	PCB-16	ppt	193	188	57.4	63,400	4,350	8,600	1,500
	PCB-160	ppt	193	0	NA	NA	<422	NA	NA
	PCB-161	ppt	193	0	NA	NA	<105.6	NA	NA
	PCB-162	ppt	193	18	27	290	58.7	37.6	49.4
	PCB-164	ppt	193	174	31.3	8,130	824	1,150	459
	PCB-165	ppt	193	2	29.3	31.6	52.6	25.2	49.2
	PCB-167	ppt	193	174	27.1	4,920	519	716	295
	PCB-169	ppt	193	1	30.6	30.6	52.7	25.2	49.2
	PCB-17	ppt	193	187	70.9	62,600	4,960	8,350	2,310
	PCB-170	ppt	193	187	30.8	28,000	2,920	4,210	1,460
	PCB-171/173	ppt	193	167	59	9,130	924	1,280	526

Table D-1
Statistical Summary of Phase III Sediment Chemistry Data in the NBSA: Bay-Wide

Parameter Group	Analyte	Units	Number of Samples	Number of Detects	Minimum of Detects	Maximum of Detects	Mean	Standard Deviation	Median
PCB Congeners	PCB-172	ppt	193	174	25.6	5,420	548	767	305
	PCB-174	ppt	193	186	34.3	32,600	2,720	4,130	1,460
	PCB-175	ppt	193	132	30.1	1,290	166	202	87.8
	PCB-176	ppt	193	168	23.4	3,740	426	581	240
	PCB-177	ppt	193	187	22.4	19,700	1,890	2,650	1,100
	PCB-178	ppt	193	179	27.6	5,970	776	984	472
	PCB-179	ppt	193	185	29.8	13,200	1,440	1,960	884
	PCB-18/30	ppt	193	189	112	141,000	9,420	18,000	3,900
	PCB-180/193	ppt	193	185	59.3	75,000	6,950	10,200	3,710
	PCB-181	ppt	193	56	26.7	271	55.4	33.5	49
	PCB-182	ppt	193	46	22	129	51.1	27.1	49
	PCB-183/185	ppt	193	183	59.7	27,400	2,470	3,560	1,370
	PCB-184	ppt	193	11	26.8	71	52.1	25.6	49.2
	PCB-186	ppt	193	0	NA	NA	<105.6	NA	NA
	PCB-187	ppt	193	188	41	41,400	4,940	6,450	2,920
	PCB-188	ppt	193	43	29	130	52.7	27.6	49
	PCB-189	ppt	193	139	28.3	1,130	144	167	78.5
	PCB-19	ppt	193	188	24	14,400	1,230	2,020	567
	PCB-190	ppt	193	172	29.4	5,840	637	897	353
	PCB-191	ppt	193	136	26	1,220	143	177	72.5
	PCB-192	ppt	193	1	30.4	30.4	52.7	25.2	49.2
	PCB-194	ppt	193	186	50.3	22,200	2,110	3,020	1,070
	PCB-195	ppt	193	164	44.2	7,570	704	1,020	354
	PCB-196	ppt	193	176	39.4	10,000	1,120	1,530	625
	PCB-197/200	ppt	193	123	88.4	3,040	332	421	172
	PCB-198/199	ppt	193	182	84.9	24,900	3,050	4,190	1,740
	PCB-2	ppt	193	187	22	2,870	302	387	185
	PCB-20/28	ppt	193	193	287	306,000	23,100	35,000	12,800
	PCB-201	ppt	193	141	44.5	2,790	332	428	186
	PCB-202	ppt	193	171	50.1	8,290	953	1,330	540
	PCB-203	ppt	193	181	39.8	14,700	1,840	2,500	1,050
	PCB-204	ppt	193	0	NA	NA	<105.6	NA	NA
	PCB-205	ppt	193	124	33.5	1,040	125	148	64.5
	PCB-206	ppt	193	184	51.1	38,300	3,060	5,560	1,410
	PCB-207	ppt	193	142	38.2	2,240	239	332	126
	PCB-208	ppt	193	179	34.4	15,700	1,160	2,220	540
	PCB-209	ppt	193	182	34.5	58,800	3,410	7,270	1,200
	PCB-21/33	ppt	193	193	92.4	121,000	7,030	14,000	2,760
	PCB-22	ppt	193	192	101	94,100	6,190	10,900	2,670
	PCB-23	ppt	193	53	12.5	188	27.9	25.2	19.8
	PCB-24	ppt	193	130	21.3	1,790	114	202	48.2
	PCB-25	ppt	193	192	30	19,600	2,130	2,610	1,370
	PCB-26/29	ppt	193	180	54.5	40,700	3,680	4,990	2,270
	PCB-27	ppt	193	187	15.9	9,990	986	1,370	567
	PCB-3	ppt	193	193	36	5,160	738	729	507
	PCB-31	ppt	193	193	216	265,000	19,000	31,500	10,000
	PCB-32	ppt	193	193	58	47,900	4,070	6,480	2,000
	PCB-34	ppt	193	144	14.8	1,100	114	148	63.2
	PCB-35	ppt	193	180	21.2	7,060	716	1,030	377
	PCB-36	ppt	193	69	13.9	60.3	24.1	12.2	19.9
	PCB-37	ppt	193	193	89.8	64,100	5,850	7,660	3,640
	PCB-38	ppt	193	45	14.5	102	24.7	16.5	19.7
	PCB-39	ppt	193	148	18.5	1,190	129	180	70.2
	PCB-4	ppt	193	192	143	24,300	3,080	3,890	1,900
	PCB-40/71	ppt	193	188	80	80,600	7,460	11,600	3,760
	PCB-41	ppt	193	147	87.8	14,700	971	1,960	304
	PCB-42	ppt	193	190	46.4	51,800	5,150	7,850	2,540

Table D-1
Statistical Summary of Phase III Sediment Chemistry Data in the NBSA: Bay-Wide

Parameter Group	Analyte	Units	Number of Samples	Number of Detects	Minimum of Detects	Maximum of Detects	Mean	Standard Deviation	Median
PCB Congeners	PCB-43	ppt	193	169	28.8	8,250	726	1,200	304
	PCB-44/47/65	ppt	193	193	92.8	185,000	16,000	24,800	8,480
	PCB-45	ppt	193	179	52.3	25,100	2,140	3,770	848
	PCB-46	ppt	193	176	22.8	9,770	840	1,450	363
	PCB-48	ppt	193	187	30	37,600	3,150	5,530	1,270
	PCB-49/69	ppt	193	192	53.7	119,000	11,500	16,800	6,260
	PCB-5	ppt	193	108	16.2	761	83.3	110	49.1
	PCB-50/53	ppt	193	165	49.6	23,400	2,180	3,540	1,060
	PCB-51	ppt	193	171	52.6	6,620	815	1,030	439
	PCB-52	ppt	193	189	86.9	211,000	17,900	29,000	8,280
	PCB-54	ppt	193	101	28.8	561	91	84.5	51
	PCB-55	ppt	193	140	24.5	2,890	192	324	87.7
	PCB-56	ppt	193	178	75.8	107,000	6,950	12,400	3,270
	PCB-57	ppt	193	129	22.4	1,100	105	115	57.7
	PCB-58	ppt	193	108	27	472	75.6	60.7	50
	PCB-59/62/75	ppt	193	172	77.5	15,800	1,480	2,170	790
	PCB-6	ppt	193	187	78	7,210	1,270	1,290	928
	PCB-60	ppt	193	190	30.3	42,200	3,330	5,940	1,390
	PCB-61/70/74/76	ppt	157	154	334	219,000	26,600	39,700	13,600
	PCB-63	ppt	193	178	25.8	7,720	735	1,110	375
	PCB-64	ppt	193	190	46.9	85,800	7,470	12,200	3,410
	PCB-66	ppt	193	191	124	221,000	17,800	28,400	8,500
	PCB-67	ppt	193	171	25	5,880	480	717	238
	PCB-68	ppt	193	148	26.9	653	132	107	89.8
	PCB-7	ppt	193	123	19	1,720	176	281	106
	PCB-70/74/76	ppt	36	36	184	431,000	40,200	84,500	11,400
	PCB-72	ppt	193	154	26.8	1,330	192	189	124
	PCB-73	ppt	193	12	28.7	63.1	52.6	25.3	49.2
	PCB-77	ppt	193	189	29	22,800	2,610	3,630	1,440
	PCB-78	ppt	193	2	60.3	79	53	25.2	49.2
	PCB-79	ppt	193	142	22.7	1,320	160	215	76.1
	PCB-8	ppt	193	193	254	53,800	6,970	8,580	4,040
	PCB-80	ppt	193	0	NA	NA	<105.6	NA	NA
	PCB-81	ppt	193	84	35	838	86.1	98.5	49.9
	PCB-82	ppt	193	182	29.5	22,000	1,900	3,060	905
	PCB-83	ppt	193	157	57.7	7,250	765	1,110	413
	PCB-84	ppt	193	184	26.9	38,900	3,560	5,450	1,780
	PCB-85/116/117	ppt	157	150	83.5	20,200	2,640	3,600	1,650
	PCB-86/87/97/108/119/125	ppt	193	174	160	108,000	9,560	14,700	4,820
	PCB-88	ppt	193	3	52	1,940	62.7	138	49.2
	PCB-89	ppt	193	140	25.6	2,870	236	384	101
	PCB-9	ppt	193	181	20	2,240	300	376	172
	PCB-90/101/113	ppt	193	184	93.6	147,000	13,000	19,200	7,570
	PCB-91	ppt	193	183	46.5	22,500	2,380	3,250	1,400
	PCB-92	ppt	193	167	36.8	24,300	1,880	2,730	1,080
	PCB-93/100	ppt	193	102	155	1,680	342	245	205
	PCB-94	ppt	193	131	26	986	127	132	69.4
	PCB-95	ppt	193	182	158	125,000	11,900	18,500	6,290
	PCB-96	ppt	193	123	31	1,460	160	217	70.5
	PCB-98/102	ppt	193	134	160	6,450	701	867	405
	PCB-99	ppt	193	189	56	69,700	7,530	10,200	4,610
	Total PCB Congeners (209)	ppt	193	193	3,750	5,030,000	461,000	658,000	261,000
Pesticides	2,4'-DDD	ppb	192	190	0.011	57	6.8	10	3.5
	2,4'-DDE	ppb	192	192	0.011	710	35	100	4.1
	2,4'-DDT	ppb	188	81	0.015	28	0.44	2.2	0.0031
	4,4'-DDD	ppb	193	193	0.036	240	22	39	9.3
	4,4'-DDE	ppb	192	192	0.042	1600	73	190	15

Table D-1
Statistical Summary of Phase III Sediment Chemistry Data in the NBSA: Bay-Wide

Parameter Group	Analyte	Units	Number of Samples	Number of Detects	Minimum of Detects	Maximum of Detects	Mean	Standard Deviation	Median
Pesticides	4,4'-DDT	ppb	175	143	0.015	450	5.2	36	0.57
	Aldrin	ppb	108	3	0.026	0.3	0.0059	0.028	0.0027
	Alpha-BHC	ppb	191	118	0.0063	1.1	0.097	0.16	0.04
	Alpha-Chlordane	ppb	192	178	0.012	13	2	2	1.5
	Beta-BHC	ppb	192	105	0.0062	1.3	0.088	0.16	0.03
	cis-Nonachlor	ppb	187	146	0.022	4.8	0.87	0.95	0.76
	Delta-BHC	ppb	192	29	0.011	0.77	0.022	0.082	0.0037
	Dieldrin	ppb	192	182	0.039	37	1.7	3.6	0.9
	Endosulfan I	ppb	188	1	0.35	0.35	0.012	0.025	0.01
	Endosulfan II	ppb	188	1	0.33	0.33	0.023	0.022	0.021
	Endosulfan Sulfate	ppb	177	0	NA	NA	<0.044	NA	NA
	Endrin	ppb	189	1	0.47	0.47	0.0077	0.034	0.0052
	Endrin Aldehyde	ppb	102	0	NA	NA	<0.04	NA	NA
	Endrin Ketone	ppb	158	2	0.23	1.5	0.024	0.12	0.013
	Gamma-BHC (Lindane)	ppb	192	38	0.015	1.8	0.032	0.15	0.0037
	Heptachlor	ppb	188	9	0.02	0.55	0.012	0.049	0.0052
	Heptachlor Epoxide	ppb	188	43	0.03	2.4	0.066	0.26	0.0047
	Hexachlorobenzene	ppb	192	191	0.013	46	3	6.6	1
	Methoxychlor	ppb	105	7	0.077	7.6	0.28	1.3	0.0059
	Mirex	ppb	126	31	0.014	1.7	0.052	0.19	0.0025
	Nonachlor, trans-	ppb	188	170	0.044	8.6	1.2	1.2	0.91
	Oxychlordane	ppb	189	1	0.21	0.21	0.0068	0.015	0.0057
	trans-Chlordane	ppb	189	182	0.027	22	2.7	3	2.2
	trans-Heptachlor Epoxide	ppb	192	22	0.11	3.2	0.092	0.35	0.0065
	Total Alpha + Gamma Chlordane	ppb	193	184	0.039	32	4.7	4.8	3.9
	Total DDT (2,4)	ppb	193	192	0.022	760	42	110	7.8
	Total DDT (4,4)	ppb	193	193	0.093	1800	100	230	26
	Total DDT (2,4 & 4,4)	ppb	193	193	0.12	2600	140	340	34
Semivolatiles	1,2,4,5-Tetrachlorobenzene	ppb	193	0	NA	NA	<64	NA	NA
	1,2-Diphenylhydrazine	ppb	193	0	NA	NA	<64	NA	NA
	2,2'-oxybis(1-Chloropropane)	ppb	193	1	56	56	32	11	31
	2,3,4,6-Tetrachlorophenol	ppb	193	0	NA	NA	<320	NA	NA
	2,4,5-Trichlorophenol	ppb	193	0	NA	NA	<64	NA	NA
	2,4,6-Trichlorophenol	ppb	193	0	NA	NA	<64	NA	NA
	2,4-Dichlorophenol	ppb	193	0	NA	NA	<64	NA	NA
	2,4-Dimethylphenol	ppb	193	0	NA	NA	<64	NA	NA
	2,4-Dinitrophenol	ppb	193	0	NA	NA	<1920	NA	NA
	2,4-Dinitrotoluene	ppb	193	0	NA	NA	<320	NA	NA
	2,6-Dinitrotoluene	ppb	193	1	31	31	32	11	31
	2-Chloronaphthalene	ppb	193	0	NA	NA	<64	NA	NA
	2-Chlorophenol	ppb	193	0	NA	NA	<64	NA	NA
	2-Methylphenol	ppb	193	0	NA	NA	<64	NA	NA
	2-Nitroaniline	ppb	193	0	NA	NA	<64	NA	NA
	2-Nitrophenol	ppb	193	0	NA	NA	<64	NA	NA
	3,3'-Dichlorobenzidine	ppb	193	0	NA	NA	<640	NA	NA
	3-Nitroaniline	ppb	193	0	NA	NA	<320	NA	NA
	4,6-Dinitro-2-methylphenol	ppb	193	0	NA	NA	<960	NA	NA
	4-Bromophenyl phenyl ether	ppb	193	0	NA	NA	<64	NA	NA
	4-Chloro-3-Methylphenol	ppb	193	1	88	88	32	12	31
	4-Chloroaniline	ppb	193	0	NA	NA	<128	NA	NA
	4-Chlorophenyl phenyl ether	ppb	193	0	NA	NA	<64	NA	NA
	4-Methylphenol	ppb	193	123	23	670	57	58	43
	4-Nitroaniline	ppb	193	0	NA	NA	<320	NA	NA
	4-Nitrophenol	ppb	193	0	NA	NA	<960	NA	NA
	Acetophenone	ppb	193	53	22	390	43	40	33
	Atrazine	ppb	193	0	NA	NA	<320	NA	NA
	Benzaldehyde	ppb	193	1	250	250	160	54	160

Table D-1
Statistical Summary of Phase III Sediment Chemistry Data in the NBSA: Bay-Wide

Parameter Group	Analyte	Units	Number of Samples	Number of Detects	Minimum of Detects	Maximum of Detects	Mean	Standard Deviation	Median
Semivolatiles	Benzidine	ppb	193	0	NA	NA	<960	NA	NA
	Benzoic Acid	ppb	193	14	410	1100	490	170	470
	Biphenyl	ppb	193	28	27	140	35	16	32
	bis(2-Chloroethoxy)methane	ppb	193	0	NA	NA	<64	NA	NA
	bis(2-Chloroethyl)ether	ppb	193	0	NA	NA	<64	NA	NA
	bis(2-Ethylhexyl)phthalate	ppb	193	145	96	31000	990	2700	290
	Butyl benzyl phthalate	ppb	193	1	110	110	160	54	160
	Caprolactam	ppb	193	0	NA	NA	<320	NA	NA
	Carbazole	ppb	193	37	27	360	41	35	33
	Dibenzofuran	ppb	193	69	20	400	42	35	36
	Diethyl phthalate	ppb	193	0	NA	NA	<320	NA	NA
	Dimethylphthalate	ppb	193	0	NA	NA	<320	NA	NA
	Di-n-Butylphthalate	ppb	193	0	NA	NA	<320	NA	NA
	Di-n-Octylphthalate	ppb	193	0	NA	NA	<320	NA	NA
	Hexachlorobutadiene	ppb	193	0	NA	NA	<64	NA	NA
	Hexachlorocyclopentadiene	ppb	193	0	NA	NA	<960	NA	NA
	Hexachloroethane	ppb	193	0	NA	NA	<320	NA	NA
	Isophorone	ppb	193	0	NA	NA	<64	NA	NA
	Nitrobenzene	ppb	193	1	34	34	32	11	31
	N-Nitroso-di-n-propylamine	ppb	193	0	NA	NA	<64	NA	NA
	N-Nitrosodiphenylamine	ppb	193	0	NA	NA	<64	NA	NA
	Pentachlorophenol	ppb	193	0	NA	NA	<320	NA	NA
	Phenol	ppb	193	33	20	480	38	40	33
	Pyridine	ppb	193	0	NA	NA	<320	NA	NA
TEQ	Total WHO Dioxin TEQ(Bird)	ppt	193	193	0.347	1870	137	233	77.8
	Total WHO Dioxin TEQ(Fish)	ppt	193	193	0.247	1810	120	223	59
	Total WHO Dioxin TEQ(Human/Mammal)	ppt	193	193	0.248	1810	121	223	60.9
TOC	Total Organic Carbon (TOC)	ppm	193	191	1000	61000	21000	11000	21000
TPH	PHC AS GASOLINE	ppm	193	65	0.3	130	6.5	17	1.4
	TPH	ppm	193	186	6.5	2900	370	470	200
Volatiles	1,2,4-Trichlorobenzene	ppb	193	2	4	10	17	61	4.5
	1,2-Dichlorobenzene	ppb	193	0	NA	NA	<42	NA	NA
	1,3-Dichlorobenzene	ppb	193	0	NA	NA	<42	NA	NA
	1,4-Dichlorobenzene	ppb	193	2	4	6	21	77	6
Physical Properties	Water Content	%	193	193	21	210	86	41	84
	Percent Moisture	%	198	198	17	68	44	13	46
	Percent Solids	%	193	193	31	82	55	13	53
	Water Content	%	5	5	140	170	150	14	150

Notes:
1. Summary statistics were calculated using 1/2 the detection limit substituted for non-detect values.
2. Field duplicates averaged with parent samples.
3. PAHs are being re-analyzed due to analytical bias and were not included.

DDT = dichlorodiphenyl-trichloroethane
NA = not applicable
ND = not detected
PCB = polychlorinated biphenyl
ppb = parts per billion
ppm = parts per million
ppt = parts per thousand
TPH= total petroleum hydrocarbons
% = percent
< = Not detected, average detection limit reported.

Table D-2
Statistical Summary of Phase III Sediment Chemistry Data in the NBSA: Newark Bay North

Parameter Group	Analyte	Units	Number of Samples	Number of Detects	Minimum of Detects	Maximum of Detects	Mean	Standard Deviation	Median
Dioxins/Furans	1,2,3,4,6,7,8-HpCDD	ppt	78	78	6.64	763	164	174	105
	1,2,3,4,6,7,8-HpCDF	ppt	78	78	5.22	5960	439	780	236
	1,2,3,4,7,8,9-HpCDF	ppt	78	78	0.26	129	14.7	20.3	9.48
	1,2,3,4,7,8-HxCDD	ppt	78	78	0.105	28.1	2.88	3.65	2.09
	1,2,3,4,7,8-HxCDF	ppt	78	78	1.62	1570	118	214	69.9
	1,2,3,6,7,8-HxCDD	ppt	78	78	0.283	49.8	10.8	11.5	7.1
	1,2,3,6,7,8-HxCDF	ppt	78	78	0.38	246	22.8	34.7	13.5
	1,2,3,7,8,9-HxCDD	ppt	78	78	0.326	28.1	6.23	6.19	4.24
	1,2,3,7,8,9-HxCDF	ppt	78	59	0.167	44.5	3.83	5.59	2.48
	1,2,3,7,8-PeCDD	ppt	78	78	0.213	25.1	3.4	4.3	2.15
	1,2,3,7,8-PeCDF	ppt	78	78	0.192	49.6	7.67	8.34	5.49
	2,3,4,6,7,8-HxCDF	ppt	78	78	0.276	44	8.18	9.14	6.12
	2,3,4,7,8-PeCDF	ppt	78	78	0.304	80.5	15.2	16.2	11.5
	2,3,7,8-TCDD	ppt	78	78	1.19	1710	132	286	47.1
	2,3,7,8-TCDF	ppt	78	78	0.259	31.2	8.85	7.78	6.71
	OCDD	ppt	78	78	77	7150	1760	1660	1090
	OCDF	ppt	78	78	8	6910	726	1120	434
Grain Size	0.001 mm	%	78	63	1	14	3.6	3.1	3
	0.002 mm	%	78	75	0.5	19	6.5	4.1	6.3
	0.02 mm	%	78	78	2	59	26	15	27
	0.05 mm	%	78	78	3	83	40	21	41
	0.064 mm	%	78	78	4	93	47	23	49
	0.3 mm	%	78	78	24	99	76	20	82
	3.35 mm	%	78	78	62	100	92	11	97
	75000 um	%	78	78	100	1000	110	100	100
	HYDROMETER, % FINER THAN 0.0050 mm	%	78	78	0.5	28	12	6.7	11
	SIEVE NO. 200, PERCENT PASSING	%	78	78	4.3	96	50	24	51
	SIEVE NO. 4, PERCENT PASSING	%	78	78	72	100	95	7.8	99
	SIEVE, 19000 MICRONS, PERCENT PASSING	%	78	78	85	100	100	1.7	100
	SIEVE, 37500 MICRONS, PERCENT PASSING	%	78	78	100	100	100	0	100
	SIEVE, NO. 100, PERCENT PASSING	%	78	78	5.8	98	64	25	68
	SIEVE, NO. 16, PERCENT PASSING	%	78	78	49	100	86	15	93
	SIEVE, NO. 30, PERCENT PASSING	%	78	78	48	99	83	15	91
	SIEVE, NO. 8, PERCENT PASSING	%	78	78	49	100	88	15	94
Herbicides	2,4,5-T	ppb	78	4	4.1	16	2.3	2.8	1.5
	2,4,5-TP (Silvex)	ppb	78	0	NA	NA	<4.2	NA	NA
	2,4-D	ppb	78	0	NA	NA	<90	NA	NA
	2,4-DB	ppb	78	0	NA	NA	<42	NA	NA
Metals	Aluminum	ppm	78	78	3580	35000	13500	6430	13100
	Antimony	ppm	78	62	0.172	1.94	0.511	0.42	0.403
	Arsenic	ppm	78	78	2.65	59.3	13.6	8.17	12
	Barium	ppm	78	78	12.1	475	100	69.4	91.5
	Beryllium	ppm	78	78	0.163	3.65	0.781	0.508	0.696
	Cadmium	ppm	78	78	0.112	7.18	1.31	1.69	0.739
	Calcium	ppm	77	77	1840	38600	7440	5050	6790
	Chromium	ppm	78	78	11.1	691	128	131	93.3
	Cobalt	ppm	78	78	2.49	35.7	9.76	5.63	8.37
	Copper	ppm	78	78	8.85	466	98.9	89.1	81.1
	Iron	ppm	78	78	5610	65900	25100	12000	23800
	Lead	ppm	78	78	9.17	1410	123	185	86.7
	Magnesium	ppm	78	78	1860	16300	6320	3110	5560
	Manganese	ppm	78	78	49.3	646	312	127	306
	Mercury	ppm	78	78	0.0618	10.4	1.69	1.84	1.29
	Methyl Mercury	ppm	78	78	0.000096	0.00287	0.000763	0.000488	0.000697
	Nickel	ppm	78	78	5.45	171	33.8	26.3	28.7
	Potassium	ppm	78	78	850	9720	3310	1750	3050
	Selenium	ppm	78	78	0.121	1.49	0.688	0.369	0.576
	Silver	ppm	78	78	0.0687	5.58	1.42	1.3	0.929
	Sodium	ppm	78	78	1630	21400	7290	3890	6700

Table D-2
Statistical Summary of Phase III Sediment Chemistry Data in the NBSA: Newark Bay North

Parameter Group	Analyte	Units	Number of Samples	Number of Detects	Minimum of Detects	Maximum of Detects	Mean	Standard Deviation	Median
Metals	Thallium	ppm	78	77	0.0533	0.645	0.201	0.0955	0.18
	Titanium	ppm	78	78	132	674	374	128	377
	Vanadium	ppm	78	78	7.33	87.4	35.6	17.7	33
	Zinc	ppm	78	78	25.1	976	209	178	161
	Total Cyanide	ppm	77	3	0.31	0.67	0.16	0.073	0.15
TEPH Alkanes	2,6,10,14-Tetramethyl Pentadecane	ppm	78	46	0.027	0.78	0.12	0.15	0.071
	2,6,10,14-Tetramethylhexadecane	ppm	78	61	0.022	0.54	0.1	0.096	0.065
	Dotriacontane	ppm	78	73	0.053	3.9	0.54	0.62	0.38
	Heneicosane	ppm	78	25	0.024	0.61	0.095	0.094	0.062
	Heptacosane	ppm	78	31	0.06	5.7	0.32	0.68	0.16
	Heptadecane	ppm	78	61	0.046	0.68	0.17	0.12	0.14
	Heptatriacontane, -n	ppm	78	41	0.017	0.95	0.093	0.12	0.053
	Hexatriacontane	ppm	78	37	0.031	1.5	0.16	0.22	0.068
	Hhentriacontane	ppm	78	60	0.041	2	0.21	0.27	0.12
	Nonacosane	ppm	78	71	0.039	4.4	0.3	0.63	0.15
	Nonadecane	ppm	78	26	0.033	1.1	0.14	0.17	0.08
	Nonatriacontane	ppm	78	0	NA	NA	<0.3	NA	NA
	Octatriacontane	ppm	78	15	0.031	0.31	0.082	0.071	0.057
	Pentacosane	ppm	78	77	0.018	1.6	0.2	0.2	0.15
	Pentadecane	ppm	78	48	0.022	1	0.1	0.15	0.062
	Pentatriacontane	ppm	78	70	0.022	0.84	0.16	0.14	0.12
	Tetracontane	ppm	78	58	0.017	0.54	0.1	0.098	0.072
	Tetratriacontane	ppm	78	26	0.03	0.52	0.1	0.089	0.063
	Tricosane	ppm	78	77	0.021	2.8	0.37	0.39	0.26
	Tritriacontane	ppm	78	42	0.035	0.51	0.11	0.092	0.086
	n-Decane	ppm	78	0	NA	NA	<0.22	NA	NA
	n-Docosane	ppm	78	73	0.017	4.7	0.65	0.83	0.42
	n-Dodecane	ppm	78	31	0.024	0.53	0.12	0.092	0.089
	n-Eicosane	ppm	78	18	0.019	0.29	0.081	0.069	0.059
	n-Hexacosane	ppm	78	34	0.032	0.86	0.11	0.12	0.065
	n-Hexadecane	ppm	78	19	0.017	0.28	0.08	0.07	0.059
	n-Nonane	ppm	78	6	0.017	0.05	0.08	0.069	0.057
	n-Octacosane	ppm	78	78	0.028	9	1.4	1.5	0.98
	n-Octadecane	ppm	78	46	0.022	0.26	0.1	0.073	0.082
	n-Tetracosane	ppm	78	72	0.018	2.4	0.25	0.37	0.15
	n-Tetradecane	ppm	78	44	0.033	1.2	0.21	0.21	0.13
	n-Triacontane	ppm	78	3	0.068	1.5	0.16	0.18	0.11
	n-Tridecane	ppm	78	20	0.02	0.19	0.08	0.067	0.058
	n-Undecane	ppm	78	0	NA	NA	<0.3	NA	NA
PCB Aroclors	Aroclor-1016	ppb	78	0	NA	NA	<34	NA	NA
	Aroclor-1221	ppb	78	0	NA	NA	<34	NA	NA
	Aroclor-1232	ppb	78	0	NA	NA	<34	NA	NA
	Aroclor-1242	ppb	78	0	NA	NA	<34	NA	NA
	Aroclor-1248	ppb	78	71	6.4	680	80	110	47
	Aroclor-1254	ppb	78	71	7.6	380	66	76	45
	Aroclor-1260	ppb	78	45	11	160	33	30	24
	Aroclor-1262	ppb	78	0	NA	NA	<34	NA	NA
	Aroclor-1268	ppb	78	0	NA	NA	<34	NA	NA
	Total Aroclor PCBs (Sum of 7 Aroclors)	ppb	78	72	6.4	1100	170	210	120
	Total Aroclor PCBs (Sum of 9 Aroclors)	ppb	78	72	6.4	1100	170	210	120
PCB Congeners	PCB-1	ppt	78	76	201	8,720	1,620	1,710	1,020
	PCB-10	ppt	78	65	28.6	1,070	235	237	164
	PCB-103	ppt	78	65	23.4	1,080	196	203	109
	PCB-104	ppt	78	29	28.6	152	50.5	15	49.1
	PCB-105	ppt	78	73	34.6	51,700	4,860	8,470	2,340
	PCB-106	ppt	78	4	45.9	68.2	49.6	3.01	49.2
	PCB-107	ppt	78	74	35.6	8,470	893	1,420	439
	PCB-108/124	ppt	78	60	62.8	6,320	519	939	228
	PCB-11	ppt	78	78	270	47,700	5,950	9,960	2,480

Table D-2
Statistical Summary of Phase III Sediment Chemistry Data in the NBSA: Newark Bay North

Parameter Group	Analyte	Units	Number of Samples	Number of Detects	Minimum of Detects	Maximum of Detects	Mean	Standard Deviation	Median
PCB Congeners	PCB-110/115	ppt	78	73	126	190,000	16,300	28,800	7,410
	PCB-111	ppt	78	2	34.3	47.9	49	1.93	49.2
	PCB-112	ppt	78	18	27.8	246	54.2	27.6	49.2
	PCB-114	ppt	78	61	33	3,740	331	604	145
	PCB-116/117	ppt	31	28	128	30,200	3,550	6,360	1,100
	PCB-118	ppt	78	76	91.8	141,000	12,700	21,900	5,990
	PCB-12/13	ppt	78	77	112	10,300	1,700	2,180	1,040
	PCB-120	ppt	78	40	28.2	288	69.2	43.6	49.6
	PCB-121	ppt	78	0	NA	NA	<98.4	NA	NA
	PCB-122	ppt	78	58	25.7	2,200	203	349	80.5
	PCB-123	ppt	78	60	35.1	2,740	277	464	107
	PCB-126	ppt	78	34	30.5	515	71.4	68.1	49.4
	PCB-127	ppt	78	15	29.3	248	57.2	30.2	49.2
	PCB-128/166	ppt	78	69	74.5	20,300	1,800	3,000	932
	PCB-129/138/163	ppt	78	74	179	146,000	13,000	21,800	6,810
	PCB-130	ppt	78	73	34	8,510	756	1,270	371
	PCB-131	ppt	78	47	34.7	2,060	145	268	56.9
	PCB-132	ppt	78	71	49.7	43,100	3,290	6,060	1,520
	PCB-133	ppt	78	62	24.3	1,720	204	273	93.4
	PCB-134	ppt	78	62	71.8	8,190	628	1,150	281
	PCB-135/151	ppt	78	73	119	36,800	3,740	6,060	1,910
	PCB-136	ppt	78	73	46.2	14,000	1,410	2,290	691
	PCB-137	ppt	78	66	34.4	6,710	549	974	280
	PCB-139/140	ppt	78	44	59.6	2,390	207	309	101
	PCB-14	ppt	78	5	24.8	39.6	20.5	3.32	19.7
	PCB-141	ppt	78	75	42.7	19,400	1,920	3,210	948
	PCB-142	ppt	78	1	43.8	43.8	49.1	1.12	49.2
	PCB-143	ppt	78	2	109	121	98.9	3.4	98.5
	PCB-144	ppt	78	68	32	6,040	511	915	234
	PCB-145	ppt	78	2	39.9	61.3	49.2	1.98	49.2
	PCB-146	ppt	78	76	43.5	14,500	1,600	2,350	809
	PCB-147/149	ppt	78	74	138	89,100	8,490	13,900	4,220
	PCB-148	ppt	78	26	29.1	127	53.7	17	49.5
	PCB-15	ppt	78	78	748	49,600	8,510	9,390	6,450
	PCB-150	ppt	78	36	30.1	284	76	56.1	49.8
	PCB-152	ppt	78	16	28.1	121	48.4	10.6	49
	PCB-153/168	ppt	78	76	63.9	96,700	10,600	16,200	5,630
	PCB-154	ppt	78	42	95.8	1,330	272	270	113
	PCB-155	ppt	78	49	28.6	771	100	108	54.6
	PCB-156/157	ppt	78	74	54.5	15,000	1,400	2,310	661
	PCB-158	ppt	78	68	52.1	12,800	1,110	1,940	539
	PCB-159	ppt	78	6	31	454	57.2	49.7	49.2
	PCB-16	ppt	78	74	103	63,400	5,380	11,600	1,490
	PCB-160	ppt	78	0	NA	NA	<394	NA	NA
	PCB-161	ppt	78	0	NA	NA	<98.4	NA	NA
	PCB-162	ppt	78	0	NA	NA	<98.4	NA	NA
	PCB-164	ppt	78	71	33.5	8,130	772	1,260	410
	PCB-165	ppt	78	1	31.6	31.6	49	2.2	49.2
	PCB-167	ppt	78	70	29.2	4,340	450	686	220
	PCB-169	ppt	78	1	30.6	30.6	49	2.31	49.2
	PCB-17	ppt	78	73	145	62,600	5,680	11,100	2,180
	PCB-170	ppt	78	76	37.8	25,200	2,570	4,110	1,230
	PCB-171/173	ppt	78	67	59.3	7,470	817	1,230	408
	PCB-172	ppt	78	71	25.6	4,390	478	727	252
	PCB-174	ppt	78	75	34.3	19,000	2,260	3,430	1,160
	PCB-175	ppt	78	51	32.2	1,290	152	208	71.8
	PCB-176	ppt	78	68	28.7	3,630	384	591	181
	PCB-177	ppt	78	76	27.4	14,700	1,650	2,480	787
	PCB-178	ppt	78	72	33.5	5,750	705	1000	368

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Statistical Summary of Phase III Sediment Chemistry Data in the NBSA: Newark Bay North

Parameter Group	Analyte	Units	Number of Samples	Number of Detects	Minimum of Detects	Maximum of Detects	Mean	Standard Deviation	Median
PCB Congeners	PCB-179	ppt	78	76	29.8	11,400	1,290	1,920	655
	PCB-18/30	ppt	78	75	219	141,000	11,500	24,400	3,650
	PCB-180/193	ppt	78	73	95.1	53,900	5,790	9,160	2,500
	PCB-181	ppt	78	23	26.7	271	53.8	30.5	49.1
	PCB-182	ppt	78	19	26.4	129	48.4	12.2	49
	PCB-183/185	ppt	78	75	59.7	17,600	2,080	3,090	1,100
	PCB-184	ppt	78	7	27.9	71	48.1	5.81	49.1
	PCB-186	ppt	78	0	NA	NA	<98.4	NA	NA
	PCB-187	ppt	78	77	77.2	34,600	4,420	6,300	2,370
	PCB-188	ppt	78	18	33.5	130	51.4	15.9	49.1
	PCB-189	ppt	78	53	28.3	923	129	159	58.8
	PCB-19	ppt	78	75	31.1	14,400	1,590	2,760	566
	PCB-190	ppt	78	69	29.4	5,560	567	894	272
	PCB-191	ppt	78	51	26	1,080	129	175	59.1
	PCB-192	ppt	78	1	30.4	30.4	49	2.33	49.2
	PCB-194	ppt	78	75	53.6	12,900	1,650	2,370	882
	PCB-195	ppt	78	66	44.2	4,300	570	845	278
	PCB-196	ppt	78	71	44.4	6,120	901	1,300	456
	PCB-197/200	ppt	78	43	96.1	1,750	274	341	114
	PCB-198/199	ppt	78	73	84.9	15,900	2,320	3,170	1,260
	PCB-2	ppt	78	77	31	2,870	436	525	251
	PCB-20/28	ppt	78	78	750	306,000	26,600	46,500	12,800
	PCB-201	ppt	78	62	44.5	1,670	272	344	139
	PCB-202	ppt	78	69	50.1	4,300	717	875	412
	PCB-203	ppt	78	73	39.8	9,630	1,420	1,980	731
	PCB-204	ppt	78	0	NA	NA	<98.4	NA	NA
	PCB-205	ppt	78	43	33.5	639	107	121	50.3
	PCB-206	ppt	78	74	63.1	12,300	1,900	2,490	949
	PCB-207	ppt	78	53	38.2	933	177	192	98.5
	PCB-208	ppt	78	71	45.9	4,760	729	951	388
	PCB-209	ppt	78	71	80	13,400	1,900	2,700	961
	PCB-21/33	ppt	78	78	279	121,000	8,890	19,100	3,040
	PCB-22	ppt	78	78	211	94,100	7,430	14,600	2,740
	PCB-23	ppt	78	15	15.3	188	27.8	26.8	19.7
	PCB-24	ppt	78	49	21.3	1,790	138	279	40
	PCB-25	ppt	78	78	53.2	19,600	2,280	3,150	1,360
	PCB-26/29	ppt	78	74	89.5	40,700	4,020	6,390	2,220
	PCB-27	ppt	78	74	21.1	9,990	1,100	1,780	536
	PCB-3	ppt	78	78	114	5,160	1,010	988	561
	PCB-31	ppt	78	78	553	265,000	23,100	42,700	10,200
	PCB-32	ppt	78	78	115	47,900	5,010	8,670	2,040
	PCB-34	ppt	78	54	16.4	1,100	116	184	58.1
	PCB-35	ppt	78	71	21.5	7,060	774	1,310	324
	PCB-36	ppt	78	31	16.5	60.3	23.3	9.1	19.8
	PCB-37	ppt	78	78	89.8	64,100	6,150	9,740	3,210
	PCB-38	ppt	78	18	14.5	102	24.9	17.2	19.7
	PCB-39	ppt	78	58	18.5	1,190	137	224	59.5
	PCB-4	ppt	78	78	227	24,300	4,160	5,380	2,130
	PCB-40/71	ppt	78	77	116	80,600	7,920	14,300	3,380
	PCB-41	ppt	78	59	110	14,700	1,070	2,490	293
	PCB-42	ppt	78	78	53.2	51,800	5,450	9,470	2,430
	PCB-43	ppt	78	69	32.7	8,250	769	1,480	290
	PCB-44/47/65	ppt	78	78	148	185,000	17,100	30,800	7,920
	PCB-45	ppt	78	73	70	25,100	2,290	4,650	838
	PCB-46	ppt	78	71	34	9,770	896	1,790	349
	PCB-48	ppt	78	76	41.5	37,600	3,370	6,810	1,190
	PCB-49/69	ppt	78	78	107	119,000	12,100	20,600	5,600
	PCB-5	ppt	78	58	18.2	761	115	158	49.5
	PCB-50/53	ppt	78	75	49.6	23,400	2,360	4,280	1,020

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Parameter Group	Analyte	Units	Number of Samples	Number of Detects	Minimum of Detects	Maximum of Detects	Mean	Standard Deviation	Median
PCB Congeners	PCB-51	ppt	78	72	58.5	6,620	936	1,230	543
	PCB-52	ppt	78	77	152	211,000	18,600	35,400	7,470
	PCB-54	ppt	78	49	28.8	561	115	113	51.1
	PCB-55	ppt	78	58	27.5	2,890	217	427	88.8
	PCB-56	ppt	78	73	75.8	107,000	6,310	14,400	2,970
	PCB-57	ppt	78	53	22.4	1,100	107	150	50.7
	PCB-58	ppt	78	41	28.4	472	72.7	63.8	49.9
	PCB-59/62/75	ppt	78	69	93	15,800	1,570	2,670	729
	PCB-6	ppt	78	74	143	7,210	1,500	1,620	1,010
	PCB-60	ppt	78	78	30.3	42,200	3,360	6,890	1,330
	PCB-61/70/74/76	ppt	47	46	922	219,000	21,500	37,000	11,200
	PCB-63	ppt	78	72	27.2	7,720	739	1,310	316
	PCB-64	ppt	78	78	67.2	85,800	7,940	15,000	3,300
	PCB-66	ppt	78	78	151	221,000	18,300	34,400	7,730
	PCB-67	ppt	78	69	25	5,880	504	880	233
	PCB-68	ppt	78	60	26.9	653	127	111	84.2
	PCB-7	ppt	78	57	60.6	1,720	252	397	117
	PCB-70/74/76	ppt	31	31	249	431,000	44,900	90,100	12,200
	PCB-72	ppt	78	62	26.8	1,330	186	212	114
	PCB-73	ppt	78	5	33.8	63.1	48.9	3.26	49.2
	PCB-77	ppt	78	77	32.4	22,800	2,350	4,000	1,080
	PCB-78	ppt	78	1	60.3	60.3	49.3	1.57	49.2
	PCB-79	ppt	78	58	22.7	1,320	158	233	70.7
	PCB-8	ppt	78	78	856	53,800	9,930	11,800	4,330
	PCB-80	ppt	78	0	NA	NA	<98.4	NA	NA
	PCB-81	ppt	78	32	38	838	84.1	116	49.6
	PCB-82	ppt	78	74	29.5	22,000	1,810	3,510	741
	PCB-83	ppt	78	62	65.7	7,250	718	1,240	298
	PCB-84	ppt	78	74	26.9	38,900	3,380	6,210	1,420
	PCB-85/116/117	ppt	47	46	87.4	20,200	2,100	3,290	1,290
	PCB-86/87/97/108/119/125	ppt	78	72	160	108,000	9,200	16,800	4,100
	PCB-88	ppt	78	1	1,940	1,940	73.4	214	49.2
	PCB-89	ppt	78	55	33.1	2,870	229	455	80.5
	PCB-9	ppt	78	76	48.2	2,240	427	523	211
	PCB-90/101/113	ppt	78	74	99.5	147,000	11,900	21,200	5,530
	PCB-91	ppt	78	74	68.4	22,500	2,340	3,750	1,110
	PCB-92	ppt	78	67	36.8	24,300	1,730	3,310	730
	PCB-93/100	ppt	78	43	155	1,680	380	293	205
	PCB-94	ppt	78	54	26.8	986	130	157	63
	PCB-95	ppt	78	74	158	125,000	11,700	20,400	5,770
	PCB-96	ppt	78	50	31	1,460	158	254	55.4
	PCB-98/102	ppt	78	53	166	6,450	701	1,020	321
	PCB-99	ppt	78	77	68.8	69,700	7,260	11,500	3,560
	Total PCB Congeners (209)	ppt	78	78	9,070	5,030,000	471,000	800,000	232,000
Pesticides	2,4'-DDD	ppb	78	77	0.09	18	3.6	3.1	3.1
	2,4'-DDE	ppb	78	78	0.053	31	4.6	6.2	2.6
	2,4'-DDT	ppb	77	29	0.015	1.4	0.089	0.18	0.0031
	4,4'-DDD	ppb	78	78	0.12	37	8.9	7.3	8
	4,4'-DDE	ppb	78	78	0.22	130	18	25	10
	4,4'-DDT	ppb	68	49	0.053	5.8	0.62	0.91	0.37
	Aldrin	ppb	42	3	0.026	0.3	0.011	0.045	0.0027
	Alpha-BHC	ppb	77	43	0.0063	0.36	0.045	0.064	0.014
	Alpha-Chlordane	ppb	78	72	0.11	13	2	2.2	1.2
	Beta-BHC	ppb	78	51	0.0096	0.41	0.07	0.08	0.04
	cis-Nonachlor	ppb	75	62	0.042	4.3	0.81	0.84	0.57
	Delta-BHC	ppb	78	14	0.011	0.14	0.013	0.027	0.0037
	Dieldrin	ppb	78	75	0.054	19	1.7	3.1	0.84
	Endosulfan I	ppb	74	0	NA	NA	<0.02	NA	NA
	Endosulfan II	ppb	74	0	NA	NA	<0.042	NA	NA

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Parameter Group	Analyte	Units	Number of Samples	Number of Detects	Minimum of Detects	Maximum of Detects	Mean	Standard Deviation	Median
Pesticides	Endosulfan Sulfate	ppb	70	0	NA	NA	<0.044	NA	NA
	Endrin	ppb	76	0	NA	NA	<0.0104	NA	NA
	Endrin Aldehyde	ppb	35	0	NA	NA	<0.04	NA	NA
	Endrin Ketone	ppb	68	0	NA	NA	<0.026	NA	NA
	Gamma-BHC (Lindane)	ppb	78	16	0.015	0.14	0.016	0.031	0.0037
	Heptachlor	ppb	75	6	0.02	0.13	0.0094	0.018	0.0052
	Heptachlor Epoxide	ppb	74	22	0.067	1.1	0.056	0.14	0.0047
	Hexachlorobenzene	ppb	78	77	0.027	14	1.8	2.5	1.1
	Methoxychlor	ppb	46	2	0.077	4.2	0.099	0.62	0.0059
	Mirex	ppb	53	13	0.029	1.7	0.058	0.23	0.0025
	Nonachlor, trans-	ppb	74	69	0.066	8.6	1.2	1.4	0.75
	Oxychlordane	ppb	75	1	0.21	0.21	0.0084	0.023	0.0057
	trans-Chlordane	ppb	75	73	0.1	17	2.6	3	1.7
	trans-Heptachlor Epoxide	ppb	78	16	0.11	3.2	0.16	0.48	0.0065
	Total Alpha + Gamma Chlordane	ppb	78	74	0.21	24	4.5	5.1	2.7
	Total DDT (2,4)	ppb	78	78	0.053	41	8.2	8.8	6
	Total DDT (4,4)	ppb	78	78	0.34	150	27	31	19
	Total DDT (2,4 & 4,4)	ppb	78	78	0.4	190	35	39	25
Semivolatiles	1,2,4,5-Tetrachlorobenzene	ppb	78	0	NA	NA	<62	NA	NA
	1,2-Diphenylhydrazine	ppb	78	0	NA	NA	<62	NA	NA
	2,2'-oxybis(1-Chloropropane)	ppb	78	0	NA	NA	<62	NA	NA
	2,3,4,6-Tetrachlorophenol	ppb	78	0	NA	NA	<300	NA	NA
	2,4,5-Trichlorophenol	ppb	78	0	NA	NA	<62	NA	NA
	2,4,6-Trichlorophenol	ppb	78	0	NA	NA	<62	NA	NA
	2,4-Dichlorophenol	ppb	78	0	NA	NA	<62	NA	NA
	2,4-Dimethylphenol	ppb	78	0	NA	NA	<62	NA	NA
	2,4-Dinitrophenol	ppb	78	0	NA	NA	<1840	NA	NA
	2,4-Dinitrotoluene	ppb	78	0	NA	NA	<300	NA	NA
	2,6-Dinitrotoluene	ppb	78	0	NA	NA	<62	NA	NA
	2-Chloronaphthalene	ppb	78	0	NA	NA	<60	NA	NA
	2-Chlorophenol	ppb	78	0	NA	NA	<62	NA	NA
	2-Methylphenol	ppb	78	0	NA	NA	<62	NA	NA
	2-Nitroaniline	ppb	78	0	NA	NA	<62	NA	NA
	2-Nitrophenol	ppb	78	0	NA	NA	<62	NA	NA
	3,3'-Dichlorobenzidine	ppb	78	0	NA	NA	<620	NA	NA
	3-Nitroaniline	ppb	78	0	NA	NA	<300	NA	NA
	4,6-Dinitro-2-methylphenol	ppb	78	0	NA	NA	<920	NA	NA
	4-Bromophenyl phenyl ether	ppb	78	0	NA	NA	<62	NA	NA
	4-Chloro-3-Methylphenol	ppb	78	0	NA	NA	<62	NA	NA
	4-Chloroaniline	ppb	78	0	NA	NA	<122	NA	NA
	4-Chlorophenyl phenyl ether	ppb	78	0	NA	NA	<62	NA	NA
	4-Methylphenol	ppb	78	52	23	200	48	28	40
	4-Nitroaniline	ppb	78	0	NA	NA	<300	NA	NA
	4-Nitrophenol	ppb	78	0	NA	NA	<920	NA	NA
	Acetophenone	ppb	78	18	30	270	42	42	30
	Atrazine	ppb	78	0	NA	NA	<300	NA	NA
	Benzaldehyde	ppb	78	0	NA	NA	<300	NA	NA
	Benzidine	ppb	78	0	NA	NA	<920	NA	NA
	Benzoic Acid	ppb	78	6	410	790	470	210	430
	Biphenyl	ppb	78	10	30	140	34	19	30
	bis(2-Chloroethoxy)methane	ppb	78	0	NA	NA	<62	NA	NA
	bis(2-Chloroethyl)ether	ppb	78	0	NA	NA	<62	NA	NA
	bis(2-Ethylhexyl)phthalate	ppb	78	58	96	31000	1200	4000	270
	Butyl benzyl phthalate	ppb	78	1	110	110	150	67	140
	Caprolactam	ppb	78	0	NA	NA	<300	NA	NA
	Carbazole	ppb	78	19	27	360	41	42	31
	Dibenzofuran	ppb	78	29	20	400	44	48	31
	Diethyl phthalate	ppb	78	0	NA	NA	<300	NA	NA
	Dimethylphthalate	ppb	78	0	NA	NA	<300	NA	NA

Table D-2
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Parameter Group	Analyte	Units	Number of Samples	Number of Detects	Minimum of Detects	Maximum of Detects	Mean	Standard Deviation	Median
Semivolatiles	Di-n-Butylphthalate	ppb	78	0	NA	NA	<300	NA	NA
	Di-n-Octylphthalate	ppb	78	0	NA	NA	<300	NA	NA
	Hexachlorobutadiene	ppb	78	0	NA	NA	<62	NA	NA
	Hexachlorocyclopentadiene	ppb	78	0	NA	NA	<920	NA	NA
	Hexachloroethane	ppb	78	0	NA	NA	<300	NA	NA
	Isophorone	ppb	78	0	NA	NA	<62	NA	NA
	Nitrobenzene	ppb	78	0	NA	NA	<62	NA	NA
	N-Nitroso-di-n-propylamine	ppb	78	0	NA	NA	<62	NA	NA
	N-Nitrosodiphenylamine	ppb	78	0	NA	NA	<62	NA	NA
	Pentachlorophenol	ppb	78	0	NA	NA	<320	NA	NA
	Phenol	ppb	78	17	20	480	38	53	30
	Pyridine	ppb	78	0	NA	NA	<300	NA	NA
TEQ	Total WHO Dioxin TEQ(Bird)	ppt	78	78	3.3	1870	181	319	88.8
	Total WHO Dioxin TEQ(Fish)	ppt	78	78	2.72	1810	166	308	75.2
	Total WHO Dioxin TEQ(Human/Mammal)	ppt	78	78	2.72	1810	165	308	74.9
TOC	TOC	ppm	78	78	1500	34000	18000	8500	19000
TPH	PHC AS GASOLINE	ppm	78	22	0.3	4.9	1.7	2.5	0.9
	TPH	ppm	78	77	7.4	1200	250	210	190
Volatiles	1,2,4-Trichlorobenzene	ppb	78	1	4	4	4.3	1.5	4
	1,2-Dichlorobenzene	ppb	78	0	NA	NA	<10.6	NA	NA
	1,3-Dichlorobenzene	ppb	78	0	NA	NA	<10.6	NA	NA
	1,4-Dichlorobenzene	ppb	78	0	NA	NA	<10.6	NA	NA
Physical Properties	Water Content	%	78	78	21	180	72	33	69
	Percent Moisture	%	78	78	17	64	40	11	41
	Percent Solids	%	78	78	37	82	59	11	57

Notes:
1. Summary statistics were calculated using 1/2 the detection limit for non-detect values.
2. Field duplicates averaged with parent samples.
3. PAHs are being re-analyzed due to analytical bias and were not included.

DDT = dichlorodiphenyl-trichloroethane
PCB = polychlorinated biphenyl
TPH= total petroleum hydrocarbons
NA = not applicable
ND = not detected
ppb = parts per billion
ppm = parts per million
ppt = parts per thousand
% = percent
< = Not detected, average detection limit reported.

Table D-3
Statistical Summary of Phase III Sediment Chemistry Data in the NBSA: Newark Bay Central

Parameter Group	Analyte	Units	Number of Samples	Number of Detects	Minimum of Detects	Maximum of Detects	Mean	Standard Deviation	Median
Dioxins/Furans	1,2,3,4,6,7,8-HpCDD	ppt	35	35	0.62	394	209	105	253
	1,2,3,4,6,7,8-HpCDF	ppt	35	35	0.397	514	226	133	249
	1,2,3,4,7,8,9-HpCDF	ppt	35	34	0.206	20.9	9.68	5.15	9.88
	1,2,3,4,7,8-HxCDD	ppt	35	35	0.024	5.27	2.98	1.37	3.55
	1,2,3,4,7,8-HxCDF	ppt	35	35	0.124	120	55.8	33.6	64.1
	1,2,3,6,7,8-HxCDD	ppt	35	35	0.0439	25.3	12	6.38	13.6
	1,2,3,6,7,8-HxCDF	ppt	35	35	0.0451	27.1	13.9	7.65	14.6
	1,2,3,7,8,9-HxCDD	ppt	35	35	0.0238	13.6	7.53	3.65	9
	1,2,3,7,8,9-HxCDF	ppt	35	23	0.0664	5.32	2.28	1.54	2.47
	1,2,3,7,8-PeCDD	ppt	35	35	0.0314	6.19	2.95	1.5	3.17
	1,2,3,7,8-PeCDF	ppt	35	35	0.0631	18.1	6.92	3.76	7.35
	2,3,4,6,7,8-HxCDF	ppt	35	35	0.0405	11.7	6.62	3.2	6.94
	2,3,4,7,8-PeCDF	ppt	35	35	0.0351	21.2	11.3	5.84	12
	2,3,7,8-TCDD	ppt	35	35	0.12	177	55.1	42.4	48.8
	2,3,7,8-TCDF	ppt	35	35	0.0924	27.9	12.1	5.99	13.5
	OCDD	ppt	35	35	9.4	4170	2320	953	2650
	OCDF	ppt	35	35	0.746	711	379	216	435
Grain Size	0.001 mm	%	35	32	0.5	16	5.1	3.3	5.5
	0.002 mm	%	35	34	2	27	9.9	5.1	10
	0.02 mm	%	35	34	2	68	46	17	51
	0.05 mm	%	35	35	2	85	67	22	75
	0.064 mm	%	35	35	5	93	76	24	86
	0.3 mm	%	35	35	56	99	94	8.8	97
	3.35 mm	%	35	35	90	100	99	2.6	100
	75000 um	%	35	35	100	100	100	0	100
	HYDROMETER, % FINER THAN 0.0050 mm	%	35	34	2	44	19	8.6	21
	SIEVE NO. 200, PERCENT PASSING	%	35	35	6	97	79	24	89
	SIEVE NO. 4, PERCENT PASSING	%	35	35	92	100	99	1.7	100
	SIEVE, 19000 MICRONS, PERCENT PASSING	%	35	35	100	100	100	0	100
	SIEVE, 37500 MICRONS, PERCENT PASSING	%	35	35	100	100	100	0	100
	SIEVE, NO. 100, PERCENT PASSING	%	35	35	8.3	98	86	23	95
	SIEVE, NO. 16, PERCENT PASSING	%	35	35	81	100	98	4.9	99
	SIEVE, NO. 30, PERCENT PASSING	%	35	35	76	99	97	5.5	98
	SIEVE, NO. 8, PERCENT PASSING	%	35	35	83	100	98	4.4	100
Herbicides	2,4,5-T	ppb	35	1	17	17	3.6	5.3	1.8
	2,4,5-TP (Silvex)	ppb	35	0	NA	NA	<7.2	NA	NA
	2,4-D	ppb	35	1	38	38	75	110	38
	2,4-DB	ppb	35	0	NA	NA	<72	NA	NA
Metals	Aluminum	ppm	35	35	1650	24500	17100	5470	18100
	Antimony	ppm	35	33	0.161	1.71	0.482	0.327	0.395
	Arsenic	ppm	35	35	1.8	85.4	18.7	16.9	14.1
	Barium	ppm	35	35	5.5	211	119	41.7	119
	Beryllium	ppm	35	35	0.0807	1.34	0.967	0.307	1
	Cadmium	ppm	35	33	0.262	3.24	0.963	0.628	0.762
	Calcium	ppm	35	35	416	23300	7460	4370	7250
	Chromium	ppm	35	35	3.95	226	105	45.9	99.6
	Cobalt	ppm	35	35	1.26	13.9	10.3	2.98	10.8
	Copper	ppm	35	35	1.5	290	107	60	99.1
	Iron	ppm	35	35	2910	44200	30600	9330	32600
	Lead	ppm	35	35	2.18	270	119	55.8	116
	Magnesium	ppm	35	35	943	11600	8520	2690	9200
	Manganese	ppm	35	35	37.5	628	408	141	426
	Mercury	ppm	35	35	0.00511	9.44	1.98	1.8	1.48
	Methyl Mercury	ppm	35	34	0.000027	0.0048	0.000936	0.000849	0.000785
	Nickel	ppm	35	35	3.83	68	42	14	43.5
	Potassium	ppm	35	35	519	6780	4250	1470	4220
	Selenium	ppm	35	33	0.224	2	0.734	0.337	0.71
	Silver	ppm	35	34	0.0448	3.94	1.78	0.839	1.78

Table D-3
Statistical Summary of Phase III Sediment Chemistry Data in the NBSA: Newark Bay Central

Parameter Group	Analyte	Units	Number of Samples	Number of Detects	Minimum of Detects	Maximum of Detects	Mean	Standard Deviation	Median
Metals	Sodium	ppm	35	35	1940	16600	9610	3190	10400
	Thallium	ppm	35	34	0.0358	0.521	0.228	0.0795	0.225
	Titanium	ppm	35	35	104	738	511	139	551
	Vanadium	ppm	35	35	4.43	59.1	41.2	12.5	43
	Zinc	ppm	35	35	8.18	461	217	82.4	220
	Total Cyanide	ppm	35	4	0.39	6.4	0.4	1.1	0.19
TEPH Alkanes	2,6,10,14-Tetramethyl Pentadecane	ppm	35	14	0.042	0.84	0.11	0.17	0.044
	2,6,10,14-Tetramethylhexadecane	ppm	35	17	0.021	0.62	0.085	0.14	0.037
	Dotriacontane	ppm	35	31	0.026	1.6	0.21	0.32	0.094
	Heneicosane	ppm	35	26	0.027	0.29	0.11	0.083	0.095
	Heptacosane	ppm	35	13	0.056	0.45	0.18	0.2	0.1
	Heptadecane	ppm	35	21	0.037	1.3	0.15	0.22	0.069
	Heptatriacontane, -n	ppm	35	19	0.02	0.15	0.066	0.07	0.038
	Hexatriacontane	ppm	35	2	0.066	0.31	0.06	0.073	0.036
	Hhentriacontane	ppm	35	11	0.025	0.45	0.11	0.12	0.054
	Nonacosane	ppm	35	31	0.024	0.4	0.16	0.093	0.16
	Nonadecane	ppm	35	7	0.048	0.6	0.09	0.12	0.037
	Nonatriacontane	ppm	35	2	0.047	0.12	0.11	0.12	0.065
	Octatriacontane	ppm	35	7	0.037	0.21	0.062	0.068	0.037
	Pentacosane	ppm	35	33	0.025	0.47	0.099	0.1	0.062
	Pentadecane	ppm	35	20	0.015	0.73	0.09	0.14	0.037
	Pentatriacontane	ppm	35	32	0.028	0.41	0.095	0.086	0.073
	Tetracontane	ppm	35	24	0.014	0.27	0.06	0.072	0.036
	Tetratriacontane	ppm	35	10	0.029	0.18	0.06	0.066	0.037
	Tricosane	ppm	35	31	0.038	1.1	0.15	0.24	0.089
	Tritriacontane	ppm	35	15	0.037	0.11	0.072	0.066	0.049
	n-Decane	ppm	35	2	0.11	0.28	0.087	0.096	0.048
	n-Docosane	ppm	35	30	0.05	1.8	0.21	0.35	0.11
	n-Dodecane	ppm	35	26	0.024	1	0.19	0.21	0.12
	n-Eicosane	ppm	35	6	0.028	0.16	0.068	0.069	0.037
	n-Hexacosane	ppm	35	17	0.035	0.24	0.079	0.073	0.049
	n-Hexadecane	ppm	35	2	0.22	0.61	0.08	0.12	0.036
	n-Nonane	ppm	35	3	0.025	0.11	0.062	0.068	0.036
	n-Octacosane	ppm	35	34	0.022	3.7	0.51	0.68	0.3
	n-Octadecane	ppm	35	27	0.041	0.77	0.12	0.14	0.069
	n-Tetracosane	ppm	35	29	0.022	0.66	0.086	0.13	0.039
	n-Tetradecane	ppm	35	29	0.032	1.8	0.34	0.34	0.25
	n-Triacontane	ppm	35	12	0.063	0.45	0.15	0.14	0.067
	n-Tridecane	ppm	35	4	0.025	1.8	0.15	0.38	0.036
	n-Undecane	ppm	35	2	0.37	0.95	0.14	0.19	0.066
PCB Aroclors	Aroclor-1016	ppb	35	0	NA	NA	<34	NA	NA
	Aroclor-1221	ppb	35	0	NA	NA	<34	NA	NA
	Aroclor-1232	ppb	35	0	NA	NA	<34	NA	NA
	Aroclor-1242	ppb	35	0	NA	NA	<34	NA	NA
	Aroclor-1248	ppb	35	31	6.9	120	45	27	42
	Aroclor-1254	ppb	35	30	17	110	45	25	41
	Aroclor-1260	ppb	35	23	20	57	27	11	24
	Aroclor-1262	ppb	35	0	NA	NA	<34	NA	NA
	Aroclor-1268	ppb	35	0	NA	NA	<34	NA	NA
	Total Aroclor PCBs (Sum of 7 Aroclors)	ppb	35	31	6.9	270	110	69	110
	Total Aroclor PCBs (Sum of 9 Aroclors)	ppb	35	31	6.9	270	110	69	110
PCB Congeners	PCB-1	ppt	35	34	68	3,620	1,240	1,010	1,040
	PCB-10	ppt	35	29	64.5	736	257	184	211
	PCB-103	ppt	35	30	22.3	475	163	117	146
	PCB-104	ppt	35	10	32.7	56.2	48.2	5.56	48.9
	PCB-105	ppt	35	31	66.5	11,800	3,410	3,020	2,940
	PCB-106	ppt	35	0	NA	NA	<99.6	NA	NA
	PCB-107	ppt	35	30	85	1,850	684	563	607

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Statistical Summary of Phase III Sediment Chemistry Data in the NBSA: Newark Bay Central

Parameter Group	Analyte	Units	Number of Samples	Number of Detects	Minimum of Detects	Maximum of Detects	Mean	Standard Deviation	Median
PCB Congeners	PCB-108/124	ppt	35	26	86	897	317	239	253
	PCB-11	ppt	35	35	253	8,320	2,740	2,160	2,610
	PCB-110/115	ppt	35	32	136	51,800	11,100	10,400	9,950
	PCB-111	ppt	35	1	31.7	31.7	49.3	4.12	49.4
	PCB-112	ppt	35	9	29.1	104	48.8	12.1	49.2
	PCB-114	ppt	35	27	56.1	734	207	169	166
	PCB-116/117	ppt	5	2	2,550	8,960	2,420	3,790	205
	PCB-118	ppt	35	34	66.8	30,000	9,000	7,820	7,760
	PCB-12/13	ppt	35	34	69.7	3,800	1,370	990	1,270
	PCB-120	ppt	35	24	26.2	150	64	28.4	51
	PCB-121	ppt	35	0	NA	NA	<99.6	NA	NA
	PCB-122	ppt	35	27	34.5	419	139	103	107
	PCB-123	ppt	35	27	51.5	656	194	157	156
	PCB-126	ppt	35	19	37.4	208	67.6	36.5	51
	PCB-127	ppt	35	11	34.4	553	88.8	102	49.6
	PCB-128/166	ppt	35	30	186	5,940	1,390	1,240	1,230
	PCB-129/138/163	ppt	35	32	136	34,800	9,980	8,470	8,900
	PCB-130	ppt	35	31	32.8	1,980	600	497	524
	PCB-131	ppt	35	25	33.4	387	124	84.4	97.7
	PCB-132	ppt	35	33	33.5	8,900	2,800	2,330	2,490
	PCB-133	ppt	35	30	23.8	448	179	135	145
	PCB-134	ppt	35	30	71.2	1,420	531	395	476
	PCB-135/151	ppt	35	31	121	11,700	3,240	2,780	3,030
	PCB-136	ppt	35	31	41	4,080	1,100	942	1000
	PCB-137	ppt	35	30	49.1	1,530	406	346	338
	PCB-139/140	ppt	35	24	97.1	429	185	102	147
	PCB-14	ppt	35	0	NA	NA	<39.8	NA	NA
	PCB-141	ppt	35	31	49.2	4,640	1,340	1,170	1,130
	PCB-142	ppt	35	0	NA	NA	<99.6	NA	NA
	PCB-143	ppt	35	0	NA	NA	<199.4	NA	NA
	PCB-144	ppt	35	30	52.6	1,630	412	355	358
	PCB-145	ppt	35	0	NA	NA	<99.6	NA	NA
	PCB-146	ppt	35	31	50.4	3,550	1,360	1,080	1,240
	PCB-147/149	ppt	35	32	84.8	17,900	6,710	5,300	6,330
	PCB-148	ppt	35	16	33.1	91	53.4	11.6	49.5
	PCB-15	ppt	35	35	142	22,700	8,010	5,920	7,760
	PCB-150	ppt	35	21	30.9	126	60.6	23.1	51
	PCB-152	ppt	35	8	31.1	43.9	46.6	7.29	48.8
	PCB-153/168	ppt	35	33	99	23,900	8,270	6,760	7,740
	PCB-154	ppt	35	24	115	650	270	177	179
	PCB-155	ppt	35	23	34	324	82.3	59.1	52.3
	PCB-156/157	ppt	35	30	123	3,880	1,100	961	889
	PCB-158	ppt	35	30	42.3	3,310	816	727	723
	PCB-159	ppt	35	0	NA	NA	<99.6	NA	NA
	PCB-16	ppt	35	34	57.4	11,300	1,780	2,050	1,620
	PCB-160	ppt	35	0	NA	NA	<398	NA	NA
	PCB-161	ppt	35	0	NA	NA	<99.6	NA	NA
	PCB-162	ppt	35	0	NA	NA	<99.6	NA	NA
	PCB-164	ppt	35	30	71.5	2,040	581	487	508
	PCB-165	ppt	35	0	NA	NA	<99.6	NA	NA
	PCB-167	ppt	35	30	44.1	1,190	373	315	304
	PCB-169	ppt	35	0	NA	NA	<99.6	NA	NA
	PCB-17	ppt	35	34	70.9	13,900	2,950	2,720	2,800
	PCB-170	ppt	35	32	30.8	6,920	1,980	1,790	1,650
	PCB-171/173	ppt	35	30	80.1	1,750	647	518	573
	PCB-172	ppt	35	30	50.6	1,210	385	326	316
	PCB-174	ppt	35	32	36.8	5,560	1,750	1,510	1,570
	PCB-175	ppt	35	26	30.1	366	122	86.2	98.1

Table D-3
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Parameter Group	Analyte	Units	Number of Samples	Number of Detects	Minimum of Detects	Maximum of Detects	Mean	Standard Deviation	Median
PCB Congeners	PCB-176	ppt	35	29	36.2	865	299	239	256
	PCB-177	ppt	35	32	22.4	3,810	1,370	1,160	1,210
	PCB-178	ppt	35	31	35.6	1,730	600	495	535
	PCB-179	ppt	35	31	43.4	2,940	1,040	849	940
	PCB-18/30	ppt	35	35	112	23,800	4,450	4,390	4,190
	PCB-180/193	ppt	35	33	59.3	17,700	4,800	4,380	4,130
	PCB-181	ppt	35	11	26.9	58.1	47.4	7.76	48.9
	PCB-182	ppt	35	9	25.9	54.4	46.6	7.79	48.8
	PCB-183/185	ppt	35	31	72.2	5,140	1,670	1,440	1,490
	PCB-184	ppt	35	2	32.1	32.2	48.9	4.97	49.4
	PCB-186	ppt	35	0	NA	NA	<99.6	NA	NA
	PCB-187	ppt	35	31	138	11,200	3,640	3,110	3,400
	PCB-188	ppt	35	10	29.1	55.9	47.4	6.86	48.8
	PCB-189	ppt	35	26	29	296	109	77.6	89.6
	PCB-19	ppt	35	34	24	2,310	676	523	648
	PCB-190	ppt	35	31	34.9	1,350	440	373	382
	PCB-191	ppt	35	25	30.8	341	104	73.6	76.9
	PCB-192	ppt	35	0	NA	NA	<99.6	NA	NA
	PCB-194	ppt	35	32	50.3	5,260	1,430	1,300	1,230
	PCB-195	ppt	35	30	54.6	1,750	488	444	397
	PCB-196	ppt	35	31	42.3	2,450	769	673	700
	PCB-197/200	ppt	35	23	105	670	232	160	187
	PCB-198/199	ppt	35	31	100	6,440	2,130	1,790	1,840
	PCB-2	ppt	35	34	22.3	1,820	288	326	246
	PCB-20/28	ppt	35	35	287	45,900	16,100	12,900	15,500
	PCB-201	ppt	35	25	53.6	724	253	199	224
	PCB-202	ppt	35	30	88.1	1,790	711	546	609
	PCB-203	ppt	35	31	53.1	4,120	1,290	1,110	1,120
	PCB-204	ppt	35	0	NA	NA	<99.6	NA	NA
	PCB-205	ppt	35	24	35.5	292	90.1	60.7	70.1
	PCB-206	ppt	35	31	51.1	5,160	1,910	1,560	1,620
	PCB-207	ppt	35	26	49	515	180	130	160
	PCB-208	ppt	35	30	76	2,070	751	606	616
	PCB-209	ppt	35	33	34.5	5,120	1,780	1,540	1,320
	PCB-21/33	ppt	35	35	92.4	14,200	3,180	2,900	2,930
	PCB-22	ppt	35	34	131	12,600	3,330	2,870	3,170
	PCB-23	ppt	35	8	14.3	29.7	19.5	2.76	19.6
	PCB-24	ppt	35	26	22.7	345	58.1	58.4	47.5
	PCB-25	ppt	35	35	30	5,430	1,910	1,490	1,790
	PCB-26/29	ppt	35	34	54.5	9,230	3,040	2,530	2,810
	PCB-27	ppt	35	33	15.9	2,700	749	616	742
	PCB-3	ppt	35	35	37.2	1,960	667	511	631
	PCB-31	ppt	35	35	216	34,200	11,600	9,280	11,100
	PCB-32	ppt	35	35	58	8,320	2,350	1,850	2,360
	PCB-34	ppt	35	27	17.4	275	93.5	71.7	78.3
	PCB-35	ppt	35	30	33.4	1,990	523	467	418
	PCB-36	ppt	35	18	17.5	54.3	25.5	8.71	20.4
	PCB-37	ppt	35	35	91.7	13,600	5,070	4,060	4,450
	PCB-38	ppt	35	7	15.1	23.3	19.7	1.82	19.7
	PCB-39	ppt	35	27	22.2	230	88.4	63.7	76.3
	PCB-4	ppt	35	35	143	6,420	2,450	1,730	2,270
	PCB-40/71	ppt	35	31	105	18,600	4,610	3,960	4,310
	PCB-41	ppt	35	27	87.8	2,460	405	439	283
	PCB-42	ppt	35	32	46.4	13,200	3,150	2,780	2,990
	PCB-43	ppt	35	29	53.5	2,110	405	395	385
	PCB-44/47/65	ppt	35	35	92.8	41,400	9,820	8,550	9,190
	PCB-45	ppt	35	30	141	5,770	1,020	1,070	927
	PCB-46	ppt	35	30	65.4	2,180	423	410	385

Table D-3
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Parameter Group	Analyte	Units	Number of Samples	Number of Detects	Minimum of Detects	Maximum of Detects	Mean	Standard Deviation	Median
PCB Congeners	PCB-48	ppt	35	31	30.2	8,470	1,530	1,570	1,430
	PCB-49/69	ppt	35	34	53.7	29,700	7,490	6,350	7,130
	PCB-5	ppt	35	24	16.2	158	47.9	27.6	48.2
	PCB-50/53	ppt	35	29	200	5,790	1,280	1,140	1,230
	PCB-51	ppt	35	30	76.7	2,330	668	533	603
	PCB-52	ppt	35	32	86.9	42,800	9,660	8,650	9,340
	PCB-54	ppt	35	21	29.4	155	69.3	32.2	51
	PCB-55	ppt	35	26	40	326	128	84.6	104
	PCB-56	ppt	35	31	82.9	13,400	4,610	3,960	4,060
	PCB-57	ppt	35	26	22.4	188	86.6	46.5	74
	PCB-58	ppt	35	22	31.1	133	62.8	27.6	49.9
	PCB-59/62/75	ppt	35	30	141	4,130	971	812	828
	PCB-6	ppt	35	34	97.9	3,320	1,160	832	976
	PCB-60	ppt	35	32	33.5	6,090	1,760	1,540	1,590
	PCB-61/70/74/76	ppt	30	28	2,070	41,700	16,100	11,700	16,100
	PCB-63	ppt	35	30	62.8	1,210	466	359	398
	PCB-64	ppt	35	32	46.9	18,600	4,100	3,750	4,010
	PCB-66	ppt	35	33	124	30,200	10,800	8,790	10,200
	PCB-67	ppt	35	30	42.9	842	323	249	275
	PCB-68	ppt	35	27	34.2	375	140	93.4	120
	PCB-7	ppt	35	21	40.8	338	113	101	88.6
	PCB-70/74/76	ppt	5	5	184	38,300	10,500	16,500	350
	PCB-72	ppt	35	29	27.9	489	180	128	161
	PCB-73	ppt	35	7	28.7	60.8	49.6	5.29	49.5
	PCB-77	ppt	35	32	32.2	14,900	2,370	2,880	1,760
	PCB-78	ppt	35	0	NA	NA	<99.6	NA	NA
	PCB-79	ppt	35	27	27	259	102	67.6	80
	PCB-8	ppt	35	35	254	14,900	4,530	3,440	3,880
	PCB-80	ppt	35	0	NA	NA	<99.6	NA	NA
	PCB-81	ppt	35	17	41.8	142	61.2	24.2	49.5
	PCB-82	ppt	35	31	32.3	5,860	1,120	1,120	905
	PCB-83	ppt	35	29	57.7	1,840	497	409	427
	PCB-84	ppt	35	32	27.6	9,560	2,100	1,930	1,980
	PCB-85/116/117	ppt	30	28	237	4,650	1,710	1,190	1,620
	PCB-86/87/97/108/119/125	ppt	35	30	175	30,400	5,940	5,890	4,990
	PCB-88	ppt	35	0	NA	NA	<99.6	NA	NA
	PCB-89	ppt	35	26	26.4	594	132	109	108
	PCB-9	ppt	35	34	22.8	595	181	130	169
	PCB-90/101/113	ppt	35	32	93.6	40,200	8,740	8,070	7,930
	PCB-91	ppt	35	31	48.3	6,390	1,620	1,390	1,490
	PCB-92	ppt	35	30	44.5	7,290	1,660	1,550	1,480
	PCB-93/100	ppt	35	24	155	778	316	157	244
	PCB-94	ppt	35	26	26	331	106	67.4	97.2
	PCB-95	ppt	35	30	881	24,100	6,610	5,650	5,950
	PCB-96	ppt	35	23	45	407	102	71.9	81.2
	PCB-98/102	ppt	35	24	246	1,760	511	349	438
	PCB-99	ppt	35	32	60.2	22,500	5,310	4,730	5,020
	Total PCB Congeners (209)	ppt	35	35	3,750	1,010,000	297,000	243,000	275,000
Pesticides	2,4'-DDD	ppb	34	33	0.011	10	3.1	2	3.2
	2,4'-DDE	ppb	34	34	0.011	17	4.7	3.7	3.9
	2,4'-DDT	ppb	34	15	0.1	0.41	0.096	0.12	0.0031
	4,4'-DDD	ppb	35	35	0.036	29	8.3	5.6	8.8
	4,4'-DDE	ppb	34	34	0.042	44	15	10	15
	4,4'-DDT	ppb	31	27	0.015	10	0.84	1.8	0.48
	Aldrin	ppb	19	0	NA	NA	<0.0054	NA	NA
	Alpha-BHC	ppb	34	28	0.025	0.38	0.064	0.072	0.046
	Alpha-Chlordane	ppb	34	32	0.012	6.2	2.1	1.4	2.5
	Beta-BHC	ppb	34	26	0.0062	1.3	0.093	0.22	0.054

Table D-3
Statistical Summary of Phase III Sediment Chemistry Data in the NBSA: Newark Bay Central

Parameter Group	Analyte	Units	Number of Samples	Number of Detects	Minimum of Detects	Maximum of Detects	Mean	Standard Deviation	Median
Pesticides	cis-Nonachlor	ppb	34	30	0.022	2.4	0.87	0.58	0.95
	Delta-BHC	ppb	34	6	0.012	0.61	0.026	0.1	0.0037
	Dieldrin	ppb	34	33	0.045	4.6	1	0.86	0.93
	Endosulfan I	ppb	34	0	NA	NA	<0.02	NA	NA
	Endosulfan II	ppb	34	0	NA	NA	<0.042	NA	NA
	Endosulfan Sulfate	ppb	34	0	NA	NA	<0.044	NA	NA
	Endrin	ppb	34	0	NA	NA	<0.0104	NA	NA
	Endrin Aldehyde	ppb	25	0	NA	NA	<0.04	NA	NA
	Endrin Ketone	ppb	31	0	NA	NA	<0.026	NA	NA
	Gamma-BHC (Lindane)	ppb	34	11	0.023	0.66	0.037	0.11	0.0037
	Heptachlor	ppb	34	1	0.021	0.021	0.0057	0.0026	0.0052
	Heptachlor Epoxide	ppb	34	12	0.03	1.2	0.067	0.21	0.0047
	Hexachlorobenzene	ppb	34	34	0.013	3.8	0.82	0.73	0.69
	Methoxychlor	ppb	19	1	0.11	0.11	0.011	0.024	0.0059
	Mirex	ppb	28	11	0.058	0.11	0.03	0.037	0.0025
	Nonachlor, trans-	ppb	34	31	0.044	3.5	1.2	0.78	1.4
	Oxychlordane	ppb	34	0	NA	NA	<0.0114	NA	NA
	Total Alpha + Gamma Chlordane	ppb	35	32	0.039	13	4.4	3	5
	trans-Chlordane	ppb	34	32	0.027	6.5	2.4	1.6	2.5
	trans-Heptachlor Epoxide	ppb	34	1	0.45	0.45	0.019	0.075	0.0065
	Total DDT (2,4)	ppb	35	34	0.022	22	7.7	5.7	7.1
	Total DDT (4,4)	ppb	35	35	0.093	73	24	16	25
	Total DDT (2,4 & 4,4)	ppb	35	35	0.12	94	32	22	33
Semivolatiles	1,2,4,5-Tetrachlorobenzene	ppb	35	0	NA	NA	<68	NA	NA
	1,2-Diphenylhydrazine	ppb	35	0	NA	NA	<68	NA	NA
	2,2'-oxybis(1-Chloropropane)	ppb	35	1	56	56	35	7.7	35
	2,3,4,6-Tetrachlorophenol	ppb	35	0	NA	NA	<340	NA	NA
	2,4,5-Trichlorophenol	ppb	35	0	NA	NA	<68	NA	NA
	2,4,6-Trichlorophenol	ppb	35	0	NA	NA	<68	NA	NA
	2,4-Dichlorophenol	ppb	35	0	NA	NA	<68	NA	NA
	2,4-Dimethylphenol	ppb	35	0	NA	NA	<68	NA	NA
	2,4-Dinitrophenol	ppb	35	0	NA	NA	<2000	NA	NA
	2,4-Dinitrotoluene	ppb	35	0	NA	NA	<340	NA	NA
	2,6-Dinitrotoluene	ppb	35	1	31	31	34	6.7	35
	2-Chloronaphthalene	ppb	35	0	NA	NA	<68	NA	NA
	2-Chlorophenol	ppb	35	0	NA	NA	<68	NA	NA
	2-Methylphenol	ppb	35	0	NA	NA	<68	NA	NA
	2-Nitroaniline	ppb	35	0	NA	NA	<68	NA	NA
	2-Nitrophenol	ppb	35	0	NA	NA	<68	NA	NA
	3,3'-Dichlorobenzidine	ppb	35	0	NA	NA	<680	NA	NA
	3-Nitroaniline	ppb	35	0	NA	NA	<340	NA	NA
	4,6-Dinitro-2-methylphenol	ppb	35	0	NA	NA	<1020	NA	NA
	4-Bromophenyl phenyl ether	ppb	35	0	NA	NA	<68	NA	NA
	4-Chloro-3-Methylphenol	ppb	35	0	NA	NA	<68	NA	NA
	4-Chloroaniline	ppb	35	0	NA	NA	<138	NA	NA
	4-Chlorophenyl phenyl ether	ppb	35	0	NA	NA	<68	NA	NA
	4-Methylphenol	ppb	35	20	31	200	56	42	44
	4-Nitroaniline	ppb	35	0	NA	NA	<340	NA	NA
	4-Nitrophenol	ppb	35	0	NA	NA	<1020	NA	NA
	Acetophenone	ppb	35	12	22	130	48	27	37
	Atrazine	ppb	35	0	NA	NA	<340	NA	NA
	Benzaldehyde	ppb	35	0	NA	NA	<340	NA	NA
	Benzidine	ppb	35	0	NA	NA	<1020	NA	NA
	Benzoic Acid	ppb	35	5	720	1100	540	150	500
	Biphenyl	ppb	35	4	30	45	35	7	36
	bis(2-Chloroethoxy)methane	ppb	35	0	NA	NA	<68	NA	NA
	bis(2-Chloroethyl)ether	ppb	35	0	NA	NA	<68	NA	NA
	bis(2-Ethylhexyl)phthalate	ppb	35	30	130	1500	430	350	310

Table D-3
Statistical Summary of Phase III Sediment Chemistry Data in the NBSA: Newark Bay Central

Parameter Group	Analyte	Units	Number of Samples	Number of Detects	Minimum of Detects	Maximum of Detects	Mean	Standard Deviation	Median
Semivolatiles	Butyl benzyl phthalate	ppb	35	0	NA	NA	<340	NA	NA
	Caprolactam	ppb	35	0	NA	NA	<340	NA	NA
	Carbazole	ppb	35	3	32	51	35	7.1	35
	Dibenzofuran	ppb	35	9	33	56	37	8.1	37
	Diethyl phthalate	ppb	35	0	NA	NA	<340	NA	NA
	Dimethylphthalate	ppb	35	0	NA	NA	<340	NA	NA
	Di-n-Butylphthalate	ppb	35	0	NA	NA	<340	NA	NA
	Di-n-Octylphthalate	ppb	35	0	NA	NA	<340	NA	NA
	Hexachlorobutadiene	ppb	35	0	NA	NA	<68	NA	NA
	Hexachlorocyclopentadiene	ppb	35	0	NA	NA	<1020	NA	NA
	Hexachloroethane	ppb	35	0	NA	NA	<340	NA	NA
	Isophorone	ppb	35	0	NA	NA	<68	NA	NA
	Nitrobenzene	ppb	35	0	NA	NA	<68	NA	NA
	N-Nitroso-di-n-propylamine	ppb	35	0	NA	NA	<68	NA	NA
	N-Nitrosodiphenylamine	ppb	35	0	NA	NA	<68	NA	NA
	Pentachlorophenol	ppb	35	0	NA	NA	<360	NA	NA
	Phenol	ppb	35	8	38	300	45	46	37
	Pyridine	ppb	35	0	NA	NA	<340	NA	NA
TEQ	Total WHO Dioxin TEQ(Bird)	ppt	35	35	0.347	241	93.9	59.7	88.7
	Total WHO Dioxin TEQ(Fish)	ppt	35	35	0.247	214	77.1	52.7	72.6
	Total WHO Dioxin TEQ(Human/Mammal)	ppt	35	35	0.248	217	78.3	53	73.3
TOC	TOC	ppm	35	33	4600	33000	21000	7300	22000
TPH	PHC AS GASOLINE	ppm	35	9	0.3	5.8	2.1	3	1.5
	TPH	ppm	35	32	11	730	160	170	120
Volatiles	1,2,4-Trichlorobenzene	ppb	35	0	NA	NA	<11.4	NA	NA
	1,2-Dichlorobenzene	ppb	35	0	NA	NA	<14.4	NA	NA
	1,3-Dichlorobenzene	ppb	35	0	NA	NA	<14.4	NA	NA
	1,4-Dichlorobenzene	ppb	35	0	NA	NA	<14.4	NA	NA
Physical Properties	Water Content	%	35	35	23	180	100	36	110
	Percent Moisture	%	35	35	19	65	49	11	52
	Percent Solids	%	35	35	36	79	49	11	47
	Percent Solids	%	80	80	31	81	54	14	51
	Water Content	%	5	5	140	170	150	14	150

Notes:
1. Summary statistics were calculated using 1/2 the detection limit for non-detect values.
2. Field duplicates averaged with parent samples.
3. PAHs are being re-analyzed due to analytical bias and were not included.

DDT = dichlorodiphenyl-trichloroethane
NA = not applicable
ND = not detected
PCB = polychlorinated biphenyl
ppb = parts per billion
ppm = parts per million
ppt = parts per thousand
TPH= total petroleum hydrocarbons
% = percent
< = Not detected, average detection limit reported.

Table D-4
Statistical Summary of Phase III Sediment Chemistry Data in the NBSA: Newark Bay South

Parameter Group	Analyte	Units	Number of Samples	Number of Detects	Minimum of Detects	Maximum of Detects	Mean	Standard Deviation	Median
Dioxins/Furans	1,2,3,4,6,7,8-HpCDD	ppt	80	80	6.16	2320	325	405	213
	1,2,3,4,6,7,8-HpCDF	ppt	80	80	2	1310	212	261	130
	1,2,3,4,7,8,9-HpCDF	ppt	80	80	0.205	76.1	12.8	15	7.48
	1,2,3,4,7,8-HxCDD	ppt	80	79	0.173	14.5	3.22	2.82	2.71
	1,2,3,4,7,8-HxCDF	ppt	80	80	0.329	209	38.9	43.8	23.2
	1,2,3,6,7,8-HxCDD	ppt	80	80	0.262	95	16.6	19	11.2
	1,2,3,6,7,8-HxCDF	ppt	80	80	0.183	74.5	15.1	16.3	9.4
	1,2,3,7,8,9-HxCDD	ppt	80	80	0.0744	38.3	8.49	8.1	6.41
	1,2,3,7,8,9-HxCDF	ppt	80	39	0.0447	16.4	2.72	2.46	2.46
	1,2,3,7,8-PeCDD	ppt	80	76	0.125	20.7	3.75	3.68	2.55
	1,2,3,7,8-PeCDF	ppt	80	80	0.163	31.2	8.36	7.93	5.53
	2,3,4,6,7,8-HxCDF	ppt	80	80	0.15	37.3	8.9	8.65	6.23
	2,3,4,7,8-PeCDF	ppt	80	80	0.254	61.7	12.7	12.7	9.44
	2,3,7,8-TCDD	ppt	80	80	0.434	833	71.7	133	26.1
	2,3,7,8-TCDF	ppt	80	79	0.389	52.4	13.3	11.2	11
	OCDD	ppt	80	80	72.7	32100	3850	5260	2390
	OCDF	ppt	80	80	2.91	3030	400	557	234
Grain Size	0.001 mm	%	80	76	1	12	4.3	2.5	4
	0.002 mm	%	80	79	1	19	7.5	4.3	8
	0.02 mm	%	80	80	1.5	68	32	17	36
	0.05 mm	%	80	80	2	78	46	22	52
	0.064 mm	%	80	80	3.5	84	54	25	60
	0.3 mm	%	80	80	30	99	83	17	91
	3.35 mm	%	80	80	52	100	97	7.2	100
	75000 um	%	80	80	100	100	100	0	100
	HYDROMETER, % FINER THAN 0.0050 mm	%	80	79	1.5	32	13	7.7	14
	SIEVE NO. 200, PERCENT PASSING	%	80	80	4.6	88	57	25	64
	SIEVE NO. 4, PERCENT PASSING	%	80	80	57	100	98	6.5	100
	SIEVE, 19000 MICRONS, PERCENT PASSING	%	80	80	77	100	99	3.7	100
	SIEVE, 37500 MICRONS, PERCENT PASSING	%	80	80	100	100	100	0	100
	SIEVE, NO. 100, PERCENT PASSING	%	80	80	12	97	70	25	81
	SIEVE, NO. 16, PERCENT PASSING	%	80	80	44	100	95	9.8	99
	SIEVE, NO. 30, PERCENT PASSING	%	80	80	38	100	92	12	97
Grain Size	SIEVE, NO. 8, PERCENT PASSING	%	80	80	48	100	96	8	99
Herbicides	2,4,5-T	ppb	77	5	2.2	22	4.2	6	1.7
	2,4,5-TP (Silvex)	ppb	77	4	4.1	14	4.3	5.8	1.7
	2,4-D	ppb	78	6	22	93	85	120	36
	2,4-DB	ppb	79	0	NA	NA	<80	NA	NA
Metals	Aluminum	ppm	80	80	3250	25100	13900	5570	15000
	Antimony	ppm	80	76	0.126	7.19	1.38	1.47	0.768
	Arsenic	ppm	80	80	2.26	96.8	24.7	19.9	17.6
	Barium	ppm	80	80	22	1190	224	211	147
	Beryllium	ppm	80	80	0.189	4.39	0.949	0.565	0.927
	Cadmium	ppm	80	80	0.0592	24.6	3.49	4.59	1.61
	Calcium	ppm	80	80	859	239000	15200	30200	7820
	Chromium	ppm	80	80	10.6	777	143	145	98.4
	Cobalt	ppm	80	80	2.59	28.9	9.94	3.84	10.6
	Copper	ppm	80	80	8.9	924	225	208	159
	Iron	ppm	80	80	5840	50200	27300	9490	29100
	Lead	ppm	80	80	12.8	855	209	192	141
	Magnesium	ppm	80	80	1540	14400	7500	2680	8150
	Manganese	ppm	80	80	68.6	633	356	127	370
	Mercury	ppm	80	80	0.0342	22.1	3.67	4.1	2.46
	Methyl Mercury	ppm	80	80	0.000056	0.0045	0.00101	0.000857	0.000838
	Nickel	ppm	80	80	8.31	282	46	32.4	45.2
	Potassium	ppm	80	80	1030	6480	3640	1420	3880
	Selenium	ppm	79	79	0.0939	7.58	1.62	1.69	0.958
	Silver	ppm	80	80	0.0645	12	2.36	2.19	1.83
	Sodium	ppm	80	80	2340	16200	8340	3880	7860

Table D-4
Statistical Summary of Phase III Sediment Chemistry Data in the NBSA: Newark Bay South

Parameter Group	Analyte	Units	Number of Samples	Number of Detects	Minimum of Detects	Maximum of Detects	Mean	Standard Deviation	Median
Metals	Thallium	ppm	80	79	0.0499	0.525	0.24	0.117	0.23
	Titanium	ppm	80	80	125	728	463	146	484
	Vanadium	ppm	80	80	8.33	92.4	40.7	16.9	41.5
	Zinc	ppm	80	80	30.1	1860	356	305	282
	Total Cyanide	ppm	80	2	0.45	1	0.18	0.11	0.17
TEPH Alkanes	2,6,10,14-Tetramethyl Pentadecane	ppm	80	41	0.029	5.2	0.36	0.66	0.17
	2,6,10,14-Tetramethylhexadecane	ppm	80	63	0.017	1.2	0.27	0.31	0.14
	Dotriacontane	ppm	80	52	0.028	2	0.25	0.34	0.14
	Heneicosane	ppm	80	42	0.015	1.2	0.16	0.19	0.12
	Heptacosane	ppm	80	23	0.042	1.3	0.4	0.44	0.24
	Heptadecane	ppm	80	61	0.032	1.6	0.32	0.35	0.2
	Heptatriacontane, -n	ppm	80	44	0.016	2.3	0.2	0.31	0.13
	Hexatriacontane	ppm	80	30	0.038	2.6	0.21	0.33	0.14
	Hhentriacontane	ppm	80	24	0.021	0.54	0.22	0.22	0.15
	Nonacosane	ppm	80	72	0.018	3.8	0.42	0.57	0.23
	Nonadecane	ppm	80	24	0.028	2.2	0.22	0.33	0.12
	Nonatriacontane	ppm	80	6	0.051	1.6	0.27	0.31	0.14
	Octatriacontane	ppm	80	13	0.028	2	0.16	0.26	0.08
	Pentacosane	ppm	80	68	0.019	2.3	0.26	0.34	0.18
	Pentadecane	ppm	80	46	0.014	0.45	0.15	0.16	0.085
	Pentatriacontane	ppm	80	68	0.022	2.4	0.23	0.33	0.13
	Tetracontane	ppm	80	39	0.018	1.5	0.16	0.23	0.081
	Tetratriacontane	ppm	80	14	0.02	1.7	0.16	0.25	0.08
	Tricosane	ppm	80	72	0.026	1.4	0.32	0.35	0.2
	Tritriacontane	ppm	80	22	0.035	0.87	0.16	0.18	0.11
	n-Decane	ppm	80	43	0.028	2.8	0.38	0.52	0.15
	n-Docosane	ppm	80	71	0.027	2.2	0.38	0.47	0.19
	n-Dodecane	ppm	80	48	0.017	0.78	0.18	0.19	0.11
	n-Eicosane	ppm	80	43	0.017	0.75	0.18	0.19	0.099
	n-Hexacosane	ppm	80	32	0.025	0.8	0.17	0.18	0.12
	n-Hexadecane	ppm	80	11	0.014	0.28	0.14	0.15	0.081
	n-Nonane	ppm	80	17	0.015	0.33	0.13	0.15	0.075
	n-Octacosane	ppm	80	80	0.021	3.5	0.73	0.79	0.42
	n-Octadecane	ppm	80	56	0.028	0.7	0.2	0.18	0.16
	n-Tetracosane	ppm	80	43	0.015	0.63	0.15	0.17	0.077
	n-Tetradecane	ppm	80	45	0.042	0.92	0.2	0.18	0.15
	n-Triacontane	ppm	80	33	0.028	2.2	0.39	0.47	0.19
	n-Tridecane	ppm	80	33	0.014	0.55	0.14	0.16	0.08
	n-Undecane	ppm	80	12	0.045	0.52	0.24	0.27	0.14
PCB Aroclors	Aroclor-1016	ppb	80	0	NA	NA	<72	NA	NA
	Aroclor-1221	ppb	80	0	NA	NA	<72	NA	NA
	Aroclor-1232	ppb	80	0	NA	NA	<72	NA	NA
	Aroclor-1242	ppb	80	0	NA	NA	<72	NA	NA
	Aroclor-1248	ppb	80	77	5.3	1000	140	180	73
	Aroclor-1254	ppb	80	75	6.5	760	140	150	80
	Aroclor-1260	ppb	80	59	10	260	64	61	41
	Aroclor-1262	ppb	80	0	NA	NA	<72	NA	NA
	Aroclor-1268	ppb	80	0	NA	NA	<72	NA	NA
	Total Aroclor PCBs (Sum of 7 Aroclors)	ppb	80	77	7.4	2000	340	380	200
	Total Aroclor PCBs (Sum of 9 Aroclors)	ppb	80	77	7.4	2000	340	380	200
PCB Congeners	PCB-1	ppt	80	61	85	3,100	673	712	497
	PCB-10	ppt	80	60	38	659	180	145	125
	PCB-103	ppt	80	64	23	697	164	145	115
	PCB-104	ppt	80	2	28.2	32.3	57.1	38.9	49.1
	PCB-105	ppt	80	79	54	50,900	7,090	9,850	3,370
	PCB-106	ppt	80	3	35.4	39.7	57	38.8	49
	PCB-107	ppt	80	76	33.4	8,590	1,220	1,600	685
	PCB-108/124	ppt	80	65	58	5,750	721	1,020	344
	PCB-11	ppt	80	80	303	22,200	4,300	4,580	2,780

Table D-4
Statistical Summary of Phase III Sediment Chemistry Data in the NBSA: Newark Bay South

Parameter Group	Analyte	Units	Number of Samples	Number of Detects	Minimum of Detects	Maximum of Detects	Mean	Standard Deviation	Median
PCB Congeners	PCB-110/115	ppt	80	78	142	131,000	20,600	26,500	12,300
	PCB-111	ppt	80	2	30.1	40.5	57.1	38.8	49
	PCB-112	ppt	80	26	27.2	249	65	47	49.6
	PCB-114	ppt	80	65	33.6	3,220	466	652	196
	PCB-118	ppt	80	80	145	133,000	17,900	24,300	9,500
	PCB-12/13	ppt	80	80	37	4,790	1,300	1,150	940
	PCB-120	ppt	80	45	25.9	187	66.4	41.4	50.4
	PCB-121	ppt	80	1	41.6	41.6	57.4	38.7	49.1
	PCB-122	ppt	80	63	24.3	1,780	272	362	119
	PCB-123	ppt	80	63	37.2	2,390	374	505	166
	PCB-126	ppt	80	31	31.6	343	80.7	66.7	50.1
	PCB-127	ppt	80	32	26	278	76.8	55.2	50.3
	PCB-128/166	ppt	80	75	61.2	16,700	2,340	2,980	1,390
	PCB-129/138/163	ppt	80	79	128	125,000	17,100	21,800	9,800
	PCB-130	ppt	80	76	29.7	7,130	993	1,240	605
	PCB-131	ppt	80	55	41.7	1,730	213	256	115
	PCB-132	ppt	80	77	83.9	40,000	5,120	6,770	2,970
	PCB-133	ppt	80	65	24.7	1,800	265	312	156
	PCB-134	ppt	80	68	76.9	6,870	921	1,160	524
	PCB-135/151	ppt	80	77	127	33,200	5,520	6,490	3,880
	PCB-136	ppt	80	74	42.2	11,300	1,770	2,200	1,050
	PCB-137	ppt	80	68	33.7	6,260	789	1,080	438
	PCB-139/140	ppt	80	56	62.1	2,200	305	348	176
	PCB-14	ppt	80	2	23.1	51.9	23.4	15.8	19.7
	PCB-141	ppt	80	79	40.7	24,100	2,880	4,140	1,460
	PCB-142	ppt	80	0	NA	NA	<115	NA	NA
	PCB-143	ppt	80	6	74	117	114	77.7	98
	PCB-144	ppt	80	70	30.7	4,940	781	951	464
	PCB-145	ppt	80	0	NA	NA	<115	NA	NA
	PCB-146	ppt	80	78	50.4	13,400	1,950	2,300	1,350
	PCB-147/149	ppt	80	79	84	87,200	11,500	14,600	7,230
	PCB-148	ppt	80	29	30.8	217	67.7	49.6	49.7
	PCB-15	ppt	80	78	222	20,800	6,650	5,520	4,940
	PCB-150	ppt	80	33	31.9	284	77.3	57.4	50.5
	PCB-152	ppt	80	12	30.5	76.8	56.7	39.2	49
	PCB-153/168	ppt	80	80	99	99,100	13,500	16,800	8,340
	PCB-154	ppt	80	37	92.1	872	240	209	108
	PCB-155	ppt	80	29	29	1,510	92.6	174	49.7
	PCB-156/157	ppt	80	76	53.8	16,900	2,130	2,920	1,270
	PCB-158	ppt	80	75	41.6	11,200	1,520	1,990	834
	PCB-159	ppt	80	2	35	379	59.4	50.1	49.1
	PCB-16	ppt	80	80	87.9	31,300	4,450	6,480	1,590
	PCB-160	ppt	80	0	NA	NA	<460	NA	NA
	PCB-161	ppt	80	0	NA	NA	<115	NA	NA
	PCB-162	ppt	80	18	27	290	71.9	55.9	49.6
	PCB-164	ppt	80	73	31.3	6,940	982	1,230	564
	PCB-165	ppt	80	1	29.3	29.3	57.3	38.8	49.1
	PCB-167	ppt	80	74	27.1	4,920	649	845	373
	PCB-169	ppt	80	0	NA	NA	<115	NA	NA
	PCB-17	ppt	80	80	111	28,300	5,130	6,550	2,270
	PCB-170	ppt	80	79	62.1	28,000	3,680	4,900	2,000
	PCB-171/173	ppt	80	70	59	9,130	1,150	1,510	679
	PCB-172	ppt	80	73	27	5,420	689	911	435
	PCB-174	ppt	80	79	57.6	32,600	3,590	5,250	2,140
	PCB-175	ppt	80	55	35.3	1,250	199	227	115
	PCB-176	ppt	80	71	23.4	3,740	523	662	338
	PCB-177	ppt	80	79	48.9	19,700	2,360	3,190	1,400
	PCB-178	ppt	80	76	27.6	5,970	922	1,110	631
	PCB-179	ppt	80	78	32.7	13,200	1,770	2,270	1,170

Table D-4
Statistical Summary of Phase III Sediment Chemistry Data in the NBSA: Newark Bay South

Parameter Group	Analyte	Units	Number of Samples	Number of Detects	Minimum of Detects	Maximum of Detects	Mean	Standard Deviation	Median
PCB Congeners	PCB-18/30	ppt	80	79	177	63,100	9,580	13,500	3,490
	PCB-180/193	ppt	80	79	135	75,000	9,020	12,500	5,300
	PCB-181	ppt	80	22	27.5	268	60.4	41.7	49
	PCB-182	ppt	80	18	22	59.3	55.8	39.6	49
	PCB-183/185	ppt	80	77	79.1	27,400	3,190	4,440	2,110
	PCB-184	ppt	80	2	26.8	59.8	57.4	38.8	49.2
	PCB-186	ppt	80	0	NA	NA	<115	NA	NA
	PCB-187	ppt	80	80	41	41,400	6,010	7,500	4,100
	PCB-188	ppt	80	15	29	83.3	56.2	39.5	48.9
	PCB-189	ppt	80	60	28.9	1,130	174	198	106
	PCB-19	ppt	80	79	33	6,460	1,120	1,460	464
	PCB-190	ppt	80	72	31.7	5,840	791	1,030	446
	PCB-191	ppt	80	60	29.9	1,220	174	205	97.5
	PCB-192	ppt	80	0	NA	NA	<115	NA	NA
	PCB-194	ppt	80	79	54.7	22,200	2,840	3,870	1,570
	PCB-195	ppt	80	68	47.3	7,570	930	1,300	516
	PCB-196	ppt	80	74	39.4	10,000	1,480	1,900	893
	PCB-197/200	ppt	80	57	88.4	3,040	432	537	256
	PCB-198/199	ppt	80	78	87	24,900	4,170	5,410	2,290
	PCB-2	ppt	80	76	22	585	178	128	153
	PCB-20/28	ppt	80	80	423	110,000	22,800	27,800	11,000
	PCB-201	ppt	80	54	52	2,790	426	545	247
	PCB-202	ppt	80	72	61.6	8,290	1,290	1,800	692
	PCB-203	ppt	80	77	51.5	14,700	2,500	3,170	1,400
	PCB-204	ppt	80	0	NA	NA	<115	NA	NA
	PCB-205	ppt	80	57	36.3	1,040	159	188	81.8
	PCB-206	ppt	80	79	72.2	38,300	4,690	7,970	1,980
	PCB-207	ppt	80	63	45.3	2,240	326	460	158
	PCB-208	ppt	80	78	34.4	15,700	1,750	3,210	702
	PCB-209	ppt	80	78	86.1	58,800	5,600	10,600	1,730
	PCB-21/33	ppt	80	80	119	44,900	6,910	10,300	2,410
	PCB-22	ppt	80	80	101	34,500	6,240	8,430	2,530
	PCB-23	ppt	80	30	12.5	162	31.7	28.2	20.1
	PCB-24	ppt	80	55	24	607	115	142	54.5
	PCB-25	ppt	80	79	48	14,300	2,080	2,420	1,010
	PCB-26/29	ppt	80	72	86	20,600	3,630	4,190	1,830
	PCB-27	ppt	80	80	22	5,060	977	1,110	522
	PCB-3	ppt	80	80	36	1,530	504	315	411
	PCB-31	ppt	80	80	321	96,600	18,200	23,400	8,450
	PCB-32	ppt	80	80	73	20,200	3,910	5,000	1,670
	PCB-34	ppt	80	63	14.8	660	122	133	61
	PCB-35	ppt	80	79	21.2	4,920	743	900	439
	PCB-36	ppt	80	20	13.9	37	24.3	15.7	19.9
	PCB-37	ppt	80	80	116	27,400	5,910	6,530	3,480
	PCB-38	ppt	80	20	14.8	79	26.7	19	19.8
	PCB-39	ppt	80	63	20	641	139	165	68.4
	PCB-4	ppt	80	79	185	10,000	2,310	2,290	1,400
	PCB-40/71	ppt	80	80	80	50,600	8,250	10,900	3,760
	PCB-41	ppt	80	61	89	8,460	1,120	1,740	363
	PCB-42	ppt	80	80	53	36,400	5,740	7,530	2,450
	PCB-43	ppt	80	71	28.8	4,970	824	1,120	305
	PCB-44/47/65	ppt	80	80	193	104,000	17,700	22,900	8,300
	PCB-45	ppt	80	76	52.3	15,100	2,480	3,510	921
	PCB-46	ppt	80	75	22.8	5,930	966	1,360	357
	PCB-48	ppt	80	80	30	21,200	3,650	5,160	1,350
	PCB-49/69	ppt	80	80	132	77,300	12,600	15,800	6,080
	PCB-5	ppt	80	26	18	295	67.6	57	49
	PCB-50/53	ppt	80	61	106	16,000	2,400	3,420	849
	PCB-51	ppt	80	69	52.6	5,240	762	966	355

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Statistical Summary of Phase III Sediment Chemistry Data in the NBSA: Newark Bay South

Parameter Group	Analyte	Units	Number of Samples	Number of Detects	Minimum of Detects	Maximum of Detects	Mean	Standard Deviation	Median
PCB Congeners	PCB-52	ppt	80	80	181	117,000	20,900	27,400	8,550
	PCB-54	ppt	80	31	29.6	294	77.4	58.5	50.5
	PCB-55	ppt	80	56	24.5	1,300	197	270	82.4
	PCB-56	ppt	80	74	108	63,000	8,580	12,800	3,320
	PCB-57	ppt	80	50	23.3	373	110	96	60.3
	PCB-58	ppt	80	45	27	392	83.9	67.2	50.8
	PCB-59/62/75	ppt	80	73	77.5	10,400	1,620	2,030	717
	PCB-6	ppt	80	79	78	7,210	1,110	1,050	739
	PCB-60	ppt	80	80	41	26,300	3,990	6,070	1,480
	PCB-61/70/74/76	ppt	80	80	334	194,000	33,500	46,500	14,100
	PCB-63	ppt	80	76	25.8	5,180	849	1,100	405
	PCB-64	ppt	80	80	74	53,600	8,490	11,500	3,490
	PCB-66	ppt	80	80	223	131,000	20,300	27,400	9,170
	PCB-67	ppt	80	72	26.8	3,360	527	673	250
	PCB-68	ppt	80	61	32	647	133	111	84.7
	PCB-7	ppt	80	45	19	645	129	154	81.1
	PCB-72	ppt	80	63	28.7	988	204	191	123
	PCB-73	ppt	80	0	NA	NA	<115	NA	NA
	PCB-77	ppt	80	80	29	17,000	2,960	3,550	1,530
	PCB-78	ppt	80	1	79	79	57.9	38.7	49.2
	PCB-79	ppt	80	57	26	1,220	187	234	79.8
	PCB-8	ppt	80	80	343	23,400	5,160	4,750	3,420
	PCB-80	ppt	80	0	NA	NA	<115	NA	NA
	PCB-81	ppt	80	35	35	534	98.8	99.2	50.8
	PCB-82	ppt	80	77	32.2	14,600	2,330	3,120	1,140
	PCB-83	ppt	80	66	66.1	5,430	929	1,160	493
	PCB-84	ppt	80	78	28	26,900	4,370	5,600	2,410
	PCB-85/116/117	ppt	80	76	83.5	19,600	3,300	4,220	1,760
	PCB-86/87/97/108/119/125	ppt	80	72	166	73,700	11,500	15,200	5,910
	PCB-88	ppt	80	2	52	66.4	57.8	38.6	49.2
	PCB-89	ppt	80	59	25.6	1,860	287	381	114
	PCB-9	ppt	80	71	20	863	229	206	162
	PCB-90/101/113	ppt	80	78	230	105,000	16,000	20,200	10,100
	PCB-91	ppt	80	78	46.5	14,400	2,740	3,290	1,750
	PCB-92	ppt	80	70	52.7	12,200	2,120	2,510	1,100
	PCB-93/100	ppt	80	35	166	1,170	317	222	204
	PCB-94	ppt	80	51	40	676	133	127	70.8
	PCB-95	ppt	80	78	202	107,000	14,500	19,900	7,840
	PCB-96	ppt	80	50	31.1	1,170	188	217	90.8
	PCB-98/102	ppt	80	57	160	4,280	785	859	420
	PCB-99	ppt	80	80	56	49,500	8,770	10,500	5,670
	Total PCB Congeners (209)	ppt	80	80	5,310	2,890,000	522,000	622,000	292,000
Pesticides	2,4'-DDD	ppb	80	80	0.1	57	12	14	5.3
	2,4'-DDE	ppb	80	80	0.16	710	77	150	13
	2,4'-DDT	ppb	77	37	0.043	28	0.94	3.4	0.0031
	4,4'-DDD	ppb	80	80	0.28	240	42	54	19
	4,4'-DDE	ppb	80	80	0.43	1600	150	280	32
	4,4'-DDT	ppb	76	67	0.12	450	11	54	0.94
	Aldrin	ppb	47	0	NA	NA	<0.0054	NA	NA
	Alpha-BHC	ppb	80	47	0.01	1.1	0.16	0.22	0.07
	Alpha-Chlordane	ppb	80	74	0.058	9.6	2	2.1	1.4
	Beta-BHC	ppb	80	28	0.012	1	0.1	0.19	0.0063
	cis-Nonachlor	ppb	78	54	0.05	4.8	0.94	1.2	0.67
	Delta-BHC	ppb	80	9	0.067	0.77	0.029	0.1	0.0037
	Dieldrin	ppb	80	74	0.039	37	2	4.6	0.97
	Endosulfan I	ppb	80	1	0.35	0.35	0.015	0.038	0.01
	Endosulfan II	ppb	80	1	0.33	0.33	0.025	0.034	0.021
	Endosulfan Sulfate	ppb	73	0	NA	NA	<0.044	NA	NA
	Endrin	ppb	79	1	0.47	0.47	0.011	0.053	0.0052

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Statistical Summary of Phase III Sediment Chemistry Data in the NBSA: Newark Bay South

Parameter Group	Analyte	Units	Number of Samples	Number of Detects	Minimum of Detects	Maximum of Detects	Mean	Standard Deviation	Median
Pesticides	Endrin Aldehyde	ppb	42	0	NA	NA	<0.04	NA	NA
	Endrin Ketone	ppb	59	2	0.23	1.5	0.042	0.2	0.013
	Gamma-BHC (Lindane)	ppb	80	11	0.016	1.8	0.047	0.21	0.0037
	Heptachlor	ppb	79	2	0.37	0.55	0.017	0.073	0.0052
	Heptachlor Epoxide	ppb	80	9	0.097	2.4	0.075	0.35	0.0047
	Hexachlorobenzene	ppb	80	80	0.038	46	5.1	9.5	1.3
	Methoxychlor	ppb	40	4	3.3	7.6	0.61	1.9	0.0059
	Mirex	ppb	45	7	0.014	0.99	0.058	0.18	0.0025
	Nonachlor, trans-	ppb	80	70	0.045	5.2	1.1	1.1	0.8
	Oxychlordane	ppb	80	0	NA	NA	<0.0114	NA	NA
	trans-Chlordane	ppb	80	77	0.047	22	3	3.4	2.2
	trans-Heptachlor Epoxide	ppb	80	5	0.16	1.8	0.058	0.25	0.0065
	Total Alpha + Gamma Chlordane	ppb	80	78	0.077	32	5	5.3	3.8
	Total DDT (2,4)	ppb	80	80	0.26	760	90	160	23
	Total DDT (4,4)	ppb	80	80	0.75	1800	200	330	66
	Total DDT (2,4 & 4,4)	ppb	80	80	1	2600	290	480	91
Semivolatiles	1,2,4,5-Tetrachlorobenzene	ppb	80	0	NA	NA	<64	NA	NA
	1,2-Diphenylhydrazine	ppb	80	0	NA	NA	<64	NA	NA
	2,2'-oxybis(1-Chloropropane)	ppb	80	0	NA	NA	<64	NA	NA
	2,3,4,6-Tetrachlorophenol	ppb	80	0	NA	NA	<320	NA	NA
	2,4,5-Trichlorophenol	ppb	80	0	NA	NA	<64	NA	NA
	2,4,6-Trichlorophenol	ppb	80	0	NA	NA	<64	NA	NA
	2,4-Dichlorophenol	ppb	80	0	NA	NA	<64	NA	NA
	2,4-Dimethylphenol	ppb	80	0	NA	NA	<64	NA	NA
	2,4-Dinitrophenol	ppb	80	0	NA	NA	<1940	NA	NA
	2,4-Dinitrotoluene	ppb	80	0	NA	NA	<320	NA	NA
	2,6-Dinitrotoluene	ppb	80	0	NA	NA	<64	NA	NA
	2-Chloronaphthalene	ppb	80	0	NA	NA	<64	NA	NA
	2-Chlorophenol	ppb	80	0	NA	NA	<64	NA	NA
	2-Methylphenol	ppb	80	0	NA	NA	<64	NA	NA
	2-Nitroaniline	ppb	80	0	NA	NA	<64	NA	NA
	2-Nitrophenol	ppb	80	0	NA	NA	<64	NA	NA
	3,3'-Dichlorobenzidine	ppb	80	0	NA	NA	<640	NA	NA
	3-Nitroaniline	ppb	80	0	NA	NA	<320	NA	NA
	4,6-Dinitro-2-methylphenol	ppb	80	0	NA	NA	<960	NA	NA
	4-Bromophenyl phenyl ether	ppb	80	0	NA	NA	<64	NA	NA
	4-Chloro-3-Methylphenol	ppb	80	1	88	88	33	11	32
	4-Chloroaniline	ppb	80	0	NA	NA	<128	NA	NA
	4-Chlorophenyl phenyl ether	ppb	80	0	NA	NA	<64	NA	NA
	4-Methylphenol	ppb	80	51	23	670	66	80	45
	4-Nitroaniline	ppb	80	0	NA	NA	<320	NA	NA
	4-Nitrophenol	ppb	80	0	NA	NA	<960	NA	NA
	Acetophenone	ppb	80	23	23	390	42	42	34
	Atrazine	ppb	80	0	NA	NA	<320	NA	NA
	Benzaldehyde	ppb	80	1	250	250	160	46	160
	Benzidine	ppb	80	0	NA	NA	<960	NA	NA
	Benzoic Acid	ppb	80	3	580	710	490	140	480
	Biphenyl	ppb	80	14	27	120	35	15	33
	bis(2-Chloroethoxy)methane	ppb	80	0	NA	NA	<64	NA	NA
	bis(2-Chloroethyl)ether	ppb	80	0	NA	NA	<64	NA	NA
	bis(2-Ethylhexyl)phthalate	ppb	80	57	110	6900	1000	1400	290
	Butyl benzyl phthalate	ppb	80	0	NA	NA	<320	NA	NA
	Caprolactam	ppb	80	0	NA	NA	<320	NA	NA
	Carbazole	ppb	80	15	27	240	44	36	34
	Dibenzofuran	ppb	80	31	23	180	43	27	38
	Diethyl phthalate	ppb	80	0	NA	NA	<320	NA	NA
	Dimethylphthalate	ppb	80	0	NA	NA	<320	NA	NA
	Di-n-Butylphthalate	ppb	80	0	NA	NA	<320	NA	NA
	Di-n-Octylphthalate	ppb	80	0	NA	NA	<320	NA	NA

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Statistical Summary of Phase III Sediment Chemistry Data in the NBSA: Newark Bay South

Parameter Group	Analyte	Units	Number of Samples	Number of Detects	Minimum of Detects	Maximum of Detects	Mean	Standard Deviation	Median
Semivolatiles	Hexachlorobutadiene	ppb	80	0	NA	NA	<64	NA	NA
	Hexachlorocyclopentadiene	ppb	80	0	NA	NA	<960	NA	NA
	Hexachloroethane	ppb	80	0	NA	NA	<320	NA	NA
	Isophorone	ppb	80	0	NA	NA	<64	NA	NA
	Nitrobenzene	ppb	80	1	34	34	32	8.9	32
	N-Nitroso-di-n-propylamine	ppb	80	0	NA	NA	<64	NA	NA
	N-Nitrosodiphenylamine	ppb	80	0	NA	NA	<64	NA	NA
	Pentachlorophenol	ppb	80	0	NA	NA	<320	NA	NA
	Phenol	ppb	80	8	29	130	34	14	33
	Pyridine	ppb	80	0	NA	NA	<320	NA	NA
TEQ	Total WHO Dioxin TEQ(Bird)	ppt	80	80	1.9	1020	113	166	61.2
	Total WHO Dioxin TEQ(Fish)	ppt	80	80	1.5	949	94.3	153	45.5
	Total WHO Dioxin TEQ(Human/Mammal)	ppt	80	80	1.9	972	97	156	47.5
TOC	TOC	ppm	80	80	1000	61000	24000	14000	24000
TPH	PHC AS GASOLINE	ppm	80	34	0.3	130	13	24	5.5
	TPH	ppm	80	77	6.5	2900	580	640	420
Volatiles	1,2,4-Trichlorobenzene	ppb	80	1	10	10	34	93	4.5
	1,2-Dichlorobenzene	ppb	80	0	NA	NA	<84	NA	NA
	1,3-Dichlorobenzene	ppb	80	0	NA	NA	<84	NA	NA
	1,4-Dichlorobenzene	ppb	80	2	4	6	42	120	5.5
Physical Properties	Water Content	%	80	80	23	210	92	47	92
	Percent Moisture	%	85	85	19	68	46	14	49
	Percent Solids	%	80	80	31	81	54	14	51
	Water Content	%	5	5	140	170	150	14	150

Notes:
1. Summary statistics were calculated using 1/2 the detection limit for non-detect values.
2. Field duplicates averaged with parent samples.
3. PAHs are being re-analyzed due to analytical bias and were not included.

DDT = dichlorodiphenyl-trichloroethane
NA = not applicable
ND = not detected
PCB = polychlorinated biphenyl
ppb = parts per billion
ppm = parts per million
ppt = parts per thousand
TPH= Total Petroleum Hydrocarbons
% = percent
< = Not detected, average detection limit reported.

Appendix E

(Provided electronically only)

Appendix F

Symbol Definitions

○ Recently Deposited

◇ Estimated Depth of 1940 Horizon

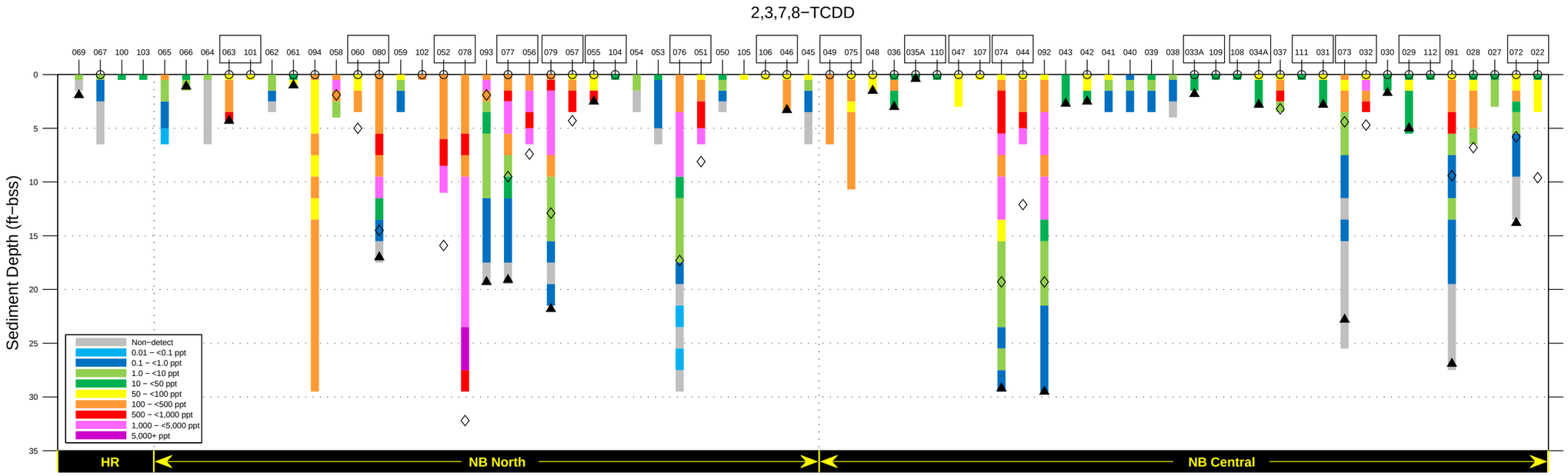
▲ Depth to Red Clay

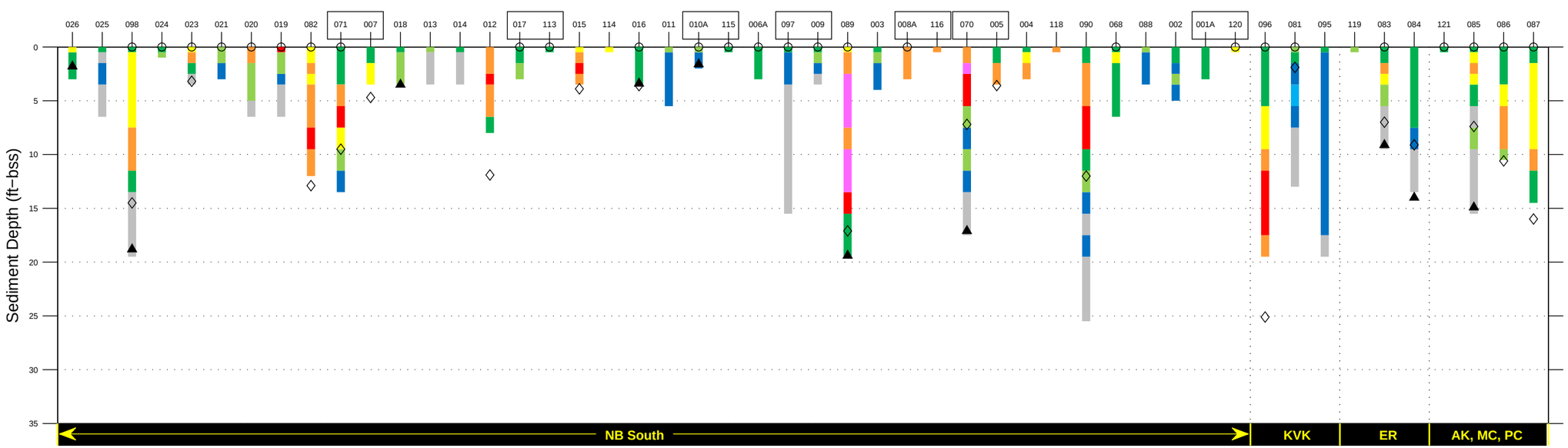
Notes:

1. This figure presents a summary of data for Phase I and Phase II sediment data.
2. Recently deposited is defined as surface sediment locations having beryllium-7 concentrations equal to or greater than 0.5 picocurie per gram.
3. Depths of the estimated 1940 horizon and depths to red clay are from the Deposition Report (Tierra 2011).
4. Core IDs enclosed within a box indicate co-located Phase I and Phase II cores.
5. For presentation purposes, the Newark Bay Phase I and Phase II location IDs were shortened to the last three characters of the location ID. For example, NB01SED026 was shortened to “026”.
6. The sediment core data are ordered north to south within each geographic area. The bottom figure is a continuation from the top figure.

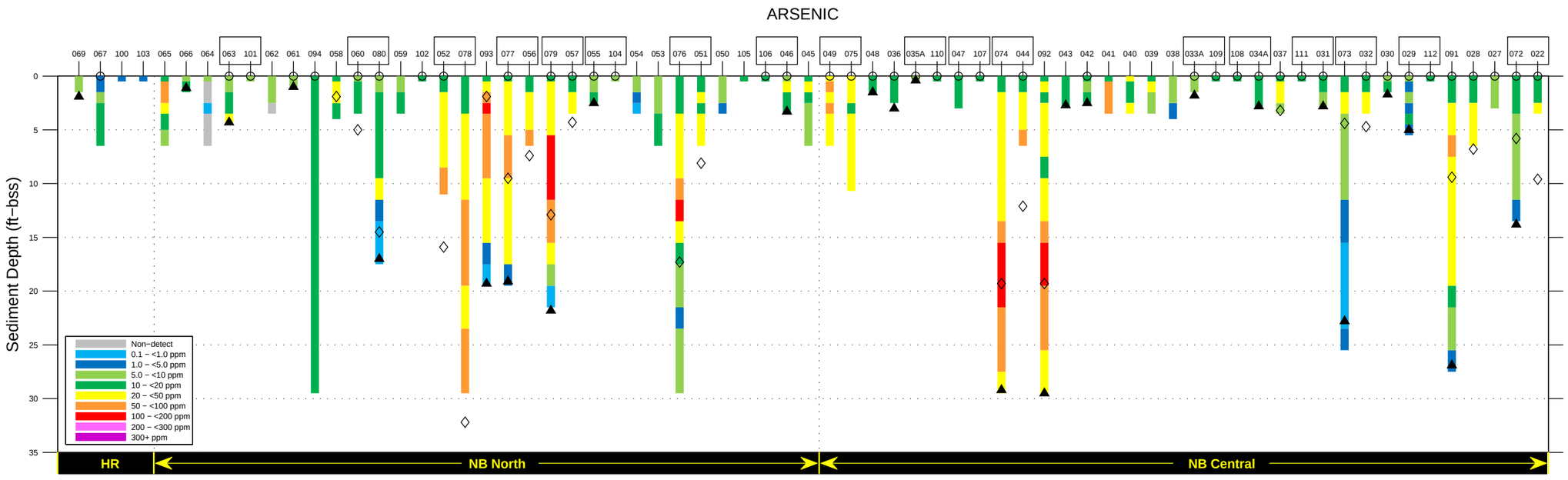
Abbreviations:

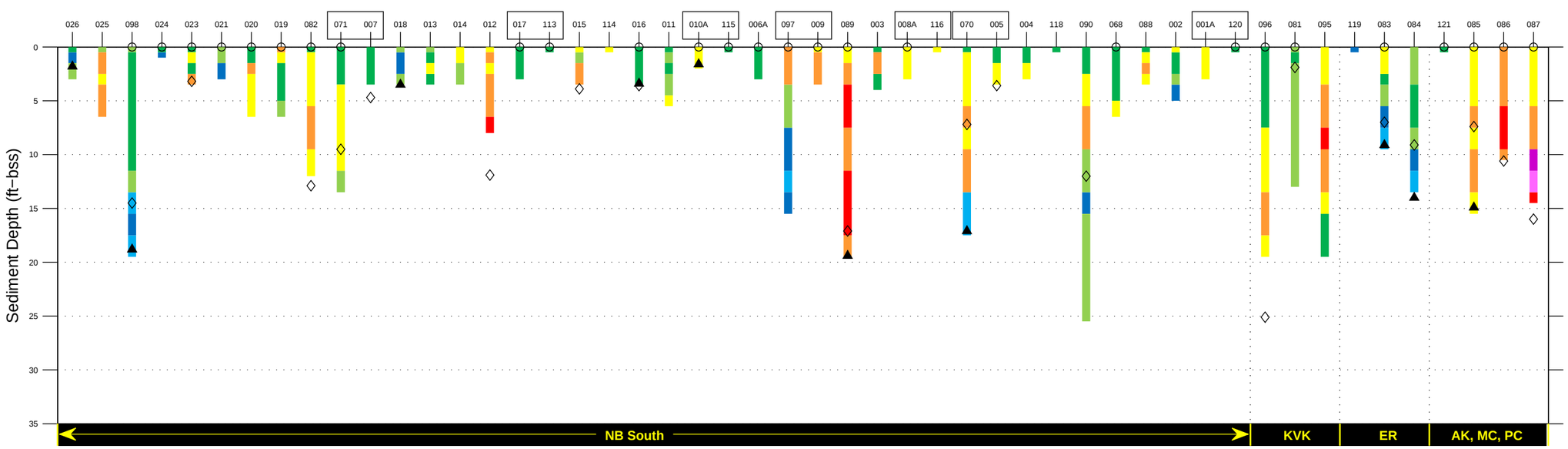
ft bss = feet below sediment surface
ppm = parts per million
ppb = parts per billion
ppt = parts per trillion
NB = Newark Bay
HR = Hackensack River
KVK = Kill van Kull
ER = Elizabeth River
AK = Arthur Kill
MC = Morses Creek
PC = Piles Creek



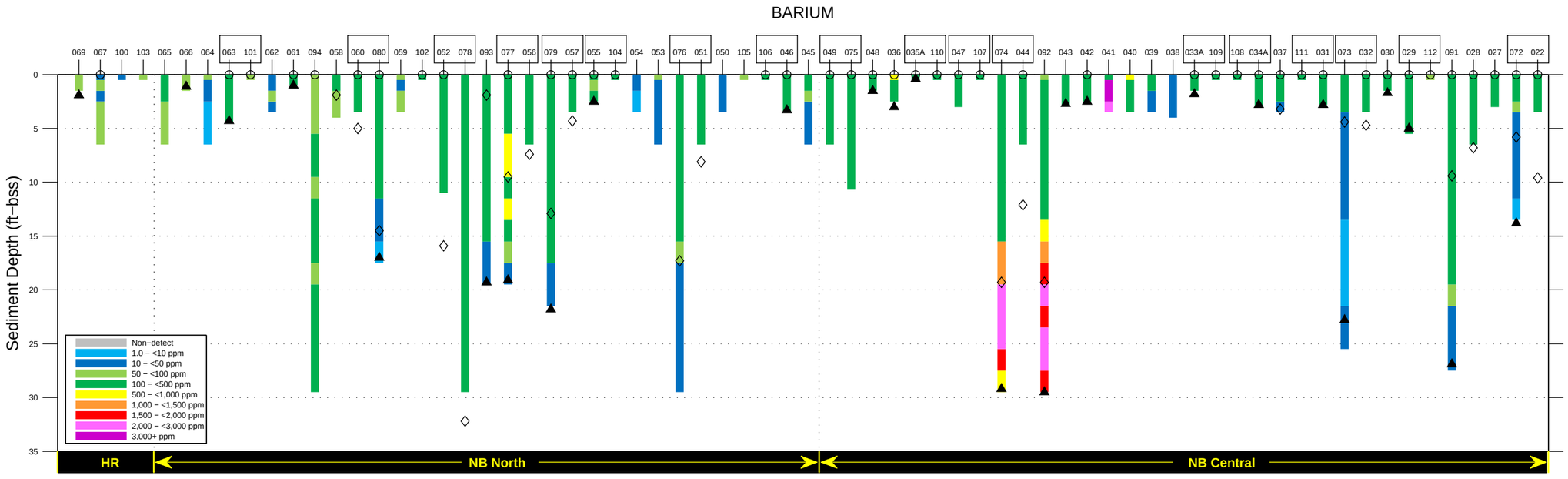


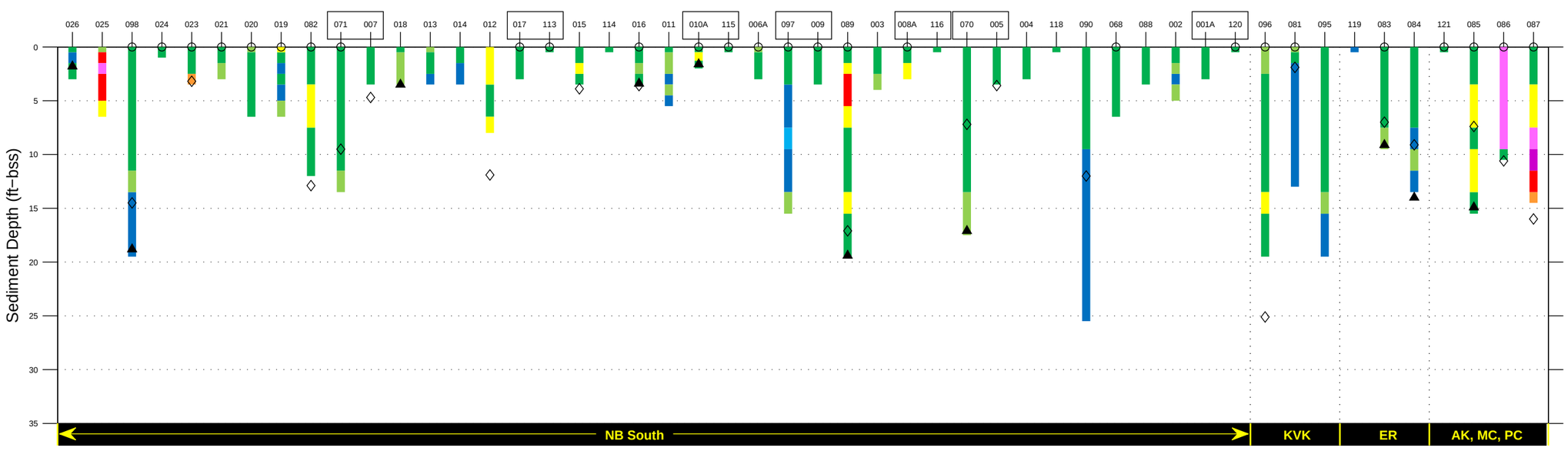
PHASE I AND PHASE II SEDIMENT CHEMISTRY DATA
2,3,7,8−TCDD
FIGURE F−1



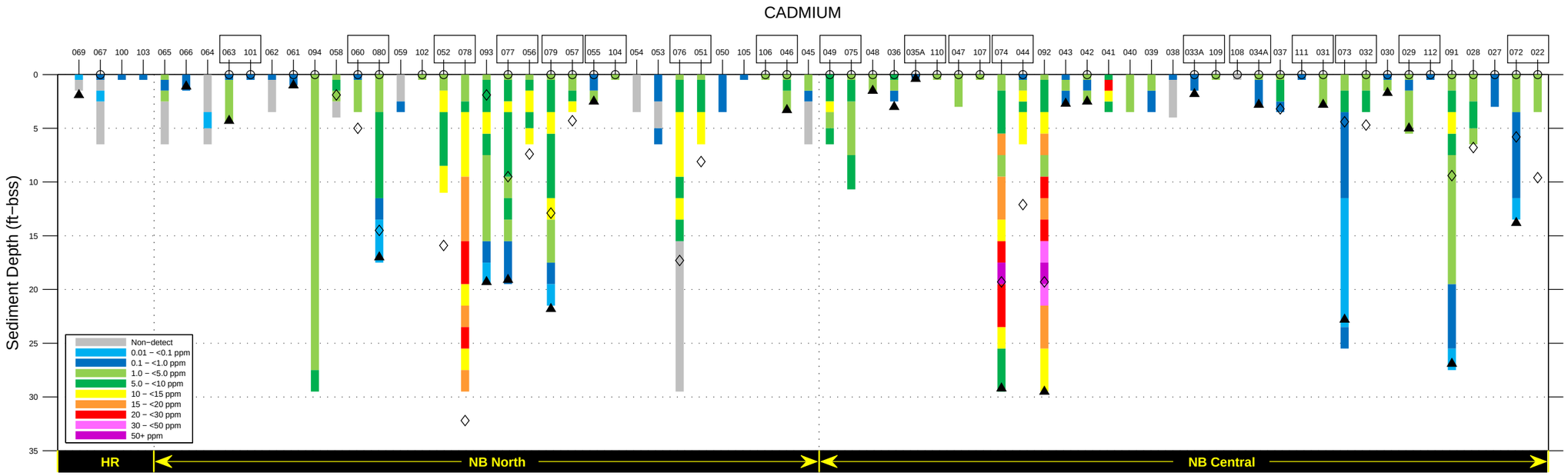


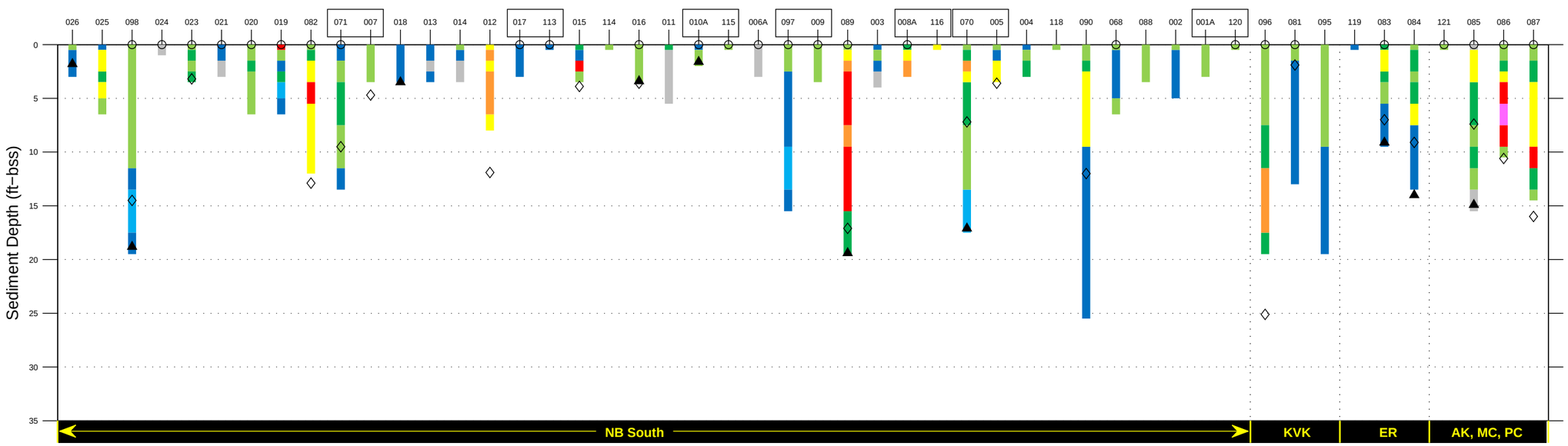
PHASE I AND PHASE II SEDIMENT CHEMISTRY DATA
ARSENIC
FIGURE F−2



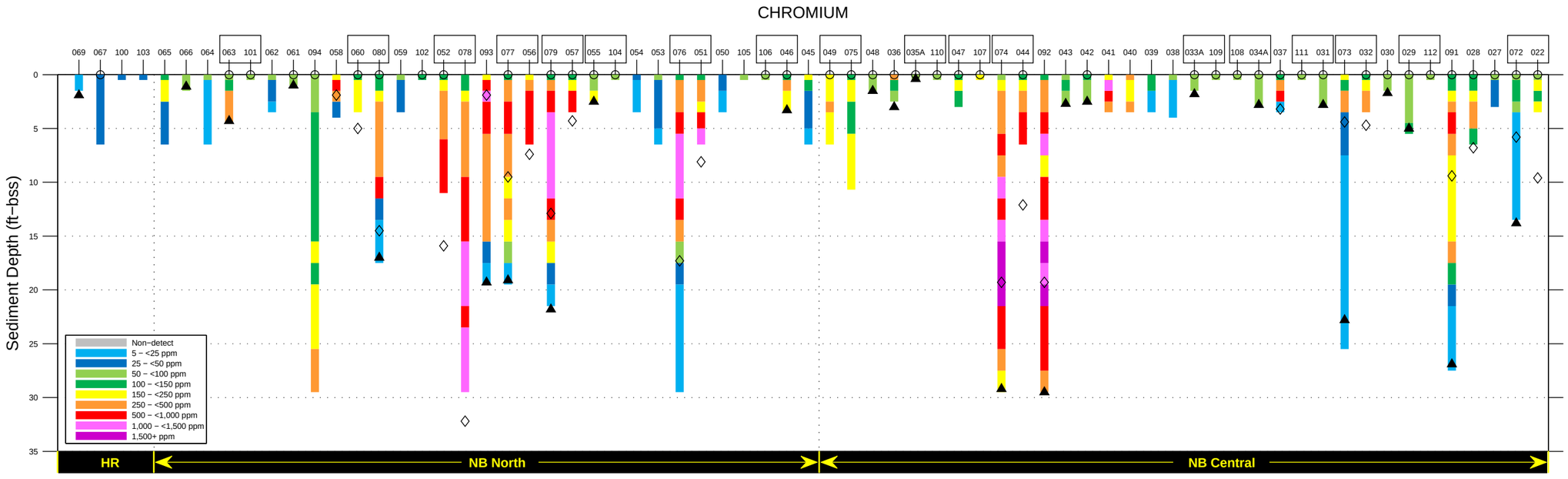


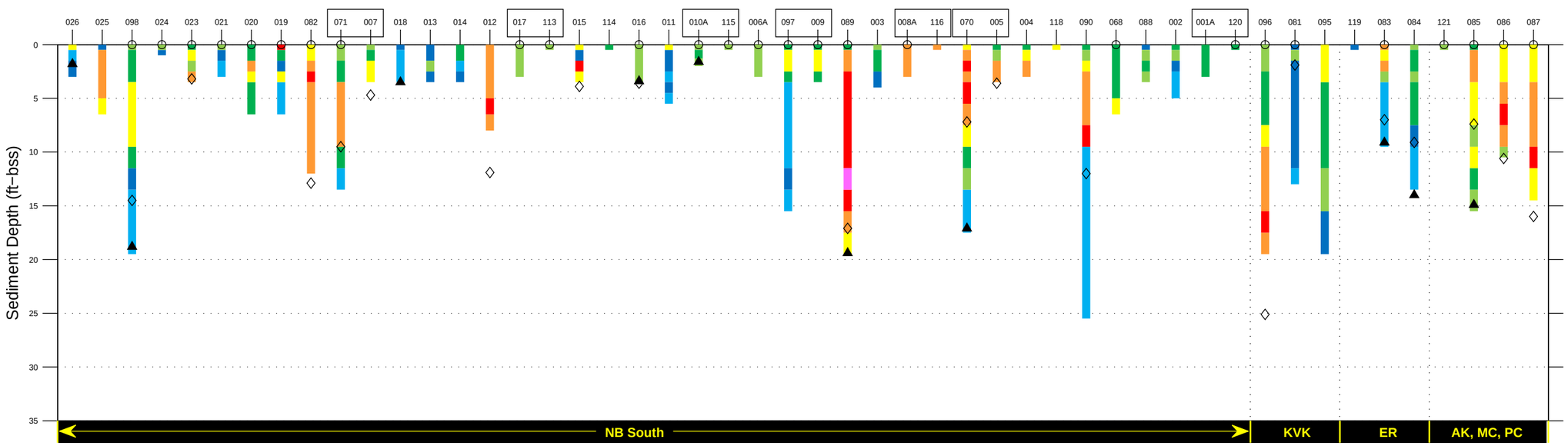
PHASE I AND PHASE II SEDIMENT CHEMISTRY DATA
BARIUM
FIGURE F−3



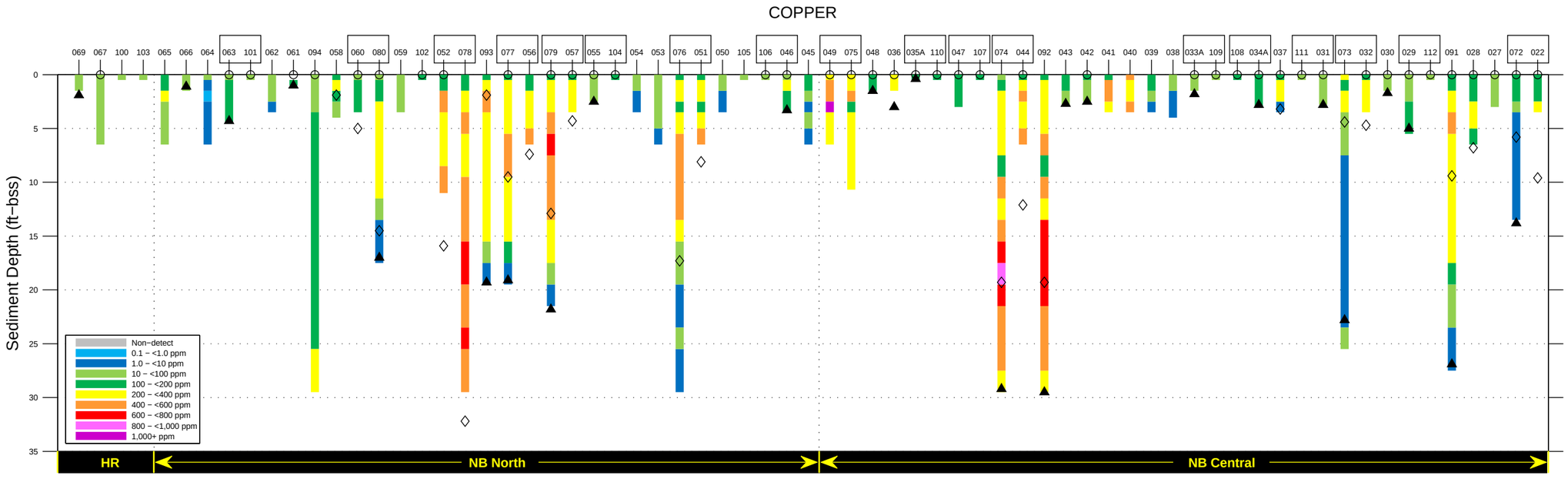


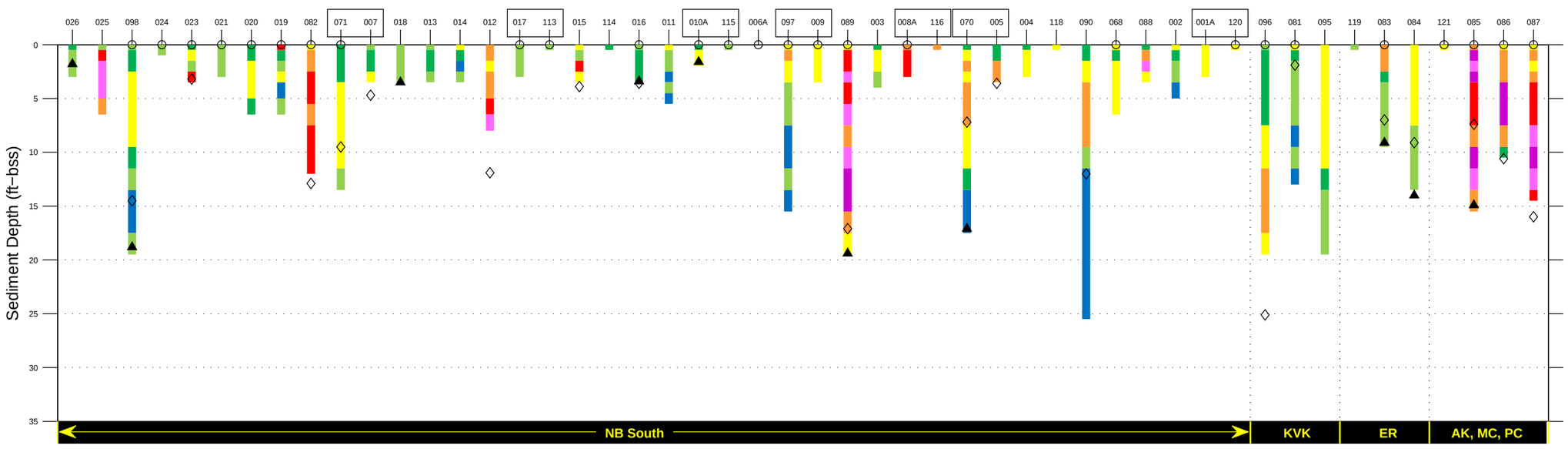
PHASE I AND PHASE II SEDIMENT CHEMISTRY DATA
CADMIUM
FIGURE F−4



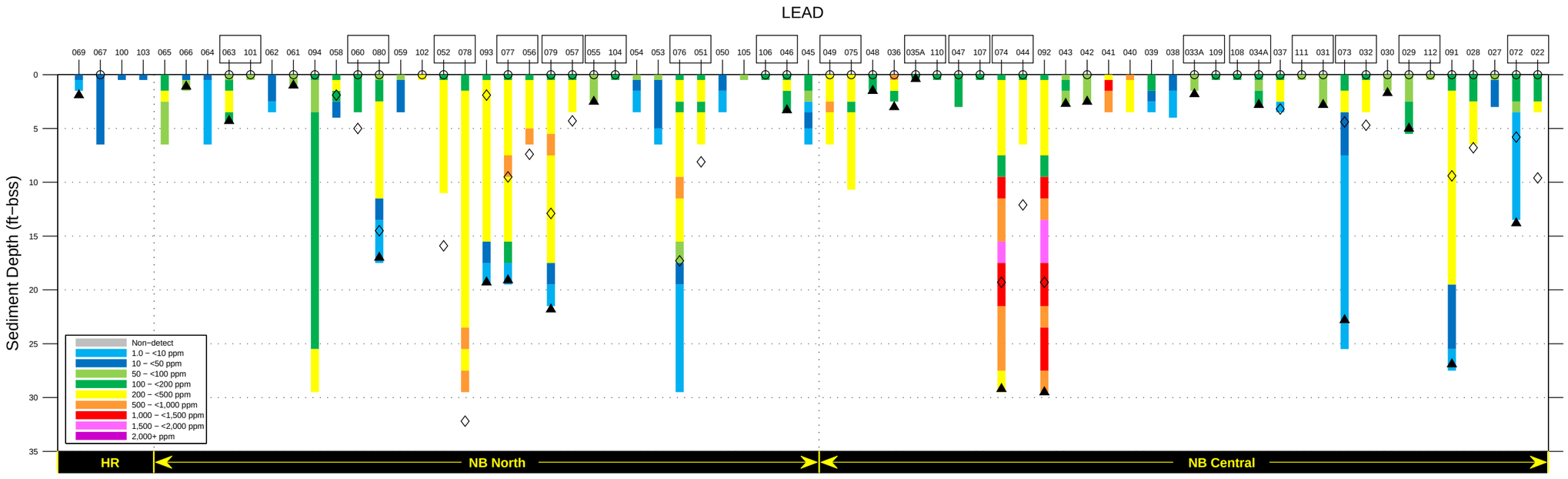


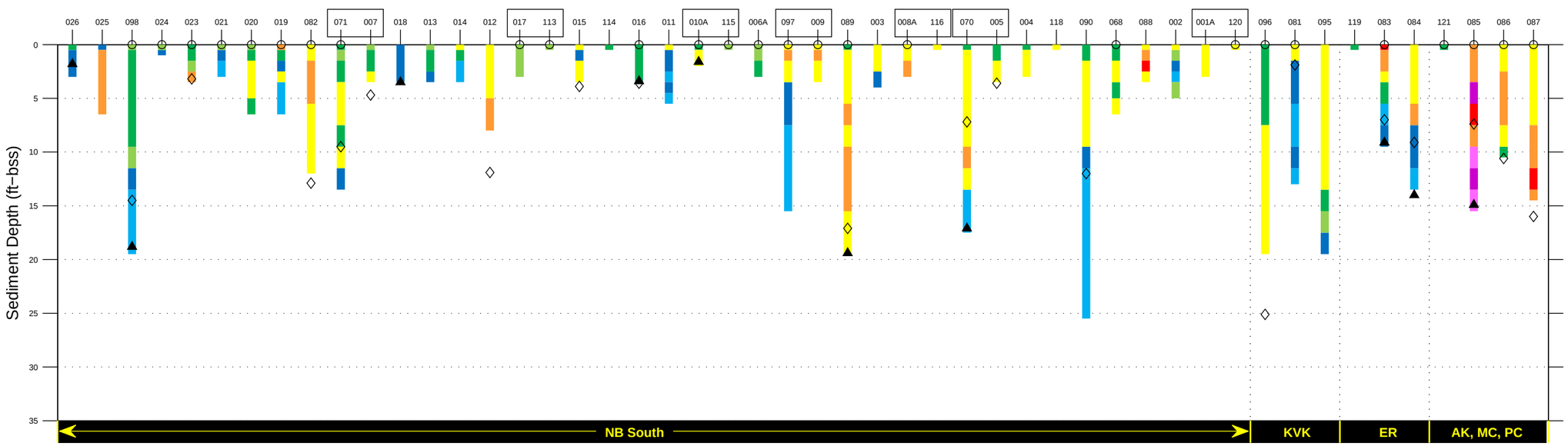
PHASE I AND PHASE II SEDIMENT CHEMISTRY DATA
CHROMIUM
FIGURE F−5



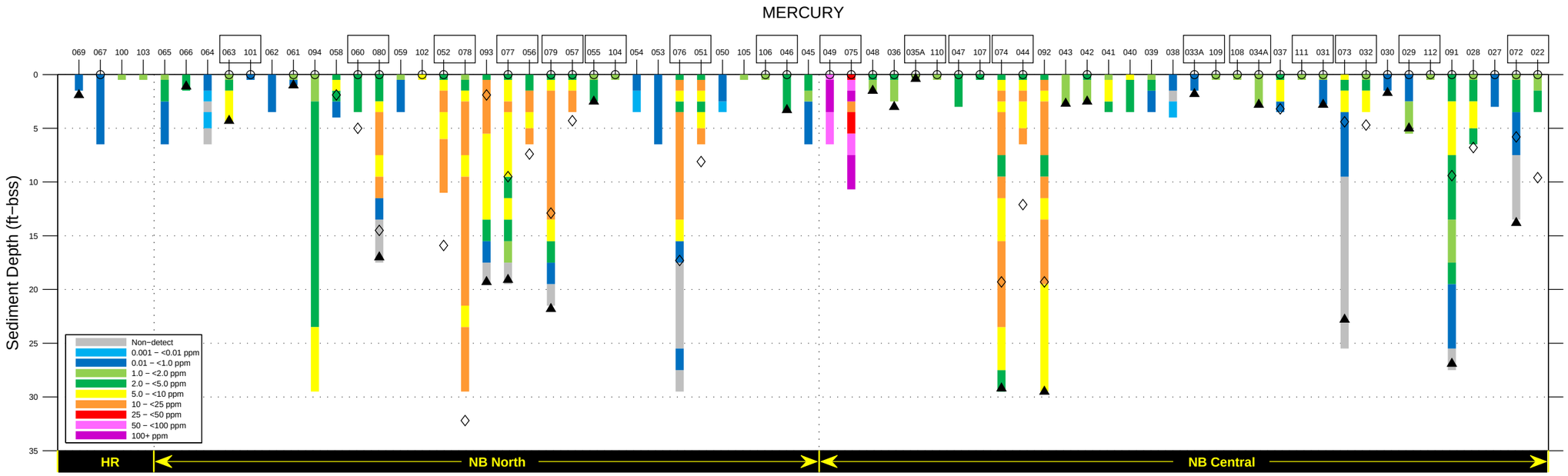


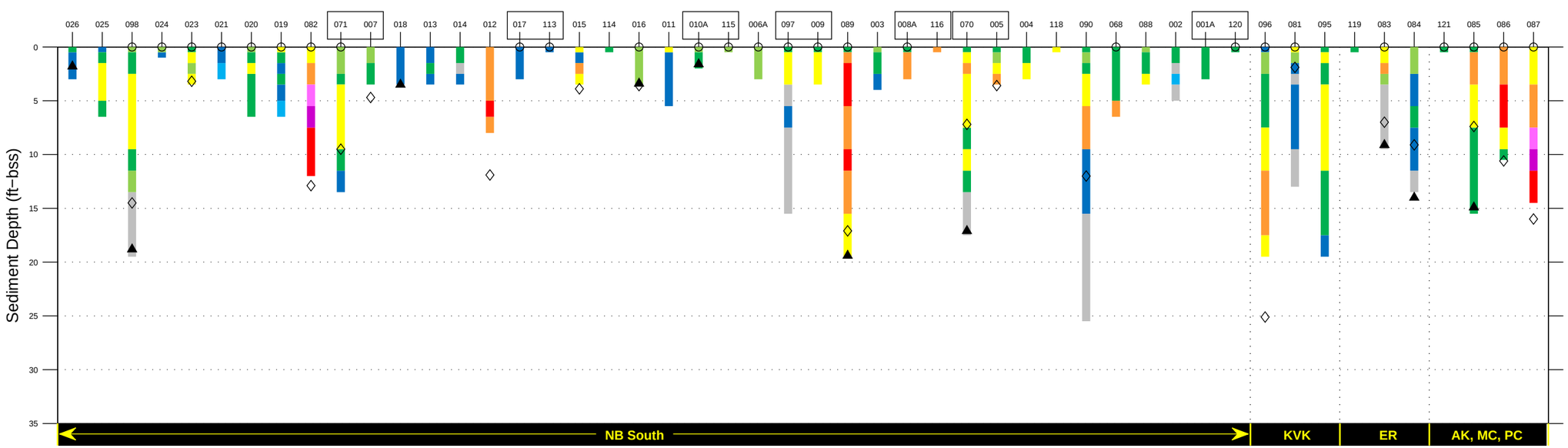
PHASE I AND PHASE II SEDIMENT CHEMISTRY DATA
COPPER
FIGURE F−6



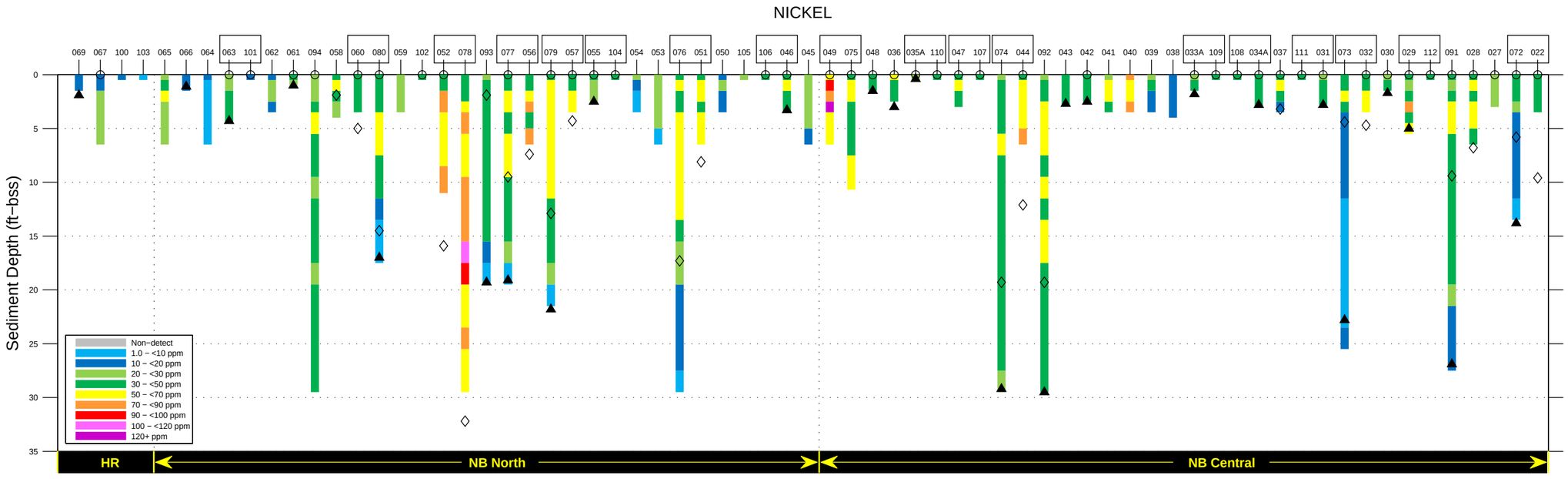


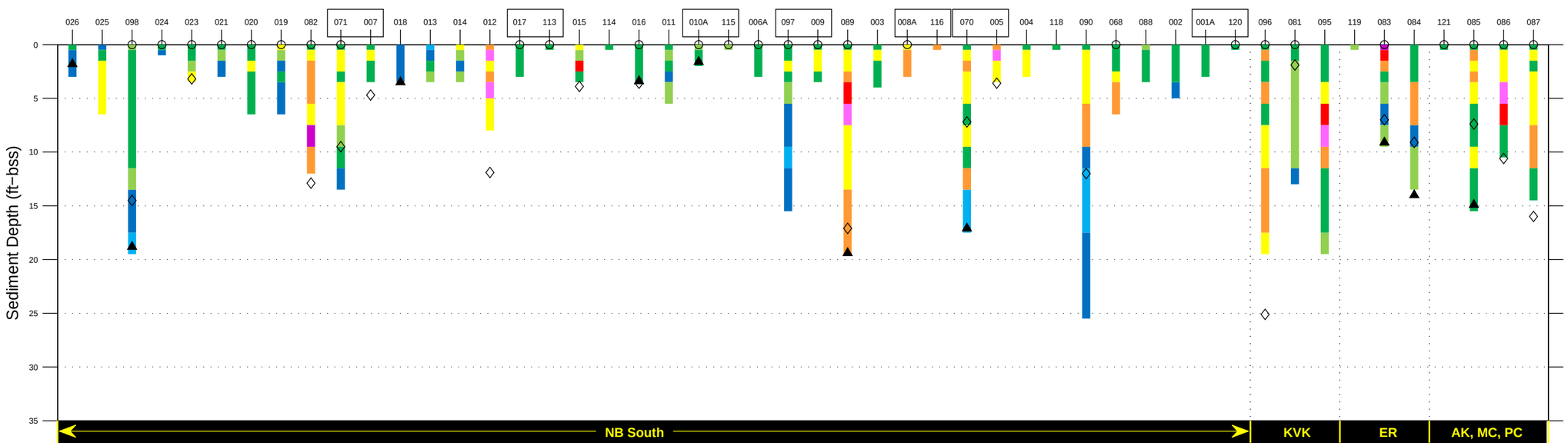
PHASE I AND PHASE II SEDIMENT CHEMISTRY DATA
LEAD
FIGURE F−7



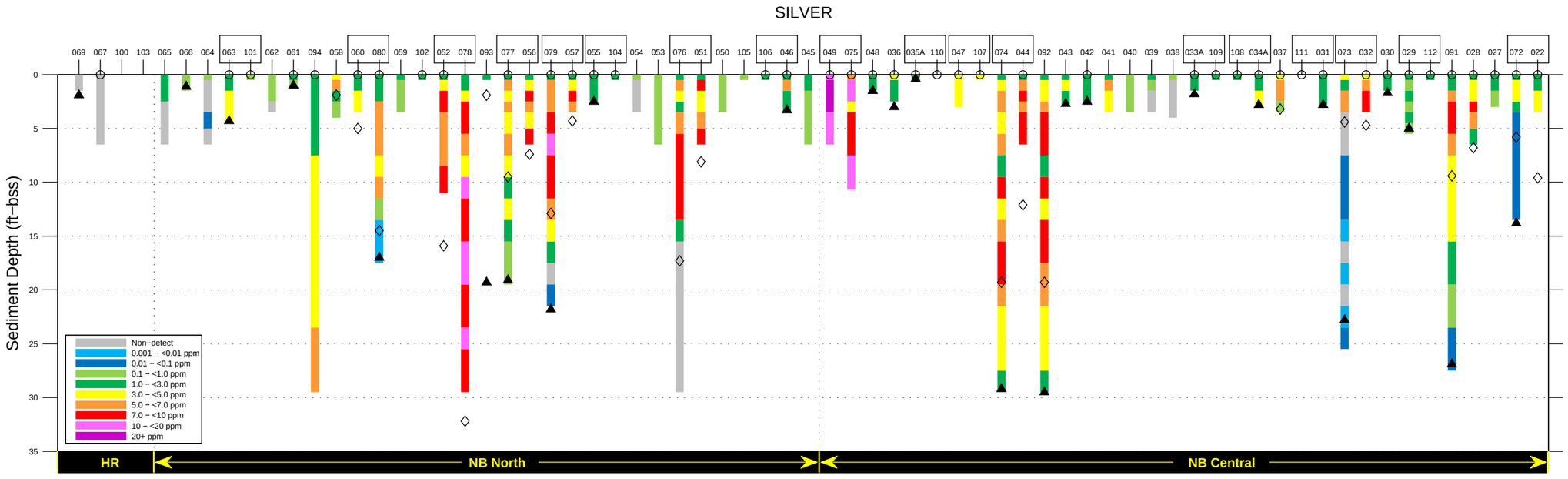


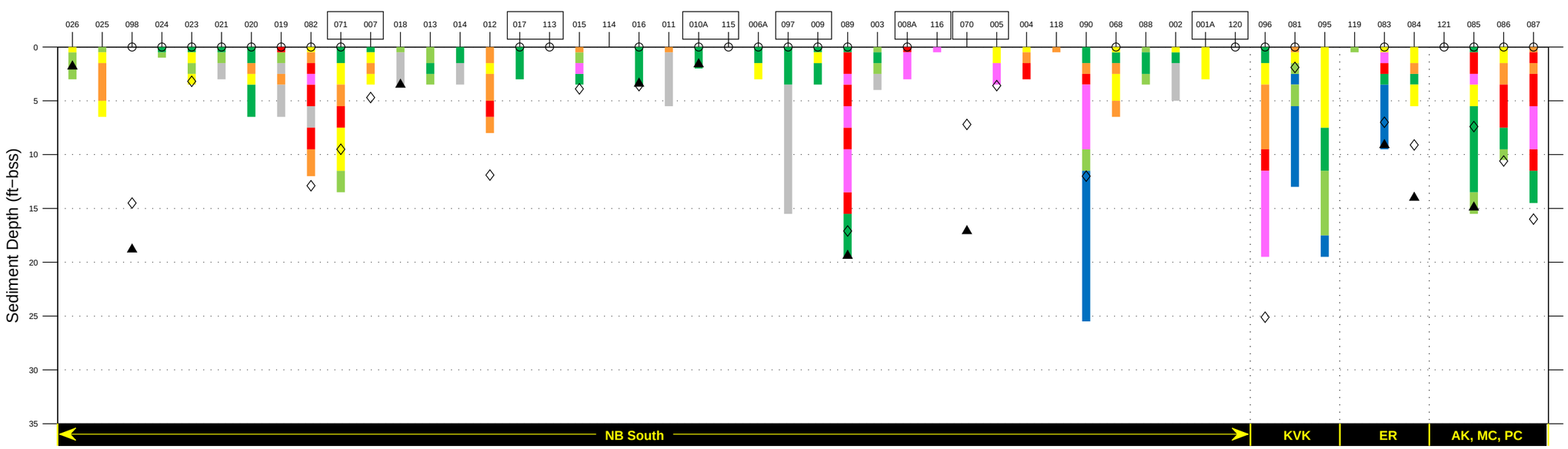
PHASE I AND PHASE II SEDIMENT CHEMISTRY DATA
MERCURY
FIGURE F−8



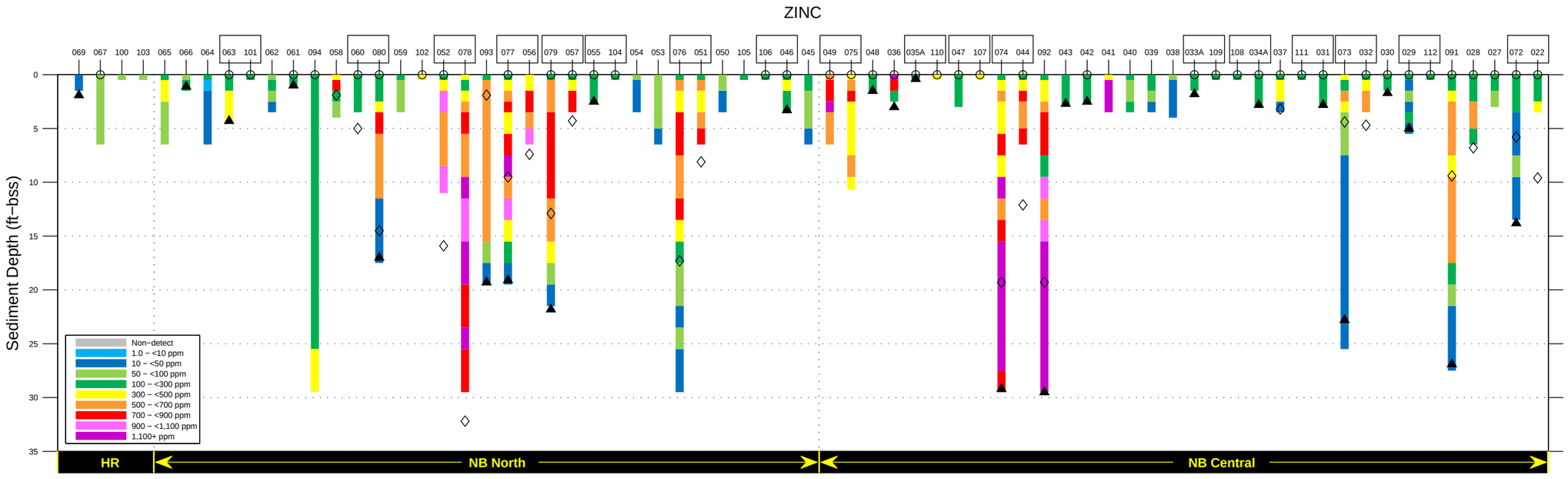


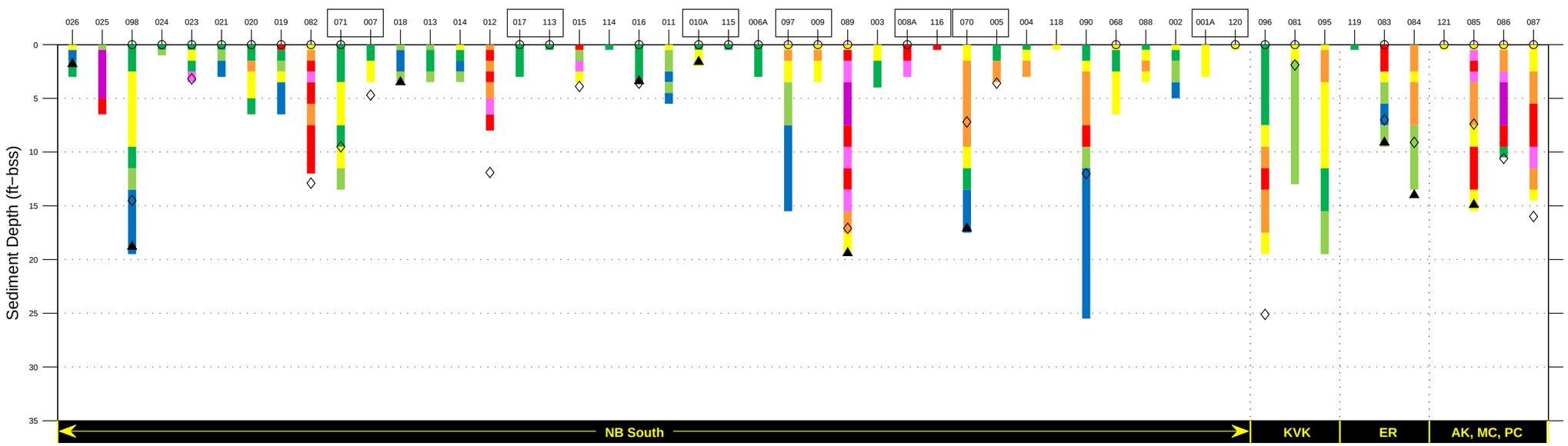
PHASE I AND PHASE II SEDIMENT CHEMISTRY DATA
NICKEL
FIGURE F−9



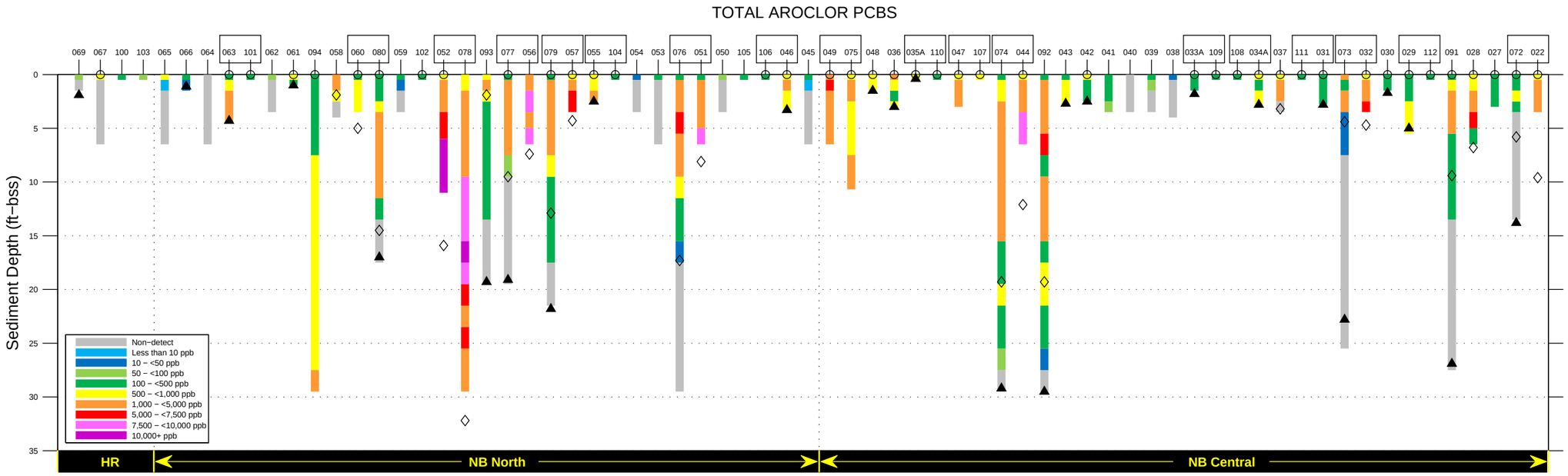


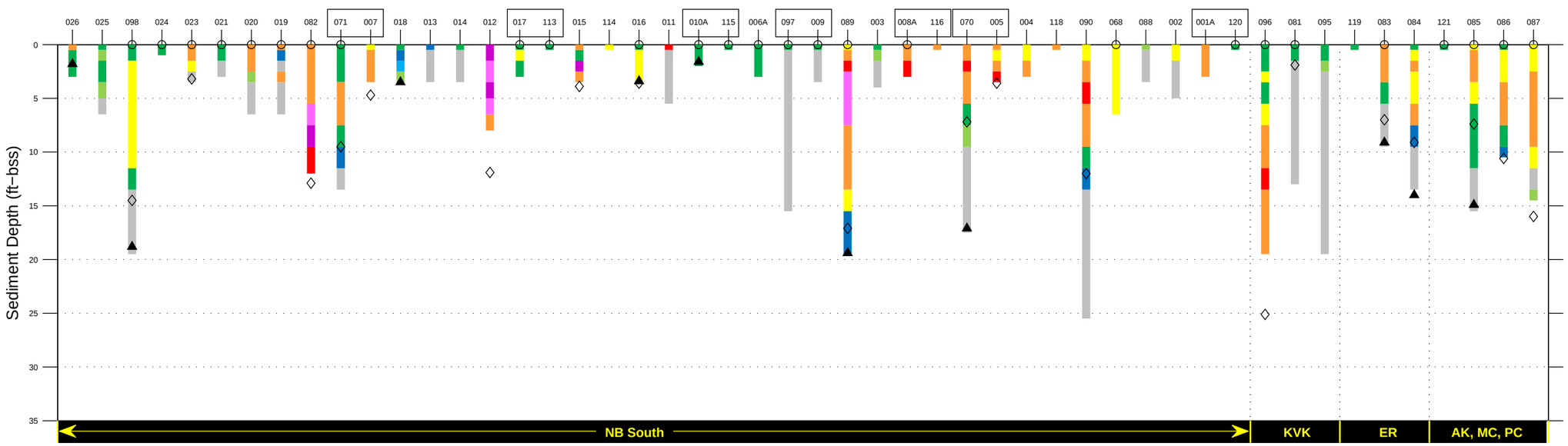
PHASE I AND PHASE II SEDIMENT CHEMISTRY DATA
SILVER
FIGURE F−10



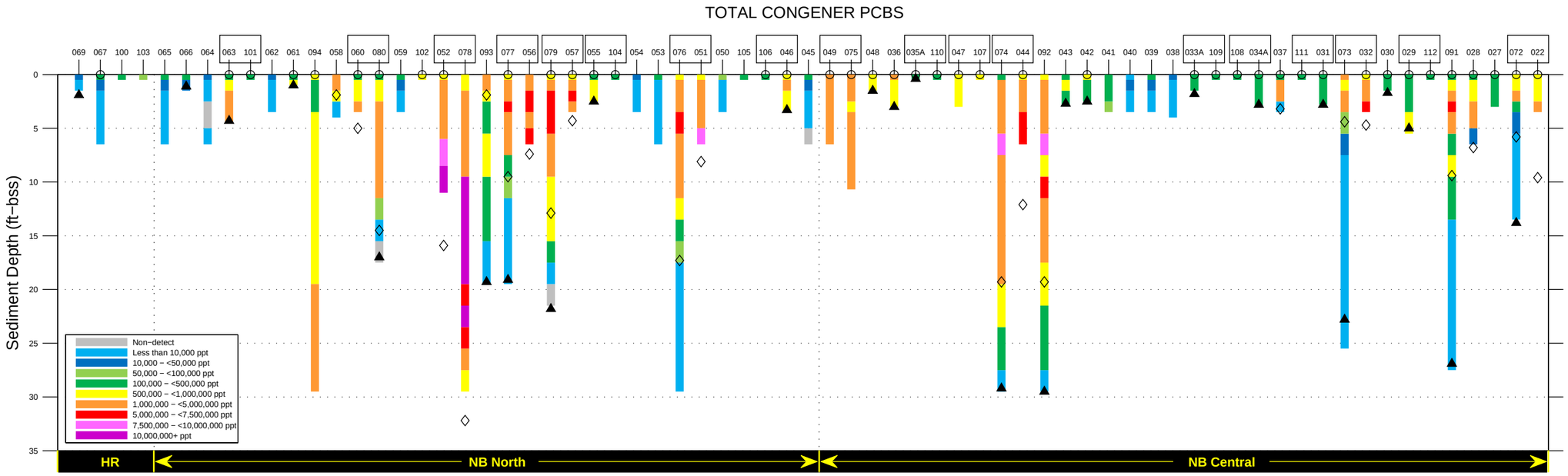


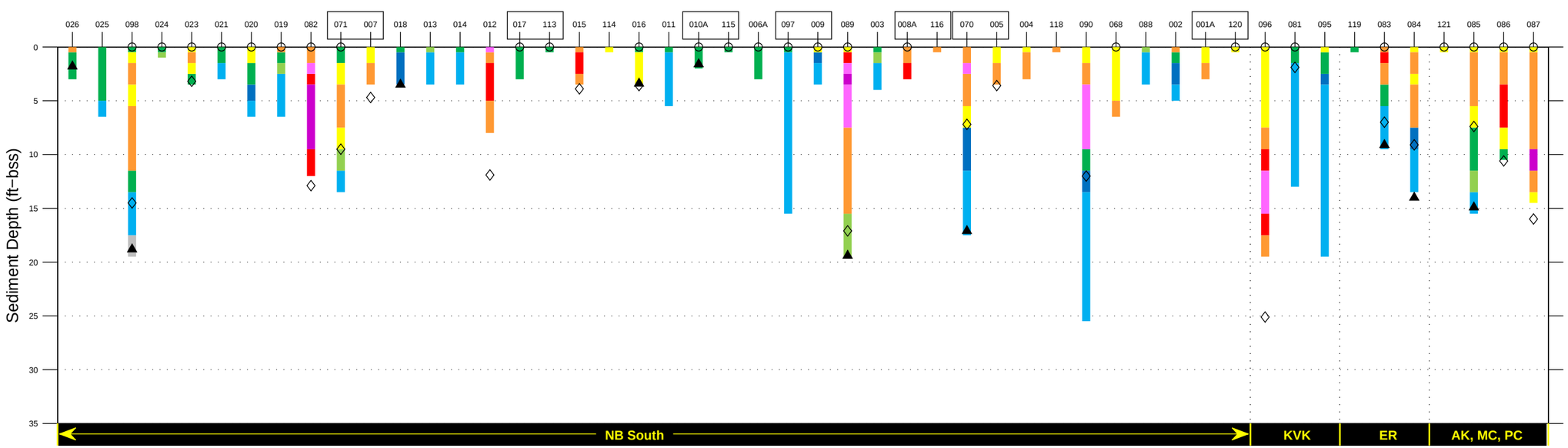
PHASE I AND PHASE II SEDIMENT CHEMISTRY DATA
ZINC
FIGURE F−11



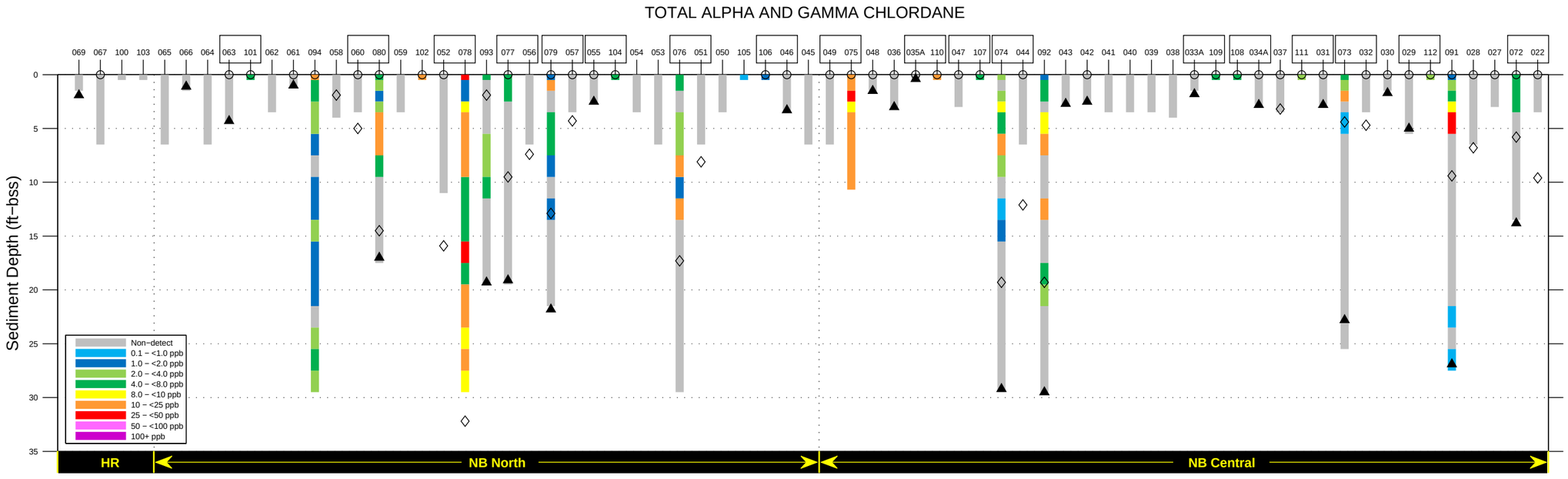


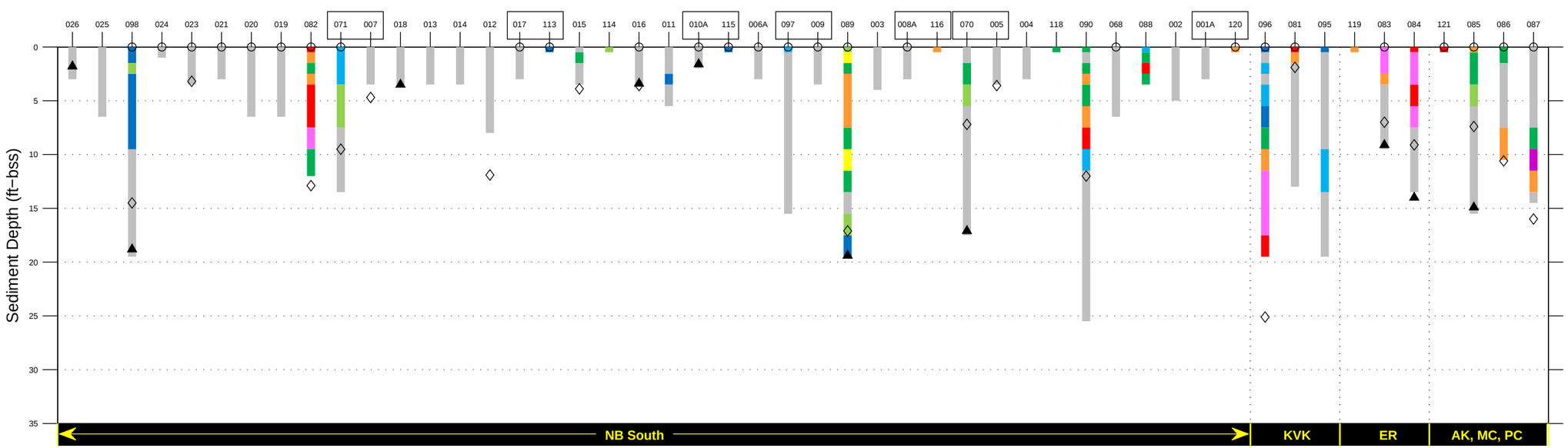
PHASE I AND PHASE II SEDIMENT CHEMISTRY DATA
TOTAL AROCLOR PCBS
FIGURE F−12



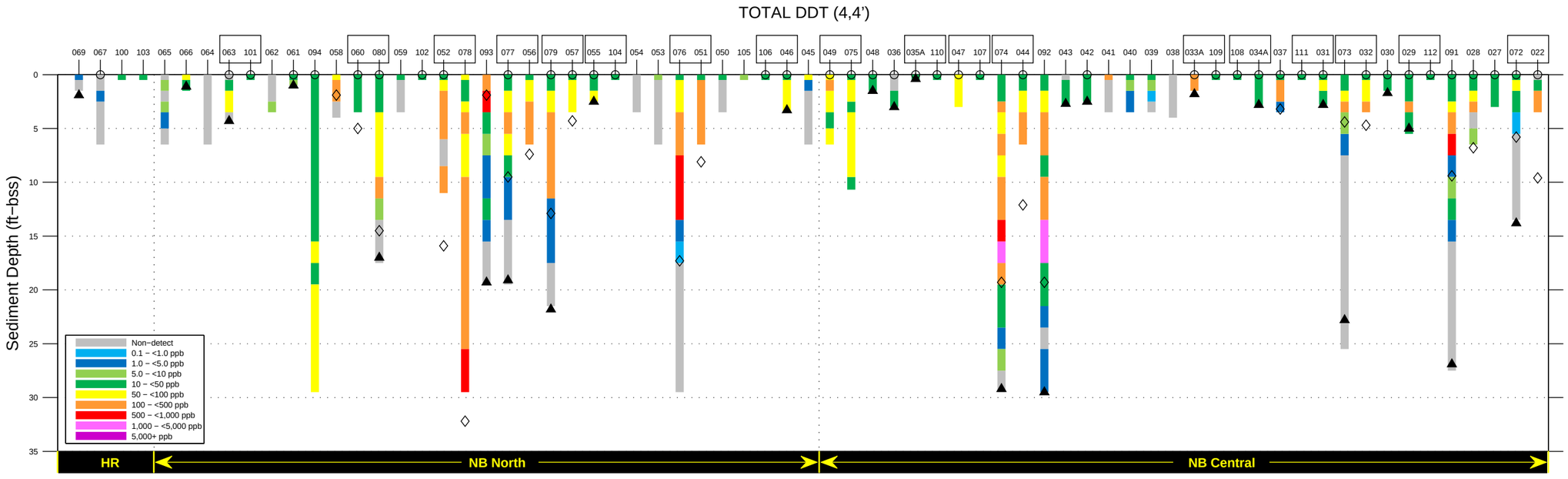


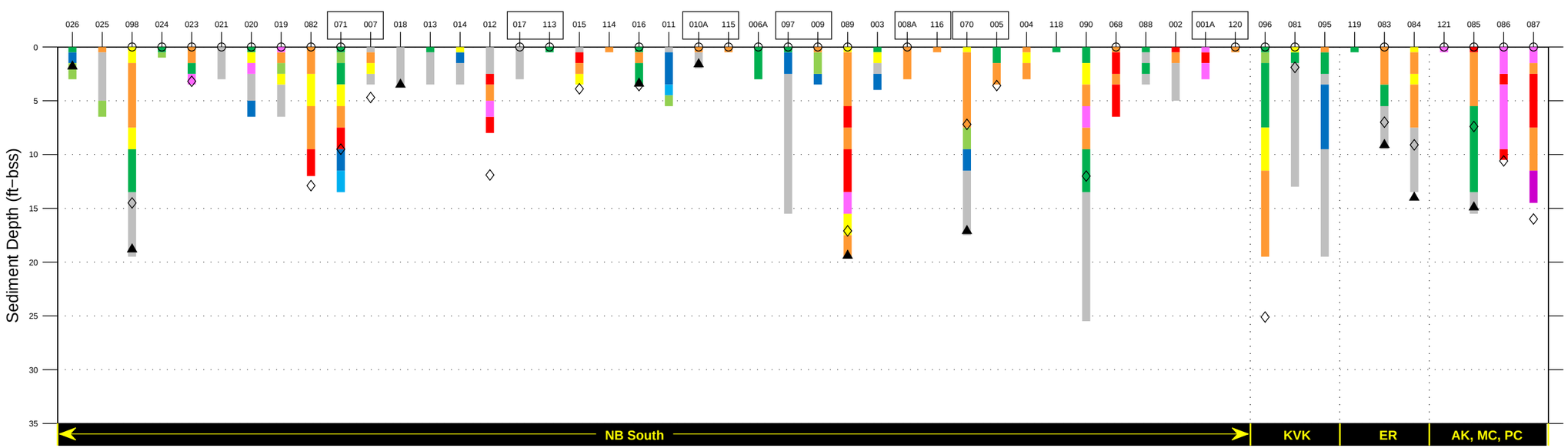
PHASE I AND PHASE II SEDIMENT CHEMISTRY DATA
TOTAL CONGENER PCBS
FIGURE F−13



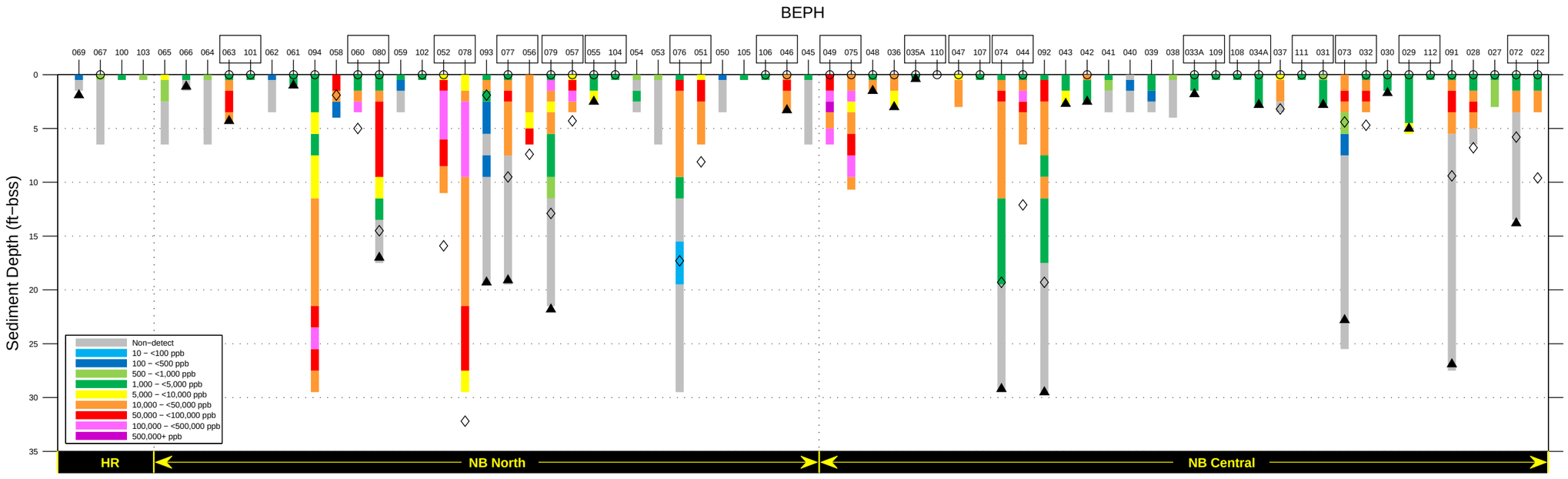


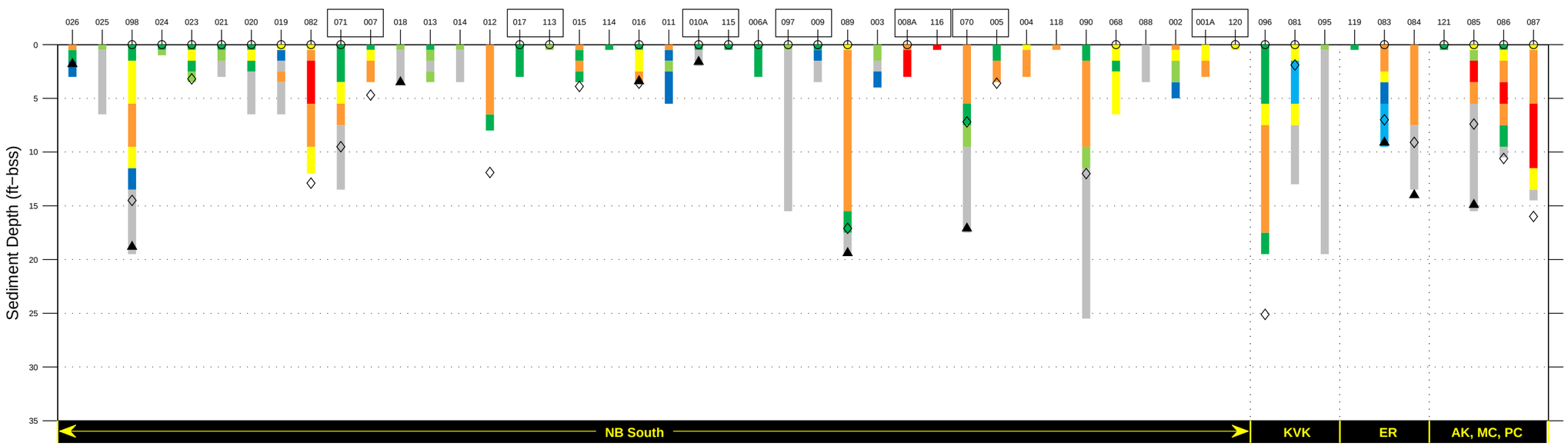
PHASE I AND PHASE II SEDIMENT CHEMISTRY DATA
TOTAL ALPHA AND GAMMA CHLORDANE
FIGURE F−14



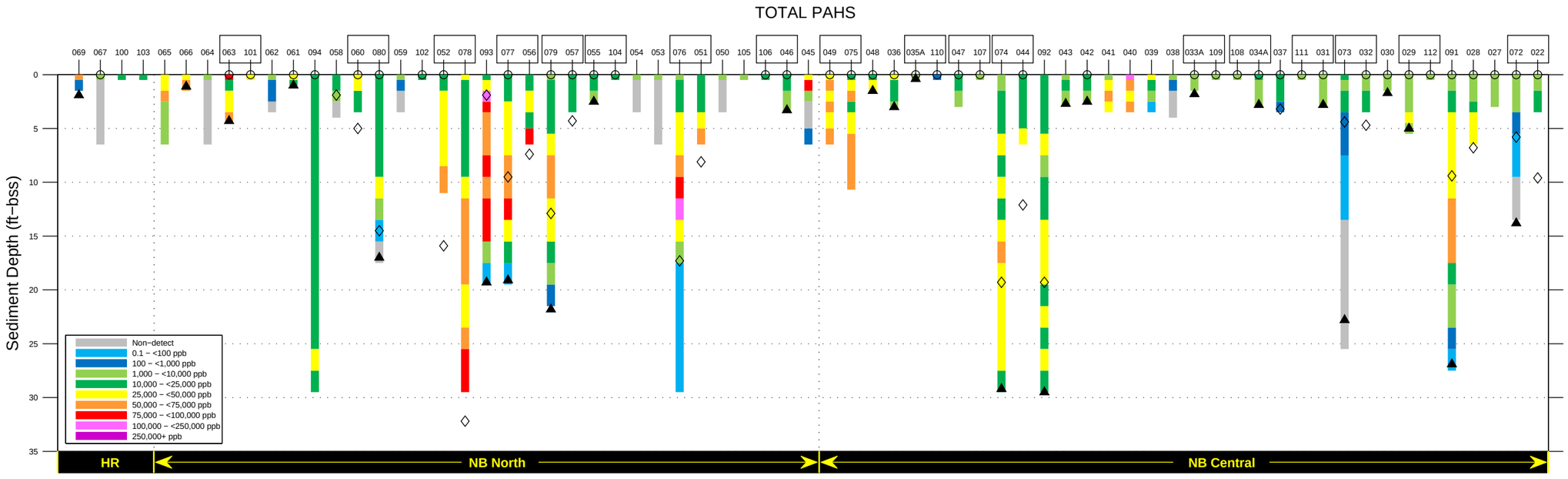


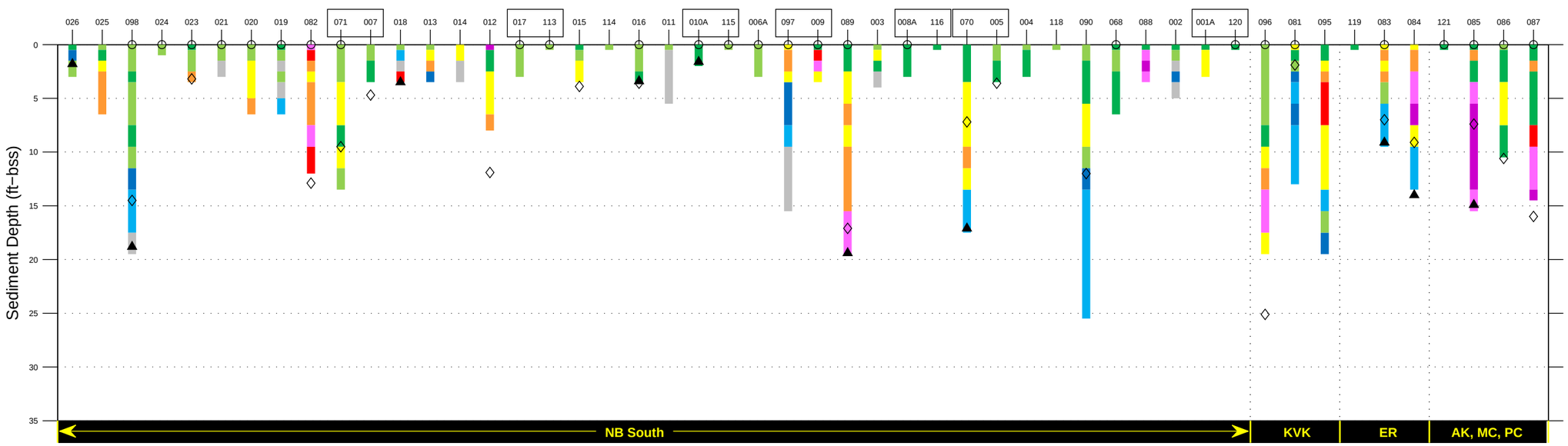
PHASE I AND PHASE II SEDIMENT CHEMISTRY DATA
TOTAL DDT (4,4')
FIGURE F−15



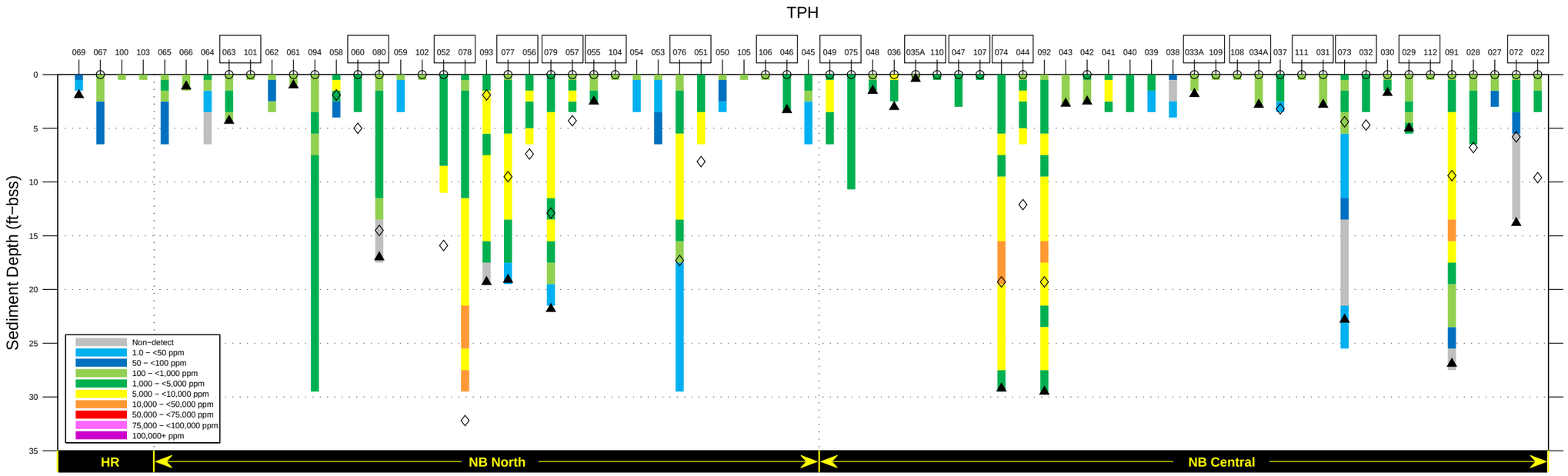


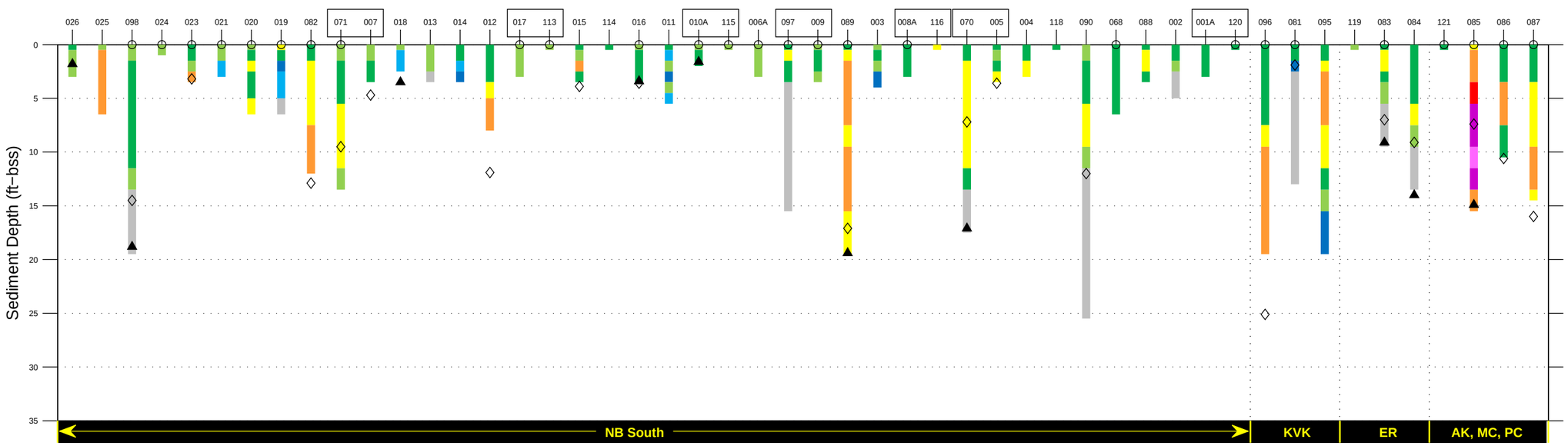
PHASE I AND PHASE II SEDIMENT CHEMISTRY DATA
BEPH
FIGURE F−16



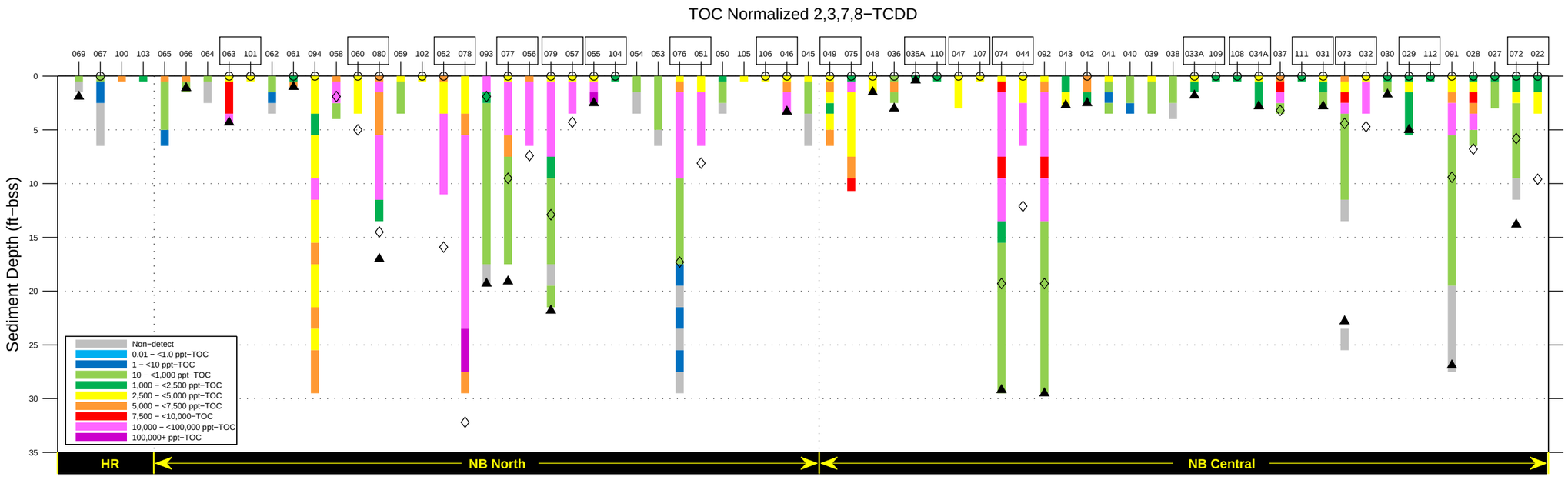


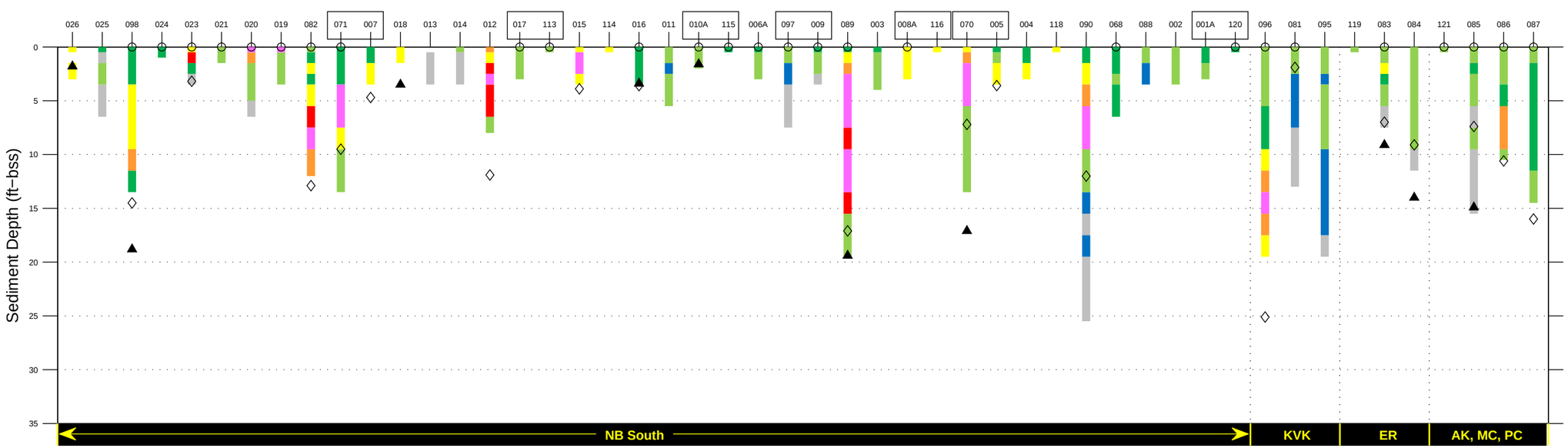
PHASE I AND PHASE II SEDIMENT CHEMISTRY DATA
TOTAL PAHS
FIGURE F−17



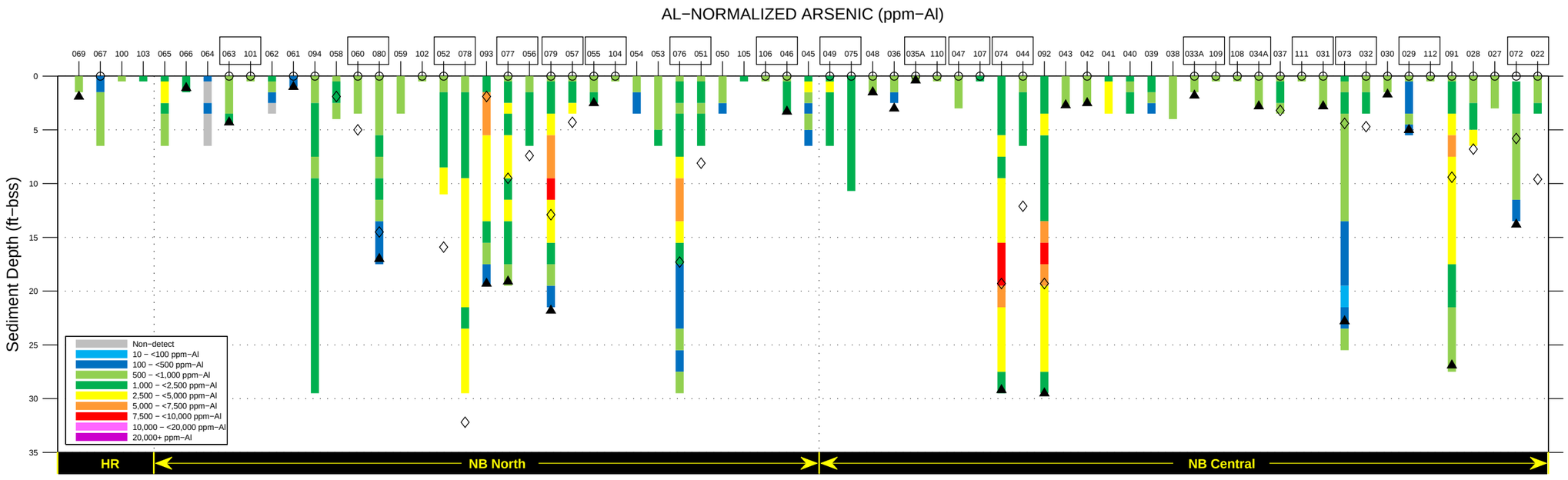


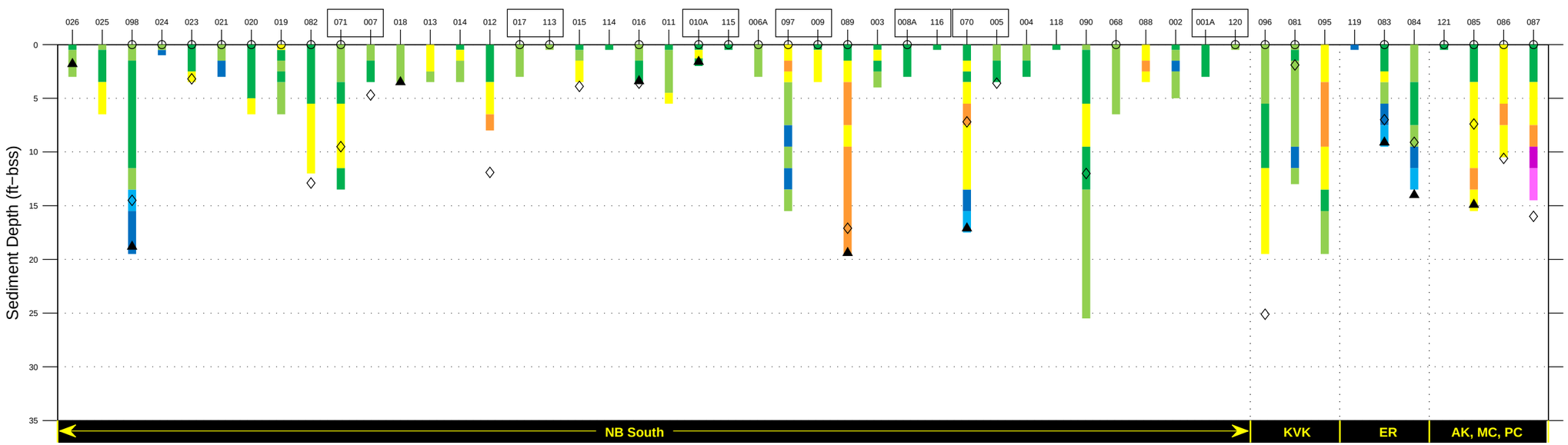
PHASE I AND PHASE II SEDIMENT CHEMISTRY DATA
TPH
FIGURE F−18



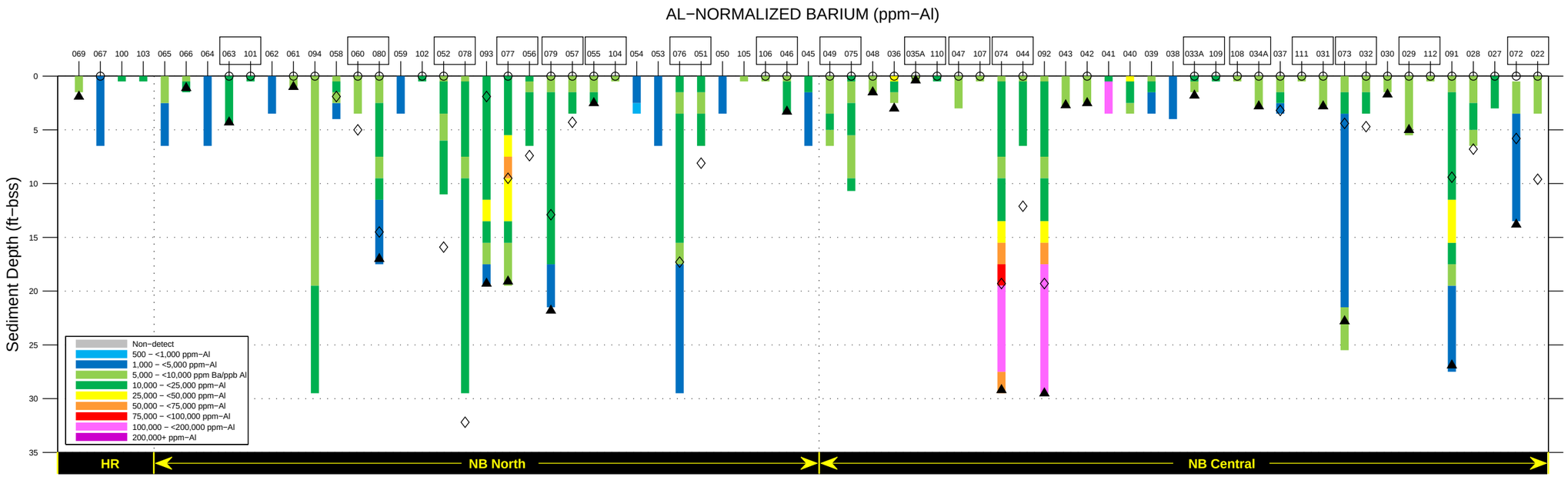


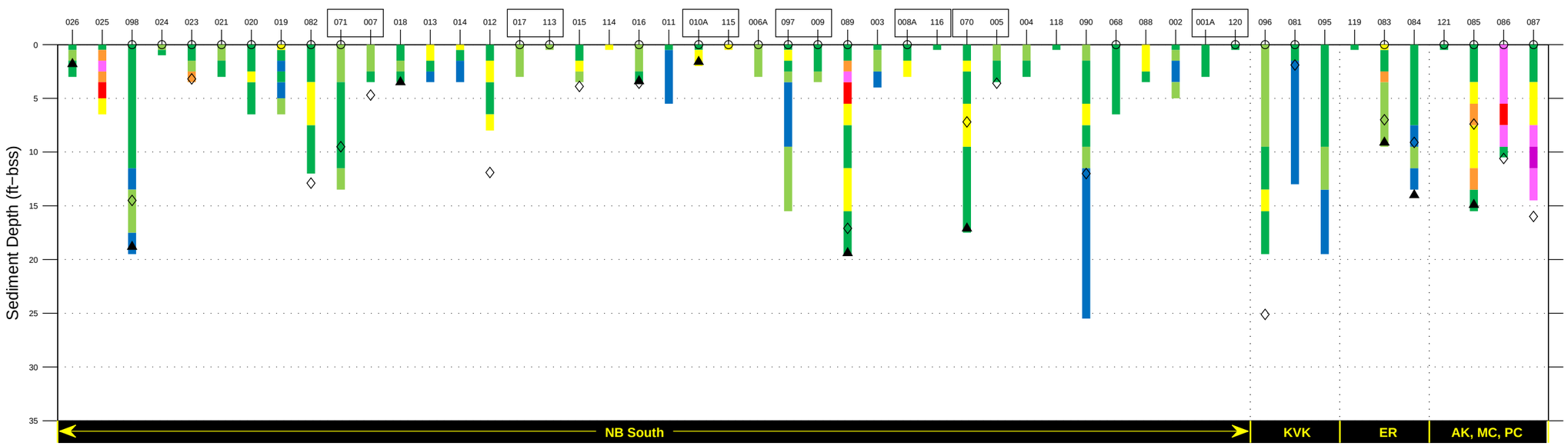
PHASE I AND PHASE II SEDIMENT CHEMISTRY DATA
TOC Normalized 2,3,7,8−TCDD
FIGURE F−19



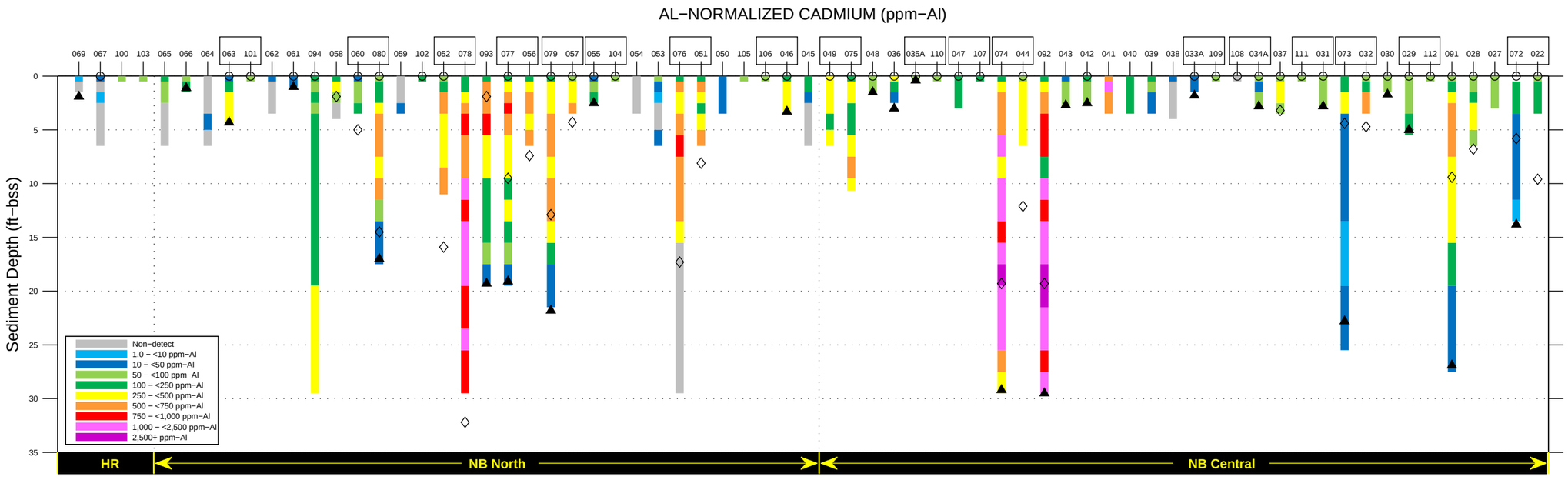


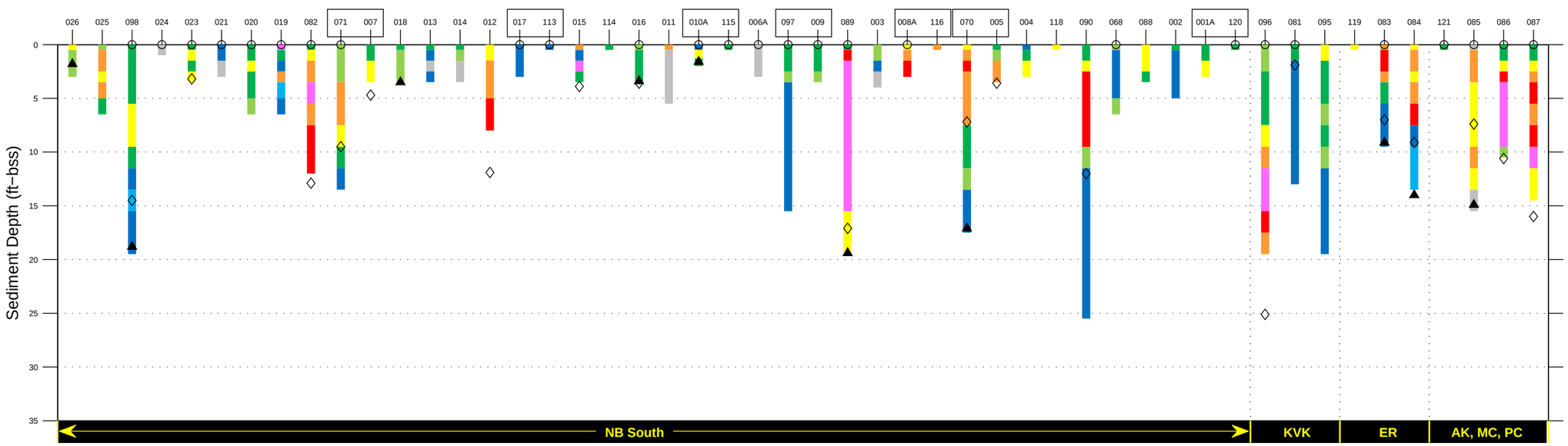
PHASE I AND PHASE II SEDIMENT CHEMISTRY DATA
AL−NORMALIZED ARSENIC (ppm−Al)
FIGURE F−20



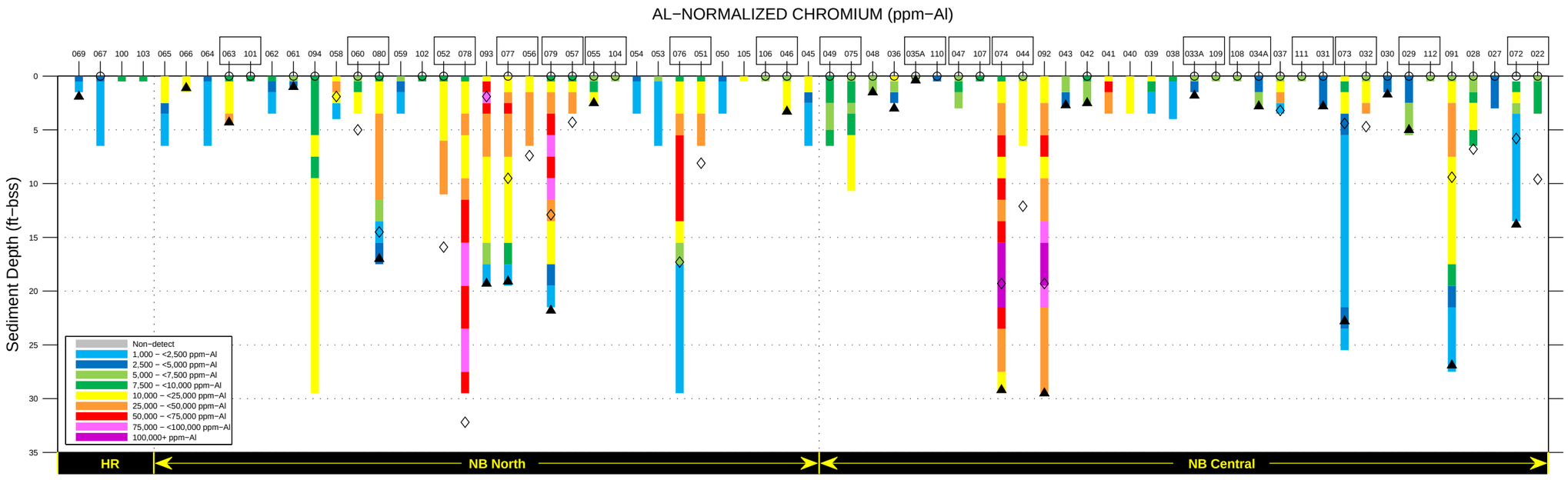


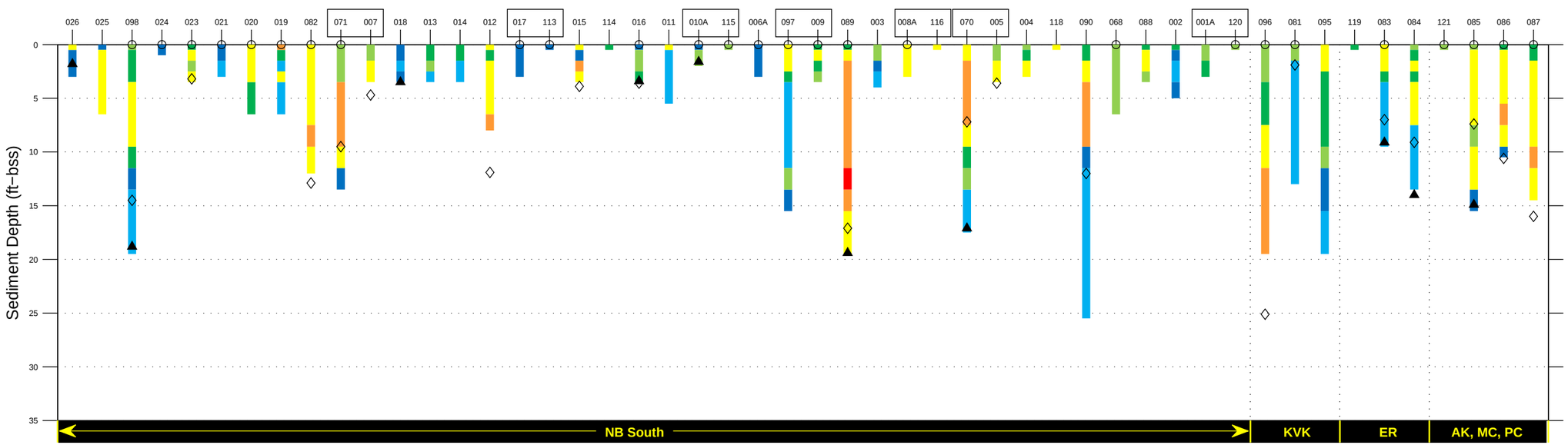
PHASE I AND PHASE II SEDIMENT CHEMISTRY DATA
AL−NORMALIZED BARIUM (ppm−Al)
FIGURE F−21



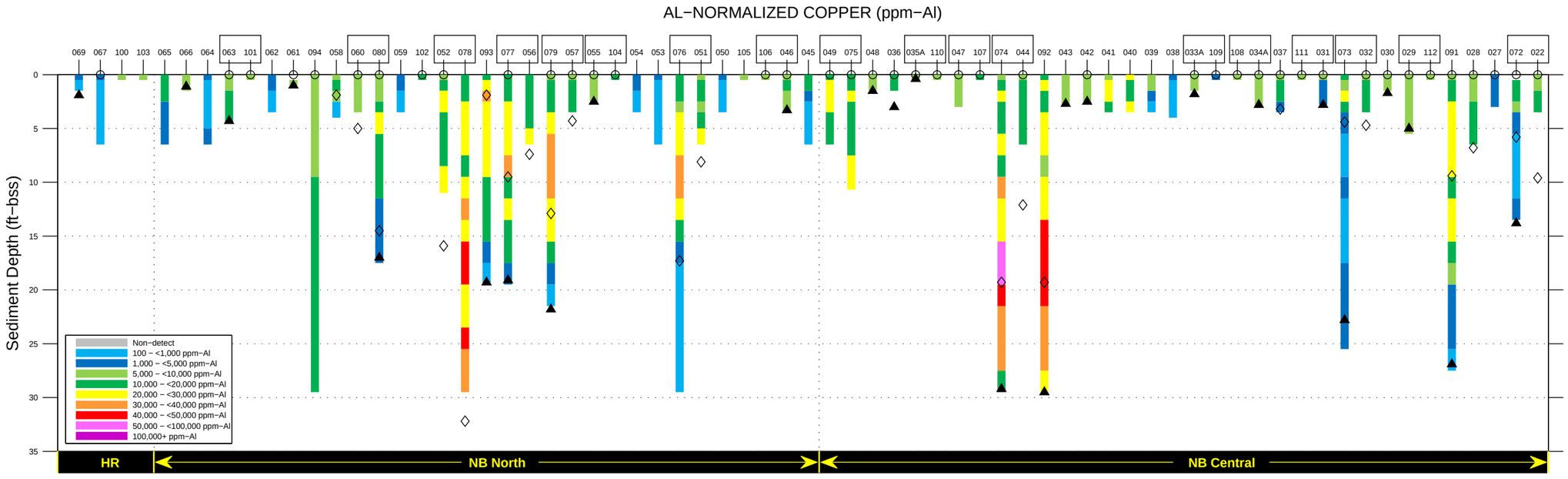


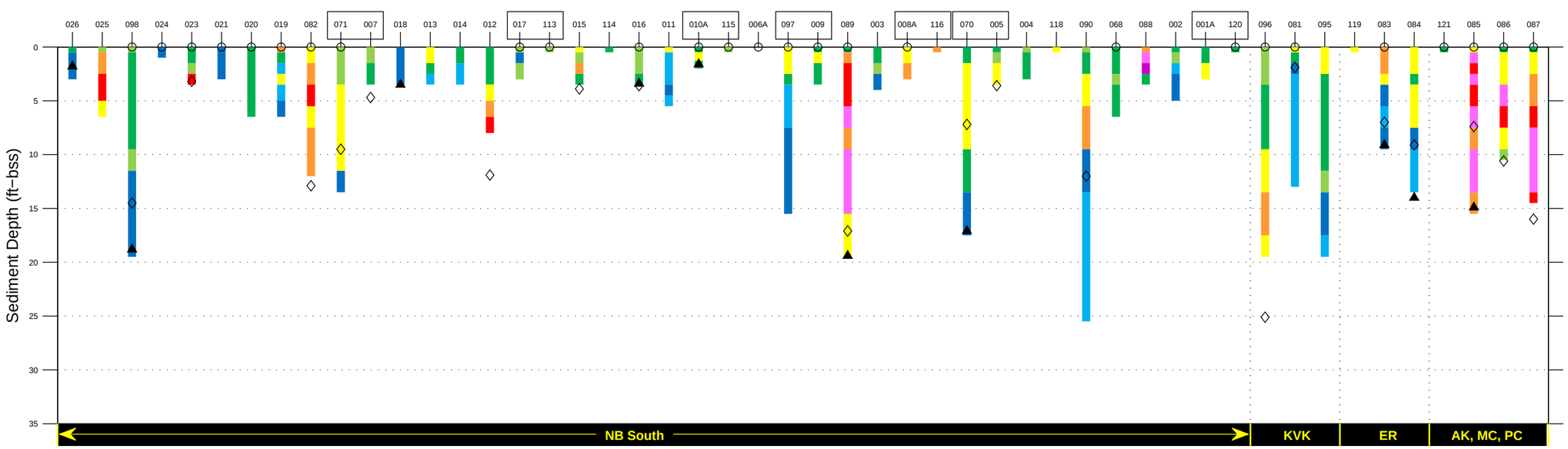
PHASE I AND PHASE II SEDIMENT CHEMISTRY DATA
AL−NORMALIZED CADMIUM (ppm−Al)
FIGURE F−22



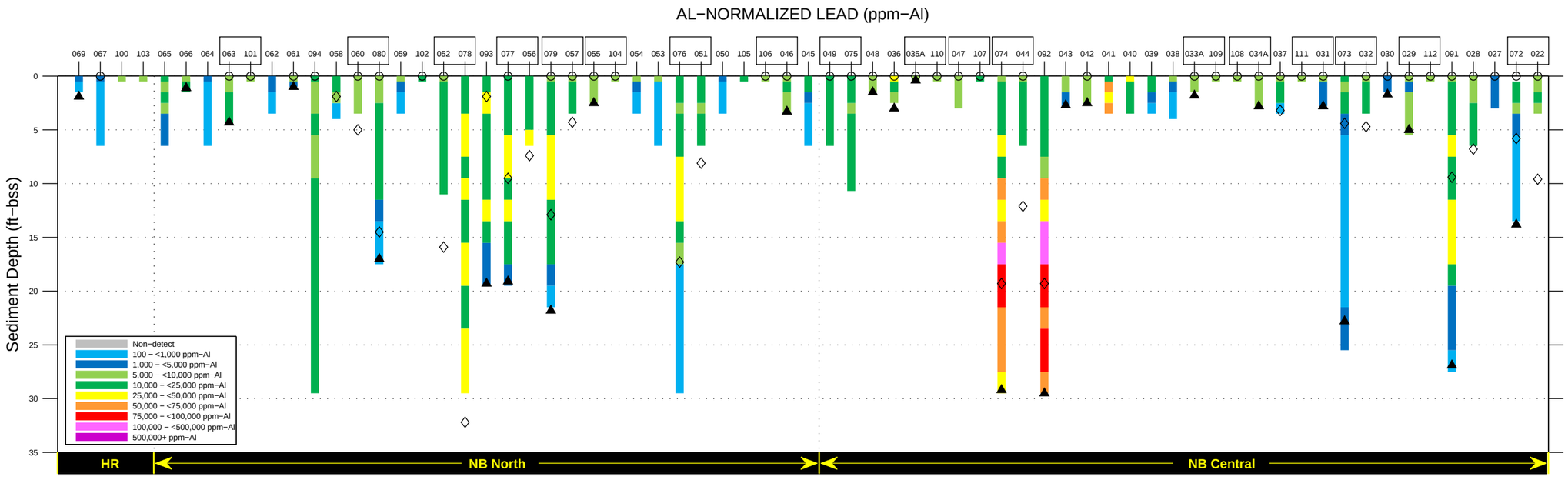


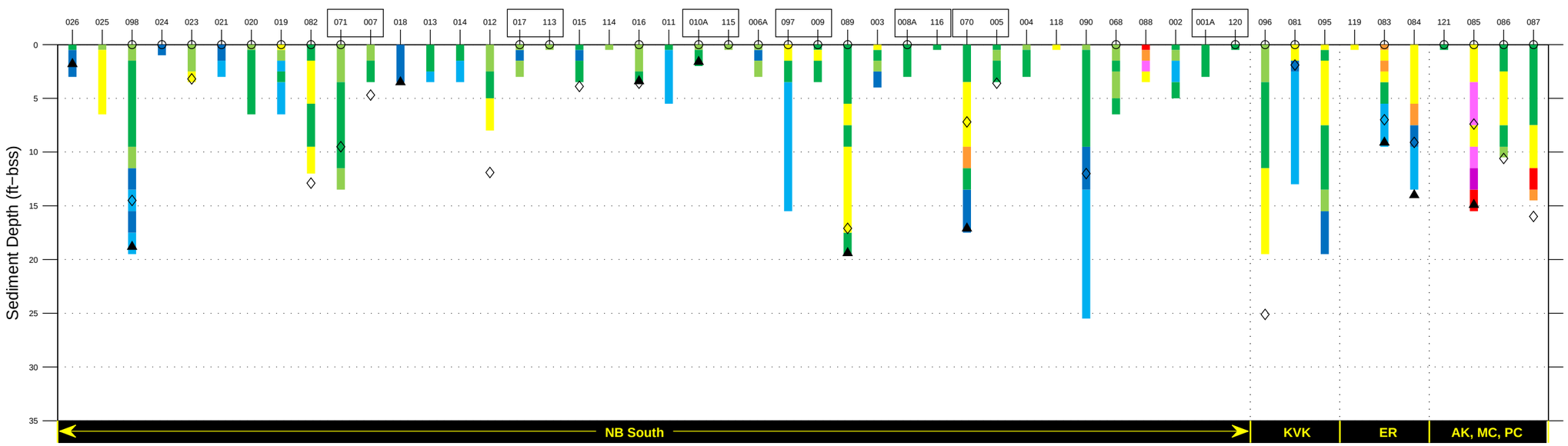
PHASE I AND PHASE II SEDIMENT CHEMISTRY DATA
AL−NORMALIZED CHROMIUM (ppm−Al)
FIGURE F−23



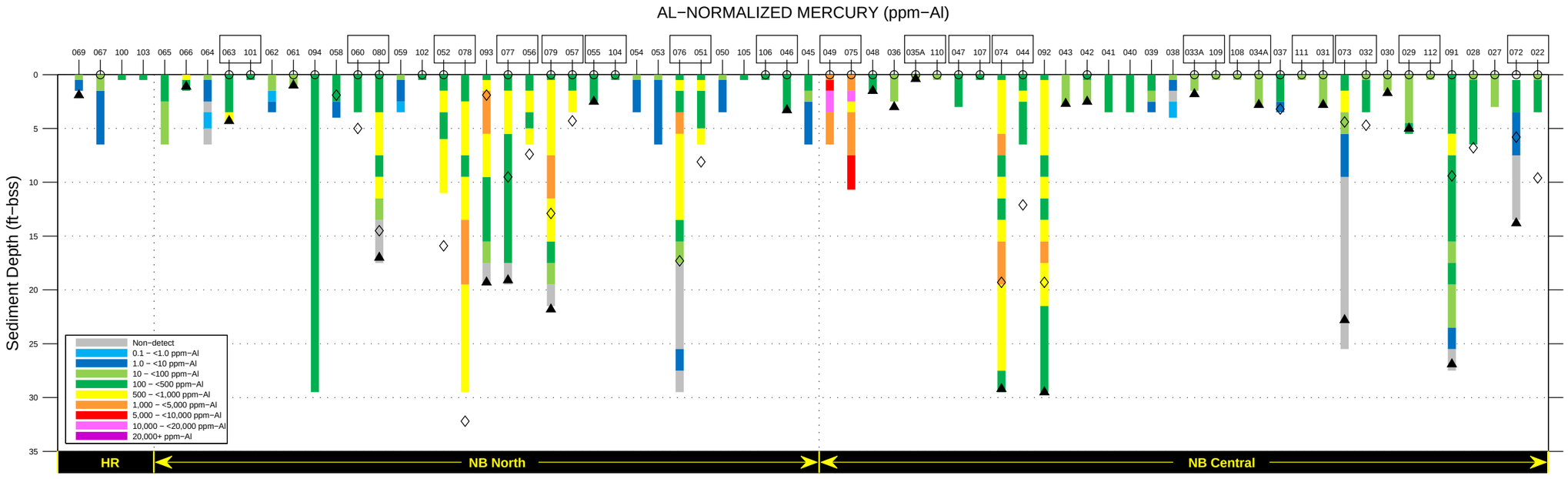


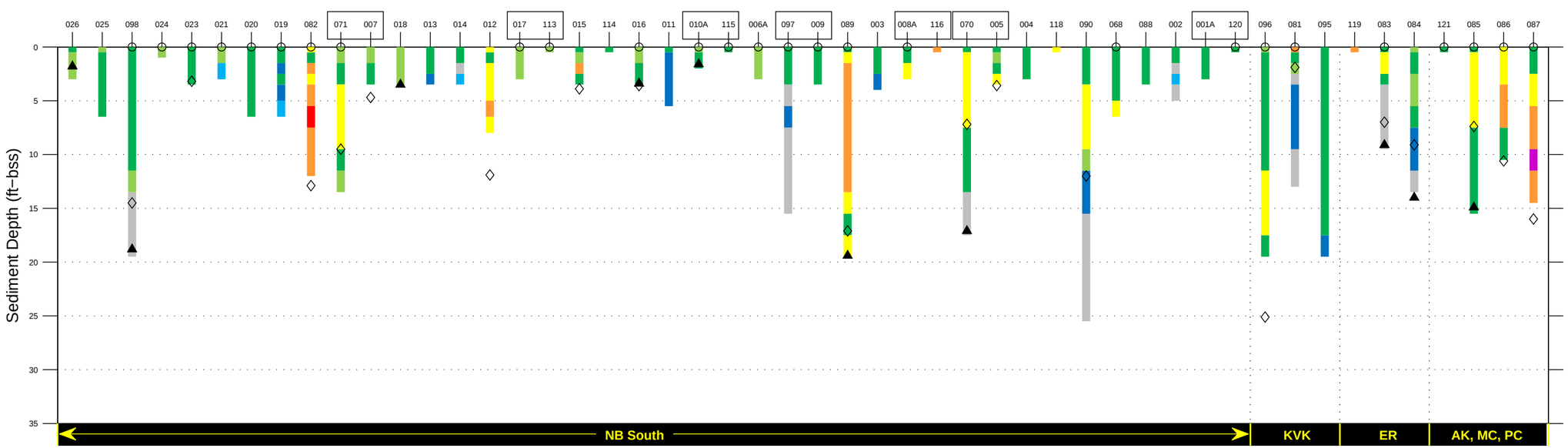
PHASE I AND PHASE II SEDIMENT CHEMISTRY DATA
AL−NORMALIZED COPPER (ppm−Al)
FIGURE F−24



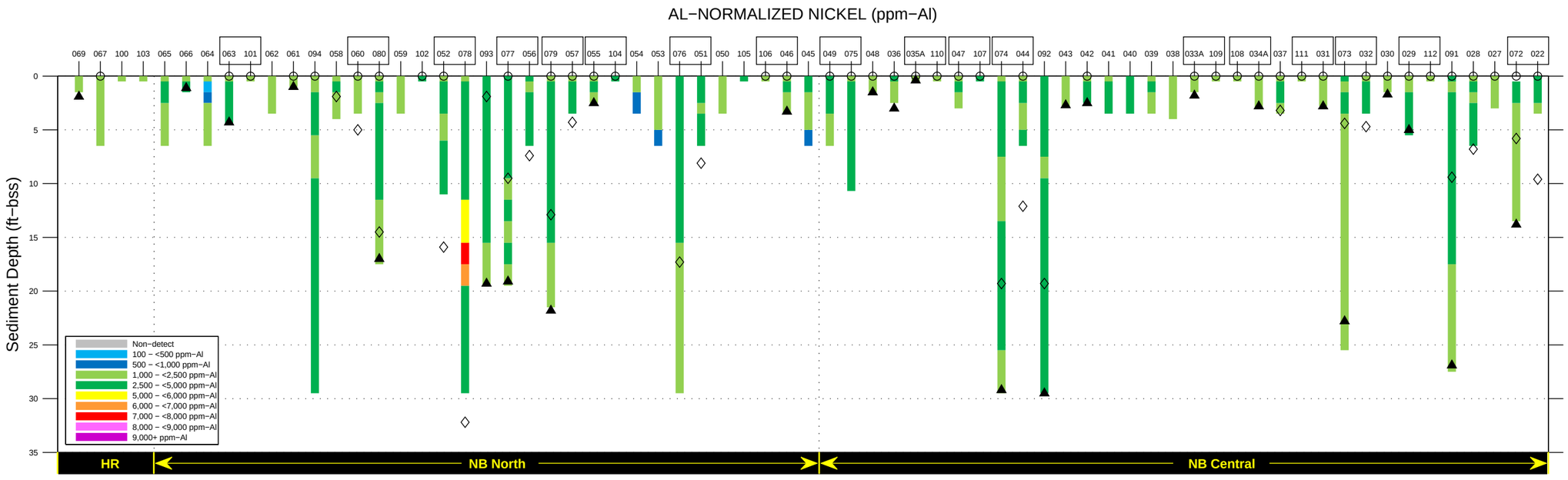


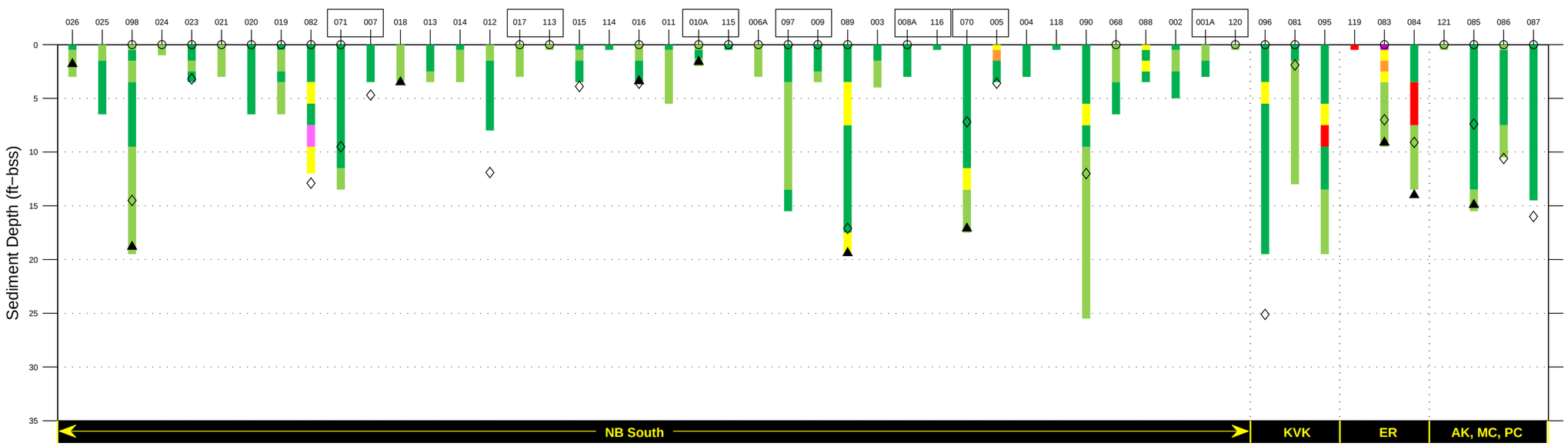
PHASE I AND PHASE II SEDIMENT CHEMISTRY DATA
AL−NORMALIZED LEAD (ppm−Al)
FIGURE F−25



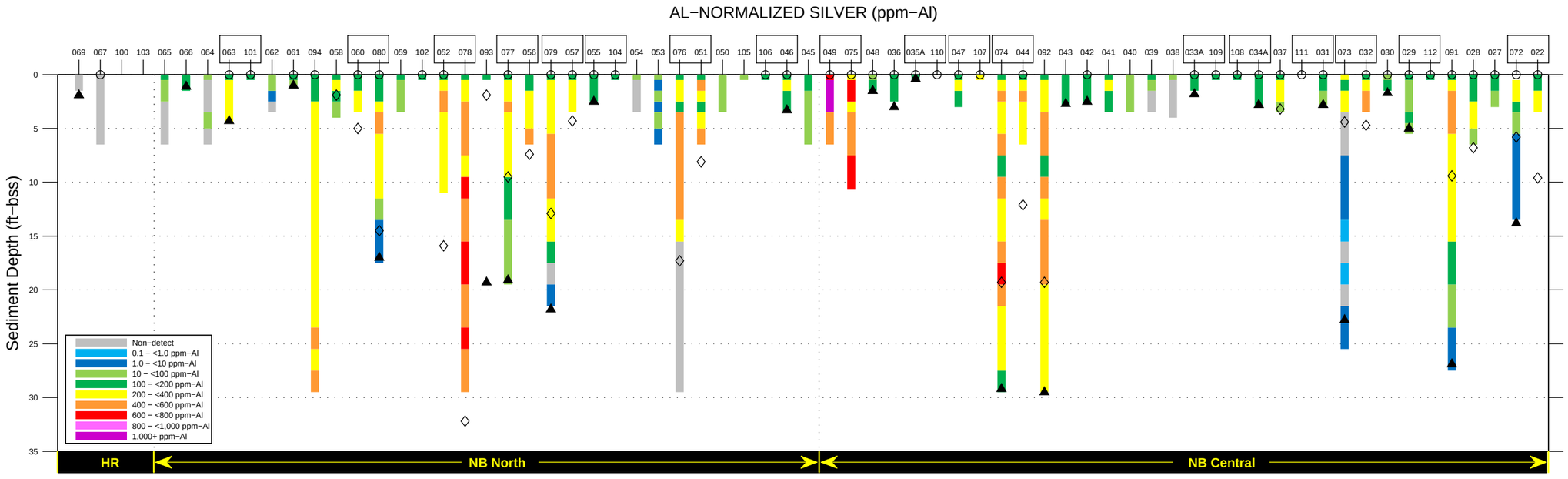


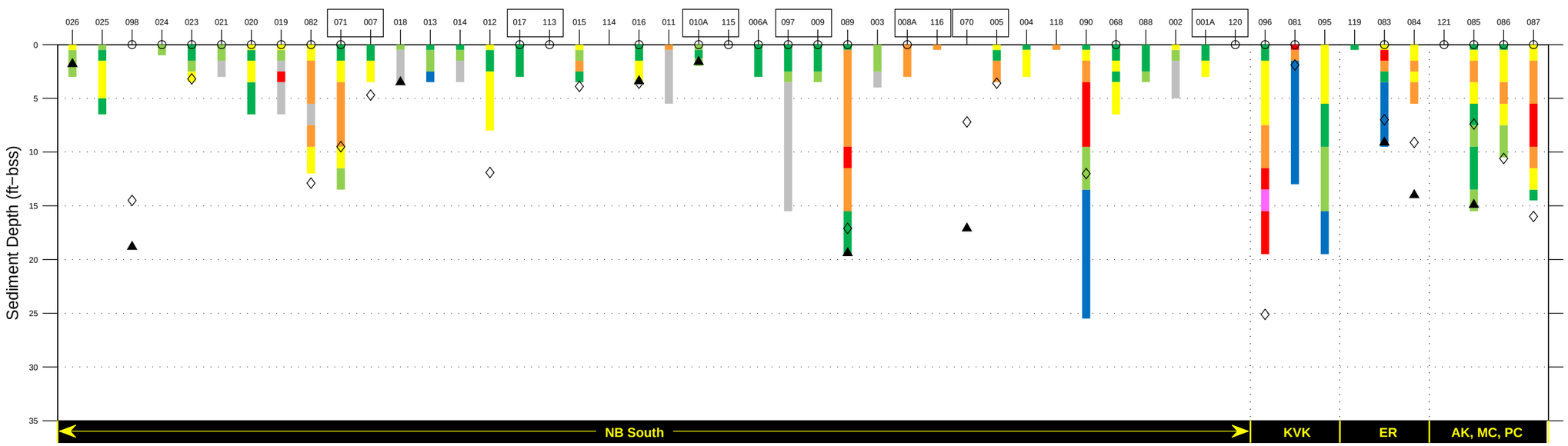
PHASE I AND PHASE II SEDIMENT CHEMISTRY DATA
AL−NORMALIZED MERCURY (ppm−Al)
FIGURE F−26



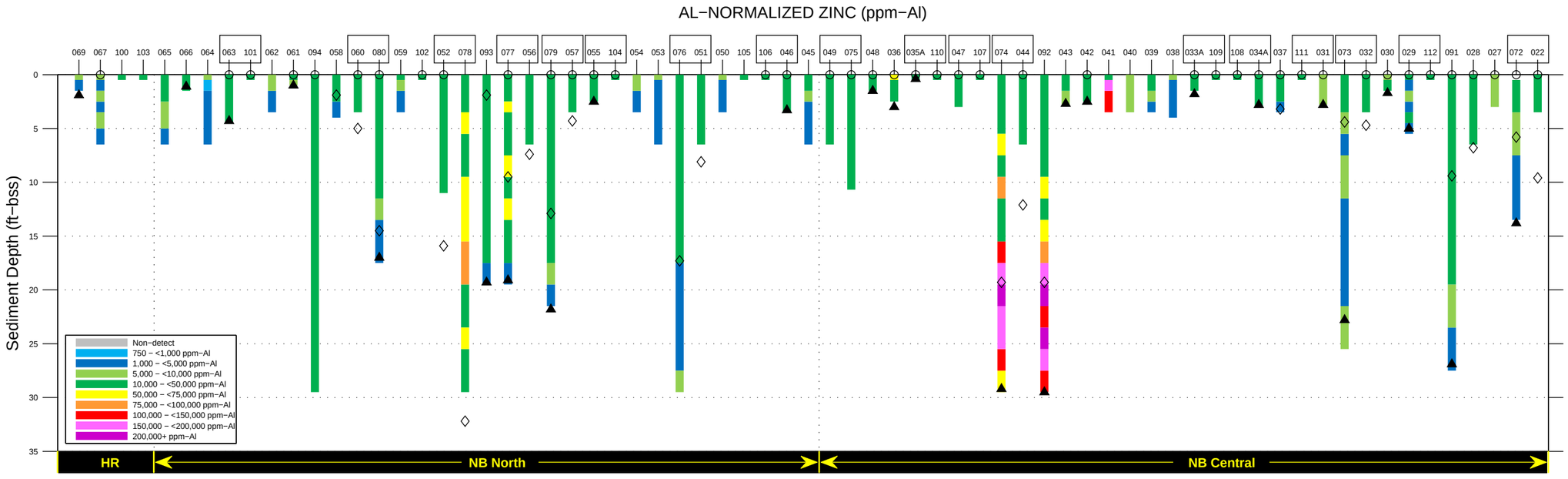


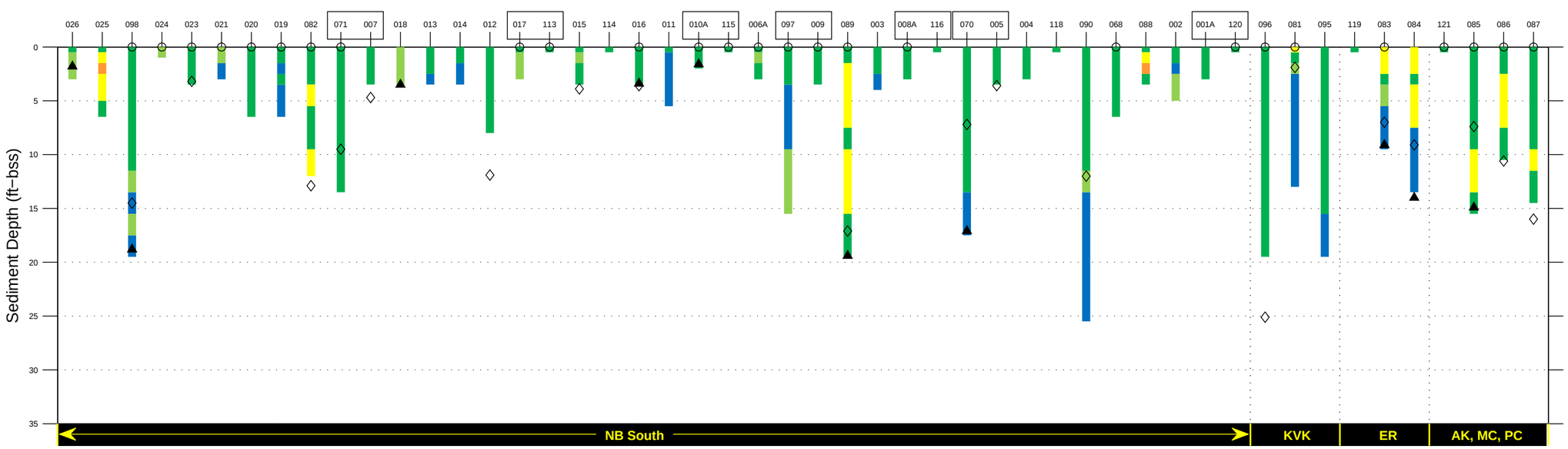
PHASE I AND PHASE II SEDIMENT CHEMISTRY DATA
AL−NORMALIZED NICKEL (ppm−Al)
FIGURE F−27



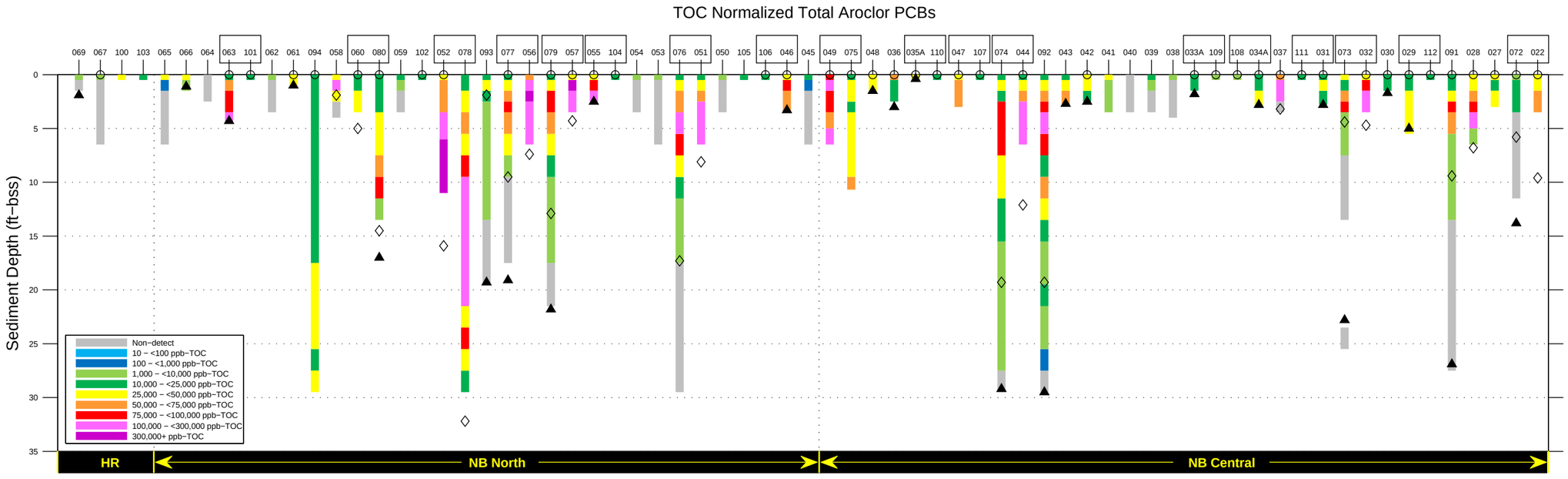


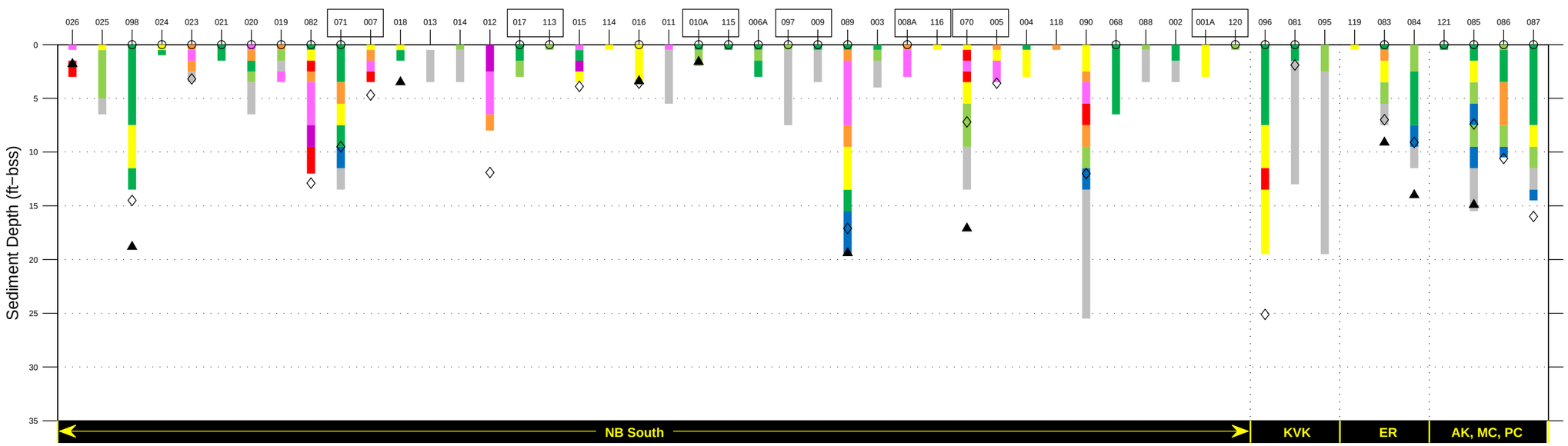
PHASE I AND PHASE II SEDIMENT CHEMISTRY DATA
AL−NORMALIZED SILVER (ppm−Al)
FIGURE F−28



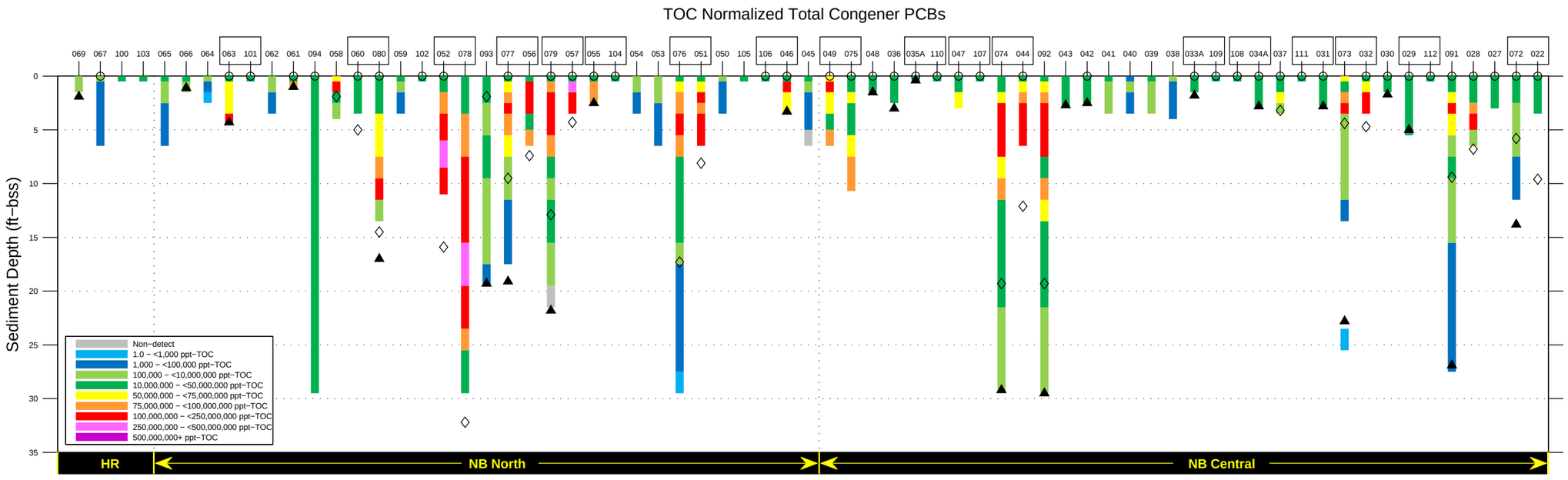


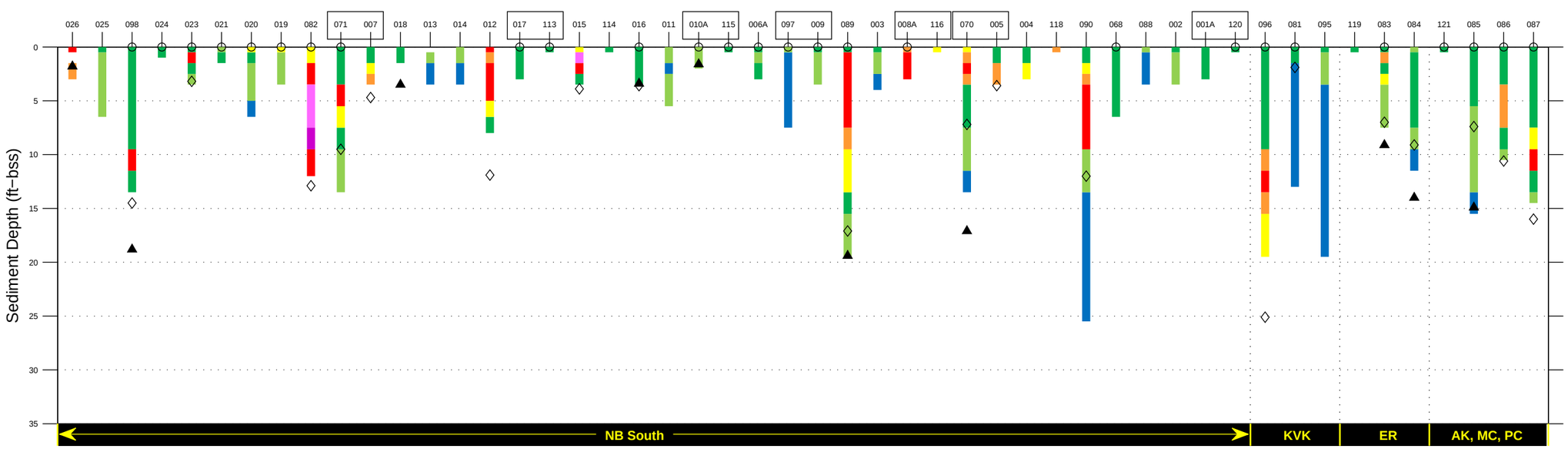
PHASE I AND PHASE II SEDIMENT CHEMISTRY DATA
AL−NORMALIZED ZINC (ppm−Al)
FIGURE F−29



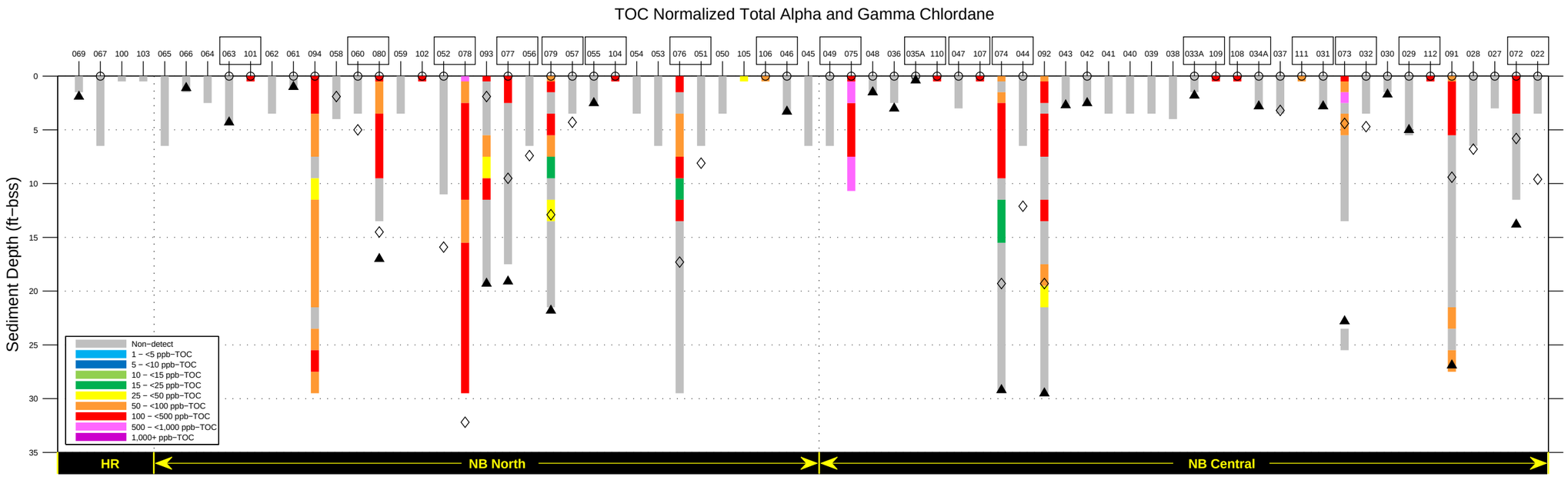


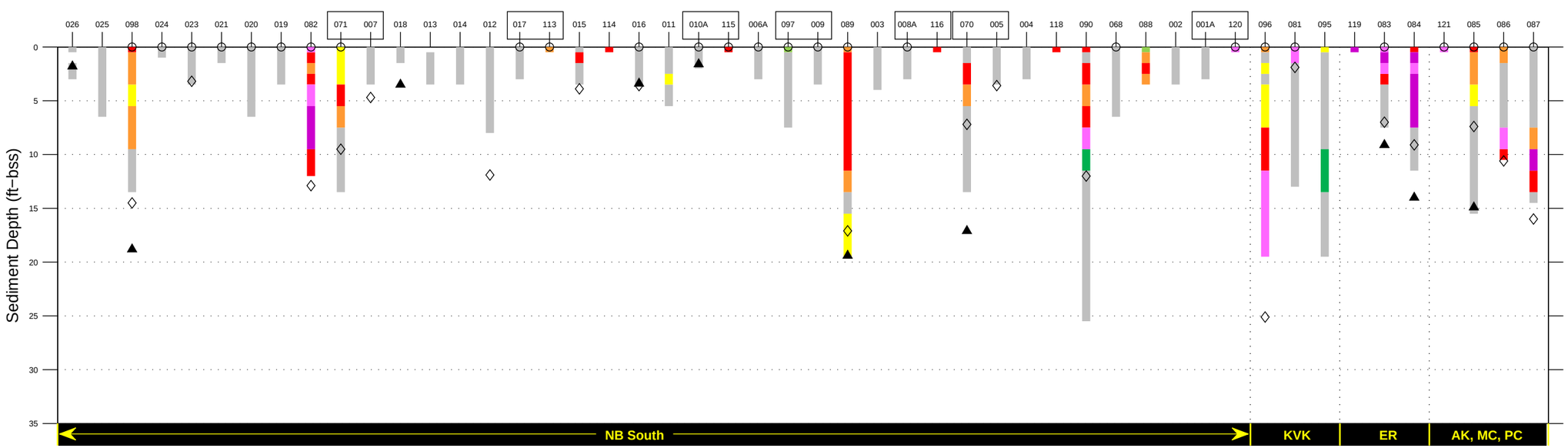
PHASE I AND PHASE II SEDIMENT CHEMISTRY DATA
TOC Normalized Total Aroclor PCBs
FIGURE F−30



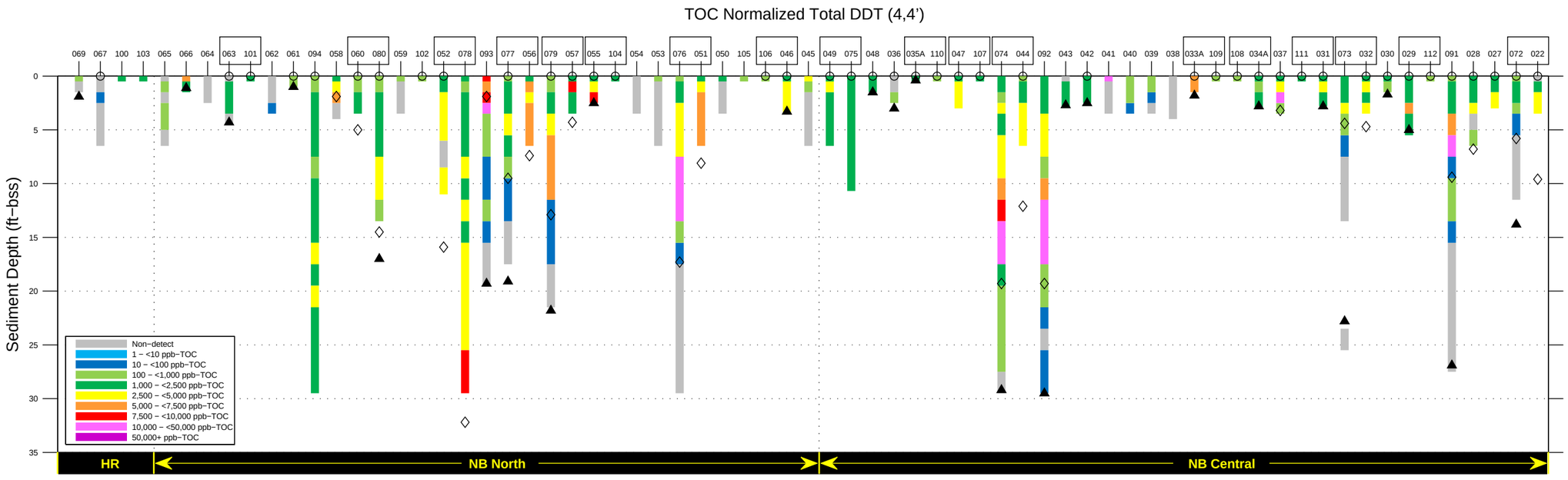


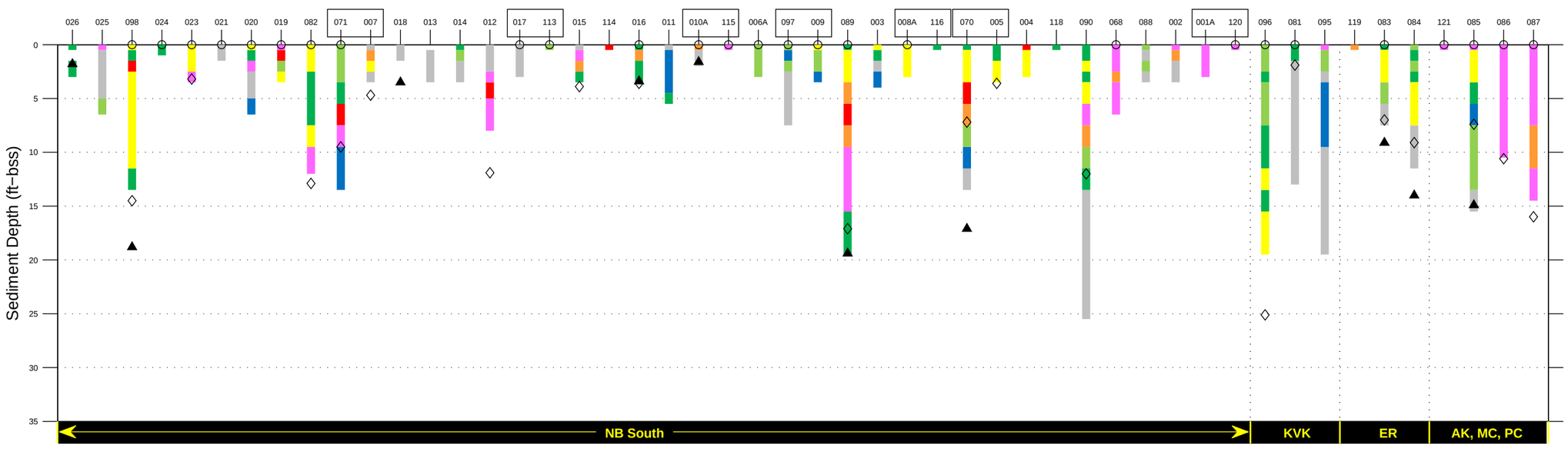
PHASE I AND PHASE II SEDIMENT CHEMISTRY DATA
TOC Normalized Total Congener PCBs
FIGURE F−31



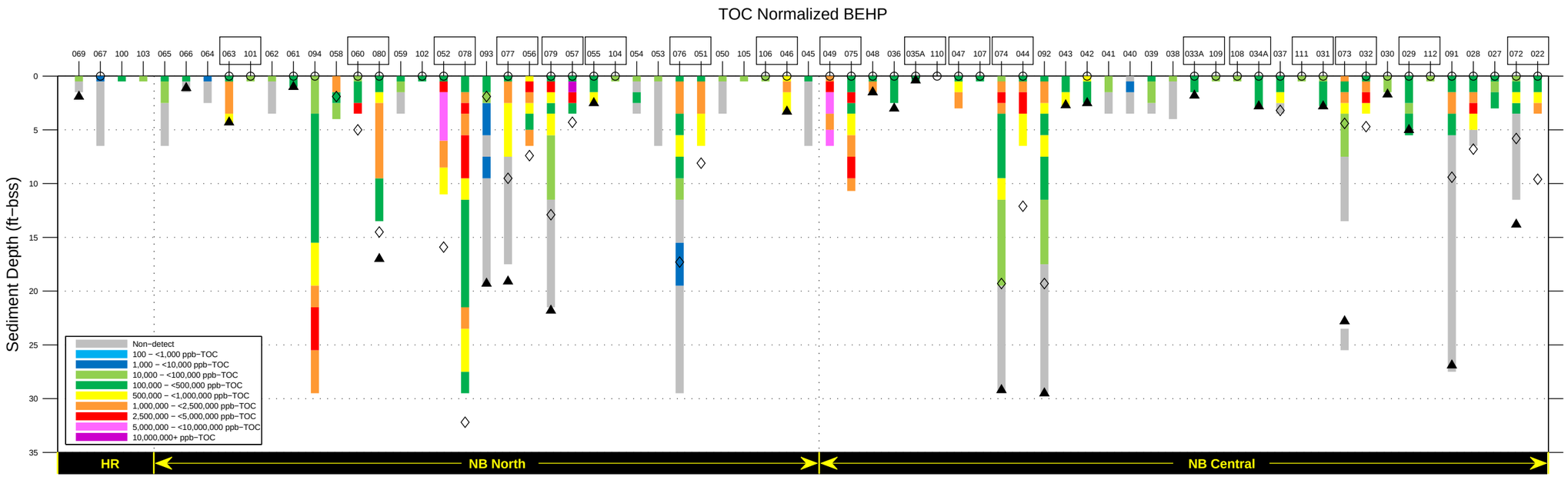


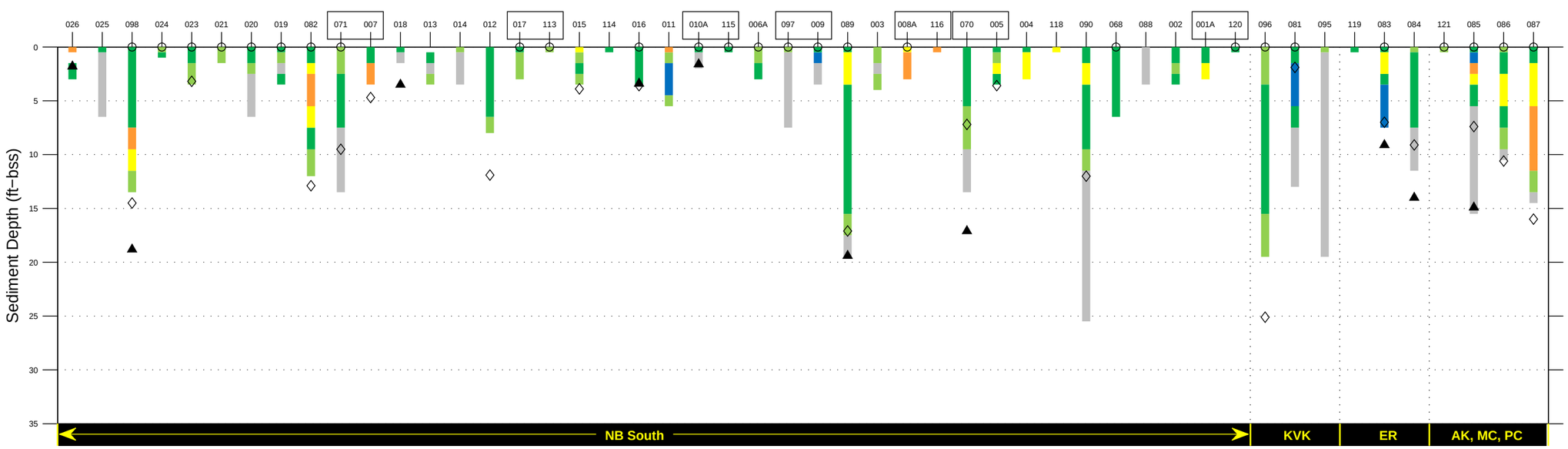
PHASE I AND PHASE II SEDIMENT CHEMISTRY DATA
TOC Normalized Total Alpha and Gamma Chlordane
FIGURE F−32



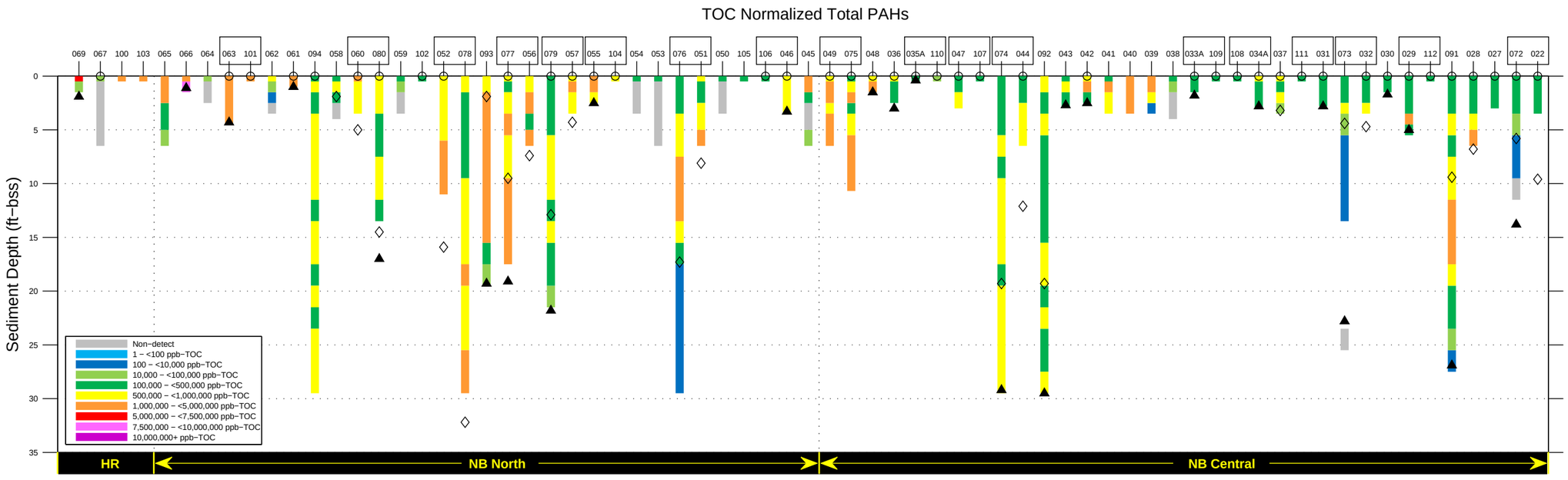


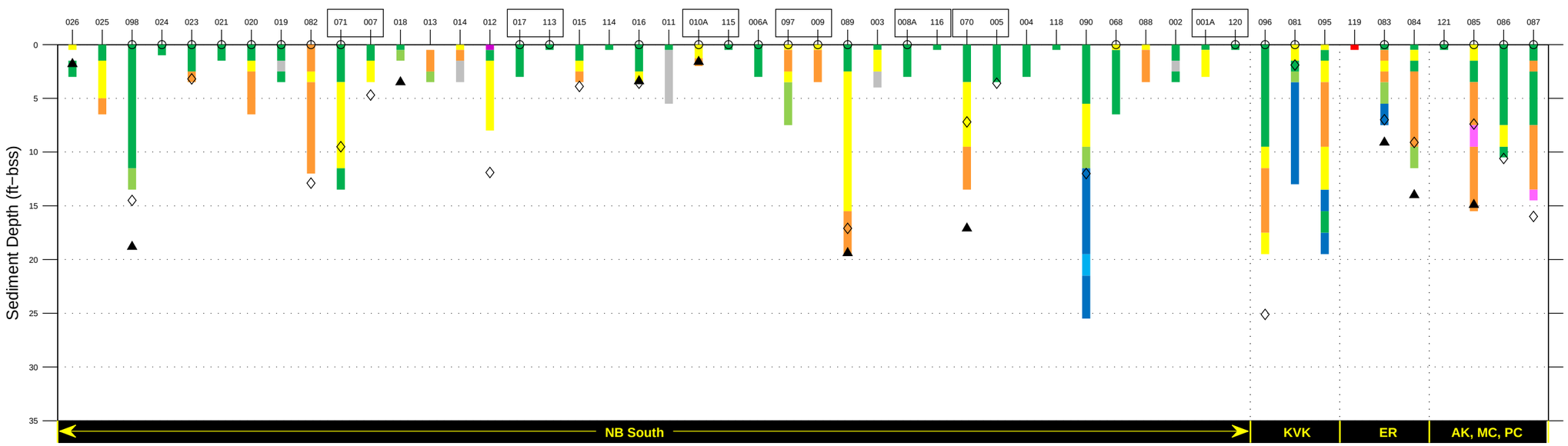
PHASE I AND PHASE II SEDIMENT CHEMISTRY DATA
TOC Normalized Total DDT (4,4')
FIGURE F−33



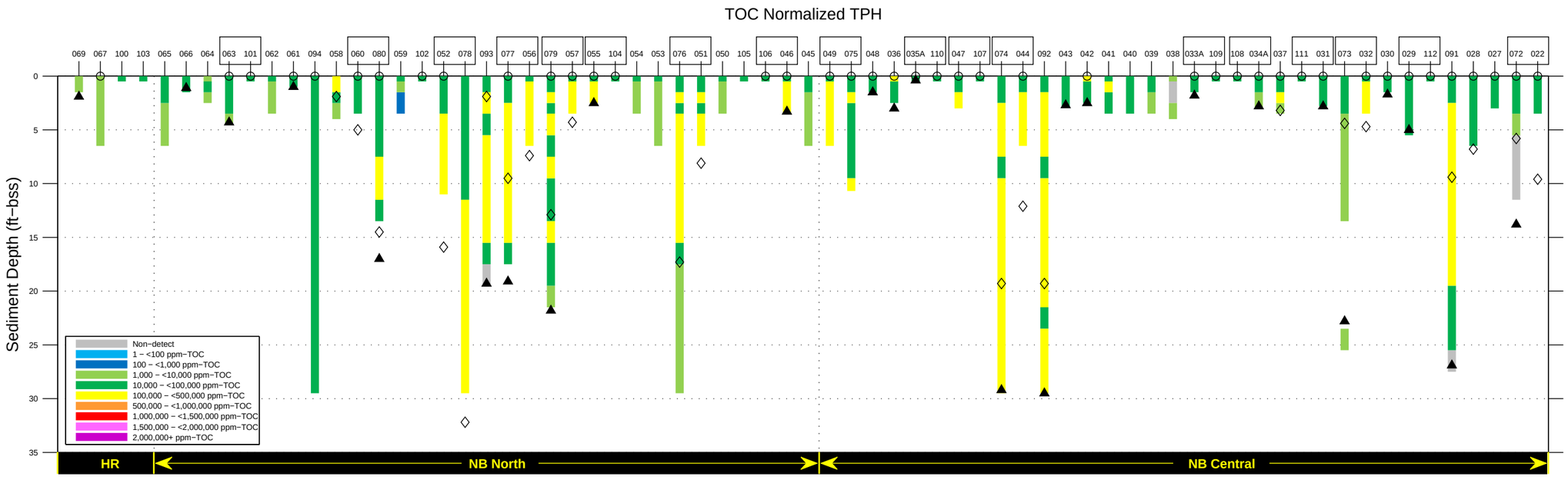


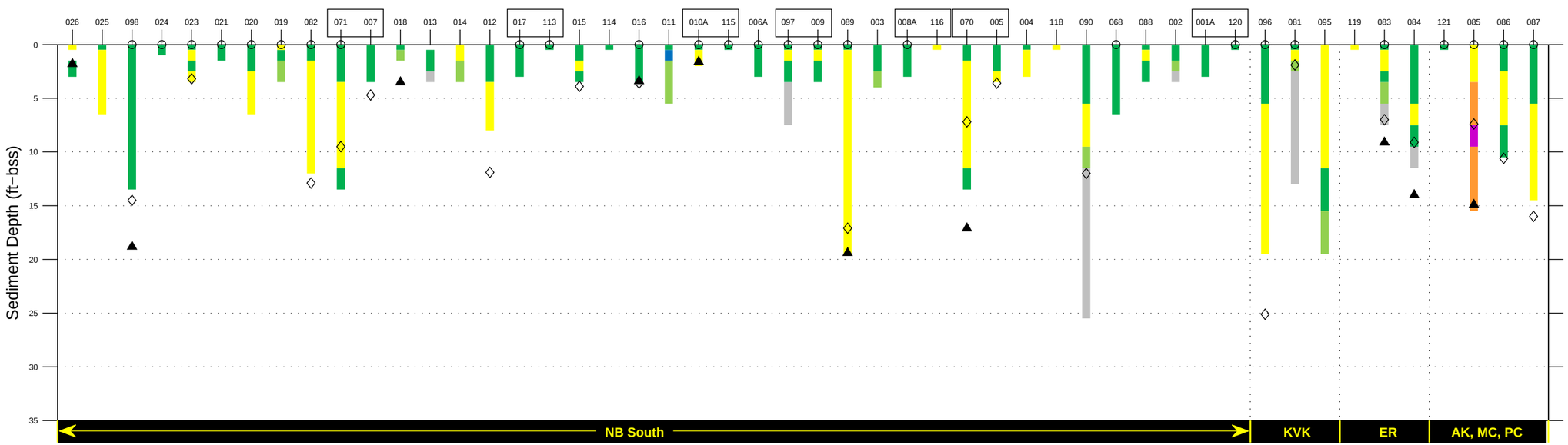
PHASE I AND PHASE II SEDIMENT CHEMISTRY DATA
TOC Normalized BEHP
FIGURE F−34





PHASE I AND PHASE II SEDIMENT CHEMISTRY DATA
TOC Normalized Total PAHs
FIGURE F−35





PHASE I AND PHASE II SEDIMENT CHEMISTRY DATA
TOC Normalized TPH
FIGURE F−36

Appendix G

APPENDIX G - SPATIAL AND TEMPORAL EVALUATION OF SEDIMENT CONCENTRATIONS IN THE NEWARK BAY STUDY AREA

G.1 Introduction

Sediment samples were collected from the Newark Bay Study Area (NBSA) over a period of 11 years (2005-2016). The Phase I (2005) and Phase II (2007) programs were designed to evaluate spatial patterns in the NBSA but locations were not randomly assigned. The programs were also designed to penetrate the entire sediment column to the 1940 horizon[1]. As described in the approved Phase III QAPP (Tierra 2016) and in the Phase III Field Report (GSH 2017), the Phase III program was designed to evaluate surface sediments only (0-6") using a systematic stratified random sample design where samples were collected within six strata (i.e., the EPA Subunits shown in Figure 6-3). A systematic grid was established in each subunit and a sample was collected in the center of each grid cell with the following exceptions: 1) if a Phase I or II sample had been previously collected in a grid cell, the Phase III location was adjusted to the historical location rather than the center of the grid cell; and 2) if a sediment sample had already been collected in a grid cell during the 2014 crab and clam sampling program or the 2015 SQT program, then the grid cell was not resampled during the 2016 Phase III event. Statistical evaluations were conducted to determine if sediment chemical concentrations can be demonstrated to vary with respect to the spatial classifications of the NBSA described in Section 6.2. The following spatial units were evaluated:

- Geographic (Figure 6-1)
- Geomorphic (Figure 6-2)
- USACE Sediment Accumulation Areas (Figure 6-2)
- Be-7 Bearing[2] (Phase I/II only)
- EPA Subunit (Phase III only; Figure 6-3)

Temporal evaluations were conducted to evaluate whether surface sediment concentrations have changed over time between the Phase I/II and Phase III programs. Area weighted average concentrations for surface sediments in the NBSA were calculated.

The spatial and temporal evaluations were conducted on all 18 select COPCs. However, all evaluations that included Phase III sediment data excluded Total PAHs. Phase III sediment data for PAHs were found to have a low analytical bias and are being re-analyzed.

G.2 Statistical Methods

G.2.1 Linear Models

Linear models were used to compare concentrations of the 18 select chemicals in sediment both spatially and temporally. Concentration data were transformed by natural logarithm to meet the assumptions of the linear model, where residual errors are assumed to be independent normal random variables with zero mean and constant variance. Except where noted, non-detect values were replaced with a value equal to ½ the detection limit.

All linear models were evaluated for statistical significance based on the F-test (α=0.05), a statistical test that compares the variance explained by the model to the overall variance. Individual model parameters were also tested for significance using the F test on the Type III (i.e., partial) sums of squares, which tests whether the parameter estimate for an effect is significantly different than zero, demonstrating that the effect is contributing to the significance of the overall model. Other model formulations or fitting methods

[1] The Phase I/II program also included sample locations within the tributaries to Newark Bay.
[2] These are areas of recent deposition defined as having Be-7 activity equal to or greater than 0.5 pCi/g.

may give different results than those presented here. If a tested model and all the independent variables was significant, post hoc multiple comparison testing was conducted to compare the means or least square means of the temporal or spatial independent variables being tested.

G.2.2 Spatial Evaluation Models

A linear model in which the dependent variable is continuous and there is one independent fixed effect categorical variable with two or more possible values is referred to as a one-way analysis of variance (ANOVA) model. This type of model was used to test the dependence of the mean concentrations among spatial categorical variables for each of the 18 select chemicals. If the model was found to be significant, post hoc group-wise comparison testing was conducted. If only two spatial groups were being compared, a two-sided t-test was conducted to determine which group had a greater mean (α=0.05). If three or more spatial groups were being compared, an analysis of means test (Hsu and Nelson 1998), was conducted (α=0.05). The analysis of means test compares the mean of each group to the overall mean of the dataset being evaluated. Phase I/II and Phase III surface sediments were evaluated separately and compared for similar trends.

A linear model in which the dependent variable is continuous, and the independent variables consist of both a categorical variable and a continuous variable (i.e., covariate), is referred to as an analysis of covariance (ANCOVA) model. Some of the variance of chemical concentrations can be attributable to other variables in the sediment. Metals concentrations often vary directly with aluminum concentrations and organic chemicals often vary directly with the total organic carbon content. To examine the effects of these variables on the spatial patterns noted in the ANOVA models described above, they were added as covariates along with the spatial categorical variables to form an ANCOVA type model. The ANCOVA models were used to test the dependence of the mean concentrations among various spatial categorical variables while controlling for variability attributable to aluminum for metals or TOC for organic compounds. Model and post hoc testing were conducted as above. Phase I/II and Phase III surface sediments were evaluated separately and compared for similar trends.

G.2.3 Temporal Evaluation Models

A temporal evaluation has been conducted to compare Phase III sediment sample data to Phase I/II sediment data. As requested by USEPA and described in the approved Phase III QAPP (Tierra 2016), the Phase III program was designed to reoccupy Phase I/II sample locations where possible. This co-location allows for a temporal comparison of COPC concentrations while controlling for spatial variability. A temporal analysis of the co-located samples is described in Section G.2.3.1. A second evaluation was conducted using all available surface sediment data from both programs while controlling for spatial variability using the EPA subunits. While demonstrable trends can be detected in these evaluations, they are subject to uncertainty due to the fact that while the Phase I/II sample locations were distributed spatially throughout the NBSA, they were not randomly located in the strict sense.

G.2.3.1 Analysis of Co-Located Samples

In the NBSA, surface sediment samples collected during the Phase I (2005), and/or the Phase II (2007) sampling programs, are co-located with Phase III (2016) sampling locations.[3] This provides a time series of two or three observations at each of 37 locations. A linear mixed model (applied to natural logarithm transformed concentration data) was used to evaluate whether concentrations of the 18 select chemicals increased or decreased over the time period (2005-2016). Since concentrations over time depend not only on time but also on location, each location was treated as a random effect in the mixed model. This

[3] The co-located analysis included only core sediment samples from 2005, 2007, and 2016. Grab sediment samples from the 2014 Crab/Clam and 2015 SQT were not included in this analysis to reduce potential confounding due to sampling methodology.

type of model is often referred to as a random intercepts linear regression model. It is a model with a slope parameter that is treated as a fixed effect and an intercept that is assumed to vary randomly by subject. The subjects are represented by individual locations. The models were tested for significance and the slope parameter was used to calculate the average percent change in concentrations over the time period. Each Phase I and II sample result was paired with its co-located Phase III sample result and presented in a series of scatterplots (Figures G-1 through G-17) along with a 1:1 agreement line. Only detected results were included in the co-located analysis.

G.2.3.2 Temporal Analysis of all Samples

A linear model in which the dependent variable is continuous and there are two independent fixed effect categorical variables with two or more possible values is referred to as a two-way ANOVA model. A two-way ANOVA model was used for a temporal comparison of surface sediment concentrations while controlling for spatial variation, the advantage being that all observations could be used rather than just those from co-located locations. The two independent categorical variables were sampling period (Phase I/II, Phase III) and spatial subunit (i.e., six EPA subunits). An interaction term (i.e., sampling period X spatial unit) was also tested for statistical significance to evaluate if an observed temporal change varied by spatial unit. The six spatial EPA subunits were used as the strata in the Phase III systematic stratified surface sediment sampling design and are therefore an appropriate spatial variable to control for spatial variation in an unbiased manner. For significant models, a post hoc least square means t-test was conducted to compare Phase I/II to Phase III means concentrations while controlling for variability due to the spatial category. When the least square means are significantly different, the difference was used to calculate the average percent change in concentrations between sampling periods.

G.2.4 Stratified Mean Surface Sediment Concentrations

For the Phase III program, the NBSA was stratified into six spatial units (i.e., EPA subunits) with an unbiased systematic sampling grid within each stratum (Tierra 2016). In order to estimate the NBSA wide mean in an unbiased manner, a stratified mean and variance was calculated for each of the 18 select chemicals. The stratified mean (μ_{st}) and variance of the stratified mean (s_{st}^2) are calculated as follows (USEPA 2006):

$$\mu_{st} = \sum_{h=1}^{6} W_h \mu_h$$

$$s_{st}{}^2 = \sum_{h=1}^{6} \frac{W_h{}^2 s_h{}^2}{n_h}$$

Where h are the six EPA subunits; μ_h and s_h^2 are the sample mean and variance of each subunit; and W_h is the weight for each subunit, which is calculated as the area of the subunit divided by the entire area of all subunits in the NBSA. The standard error s_{st} is the square root of s_{st}^2. Since the degrees of freedom are sufficiently large, a one-sided 95% upper confidence limit (95UCL) was calculated by the following equation: 95UCL = μ_{st} + (s_{st} * 1.645). Similarly, a 95% lower confidence limit (95LCL) was calculated by the following equation: 95LCL = μ_{st} - (s_{st} * 1.645).

The Phase I and II programs cannot be known to be unbiased and were not used in the stratified mean calculation. Non-detect values were replaced with a value equal to half the detection limit.

G.3 Results of Spatial and Temporal Statistical Evaluations

G.3.1 Spatial Evaluations

Arithmetic and geometric mean sediment concentrations, both non-normalized and normalized, are presented for each spatial categorization in Tables G-1 (a-d) for Phase I/II data and Tables G-2 (a-d) for Phase III data. Normalized data are presented as the concentration of the chemical relative to either total organic carbon (TOC) for organic chemicals or to aluminum for metals. Phase I/II data were grouped by depth as follows: 0-0.5 feet below sediment surface (ft bss); 0.5 -3.5 ft bss; and >3.5 ft bss. Statistically significant differences observed in post hoc multiple comparison tests are identified by symbols: < indicates the mean group concentration is less than the overall mean and > indicates that the mean concentration is greater than the overall mean.

G.3.1.1 Geographic Trends

The results of the evaluation of geographic trends is presented in Tables G-1a and G-2a.

Metals – For both Phase I/II and Phase III sediments, both normalized and non-normalized surface metal concentrations tended to be greater in the South and lower in North with statistically significant differences for many constituents. This geographic trend dissipates somewhat with depth. Metals concentrations were two to four times greater in the deeper sediments indicating a long-term temporal trend of declining concentrations in all geographic units.

Organics – Normalized and non-normalized 2,3,7,8-TCDD sediment concentrations were greater in the North and lower in the South for Phase III and all sampling depths examined in Phase I/II although this observed difference was not always statistically significant. Concentrations of 2,3,7,8-TCDD were two to eight times greater in the deeper sediments. Normalized and non-normalized total DDT concentrations were lower in the North and Central and greater in the South for both Phase I/II and Phase III. Total DDT increased with depth. Total petroleum hydrocarbons (TPH) were greater in the South and lower in the North and Central and increased with depth. Total Aroclor PCBs were greater in South at 0-0.5 ft depths for both normalized and non-normalized data in Phase I/II and Phase III. However, sediment collected at >3.5 ft bss was greatest in the North. Total PCB congeners had a similar pattern as total Aroclors although there were no significant differences for Phase III data. Total PCBs increased with depth. Total PAHs were greatest in the North for normalized total PAH in sediment from 0-0.5ft in Phase I/II. But non-normalized Phase I/II total PAH concentrations in sediment collected from 0-0.5 ft tended to be greatest in the South, although differences were not significant. Concentrations increased with depth for all organic compounds indicating a long-term temporal trend of declining chemical concentrations in sediments in all geographic units.

G.3.1.2 Geomorphic Trends

The results of the evaluation of geomorphic trends is presented in Tables G-1b and G-2b.

Metals – Phase I/II and III normalized and non-normalized metal concentrations tended to be greater in sediments collected from the Industrial Waterfront Areas and Historically Disturbed Subtidal Flats at all sampling depths.

Organics – Most Phase I/II and III normalized and non-normalized organic compound concentrations tended to be greater in sediments collected from the Industrial Waterfront Areas and Historically Disturbed Subtidal Flats at all sampling depths. Normalized and non-normalized 2,3,7,8-TCDD sediment concentrations were greatest in the Historically Disturbed Subtidal Flats at all sampling depths.

G.3.1.3 USACE Sediment Accumulation Area

The results of the evaluation of USACE accumulation area trends are presented in Tables G-1c and G-2b.

Metals – Phase I/II and Phase III normalized and non-normalized metal concentrations were greater in USACE Sediment Accumulation Areas at all depths. One exception was Phase III arsenic which was not significantly different among accumulation areas.

Organics – Phase I/II and Phase III normalized and non-normalized organic compound concentrations tended to be greater in the USACE Sediment Accumulation Areas at all depths.

G.3.1.4 Be-7 Bearing (Phase I/II only)

Be-7 was measured in surface sediment samples collected during the Phase I and II programs and is used as an indicator of recent deposition. The results of the evaluation of trends related to Be-7 concentrations are presented in Table G-1d.

Metals – Few trends were noted related to Be-7 concentrations. Non-normalized silver was greater in the recently deposited sediments. Normalized arsenic, cadmium, and chromium were lower in the recently deposited sediments.

Organics – There were no trends in organic compounds related to Be-7.

G.3.1.5 EPA Subunit (Phase III only)

For the Phase III sampling program, the NBSA was stratified into six spatial subunits suggested by EPA (i.e., EPA subunits) with a systematic sampling grid within each stratum. The results of the comparison of concentrations within subunits for the Phase III surface sediments are shown in Table G-2d.

Metals – All normalized and non-normalized sediment metal concentrations were greatest in EPA Subunit 1 which is comprised of the intertidal and subtidal areas in the southern bay west and south of the navigation channel. Most normalized and non-normalized sediment metal concentrations were lowest in EPA Subunit 6 which is comprised of a portion of the intertidal and subtidal areas in the northern bay north and east of the navigation channel.

Organics – Normalized and non-normalized concentrations of 2,3,7,8-TCDD and total chlordane were greater in EPA Subunit 4 which is comprised of portions of the intertidal and subtidal flats east and west of the navigation channel in the northern bay. Normalized and non-normalized concentrations of total DDT, total TPH, and total PCBs (both Aroclors and congeners) were greater in EPA Subunit 1 (intertidal and subtidal areas in the southern bay west and south of the navigation channel). Total DDT, total Aroclor PCBs and total Alpha + Gamma Clordanes were lower in EPA Subunit 6 (intertidal and subtidal areas in the northern bay north and east of the navigation channel).

G.3.2 Temporal Evaluations

G.3.2.1 Results of Mixed Model for Co-located Samples

The slope parameter (β) in the log linear mixed models was significant and negative for 12 of the 18 chemicals (Table G-3) suggesting a decline in concentrations may have occurred over the period from 2005 to 2016. For six of the 10 metals evaluated, a decrease of 20-30% is suggested. For organics the following decreases are suggested: total DDT, 40%; total Aroclor PCBs, 71%; total PCB congeners, 46%; and 2,3,7,8-TCDD, 31%. Figures G-1 through G-17 illustrate graphically the lower concentrations in Phase III vs. Phase I/II co-located samples. Where concentrations are similar, one would expect the observations to approximately equally straddle the 1:1 agreement line show on the graphs. For the 12 chemicals in which a reduction is noted in Table G-3, the observations are more likely to fall below the 1:1 agreement line indicating lower concentrations for Phase III compared to Phase I or II.

G.3.2.2 Results of Two-way ANOVA Model

Least square log means were significantly lower in Phase III for 10 of the 18 chemicals (indicated by the shaded and bolded p-values in Table G-4) when controlling for spatial subunit. The interaction term was not significant for any of the models suggesting that reductions were similar across spatial units. The estimated percent reductions were generally similar to those estimated in the co-located analysis. The estimated decrease in sediment concentrations between time periods was 37-82% for organics. For five of the 10 metals, decreases of 20-40% are suggested. The suggested decrease for Total DDT is 28% and while this change was not significant the p-value was low ($p = 0.07$). Total Alpha + Gamma Chlordane was not evaluated. Phase I alpha and gamma chlordane results were all qualified as not detected with elevated detection limits which would render the analysis non-interpretable due to potential bias caused by data substitution for non-detects.

G.3.2 Stratified Means

The stratified means and confidence limits for the 18 select chemicals are presented in Table G-5.

G.4 Summary and Conclusions

In general, surface sediment concentrations do not vary greatly in the NBSA but some spatial patterns were noted for the 18 select chemicals as discussed below. Chemical concentrations increased with depth indicating a long-term temporal decline in the NBSA.

With the exception of the co-located temporal evaluation, non-detect data were evaluated at half the detection limit in the linear models. While most of the 18 select chemicals were fully detected, there is some uncertainty in the results due to the substitution for a few analytes. They are listed as follows with the frequency of detection for surface sediment in each of the Phase I, II, and III programs respectively: cadmium (93%, 98%, 99%); Total Alpha + Gamma Chlordane (0%, 95%, 96%); total Aroclor PCBs (97%, 100%, 94%); total DDT (76%, 100%, 100%); and bis(2-ethylhexyl) phthalate (99%, 97%, 78%).

G.4.1 Metals

Metals concentrations were greatest in the southern portion of the NBSA. Mean surface concentrations in EPA Subunit 1 are generally 1.5 to 2 times greater than those of other subunits for all ten metals evaluated. Mean metals concentrations are lowest in Subunit 6 in the northern part of the NBSA.

The temporal evaluation suggests that some metals concentrations may have declined over the period from 2005 to 2016, specifically, cadmium, chromium, copper, lead, mercury, and silver. Percent reduction estimates range from 20 to 40%.

A qualitative comparison indicates metals concentrations were greater in the deeper sediments compared to surface sediments suggesting a long-term temporal decline.

G.4.2 Organics

Mean 2,3,7,8-TCDD concentrations are greatest in the northern subtidal areas of the NBSA (EPA subunits 4 and 6) approximately 1.5 times greater than the southern subtidal areas (i.e., EPA Subunit 1). The lowest mean 2,3,7,8-TCDD concentration was in the southern navigation channel. Mean 2,3,7,8-TCDD concentrations are greatest in the historically disturbed subtidal flats. Mean TPH, total DDT, total Aroclor PCBs and total PCB congeners concentrations are greatest in the southern subtidal areas (i.e., EPA Subunit 1) by as much as 2 to 4 times as compared to other areas such as the northern part of the NBSA and the channels. Most organic chemicals (except the pesticides) had the lowest mean concentrations in the southern navigation channel (i.e., EPA Subunit 2).

The temporal evaluation suggests that surface concentrations of organic compounds may have declined over the period from 2005 to 2016 between approximately 20% and 70%. Concentrations of 2,3,7,8-TCDD declined by 31% percent on average at co-located sampling locations and approximately 37% overall.

A qualitative comparison indicates organics concentrations were greater in the deeper sediments compared to surface sediments suggesting a long-term temporal decline.

G.5 References

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USEPA. 2006. Data Quality Assessment: Statistical Methods for Practitioners. Office of Environmental Information. EPA/240/B-06/003. February.

Table G-1
Multiple Comparison Testing - Phase I and II Sediment Data

a

ARITHMETIC MEANS

Depth (ft bss)	Geographic Area	N	Arsenic	Barium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Silver	Zinc	2,3,7,8-TCDD	bis(2-Ethylhexyl) phthalate	TPH	Total DDT (4,4')	Total Aroclor PCBs	Total Congener PCBs (209)	TOTAL PAHs - SVOC	Total Alpha + Gamma Chlordane
0-0.5	NEWARK BAY NORTH	31	< 10.2	< 99.5	< 1.2	106	< 97.7	< 105	2	< 28.9	< 1.7	< 198	92.9	5200	920	< 32	460	487,000	18000	6.1
	NEWARK BAY CENTRAL	34	13.6	170	1.9	118	138	156	5.2	37.8	2.7	265	57.9	7000	1300	37	680	621,000	14000	6.2
	NEWARK BAY SOUTH	40	> 19.3	> 222	3.2	139	> 209	> 197	3.6	> 41.2	3.2	> 325	66.6	8400	1700	> 160	1300	1,110,000	27000	13
0-0.5 Normalized Data	NEWARK BAY NORTH	31	< 867	< 8080	97.3	8820	< 7900	8480	171	< 2340	135	16000	3950	230000	< 38000	< 1500	22000	21,000,000	890000	270
	NEWARK BAY CENTRAL	33	849	10200	116	7440	8190	9290	280	2330	156	15700	2440	250000	45000	1700	26000	23,400,000	480000	260
	NEWARK BAY SOUTH	40	> 1370	> 15600	208	9290	> 14600	> 14700	236	> 2950	> 209	> 22800	2490	290000	> 56000	> 5400	52000	38,600,000	820000	440
0.5-3.5	NEWARK BAY NORTH	70	< 19.5	< 125	3.5	239	< 160	< 157	4.6	< 36.7	2.8	311	309	28000	< 1800	62	1300	1,400,000	17000	< 5.8
	NEWARK BAY CENTRAL	69	20.5	280	4.3	208	222	230	26.9	45.1	> 5.3	421	157	> 38000	2100	52	1300	1,330,000	17000	8.1
	NEWARK BAY SOUTH	92	> 29.9	> 318	4.7	175	276	248	5.3	45.8	3.5	393	< 98.1	< 10000	3000	160	1600	1,560,000	27000	> 13
0.5-3.5 Normalized Data	NEWARK BAY NORTH	70	< 1260	< 8190	219	15100	< 10100	< 10000	294	< 2400	173	19800	11800	1100000	66000	2200	50000	51,200,000	710000	< 300
	NEWARK BAY CENTRAL	68	1170	15900	243	12200	12200	12900	1030	2640	263	23600	> 5530	> 1000000	66000	2000	45000	43,800,000	530000	310
	NEWARK BAY SOUTH	92	> 1810	> 18700	259	10100	> 16500	15600	294	2820	196	23300	< 2670	< 290000	76000	4600	46000	43,800,000	700000	440
>3.5	NEWARK BAY NORTH	87	33	198	6.3	439	262	250	7.2	42	4.5	476	> 865	> 24000	3800	110	> 2100	2,520,000	31000	7.7
	NEWARK BAY CENTRAL	66	36.6	526	10.3	448	277	446	12.5	36.8	4.1	768	342	12000	4300	140	1100	1,350,000	23000	5.9
	NEWARK BAY SOUTH	63	36.1	266	6.2	< 230	296	250	10.1	43.1	4	388	240	7300	5100	240	1800	2,500,000	27000	12
>3.5 Normalized Data	NEWARK BAY NORTH	87	2110	12900	389	27200	16500	15800	446	2870	285	30300	17800	650000	86000	2400	50000	56,900,000	730000	210
	NEWARK BAY CENTRAL	66	2450	35500	669	29300	17900	29300	739	2570	250	51000	8100	380000	99000	2800	28000	34,300,000	610000	170
	NEWARK BAY SOUTH	63	2330	16700	367	< 14400	17700	15300	579	3010	239	24300	5290	200000	120000	5800	45000	62,100,000	690000	320

GEOMETRIC MEANS

Depth (ft bss)	Geographic Area	N	Arsenic	Barium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Silver	Zinc	2,3,7,8-TCDD	bis(2-Ethylhexyl) phthalate	TPH	Total DDT (4,4')	Total Aroclor PCBs	Total Congener PCBs (209)	TOTAL PAHs - SVOC	Total Alpha + Gamma Chlordane
0-0.5	NEWARK BAY NORTH	31	< 9.8	< 93	< 0.81	97	< 85	< 93	1.6	< 28	< 1.5	< 180	64	2874	717	< 22	359	345,503	13705	4.9
	NEWARK BAY CENTRAL	34	13	145	1.4	107	119	126	2.0	36	2.1	225	45	3320	878	29	472	424,976	8226	5.2
	NEWARK BAY SOUTH	40	> 17	> 191	1.7	109	> 166	> 154	2.4	> 38	2.4	> 275	35	3559	1101	> 64	609	590,197	9898	6.2
0-0.5 Normalized Data	NEWARK BAY NORTH	31	< 811	< 7641	67	8047	< 7060	7713	133	< 2287	121	14879	2846	129466	< 31902	< 973	16232.2	15,320,505	615708.5	209
	NEWARK BAY CENTRAL	33	808	9332	91	6879	7521	8057	131	2283	134	14399	1919	148063	38212	1260	20796.4	18,487,066	360478.3	233
	NEWARK BAY SOUTH	40	> 1219	> 14053	122	8042	> 12282	> 11340	176	> 2837	> 178	> 20261	1551	153757	> 48000	> 2746	27471.2	26,210,093	425020.9	268
0.5-3.5	NEWARK BAY NORTH	70	< 12	< 93	1.0	122	< 74	< 76	1.1	< 31	1.2	191	23	5223	< 586	26	382	96,535	5390	< 4.5
	NEWARK BAY CENTRAL	69	16	160	2.2	144	148	146	2.5	41	> 2.5	260	39	> 8375	1116	32	678	367,128	9171	6.1
	NEWARK BAY SOUTH	92	> 22	> 200	1.5	116	156	138	1.7	41	1.6	274	< 10	< 2989	1109	34	389	165,075	9211	> 7.0
0.5-3.5 Normalized Data	NEWARK BAY NORTH	70	< 871	< 6555	72	8615	< 5224	< 5393	74	< 2197	85	13495	1171	253738	28943	1239	18497	5,156,264	264605	< 211
	NEWARK BAY CENTRAL	68	984	9885	137	8882	9207	9058	155	2537	154	16091	> 1620	> 348090	46394	1307	28080	15,156,970	380330	257
	NEWARK BAY SOUTH	92	> 1419	> 13082	100	7593	> 10226	9036	113	2653	103	17862	< 388	< 113966	43978	1337	14863	6,302,188	354409	265
>3.5	NEWARK BAY NORTH	87	19	128	2.3	191	123	119	1.8	34	2.0	274	> 23	> 3020	1189	26	> 430	113,014	7204	3.7
	NEWARK BAY CENTRAL	66	19	165	2.5	161	112	131	1.4	31	1.0	300	5.9	1119	1048	18	212	58,800	3443	3.0
	NEWARK BAY SOUTH	63	16	128	1.3	< 91	87	75	0.67	31	1.1	183	5.7	1315	588	27	208	22,927	2078	3.8
>3.5 Normalized Data	NEWARK BAY NORTH	87	1467	9947	182	14877	9565	9242	140	2666	154	21322	981	111375	49536	936	15795	5,924,775	316113	120
	NEWARK BAY CENTRAL	66	1572	13368	204	13040	9086	10617	110	2474	83	24285	280	44399	51392	682	8383	4,123,059	211139	104
	NEWARK BAY SOUTH	63	1425	11088	112	< 7941	7585	6487	59	2722	90	15902	437	67071	46487	1456	10535	3,634,641	170919	153

Table G-1
Multiple Comparison Testing - Phase I and II Sediment Data

b

ARITHMETIC MEANS

Depth (ft bss)	Geomorphic Area	N	Arsenic	Barium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Silver	Zinc	2,3,7,8-TCDD	bis(2-Ethylhexyl)phthalate	TPH	Total DDT (4,4')	Total Aroclor PCBs	Total Congener PCBs (209)	TOTAL PAHs - SVOC	Total Alpha + Gamma Chlordane
0-0.5	NAVIGATION CHANNEL	28	12.4	163	1.8	105	141	126	2.4	34.5	2.6	240	56.9	7400	1000	100	570	704,000	14000	7.9
	PORT CHANNEL	10	14.8	232	2.2	124	160	207	5.7	41.3	3	399	59	7100	1700	34	950	836,000	11000	9
	HIST. DIST. SUBTIDAL FLATS	17	> 16.3	153	2.1	125	146	151	2.8	38.3	2.2	266	107	4700	1200	61	660	751,000	14000	4.9
	INDUSTRIAL WATERFRONT	9	> 21.5	234	3.4	145	221	223	> 13.2	40.2	4.1	346	80.9	14000	1800	120	2600	1,960,000	> 88000	15
	INTERTIDAL AREAS	3	12.1	88.7	1.2	124	106	120	1.7	26.5	1.8	203	94.7	19000	1400	23	670	695,000	15000	<13
	SUBTIDAL FLATS	28	14.7	159	2.5	138	153	168	2.5	35.2	2.1	244	76.1	4500	1400	72	680	< 532,000	17000	11
	TRANSITIONAL SLOPES	10	13.5	146	2.1	102	139	123	2.2	37.4	2.5	236	37.1	6700	990	110	960	519,000	6800	8.7
0-0.5 Normalized Data	NAVIGATION CHANNEL	28	872	11500	115	7430	9510	8680	171	2410	176	16500	2340	240000	38000	4000	24000	25,900,000	720000	350
	PORT CHANNEL	10	768	11300	104	6330	8140	9920	292	2130	155	19500	2110	200000	47000	1200	27000	24,500,000	340000	310
	HIST. DIST. SUBTIDAL FLATS	17	1260	11900	163	10100	11400	11700	227	> 3020	175	20800	4760	190000	47000	2600	32000	33,700,000	510000	< 160
	INDUSTRIAL WATERFRONT	9	1480	14900	195	9040	15000	20200	> 626	2800	217	23700	2800	470000	61000	5400	86000	61,000,000	2400000	450
	INTERTIDAL AREAS	3	1040	6960	86	9860	8020	9200	129	2120	128	15500	3910	720000	56000	1100	28000	27,100,000	700000	<720
	SUBTIDAL FLATS	27	1130	11800	168	9810	11000	12000	178	2570	147	18200	2990	190000	51000	2600	28000	< 21,300,000	640000	370
	TRANSITIONAL SLOPES	10	951	10500	158	7280	9750	8590	156	2640	174	16600	1910	310000	46000	2900	50000	23,700,000	340000	380
0.5-3.5	NAVIGATION CHANNEL	33	15.3	194	2.8	133	173	149	2.7	36.3	3.1	265	89.2	15000	1400	120	970	929,000	15000	10
	PORT CHANNEL	12	17.2	193	2.4	119	193	182	37.5	42.2	4.9	349	104	25000	1600	41	850	929,000	17000	9.2
	HIST. DIST. SUBTIDAL FLATS	47	> 33.4	217	> 6.3	> 332	> 293	> 291	> 7.9	> 52.5	> 5	> 497	> 360	> 37000	> 3400	> 120	> 2000	> 2,240,000	> 26000	7.2
	INDUSTRIAL WATERFRONT	20	> 40.5	> 586	> 7.7	231	> 509	> 461	> 66.6	> 60.1	> 9.9	> 671	98.6	62000	> 5800	160	2900	2,430,000	> 62000	> 22
	INTERTIDAL AREAS	9	27.1	< 93.2	< 1.3	178	116	117	< 2.2	34.2	1.4	229	145	9800	< 1400	37	660	< 501,000	15000	<10.4
	SUBTIDAL FLATS	84	21	< 240	< 3.6	194	< 172	< 184	< 3.7	< 37.6	< 2.6	< 345	< 174	18000	< 1700	84	< 1200	< 1,140,000	< 15000	9.1
	TRANSITIONAL SLOPES	26	16.4	218	3.5	< 120	163	121	4.5	40.8	2.5	< 238	97	8900	2000	66	1200	1,450,000	12000	6.3
0.5-3.5 Normalized Data	NAVIGATION CHANNEL	33	1000	12600	158	8440	10500	9150	166	2370	181	16500	6460	530000	61000	4200	40000	> 38300000	840000	470
	PORT CHANNEL	11	914	11200	125	6400	10200	9510	1860	2320	256	18300	3460	850000	56000	1600	33000	32800000	600000	350
	HIST. DIST. SUBTIDAL FLATS	47	> 2100	> 13700	> 396	> 21100	> 18500	> 18300	> 496	> 3340	> 312	> 31300	> 10600	1100000	> 91000	2900	60000	65400000	680000	< 200
	INDUSTRIAL WATERFRONT	19	2130	> 29200	342	10800	> 26700	27800	2110	2960	382	33400	2820	1400000	> 120000	4900	79000	64500000	> 1200000	> 560
	INTERTIDAL AREAS	9	1520	< 5380	< 71.2	9760	< 6200	6280	< 118	2040	< 74.1	12700	4370	310000	< 47000	1500	22000	< 14900000	570000	<630
	SUBTIDAL FLATS	84	1290	< 14300	< 206	11500	< 10200	< 11000	< 215	< 2340	< 155	< 20500	< 6300	690000	< 58000	2800	43000	< 40700000	< 550000	380
	TRANSITIONAL SLOPES	24	1070	14100	217	7800	10300	8010	264	2800	165	15600	2760	310000	58000	2300	37000	40600000	< 330000	310
>3.5	NAVIGATION CHANNEL	14	15.3	122	3	182	162	155	3.9	36.2	3.8	270	> 207	> 35000	1400	53	990	1170000	21000	4.1
	PORT CHANNEL	4	28.3	198	5.7	193	306	256	> 90.2	49.9	9.6	500	177	> 62000	2600	57	1200	2220000	56000	> 17
	HIST. DIST. SUBTIDAL FLATS	108	38.3	> 432	> 9.6	> 479	300	> 406	6.8	41.7	> 4.8	> 716	695	15000	> 4900	160	1800	2310000	29000	6.8
	INDUSTRIAL WATERFRONT	13	52	> 568	11.1	336	> 579	> 469	> 38.3	> 77.7	> 7	> 734	219	> 36000	> 9200	> 410	> 5300	> 6520000	> 54000	> 41
	INTERTIDAL AREAS	2	11.1	54.5	< <0.044	30	28.5	69	0.35	22.9	<0.26	80.9	0.167	<1700	69	5.4	<170	238	2800	<8.8
	SUBTIDAL FLATS	57	< 24.5	< 111	< 3.4	< 285	< 153	< 139	< 4.5	< 27.9	< 2.4	< 259	< 383	< 7400	< 1900	< 90	< 840	< 1080000	< 14000	< 4.9
	TRANSITIONAL SLOPES	18	55.6	317	9.8	364	417	316	9.8	52.8	4.9	499	528	9400	7900	310	1900	2430000	37000	6.6
>3.5 Normalized Data	NAVIGATION CHANNEL	14	1220	9720	237	14300	12900	12400	313	2910	> 306	21500	> 6810	> 1100000	45000	1700	33000	38100000	680000	130
	PORT CHANNEL	4	1690	11900	341	11500	18300	15200	> 5420	2980	572	29800	5460	> 1800000	79000	1700	38000	68300000	1700000	> 520
	HIST. DIST. SUBTIDAL FLATS	108	> 2570	> 29400	> 620	> 31000	> 19500	> 26600	437	2920	> 302	> 47300	14600	380000	110000	3300	43000	52300000	690000	170
	INDUSTRIAL WATERFRONT	13	2580	27800	558	< 16600	28800	23100	1920	3850	339	36200	4690	> 940000	190000	> 8800	> 110000	138000000	1200000	> 890
	INTERTIDAL AREAS	2	706	3490	< <2.8	< 1920	< 1820	4420	22.1	< 1470	< <17	< 5170	8.61	<93000	3700	320	<9300	11800	140000	<480
	SUBTIDAL FLATS	57	< 1590	< 7480	< 203	< 17200	< 9320	< 8440	< 262	< 2180	< 144	< 16700	10100	220000	< 53000	2200	26000	31000000	< 400000	190
	TRANSITIONAL SLOPES	18	3610	20200	594	23000	25900	20600	601	> 3550	314	31900	8910	180000	150000	5600	36000	46000000	780000	170

Table G-1
Multiple Comparison Testing - Phase I and II Sediment Data

GEOMETRIC MEANS

Depth (ft bss)	Geomorphic Area	N	Arsenic	Barium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Silver	Zinc	2,3,7,8-TCDD	bis(2-Ethylhexyl)phthalate	TPH	Total DDT (4,4')	Total Aroclor PCBs	Total Congener PCBs (209)	TOTAL PAHs - SVOC	Total Alpha + Gamma Chlordane
0-0.5	NAVIGATION CHANNEL	28	11	145	0.93	90	110	106	1.6	33	2.0	207	42	3131	706	40	426	456,895	10008	5.8
	PORT CHANNEL	10	14	188	1.2	115	146	154	2.4	40	2.8	320	54	4807	1186	32	672	655,451	7185	8.1
	HIST. DIST. SUBTIDAL FLATS	17	> 14	140	1.9	120	138	140	2.7	37	2.2	256	79	3758	1101	44	559	671,803	11787	3.4
	INDUSTRIAL WATERFRONT	9	> 18	181	2.2	116	176	182	> 4.4	36	2.4	293	50	4414	1404	60	854	854,960	> 23488	6.4
	INTERTIDAL AREAS	3	12	78	0.84	115	83	104	1.4	24	1.2	172	39	5392	565	15	334	275,429	9942	<5.7
	SUBTIDAL FLATS	28	13	123	1.1	110	110	120	1.7	32	1.6	201	37	2307	878	29	364	< 271,815	10153	5.8
	TRANSITIONAL SLOPES	10	13	137	1.6	91	117	108	1.7	36	2.2	213	30	3556	806	33	530	429,112	6135	5.2
0-0.5 Normalized Data	NAVIGATION CHANNEL	28	816	10511	67	6526	8043	7634	116	2353	147	14935	1932.4	147327	32706	1891	20107	21,440,054	463717	267
	PORT CHANNEL	10	734	9881	64	6043	7652	8057	126	2113	145	16778	1918.2	169823	41905	1147	23747	23,157,094	253935	285
	HIST. DIST. SUBTIDAL FLATS	17	1119	11081	149	9516	10958	11120	212	> 2936	173	20239	3130.7	153593	43622	1837	23571	28,101,835	480544	< 125
	INDUSTRIAL WATERFRONT	9	1344	13438	163	8631	13028	13502	> 324	2670	177	21744	1952.6	171106	54381	2333	33055	33,125,549	909084	248
	INTERTIDAL AREAS	3	992	6717	72	9813	7129	8881	122	2097	106	14712	2347.7	322324	33787	898	19942	16,464,379	594324	<342
	SUBTIDAL FLATS	27	987	9522	87	8500	8419	9262	136	2456	119	15473	1725.5	102812	39670	1255	17097	< 12,308,166	454690	260
	TRANSITIONAL SLOPES	10	900	9825	116	6573	8386	7781	119	2594	155	15324	1525.3	180322	41385	1665	27022	21,940,945	310076	263
0.5-3.5	NAVIGATION CHANNEL	33	13	160	1.1	101	120	108	1.5	34	2.1	209	26	4506	752	38	467	442,600	8814	7.0
	PORT CHANNEL	12	14	178	1.4	107	149	143	4.1	40	3.3	282	60	9463	1079	30	705	699,434	11334	6.4
	HIST. DIST. SUBTIDAL FLATS	47	> 27	201	> 5.1	> 271	> 275	> 272	> 6.7	> 51	> 4.4	> 465	> 86	> 12127	> 2858	> 55	> 1015	> 797,286	> 19837	5.1
	INDUSTRIAL WATERFRONT	20	> 33	> 388	> 4.2	180	> 377	> 327	> 8.6	> 53	> 4.3	> 520	19	8249	> 3665	51	722	476,168	> 29118	> 13.5
	INTERTIDAL AREAS	9	18	< 67	< 0.16	76	46	46	< 0.22	28	0.50	127	2.6	1400	< 178	13	109	< 5,141	3307	<4.3
	SUBTIDAL FLATS	84	14	< 109	< 0.97	103	< 75	< 77	< 0.77	< 32	< 1.0	< 181	< 8.5	3225	< 508	22	< 306	< 46,270	< 4316	5.6
	TRANSITIONAL SLOPES	26	11	124	1.1	< 74	75	64	0.69	36	0.86	< 146	17	2674	551	21	359	248,012	3520	4.1
0.5-3.5 Normalized Data	NAVIGATION CHANNEL	33	895	11040	79	6972	8484	7480	102	2329	145	14464	1568.8	253619	44905	2120	26295	> 26560847	516820	378
	PORT CHANNEL	11	790	10103	78	6093	8625	8101	233	2271	189	16040	2701.9	413493	45660	1246	29368	29618903	492076	287
	HIST. DIST. SUBTIDAL FLATS	47	> 1749	> 12934	> 326	> 17437	> 17656	> 17442	> 430	> 3265	> 281	> 29864	> 2468.9	346874	> 81764	1574	29048	22805769	567428	< 146
	INDUSTRIAL WATERFRONT	19	1768	> 20781	227	9657	> 20193	17504	461	2828	232	27840	484	220396	> 106303	1522	18566	12216456	> 870899	> 378
	INTERTIDAL AREAS	9	1201	< 4529	< 11	5165	< 3112	3104	< 15	1906	< 34	8620	158	83865	< 10935	786	6663	< 323638	198287	<261
	SUBTIDAL FLATS	84	931	< 7333	< 65	6977	< 5074	< 5220	< 52	< 2144	< 68	< 12246	< 409	150312	< 24113	1017	14271	< 2326807	< 203552	257
	TRANSITIONAL SLOPES	24	807	9065	79	5461	5473	4707	51	2612	63	10691	896	148297	29207	1158	20301	14008367	< 160610	204
>3.5	NAVIGATION CHANNEL	14	15	119	2.7	169	156	151	3.6	36	3.7	263	> 162	> 20439	1261	49	772	1044720	18706	2.4
	PORT CHANNEL	4	28	194	5.3	190	301	255	> 84	50	9.5	499	170	> 51729	2546	56	1199	2141362	53994	> 16
	HIST. DIST. SUBTIDAL FLATS	108	22	> 196	> 3.09995	> 203	142	> 158	1.7	34	> 2.2	> 350	10	1491	> 1499	23	286	64977	6104	3.2
	INDUSTRIAL WATERFRONT	13	46	> 464	7.9	305	> 535	> 425	> 24	> 74	> 6.6	> 692	65	> 14280	> 7433	> 186	> 2360	> 1897289	> 46722	> 31
	INTERTIDAL AREAS	2	11	54	< <0.021	30	28	69	0.31	23	<0.13	80	0.15	<849	68	4.7	85	166	2145	<4.4
	SUBTIDAL FLATS	57	< 9	< 50	< 0.59	< 61	< 33	< 28	< 0.18	< 21	< 0.32	< 98	< 1.8	< 572	< 168	< 9.1	< 110	< 5898	< 415	< 2.2
	TRANSITIONAL SLOPES	18	34	201	2.8	198	201	185	2.4	45	2.1	296	46	2613	2287	63	386	306260	12744	4.6
>3.5 Normalized Data	NAVIGATION CHANNEL	14	1206	9632	221	13632	12601	12217	290	2875	> 295	21217	> 5264.7	> 663560	41008	1591	25100	33965993	608118	79
	PORT CHANNEL	4	1683	11559	316	11317	17903	15201	> 4994	2969	564	29724	5082.7	> 1551044	76341	1690	35940	64206617	1618965	> 484
	HIST. DIST. SUBTIDAL FLATS	108	> 1800	> 15846	> 250	> 16367	> 11500	> 12747	134	2761	> 165	> 28265	461	53425	66894	807	10220	4605387	307092	99
	INDUSTRIAL WATERFRONT	13	2225	22319	380	< 14673	25745	20436	1168	3553	315	33304	1442	> 316144	164721	> 4148	> 52394	42110221	1030027	> 688
	INTERTIDAL AREAS	2	703	3488	< <1.4	< 1919	< 1812	4421	20	< 1468	< <8.5	< 5144	8.0	<46291	3708	258	4629	9087	117006	<241
	SUBTIDAL FLATS	57	< 852	< 4952	< 59	< 6013	< 3237	< 2723	< 18	< 2031	< 31	< 9684	185	36283	< 16295	579	7384	1009081	< 45266	114
	TRANSITIONAL SLOPES	18	2539	14888	205	14606	14871	13672	174	> 3350	153	21852	1512.8	78670	89398	2025	11988	11419863	440972	131

Table G-1
Multiple Comparison Testing - Phase I and II Sediment Data

c

ARITHMETIC MEANS

Depth (ft bss)	USACE Sediment Accumulation Area	N	Arsenic	Barium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Silver	Zinc	2,3,7,8-TCDD	bis(2-Ethylhexyl)phthalate	TPH	Total DDT (4,4')	Total Aroclor PCBs	Total Congener PCBs (209)	TOTAL PAHs - SVOC	Total Alpha + Gamma Chlordane
0-0.5	No	63	13.4	159	1.9	112	135	143	3.7	34.2	2.3	244	58.8	6200	1200	49	720	538000	13000	8.4
	Yes	42	> 16.7	183	> 2.7	> 138	> 179	> 177	> 3.6	> 39.8	> 2.9	> 304	> 90.7	> 8200	> 1500	> 130	> 1100	> 1110000	> 30000	9.7
0-0.5 Normalized	No	62	957	10900	119	7670	9040	9380	222	2350	149	16200	2500	250000	45000	2000	30000	21900000	600000	360
	Yes	42	> 1200	> 12800	> 185	> 9880	> 12700	> 13800	> 242	> 2890	> 197	> 21900	> 3520	270000	50000	> 4700	42000	> 39300000	940000	300
0.5-3.5	No	129	18.4	143	2.3	134	151	136	14.8	36	3.1	240	122	20000	1400	62	930	881000	14000	7.9
	Yes	102	> 31	> 380	> 6.6	> 292	> 314	> 314	> 7.4	> 51.5	> 4.8	> 547	> 253	> 29000	> 3600	> 140	> 2000	> 2150000	> 29000	> 12
0.5-3.5 Normalized	No	128	1120	9320	133	8140	8770	8110	577	2260	160	14400	5220	660000	55000	2400	37000	34400000	620000	380
	Yes	102	> 1870	> 21400	> 379	> 17400	> 18800	> 19300	> 429	> 3120	> 278	> 32200	> 7690	> 860000	> 88000	> 3800	> 59000	> 60400000	> 690000	340
>3.5	No	52	20.1	99.1	2.5	198	133	118	12.1	27.5	2.6	225	223	16000	1500	45	580	823000	14000	4.3
	Yes	164	> 39.7	> 388	> 9.1	> 439	> 322	> 370	> 8.9	> 45	> 4.8	> 639	> 618	> 16000	> 5200	> 200	> 2000	> 2580000	> 32000	> 9.6
>3.5 Normalized Data	No	52	1300	6560	150	12100	7960	7040	685	2110	149	14300	6440	580000	46000	1300	21000	27200000	490000	200
	Yes	164	> 2590	> 25500	> 569	> 27900	> 20200	> 23800	> 539	> 3050	> 303	> 41400	12800	410000	> 110000	4000	47000	57600000	730000	230

GEOMETRIC MEANS

Depth (ft bss)	USACE Sediment Accumulation Area	N	Arsenic	Barium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Silver	Zinc	2,3,7,8-TCDD	bis(2-Ethylhexyl)phthalate	TPH	Total DDT (4,4')	Total Aroclor PCBs	Total Congener PCBs (209)	TOTAL PAHs - SVOC	Total Alpha + Gamma Chlordane
0-0.5	No	63	12	130	0.95	94	104	107	1.7	32	1.7	200	34	2623	747	26	397	325587	8573	5.4
	Yes	42	> 15	160	> 2.0	> 123	> 154	> 156	> 2.7	> 38	> 2.4	> 277	> 68	> 4516	> 1195	> 59	> 637	> 743683	> 13441	5.5
0-0.5 Normalized	No	62	859	9331	68	6777	7463	7687	120	2284	123	14328	1701.2	127633	36319	1240	19668	15908502	413912	263
	Yes	42	> 1093	> 11893	> 147	> 9161	> 11462	> 11579	> 200	> 2809	> 180	> 20571	> 2517.8	174198	44721	> 2325	24968	> 28940645	510446	204
0.5-3.5	No	129	12	104	0.66	80	68	67	0.74	31	0.96	152	8.6	2695	430	19	273	59538	4205	5.1
	Yes	102	> 25	> 233	> 4.3	> 222	> 248	> 240	> 4.6	> 49	> 3.6	> 433	> 56	> 10035	> 2341	> 58	> 875	> 713072	> 17138	> 7.1
0.5-3.5 Normalized	No	128	843	7145	45	5509	4765	4589	51	2108	66	10471	474	147825	24170	1007	14960	3364305	227174	272
	Yes	102	> 1528	> 14429	> 268	> 13749	> 15347	> 14861	> 283	> 3019	> 220	> 26867	> 1691.4	> 303409	> 71434	> 1771	> 26277	> 21439651	> 525503	215
>3.5	No	52	7.5	47	0.40	49	31	26	0.23	20	0.26	87	1.9	849	144	8.0	116	6346	536	2.4
	Yes	164	> 24	> 194	> 3.4	> 207	> 160	> 167	> 2.1	> 37	> 2.5	> 350	> 17	> 2201	> 1685	> 33	> 371	> 117381	> 7569	> 3.9
>3.5 Normalized Data	No	52	734	4599	39	4745	3069	2547	23	1981	25	8527	220	66586	15375	535	8721	1375839	74133	141
	Yes	164	> 1858	> 14917	> 258	> 15925	> 12290	> 12836	> 162	> 2866	> 187	> 26844	678	75015	> 66807	1108	12573	6396876	321182	118

Table G-1
Multiple Comparison Testing - Phase I and II Sediment Data

d

ARITHMETIC MEANS

Depth (ft bss)	Be-7 Bearing	N	Arsenic	Barium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Silver	Zinc	2,3,7,8-TCDD	bis(2-Ethylhexyl)phthalate	TPH	Total DDT (4,4')	Total Aroclor PCBs	Total Congener PCBs (209)	TOTAL PAHs - SVOC	Total Alpha + Gamma Chlordane
0-0.5	No	44	15.1	168	2.5	131	156	161	3.3	35.6	2.3	265	70.6	8800	1400	93	1100	856000	26000	9.2
	Yes	61	14.5	170	1.9	116	151	154	4	37.1	> 2.7	270	72.3	5700	1300	72	700	706000	16000	8.7
0-0.5	No	44	> 1240	12900	> 187	> 10200	12100	13500	239	2800	173	20900	3030	340000	53000	4000	48000	34300000	1000000	390
Normalized Data	Yes	60	923	10800	115	7360	9350	9420	224	2400	164	16700	2800	200000	43000	2500	26000	24700000	540000	300

GEOMETRIC MEANS

Depth (ft bss)	Be-7 Bearing	N	Arsenic	Barium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Silver	Zinc	2,3,7,8-TCDD	bis(2-Ethylhexyl)phthalate	TPH	Total DDT (4,4')	Total Aroclor PCBs	Total Congener PCBs (209)	TOTAL PAHs - SVOC	Total Alpha + Gamma Chlordane
0-0.5	No	44	13	130	1.4	108	116	124	2.0	32	1.6	217	36	3259	886	36	445	363474	10568	5.4
	Yes	61	13	150	1.2	103	127	125	2.0	36	> 2.3	235	53	3272	914	36	506	531094	10047	5.5
0-0.5	No	44	> 1124	10928	> 118	> 9079	9739	10422	172	2662	136	18302	1745.6	160084	43164	1733	22785	17832313	516673	265
Normalized Data	Yes	60	835	9848	78	6754	8321	8192	132	2360	149	15424	2156.6	134124	37090	1484	20771	21710611	407555	222

Notes:
Arithmetic and geometric means for each category are shown. Modeling and post hoc testing was conducted on natural log-transformed data.
For non-normalized data, a one-way analysis of variance model was conducted on natural log-transformed data. Where the model was significant, a post hoc Nelson-Hsu analysis of means multiple comparison test was conducted to compare the mean of each group to the overall mean. For
For non-normalized data, > indicates that the group mean of log-transformed data is statistically significantly greater than the overall mean within the depth interval (α = 0.05).
For non-normalized data, < indicates that the group mean of log-transformed data is statistically significantly less than the overall mean within the depth interval (α = 0.05).
Normalized data: Metals are normalized by aluminum. Organics are normalized by total organic carbon (TOC).
To evaluate the effect of the normalization variable, an analysis of covariance models was conducted by adding the the natural logarithm transformed normalization variable, aluminum or TOC as appropriate, as a covariate to the model along with the categorical variable.
For normalized data, > indicates that the least squares group mean, after controlling for the normalization variable, is statistically significantly greater than the overall mean within the depth interval (α = 0.05).
For normalized data, < indicates that the least squares group mean, after controlling for the normalization variable, is statistically significantly less than the overall mean within the depth interval (α = 0.05).
Units: Metals and TPH, ppm; 2,3,7,8 TCDD and Total Congener PCBs, ppt; other organics, ppb.
Units for normalized data: Metals ppm-aluminum, TPH, ppm-oc; 2,3,7,8 TCDD and Total Congener PCBs, ppt-oc; other organics, ppb-oc.
1/2 the detection limit was substituted for non-detects.
Maximum sample size shown. Sample size may differ for individual chemicals due to missing data.
Analysis includes Phase I and Phase II Sediment Investigation data only.
The geomorphic units are depicted in Figure 6-2.

Acronyms:
2,3,7,8-TCDD = 2,3,7,8-tetrachlorodibenzo-p-dioxin
DDT = dichlorodiphenyl-trichloroethane
ft bss = feet below sediment surface
N = sample size
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
ppb = parts per billion
ppm = parts per million
ppt = parts per trillion
SVOC = semivolatile organic compounds
TPH = total petroleum hydrocarbon
USACE = U.S. Army Corps of Engineers
Hist. Dist. = Historically Disturbed

Legend for Shading of Mean Concentrations

<10	Not Detected in all Samples
1	Lowest Arithmetic or Geometric Mean Concentration
2	
3	
4	
5	
6	
7	
8	
9	Highest Arithmetic or Geometric Mean Concentration

Table G-2
Multiple Comparison Testing - Phase III Sediment Data

a

ARITHMETIC MEANS

Depth (ft bss)	Geographic Area	N	Arsenic	Barium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Silver	Zinc	2,3,7,8-TCDD	bis(2-Ethylhexyl) phthalate	TPH	Total DDT (4,4')	Total Aroclor PCBs	Total Congener PCBs (209)	Total Alpha + Gamma Chlordane
0-0.5 Phase III Data	NEWARK BAY NORTH	103	< 12.5	< 96.9	< 1.21	116	< 96.5	< 116	< 1.6	< 32.7	< 1.37	< 205	> 118	1,100	230	< 29	170	437,000	4.8
	NEWARK BAY CENTRAL	49	16.5	119	0.992	102	105	117	1.8	41.7	1.68	213	53.1	1,400	< 190	< 29	140	340,000	5.3
	NEWARK BAY SOUTH	102	> 24.9	> 234	> 3.43	139	> 223	> 240	> 3.4	> 48.7	> 2.32	> 436	72.1	1,000	> 520	> 190	> 350	590,000	5.2
0-0.5 Phase III Normalized Data	NEWARK BAY NORTH	103	< 1080	< 7690	< 91.5	8780	< 7590	< 10400	126.0	< 2620	102	< 16400	> 5950	61,000	18,000	< 1600	11000	23,100,000	240
	NEWARK BAY CENTRAL	49	1120	< 8280	< 68.6	7220	< 6910	7940	117.0	2760	106	< 14600	2590	72,000	< 17,000	< 1600	8600	17,800,000	440
	NEWARK BAY SOUTH	102	> 1700	> 16100	> 210	9020	> 15000	> 16400	> 216.0	> 3730	> 147	> 31100	< 2410	41,000	> 22,000	> 6600	> 14000	22,300,000	200

GEOMETRIC MEANS

Depth (ft bss)	Geographic Area	N	Arsenic	Barium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Silver	Zinc	2,3,7,8-TCDD	bis(2-Ethylhexyl) phthalate	TPH	Total DDT (4,4')	Total Aroclor PCBs	Total Congener PCBs (209)	Total Alpha + Gamma Chlordane
0-0.5 Phase III Data	NEWARK BAY NORTH	103	< 10.9	< 79.9	< 0.743	83.1	< 69.5	< 76.5	< 1	< 27	< 0.896	< 161	> 40.9	400	160	< 16	100	198,000	2.3
	NEWARK BAY CENTRAL	49	13.2	103	0.746	86.6	83.4	97.8	1.2	35.7	1.24	187	28.2	430	< 120	< 15	92	180,000	2.7
	NEWARK BAY SOUTH	102	> 18.2	> 164	> 1.57	93	> 135	> 142	> 1.7	> 41	> 1.39	> 273	22.9	450	> 240	> 54	> 180	261,000	2.5
0-0.5 Phase III Normalized Data	NEWARK BAY NORTH	103	< 956	< 7030	< 65.4	7310	< 6110	< 6730	88.3	< 2380	78.8	< 14200	> 2440	24,000	9,600	< 970	6200	11,800,000	130
	NEWARK BAY CENTRAL	49	970	< 7600	< 54.9	6370	< 6130	7200	90.1	2630	91.6	< 13700	1740	27,000	< 7,400	< 950	5700	11,100,000	170
	NEWARK BAY SOUTH	102	> 1450	> 13000	> 125	7400	> 10800	> 11300	> 138	> 3260	> 111	> 21700	< 1150	23,000	> 12,000	> 2700	> 8900	13,100,000	120

b

ARITHMETIC MEANS

Depth (ft bss)	Geomorphic Unit	N	Arsenic	Barium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Silver	Zinc	2,3,7,8-TCDD	bis(2-Ethylhexyl) phthalate	TPH	Total DDT (4,4')	Total Aroclor PCBs	Total Congener PCBs (209)	Total Alpha + Gamma Chlordane
0-0.5 Phase III Data	HIST. DIST. SUBTIDAL FLATS	27	18.1	188	> 3.22	159	165	153	2.81	> 48.4	> 2.51	300	> 162	1,200	260	85	> 400	916,000	> 7.4
	INDUSTRIAL WATERFRONT	31	< 15.2	146	1.54	85.8	158	244	1.57	48.7	1.34	598	45.6	1,000	400	64	300	564,000	6.8
	INTERTIDAL AREA	9	11.4	103	0.854	83.1	96.2	96.6	1.41	25.7	1.08	211	47	600	270	68	140	< 210,000	5.4
	NAVIGATION CHANNEL	22	12.7	141	1.69	105	113	166	1.67	42	1.77	226	60.5	1,000	320	59	240	292,000	5.1
	PORT CHANNEL	3	16.3	166	1.25	101	115	133	2.08	44.9	1.93	268	39.2	410	110	54	99	203,000	8.6
	SUB-TIDAL FLATS	151	20.1	155	2.05	128	149	156	2.52	< 37.5	1.72	< 249	90.8	< 1,100	360	110	< 200	439,000	< 4
	TRANSITIONAL SLOPES	11	19.2	193	2.82	140	205	185	3.32	55.4	> 3.36	390	68.9	1,600	310	96	310	404,000	6.9
0-0.5 Phase III Data Normalized	HIST. DIST. SUBTIDAL FLATS	27	1130	11400	196	10100	10300	9820	177	3210	158	19200	5650	47,000	8,600	2500	13000	31,900,000	270
	INDUSTRIAL WATERFRONT	31	1340	> 13900	133	8020	> 15100	> 21300	144	> 4770	120	> 51100	2370	70,000	29,000	2700	19000	30,700,000	> 470
	INTERTIDAL AREA	9	1260	12100	85.8	9750	9830	9980	156	2630	104	22400	2500	59,000	36,000	3700	5200	< 11,600,000	800
	NAVIGATION CHANNEL	22	< 856	9490	104	7130	7760	17200	107	2950	110	15200	3030	41,000	16,000	2300	12000	13,300,000	210
	PORT CHANNEL	3	775	7680	58.2	4770	5420	6270	98.4	2120	90.3	12600	1390	15,000	4,200	2000	3700	7,280,000	310
	SUB-TIDAL FLATS	151	> 1470	10800	132	8710	9990	10700	169	2790	113	17700	4260	57,000	20,000	4200	11000	21,000,000	< 200
	TRANSITIONAL SLOPES	11	1060	10800	153	7570	11100	10000	177	3080	180	21200	2180	48,000	9,800	2800	10000	11,800,000	220

GEOMETRIC MEANS

Depth (ft bss)	Geomorphic Unit	N	Arsenic	Barium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Silver	Zinc	2,3,7,8-TCDD	bis(2-Ethylhexyl) phthalate	TPH	Total DDT (4,4')	Total Aroclor PCBs	Total Congener PCBs (209)	Total Alpha + Gamma Chlordane
0-0.5 Phase III Data	HIST. DIST. SUBTIDAL FLATS	27	16.1	150	> 1.93	129	136	139	2.12	> 46	> 2.08	277	> 81.1	700	170	51	> 240	571,000	> 5.9
	INDUSTRIAL WATERFRONT	31	< 9.93	113	0.897	70.5	104	125	1.07	33.6	0.924	267	24.3	560	240	30	170	271,000	4.5
	INTERTIDAL AREA	9	10.7	90.3	0.717	74.6	80.2	82.1	1.21	23.2	0.852	192	31.1	540	170	33	75	< 158,000	4.3
	NAVIGATION CHANNEL	22	11.6	126	0.912	83.8	88.7	101	1.17	38.1	1.27	194	32.1	400	160	24	160	213,000	3.4
	PORT CHANNEL	3	16.3	162	1.22	101	115	133	2.02	44.8	1.9	266	36.8	380	100	50	94	187,000	7.9
	SUB-TIDAL FLATS	151	14.8	101	0.9	84.5	83.9	91.7	1.2	< 30.8	0.99	< 179	24.9	< 350	170	21	< 100	175,000	< 1.5
	TRANSITIONAL SLOPES	11	17.5	178	1.87	124	166	163	2.43	54.2	> 2.84	336	53.9	880	220	62	210	289,000	5.7
0-0.5 Phase III Data Normalized	HIST. DIST. SUBTIDAL FLATS	27	1050	9790	126	8430	8930	9070	139	3010	136	18100	2870	25,000	6,100	1800	8500	20,200,000	210
	INDUSTRIAL WATERFRONT	31	1050	> 12100	95.3	7480	> 11000	> 13300	114	> 3570	98.1	> 28400	1490	34,000	15,000	1800	10000	16,600,000	> 270
	INTERTIDAL AREA	9	1210	10200	80.6	8390	9010	9230	136	2600	95.7	21600	1790	31,000	9,600	1900	4300	< 9,080,000	250
	NAVIGATION CHANNEL	22	< 827	8960	64.8	5950	6290	7140	82.8	2700	89.9	13800	1710	21,000	8,600	1300	8600	11,400,000	180
	PORT CHANNEL	3	768	7650	57.5	4740	5400	6250	95.2	2110	89.6	12600	1330	14,000	3,600	1800	3400	6,740,000	290
	SUB-TIDAL FLATS	151	> 1240	8480	75.4	7080	7030	7690	100	2580	83	15000	1570	22,000	11,000	1300	6400	11,100,000	< 97
	TRANSITIONAL SLOPES	11	973	9860	104	6890	9200	9040	135	3010	158	18700	1780	29,000	7,400	2000	6800	9,520,000	190

Table G-2
Multiple Comparison Testing - Phase III Sediment Data

c

ARITHMETIC MEANS

Depth (ft bss)	USACE Accumulation Area	N	Arsenic	Barium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Silver	Zinc	2,3,7,8-TCDD	bis(2-Ethylhexyl) phthalate	TPH	Total DDT (4,4')	Total Aroclor PCBs	Total Congener PCBs (209)	Total Alpha + Gamma Chlordane
0-0.5 Phase III Data	NO	178	18.4	146	1.82	116	136	157	2.17	37.8	1.58	252	78.8	990	340	> 93	190	386,000	4.3
	YES	74	18.1	> 179	> 2.68	> 139	> 182	> 188	> 2.79	> 48.4	> 2.37	> 415	> 109	> 1,400	360	91	> 350	> 712,000	> 6.8
0-0.5 Phase III Data Normalized	NO	178	1410	11100	124	8540	10000	12500	155	3040	111	19800	3880	53,000	22,000	3900	12000	20,000,000	250
	YES	74	1170	11200	162	8770	11600	12200	174	> 3240	145	> 27300	3960	> 60,000	13,000	2700	> 12000	26,400,000	> 300

GEOMETRIC MEANS

Depth (ft bss)	USACE Accumulation Area	N	Arsenic	Barium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Silver	Zinc	2,3,7,8-TCDD	bis(2-Ethylhexyl) phthalate	TPH	Total DDT (4,4')	Total Aroclor PCBs	Total Congener PCBs (209)	Total Alpha + Gamma Chlordane
0-0.5 Phase III Data	NO	178	13.6	103	0.864	81.6	83.2	91.5	1.15	30.7	0.975	182	25.4	360	180	> 21	100	177,000	1.8
	YES	74	14.5	> 135	> 1.44	> 104	> 125	> 136	> 1.72	> 42	> 1.64	> 271	> 45.9	> 680	190	40	> 200	> 358,000	> 4.7
0-0.5 Phase III Data Normalized	NO	178	1190	8960	75.3	7110	7250	7980	100	2680	85	15900	1620	23,000	11,000	1400	6600	11,200,000	120
	YES	74	1020	9530	102	7340	8860	9590	122	> 2970	116	> 19100	1910	> 28,000	8,000	1700	> 8200	14,900,000	> 200

d

ARITHMETIC MEANS

Depth (ft bss)	EPA Subunit	N	Arsenic	Barium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Silver	Zinc	2,3,7,8-TCDD	bis(2-Ethylhexyl) phthalate	TPH	Total DDT (4,4')	Total Aroclor PCBs	Total Congener PCBs (209)	Total Alpha + Gamma Chlordane
0-0.5 Phase III Data	1	90	> 25.8	> 244	> 3.74	145	> 237	> 253	> 3.63	> 47.8	2.39	> 462	76.7	1,100	> 550	> 200	> 380	> 630,000	5.4
	2	9	13.8	148	0.766	72.8	85.7	93.3	1.17	44.9	1.33	193	21.5	260	< 85	51	110	214,000	4.8
	3	12	10.8	124	1.44	111	101	212	1.76	35.3	1.57	215	67.7	1,200	330	23	240	299,000	5.3
	4	43	13.9	116	1.51	140	121	132	1.93	38.4	1.77	256	> 133	1,100	190	32	200	593,000	> 7.3
	5	50	17.3	124	1.04	104	112	126	1.8	44.7	1.76	223	53.8	1,400	230	33	160	353,000	5
	6	50	< 12	< 75.4	< 0.919	< 97.9	< 74.5	< 80.6	< 1.31	< 27.3	< 1.01	< 161	116	1,000	250	< 29	< 130	331,000	< 2.5
0-0.5 Phase III Data Normalized	1	90	> 1780	> 16800	> 228	9470	> 16100	> 17400	> 233	> 3760	> 153	> 33100	< 2570	45,000	> 23,000	> 7100	> 15000	23,600,000	210
	2	9	795	8440	< 41.7	< 3970	< 4660	5110	62.4	2690	72.8	10700	993	13,000	< 5,400	2100	6800	10,600,000	210
	3	12	847	9710	99.1	8600	8420	26400	123	2950	109	16800	4010	51,000	19,000	1000	13000	14,400,000	230
	4	43	< 1000	8080	105	9410	8530	9600	136	2710	118	18200	> 5720	64,000	14,000	1600	13000	28,900,000	> 340
	5	50	1170	8800	< 73	7270	7370	8660	118	2960	111	15700	2510	71,000	18,000	< 1600	9300	18,000,000	420
	6	50	1210	< 6920	< 79.5	8390	< 6590	< 7210	119	< 2450	< 88	< 14700	6520	59,000	20,000	< 1800	< 8400	19,900,000	< 140

GEOMETRIC MEANS

Depth (ft bss)	EPA Subunit	N	Arsenic	Barium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Silver	Zinc	2,3,7,8-TCDD	bis(2-Ethylhexyl) phthalate	TPH	Total DDT (4,4')	Total Aroclor PCBs	Total Congener PCBs (209)	Total Alpha + Gamma Chlordane
0-0.5 Phase III Data	1	90	> 18.6	> 166	> 1.69	95.5	> 141	> 147	> 1.83	> 39.9	1.38	> 282	23.9	490	> 250	> 59	> 180	> 266,000	2.6
	2	9	13.5	139	0.706	68.2	78.6	87.1	1.02	44.7	1.24	184	16.3	220	< 61	30	100	194,000	3.5
	3	12	9.72	110	0.868	88.3	80.1	104	1.18	30.6	1.09	181	45	490	190	15	160	206,000	3.3
	4	43	11.7	104	1.05	111	99.8	107	1.37	33.7	1.37	219	> 60.7	530	160	23	150	305,000	> 5.1
	5	50	13.4	106	0.771	86.3	86.7	103	1.23	37.2	1.28	193	26.3	430	150	15	99	184,000	2.4
	6	50	< 10.7	< 60.2	< 0.545	< 65	< 49.9	< 53.9	< 0.762	< 21.9	< 0.612	< 122	29.3	300	160	< 13	< 70	137,000	< 1
0-0.5 Phase III Data Normalized	1	90	> 1510	> 13500	> 137	7760	> 11500	> 11900	> 148	> 3240	> 112	> 22900	< 1220	25,000	> 13,000	> 3000	> 9400	13,700,000	130
	2	9	781	7990	< 40.7	< 3930	< 4530	5030	58.7	2580	71.7	10600	872	12,000	< 3,200	1600	5500	9,840,000	190
	3	12	819	9260	73	7430	6740	8770	99.2	2580	91.7	15200	2510	27,000	11,000	840	8900	12,100,000	180
	4	43	< 867	7710	78.4	8230	7430	7980	102	2500	102	16300	> 3150	27,000	8,300	1200	7500	15,800,000	> 260
	5	50	1010	7990	< 58.2	6520	6550	7740	93.1	2810	96.4	14500	1560	26,000	8,700	< 910	5900	10,900,000	140
	6	50	1090	< 6140	< 55.6	6630	< 5090	< 5500	77.6	< 2230	< 62.4	< 12400	1960	20,000	11,000	< 850	< 4700	9,210,000	< 70

Table G-2
Multiple Comparison Testing - Phase III Sediment Data

Notes:
Arithmetic means and geometric means for each category are shown. Modeling and post hoc testing was conducted on natural log-transformed data.
For non-normalized data, a one-way analysis of variance model was conducted on natural log-transformed data. Where the model was significant, a post hoc Nelson-Hsu analysis of means multiple comparison test was conducted to compare the mean of each group to the overall mean.
For non-normalized data, > indicates that the group mean of log-transformed data is statistically significantly greater than the overall mean within the depth interval (α = 0.05).
For non-normalized data, < indicates that the group mean of log-transformed data is statistically significantly less than the overall mean within the depth interval (α = 0.05).
Normalized data: Metals are normalized by aluminum. Organics are normalized by total organic carbon (TOC).
To evaluate the effect of the normalization variable, an analysis of covariance models was conducted by adding the the natural logarithm transformed normalization variable, aluminum or TOC as appropriate, as a covariate to the model along with the categorical variable.
For normalized data, > indicates that the least squares group mean, after controlling for the normalization variable, is statistically significantly greater than the overall mean within the depth interval (α = 0.05).
For normalized data, < indicates that the least squares group mean, after controlling for the normalization variable, is statistically significantly less than the overall mean within the depth interval (α = 0.05).
Units: Metals and TPH, ppm; 2,3,7,8 TCDD and Total Congener PCBs, ppt; other organics, ppb.
Units for normalized data: Metals ppm-aluminum, TPH, ppm-oc; 2,3,7,8 TCDD and Total Congener PCBs, ppt-oc; other organics, ppb-oc.
1/2 the detection limit was substituted for non-detects.
Analysis includes all Phase III Sediment data collected 2014-2016.
The geomorphic units are depicted in Figure 6-2.
PAHs in sediment are being reanalyzed due to laboratory bias and are not presented.

Acronyms:
2,3,7,8-TCDD = 2,3,7,8-tetrachlorodibenzo-p-dioxin
DDT = dichlorodiphenyl-trichloroethane
ft bss = feet below sediment surface
N = sample size
PCB = polychlorinated biphenyl
ppb = parts per billion
ppm = parts per million
ppt = parts per trillion
TPH = total petroleum hydrocarbon
USACE = U.S. Army Corps of Engineers
Hist. Dist. = Historically Disturbed

Legend for Shading of Mean Concentrations

1	Lowest Arithmetic or Geometric Mean Concentration
2	
3	
4	
5	
6	Highest Arithmetic or Geometric Mean Concentration

Table G-3
Results of Temporal Comparison of Phase I/II and Phase III Co-located Samples

Chemical	Intercept[1]	β[1]	p-value[2]	95% Confidence limits on β		Percent Decrease from 2005 to 2016[3]		
						Mean	95% Confidence Limits	
Arsenic	2.51	0.018	**0.008**	0.005	0.031	**-22%**	**-40%**	**-6%**
Barium	4.80	-0.012	0.095	-0.027	0.002	13%	**-2%**	**26%**
Cadmium	0.34	-0.029	**0.022**	-0.053	-0.004	**27%**	**5%**	**44%**
Chromium	4.71	-0.020	**0.017**	-0.037	-0.004	**20%**	**4%**	**33%**
Copper	4.72	-0.023	**0.005**	-0.039	-0.008	**23%**	**8%**	**35%**
Lead	4.78	-0.023	**0.011**	-0.040	-0.006	**22%**	**6%**	**36%**
Mercury	0.738	-0.030	**0.023**	-0.055	-0.004	**28%**	**5%**	**45%**
Nickel	3.46	-0.004	0.471	-0.016	0.007	5%	**-9%**	**16%**
Silver	0.499	-0.033	**0.002**	-0.054	-0.013	**31%**	**13%**	**45%**
Zinc	5.33	-0.009	0.240	-0.024	0.006	9%	**-7%**	**23%**
2,3,7,8-TCDD	3.85	-0.034	**0.032**	-0.065	-0.003	**31%**	**3%**	**51%**
bis(2-Ethylhexyl)phthalate	8.13	-0.188	**<.0001**	-0.220	-0.156	**87%**	**82%**	**91%**
TPH[4]	6.91	-0.130	**<.0001**	-0.162	-0.098	**76%**	**66%**	**83%**
Total DDT (4,4)	3.54	-0.047	**0.013**	-0.083	-0.010	**40%**	**11%**	**60%**
Total Aroclor PCBs (Sum of 9 Aroclors)	6.19	-0.114	**<.0001**	-0.144	-0.084	**71%**	**60%**	**79%**
Total PCB Congeners (209)	12.83	-0.055	**0.0001**	-0.082	-0.029	**46%**	**27%**	**60%**
Total Alpha + Gamma Chlordane[5]	0.592	0.043	**0.029**	0.005	0.081	**-61%**	**-144%**	**-6%**

Footnotes:

[1]Parameter estimates from the model: $\log_e$(concentration) = intercept + (β* year0) + γ_i where year0 = 0 in 2005 and γ_i is the random intercept for colocation i.

[2]Null hypothesis: β = 0. p-value is shaded and bolded where significant (α= 0.05) indicating β is different from 0.

[3]Negative percent indicates increase.

[4]Differences between sampling periods may be partially attributable to differences in the analytical methods used for TPH

[5]Results may be uncertain due to the low detection frequency caused by elevated detection limits in the Phase I program. PAHs are being re-analyzed in Phase III sediment samples due to laboratory bias and were not included in the evaluation

Notes:

Non-detect data was excluded from the analysis.
2,3,7,8-TCDD = 2,3,7,8-tetrachlorodibenzo-p-dioxin
DDT = dichlorodiphenyl-trichloroethane
PCB = polychlorinated biphenyl
TPH = total petroleum hydrocarbon

Table G-4

Results of Two-Way ANOVA Model comparing concentrations from Phase I/II and Phase III Time Periods while controlling for Variation Attributable to Spatially Based Subunits[1]

Chemical	p-value[2]	Percent Reduction from Phase I/II to Phase III Sampling Period[3]		
		Mean	95% Confidence Limits	
Arsenic	0.684	-3.3%	-21%	12%
Barium	0.119	13%	-3.5%	26%
Cadmium	**0.023**	27%	4.2%	44%
Chromium	**0.019**	20%	3.6%	34%
Copper	**0.021**	23%	3.9%	38%
Lead	0.081	17%	-2.4%	33%
Mercury	**0.0003**	39%	21%	54%
Nickel	0.591	-3.8%	-19%	9%
Silver	**0.0002**	38%	21%	52%
Zinc	0.283	9%	-8.3%	24%
2,3,7,8-TCDD	**0.011**	37%	10%	56%
bis(2-Ethylhexyl)phthalate	**<.0001**	87%	83%	90%
TPH[4]	**<.0001**	82%	77%	87%
Total DDT (4,4)	0.070	28%	-2.7%	49%
Total Aroclor PCBs (Sum of 9 Aroclors)	**<.0001**	73%	64%	79%
Total PCB Congeners (209)[5]	**<.0000**	51%	32%	65%
Total Alpha + Gamma Chlordane[5]	--	--	--	--

Footnotes:

[1] The six spatially based subunits are shown on Figure 6-3.

[2] p-value of F-test for sampling period. Shaded and bolded when significant.

[3] Based on difference of the least square log mean estimates from the model. Negative values indicate an increase.

[4]Differences between sampling periods may be partially attributable to differences in the analytical methods used for TPH.

[5]Analysis not conducted due to low detection frequency and elevated detection limits in the Phase I data set.

PAHs are being re-analyzed in Phase III sediment samples due to analytical bias and were excluded from the analysis.

Notes:

1. Model ln(concentration) =Intercept + subunit + sampling period (phase I/II vs. Phase II)
2. Interaction term (subunit X sampling period) was tested but found to not be significant for any
3. 1/2 the detection limit was substituted for non-detects.

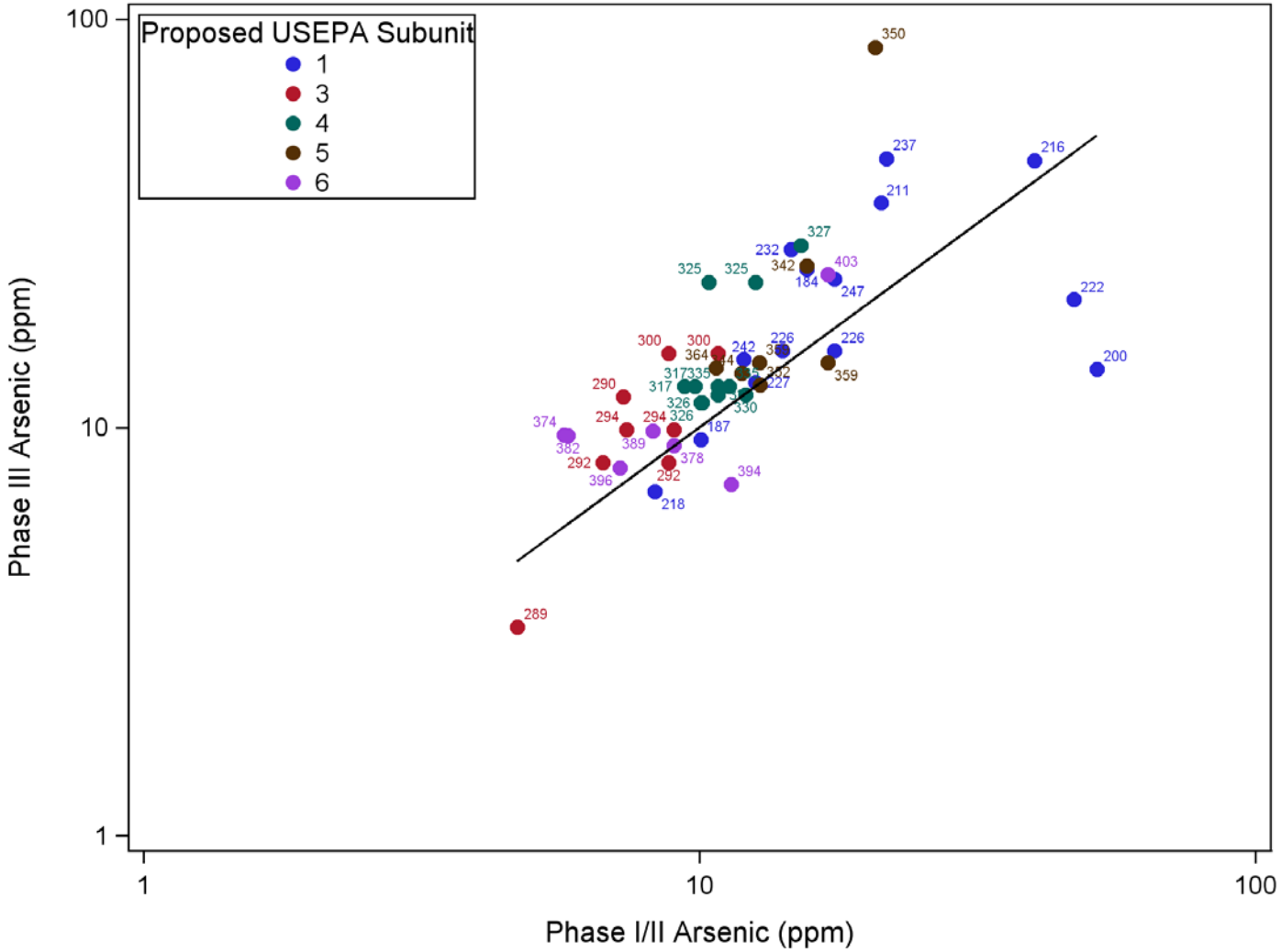
2,3,7,8-TCDD = 2,3,7,8-tetrachlorodibenzo-p-dioxin
ANOVA = analysis of variance
DDT = dichlorodiphenyl-trichloroethane
PCB = polychlorinated biphenyl
TPH = total petroleum hydrocarbon

Table G-5
Stratified Mean Surface Sediment Concentrations in the NBSA

Chemical	Units	Number of Samples[1]	Number of Detects	Stratified Mean[2]	Standard Error	95LCL	95UCL	Median	Minimum Detect	Maximum Detect
Arsenic	ppm	254	254	16.1	0.702	15	17.3	13.3	1.18	115
Barium	ppm	254	254	146	8.4	132	160	117	5.5	1260
Cadmium	ppm	254	252	1.56	0.125	1.35	1.76	0.91	0.0592	24.6
Chromium	ppm	254	254	107	5.59	98	116	95.8	3.95	777
Copper	ppm	254	254	123	6.27	113	133	100	1.5	924
Lead	ppm	254	254	146	15.4	121	172	111	2.18	2190
Mercury	ppm	254	254	1.92	0.131	1.7	2.14	1.48	0.0051	22.1
Nickel	ppm	254	254	41.2	1.32	39	43.4	37.9	3.83	282
Silver	ppm	254	253	1.64	0.0857	1.5	1.78	1.46	0.0448	12
Zinc	ppm	254	254	254	17.4	226	283	220	8.18	6810
2,3,7,8-TCDD	ppt	254	254	67.8	7.67	55.2	80.4	42.8	0.12	1710
bis(2-Ethylhexyl)phthalate	ppb	253	198	930	190	610	1200	340	96	38000
TPH	ppm	254	246	260	18	230	290	190	6.5	2900
Total DDT (4,4)	ppb	254	254	68	8.6	53	82	26	0.093	1800
Total Aroclor PCBs (Sum of 9 Aroclors)	ppb	254	239	200	15	170	220	140	6.4	2500
Total PCB Congeners (209)	ppt	254	254	382,000	27,800	336,000	428,000	277,254	2,480	5,030,000
Total Alpha + Gamma Chlordane	ppb	254	244	5	0.4	4.3	5.6	4.3	0.039	32

Notes:
[1] Sample counts and statistics include sediment samples collected during all Phase III sampling activities, including the 2014 Crab and Clam sampling program, the 2015 SQT sampling program, and the 2016 Phase III SI sampling program. Sample counts exclude samples with analytical results that were rejected in the data validation process.
[2] The stratified mean is a spatially weighted average (i.e. the average of each EPA subunit average, weighted by the area of the subunit) using the EPA subunits depicted on Figure 6-3.
One half the detection limit was substituted for non-detect data.
PAHs in sediment are being reanalyzed due to laboratory bias and are not presented.

Notes:
95LCL = One-sided 95% Lower Confidence Limit
95UCL = One-sided 95% Upper Confidence Limit
2,3,7,8-TCDD = 2,3,7,8-tetrachlorodibenzo-p-dioxin
DDT = dichlorodiphenyl-trichloroethane
PCB = polychlorinated biphenyl
TPH = total petroleum hydrocarbon
ppb = parts per billion; ppm = parts per million; ppt = parts per trillion



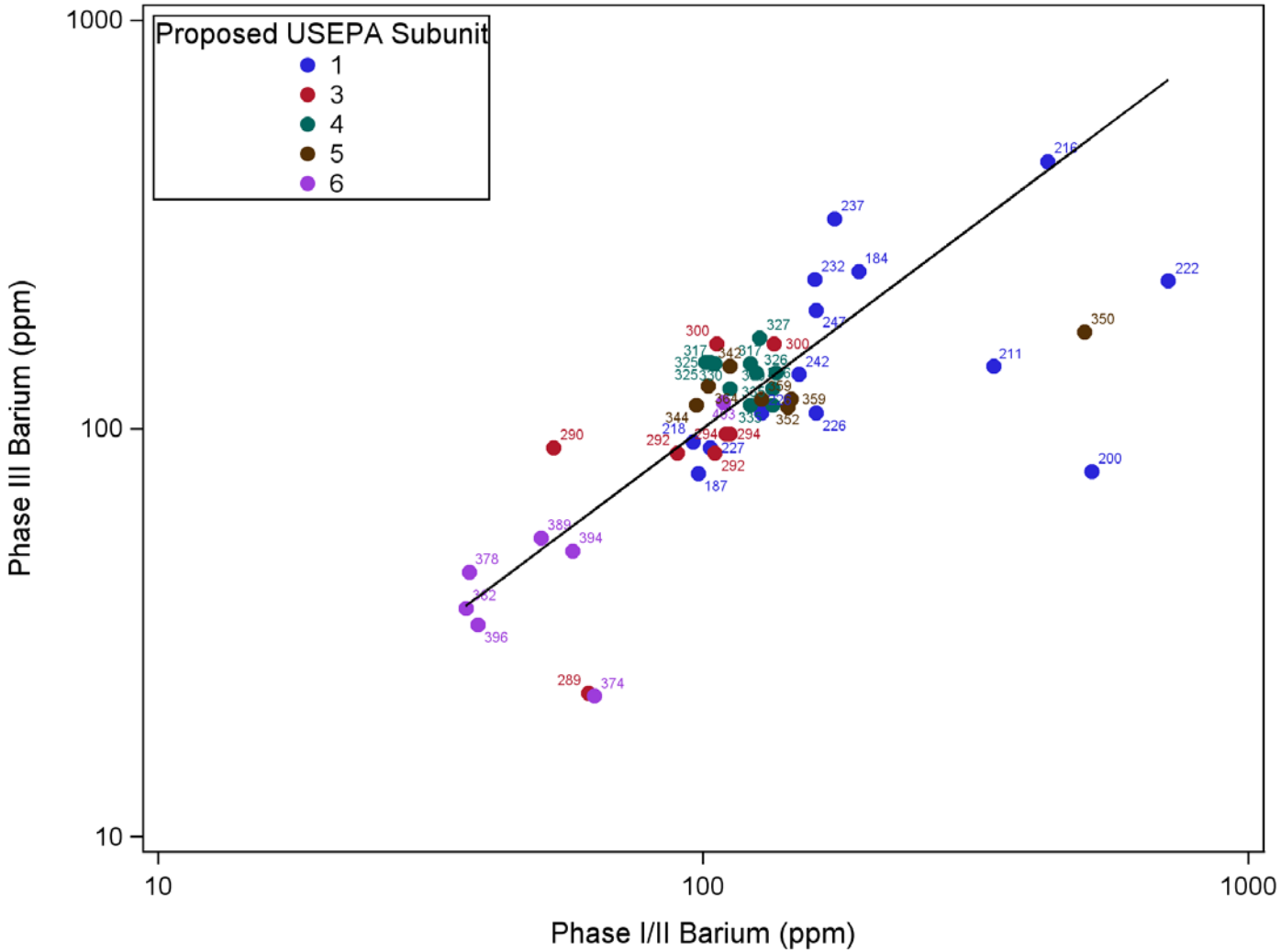
Notes:
Data labels indicate Phase III Station Identification. Black line is a 1:1 line along which concentrations would be in perfect agreement.
Only data detected in both programs are shown.
ppm = parts per million

NEWARK BAY STUDY AREA CONCEPTUAL SITE MODEL

Comparison of Phase I/II to Phase III Sediment Concentrations in Co-locates: Arsenic

JANUARY 2019

FIGURE
G-1



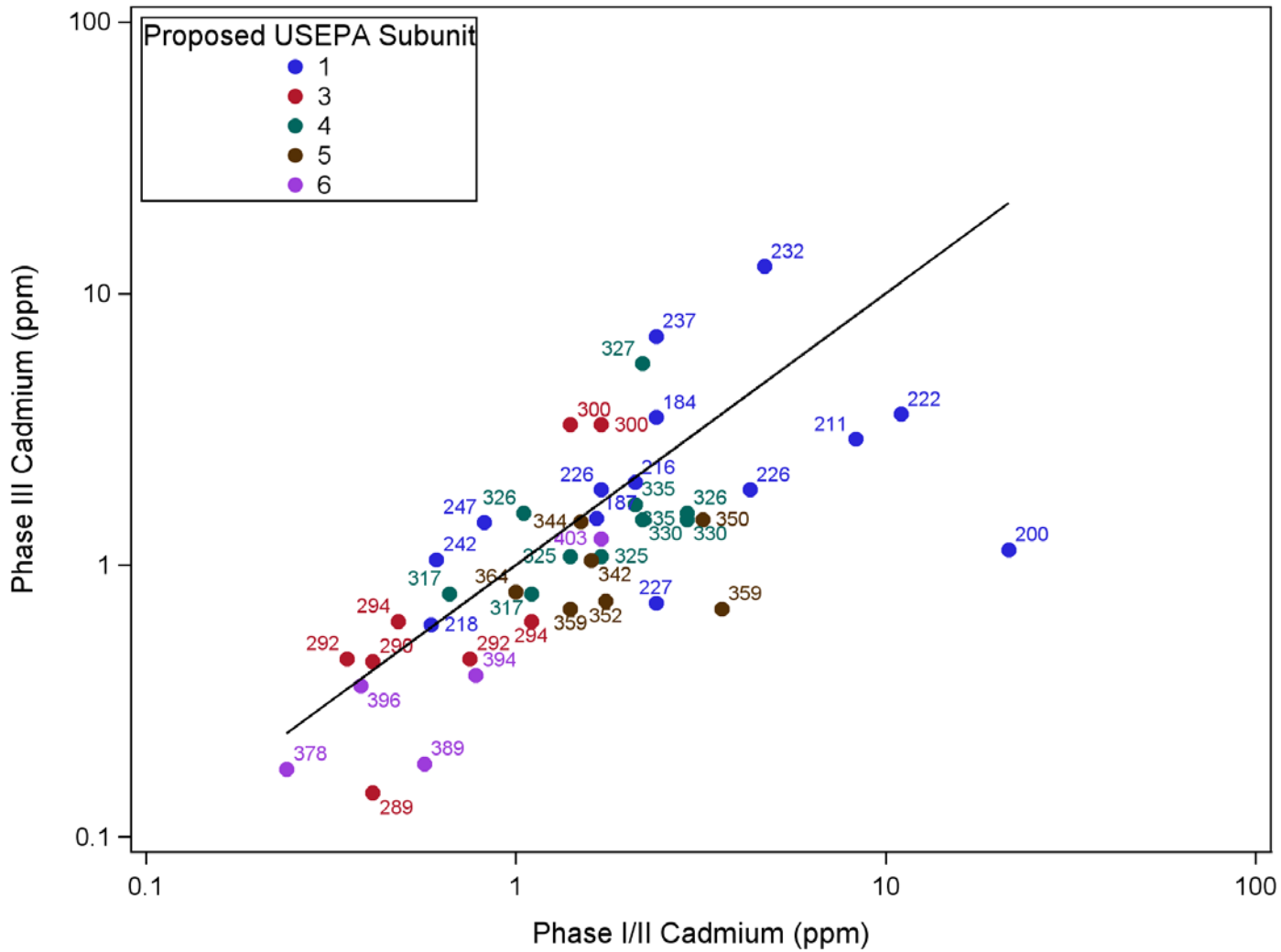
Notes:
Data labels indicate Phase III Station Identification. Black line is a 1:1 line along which concentrations would be in perfect agreement.
Only data detected in both programs are shown.
ppm = parts per million

NEWARK BAY STUDY AREA CONCEPTUAL SITE MODEL

Comparison of Phase I/II to Phase III Sediment Concentrations in Co-locates: Barium

JANUARY 2019

FIGURE
G-2



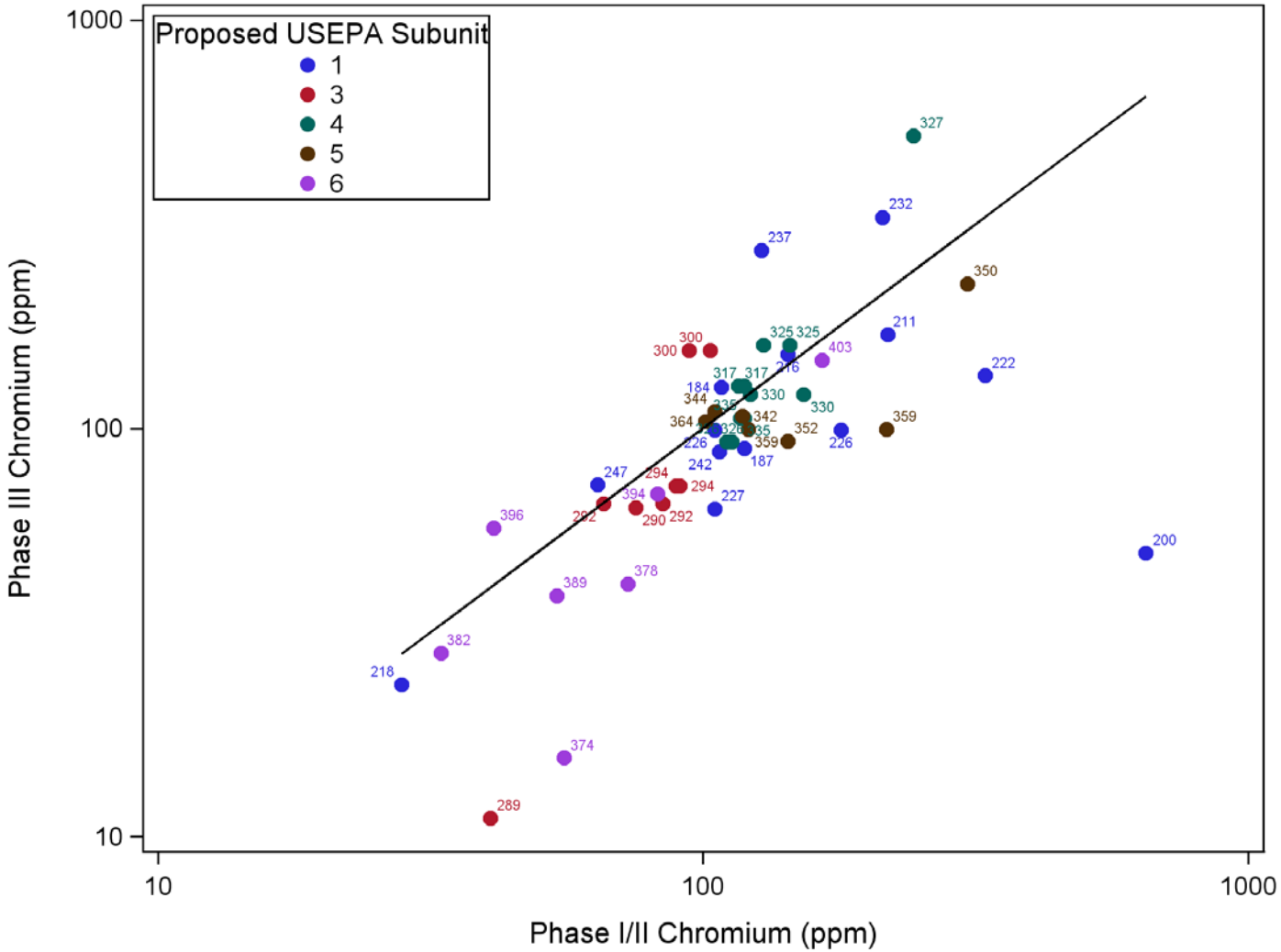
Notes:
Data labels indicate Phase III Station Identification. Black line is a 1:1 line along which concentrations would be in perfect agreement.
Only data detected in both programs are shown.
ppm = parts per million

NEWARK BAY STUDY AREA CONCEPTUAL SITE MODEL

Comparison of Phase I/II to Phase III Sediment Concentrations in Co-locates: Cadmium

JANUARY 2019

FIGURE
G-3



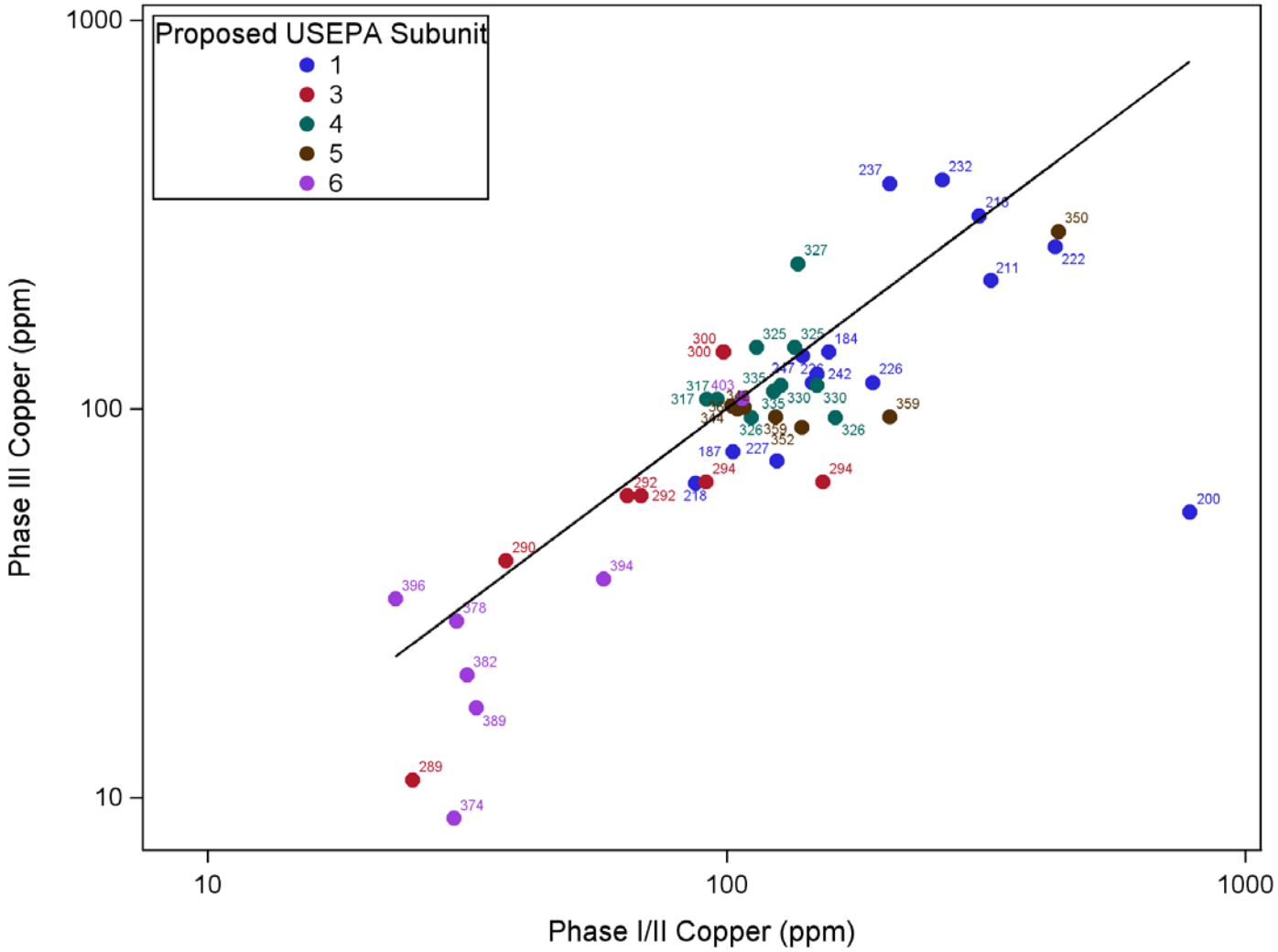
Notes:
Data labels indicate Phase III Station Identification. Black line is a 1:1 line along which concentrations would be in perfect agreement.
Only data detected in both programs are shown.
ppm = parts per million

NEWARK BAY STUDY AREA CONCEPTUAL SITE MODEL

Comparison of Phase I/II to Phase III Sediment Concentrations in Co-locates: Chromium

JANUARY 2019

FIGURE
G-4



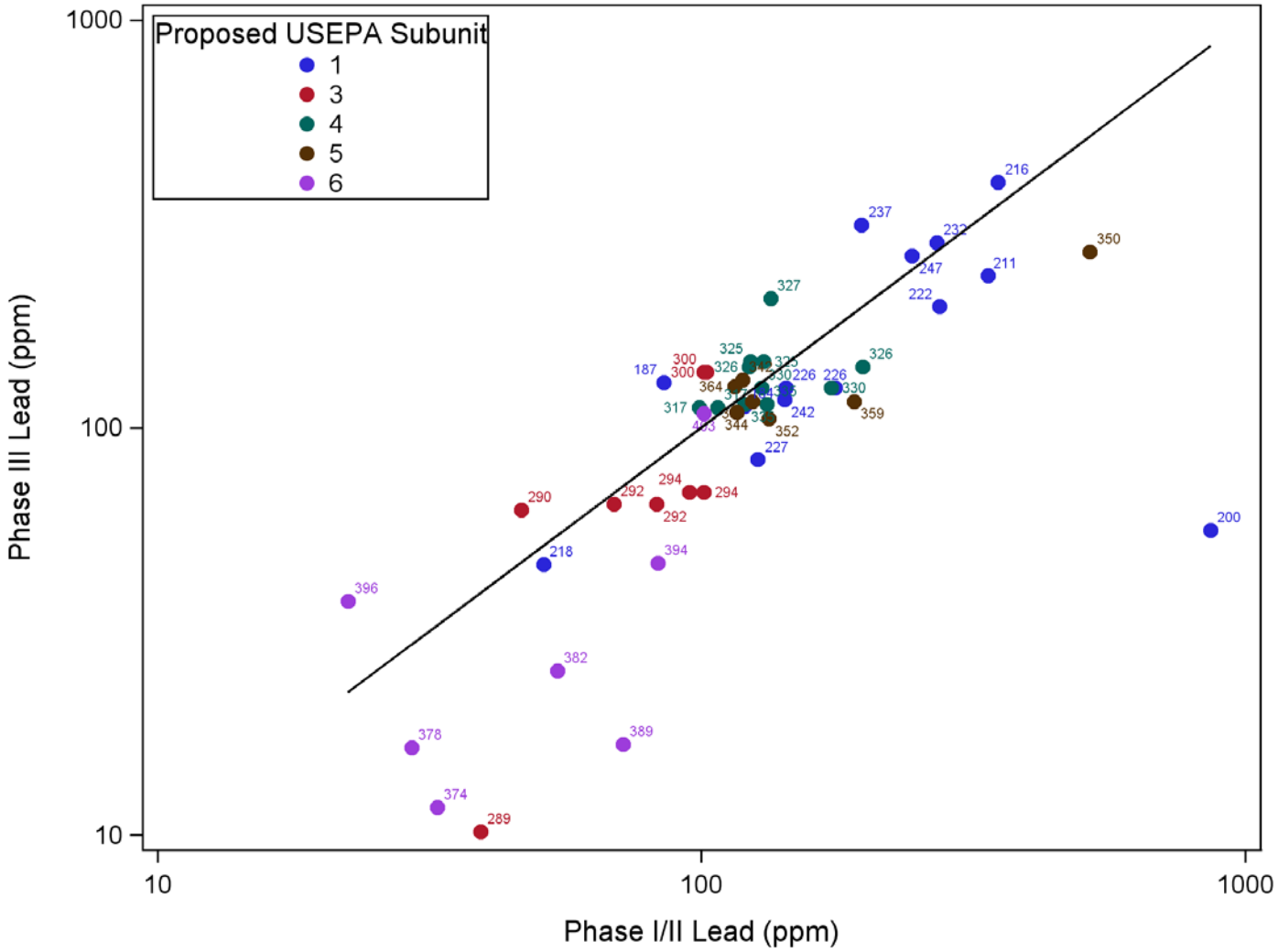
Notes:
Data labels indicate Phase III Station Identification. Black line is a 1:1 line along which concentrations would be in perfect agreement.
Only data detected in both programs are shown.
ppm = parts per million

NEWARK BAY STUDY AREA CONCEPTUAL SITE MODEL

Comparison of Phase I/II to Phase III Sediment Concentrations in Co-locates: Copper

JANUARY 2019

FIGURE
G-5



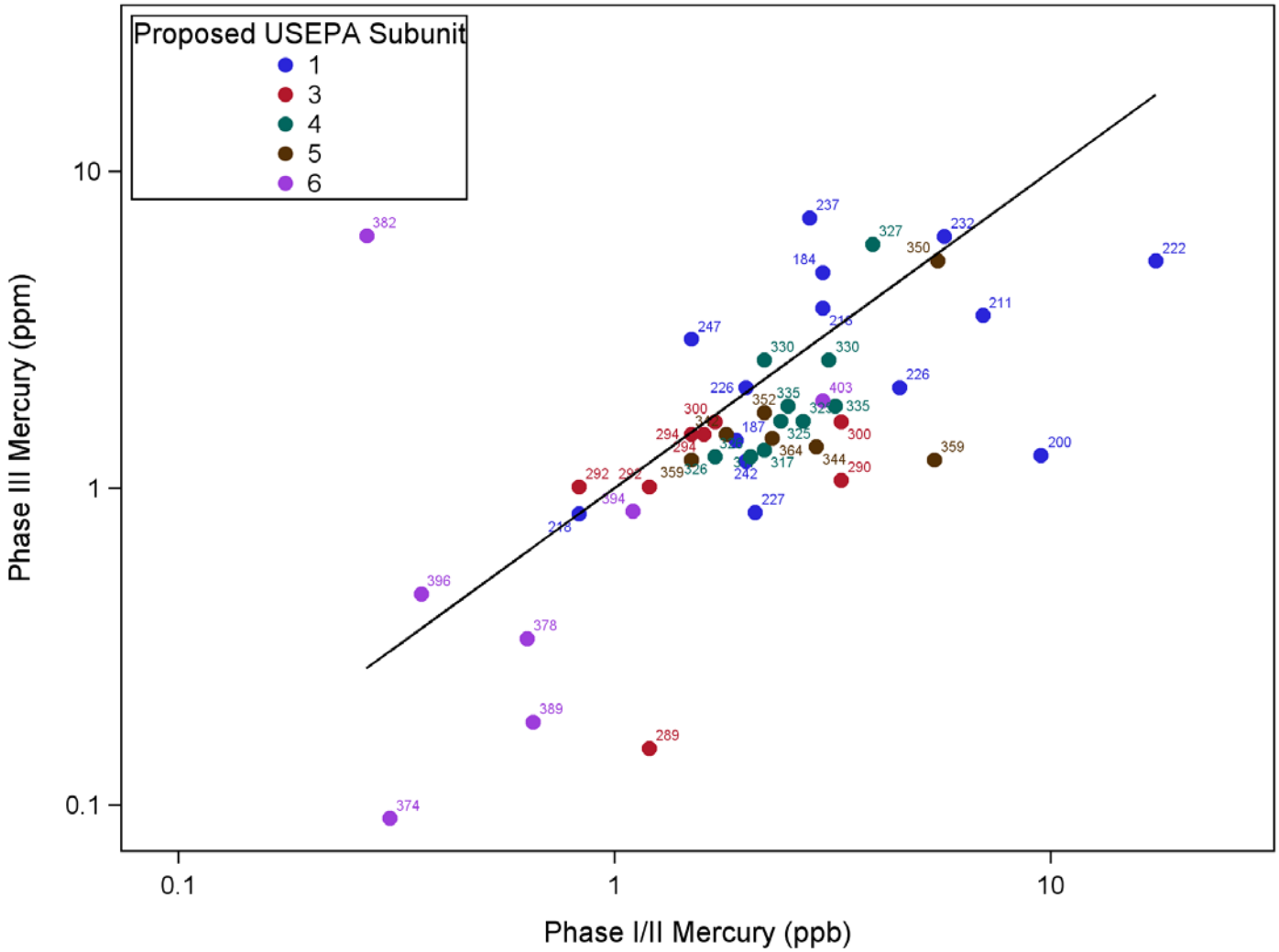
Notes:
Data labels indicate Phase III Station Identification. Black line is a 1:1 line along which concentrations would be in perfect agreement.
Only data detected in both programs are shown.
ppm = parts per million

NEWARK BAY STUDY AREA CONCEPTUAL SITE MODEL

Comparison of Phase I/II to Phase III Sediment Concentrations in Co-locates: Lead

JANUARY 2019

FIGURE
G-6



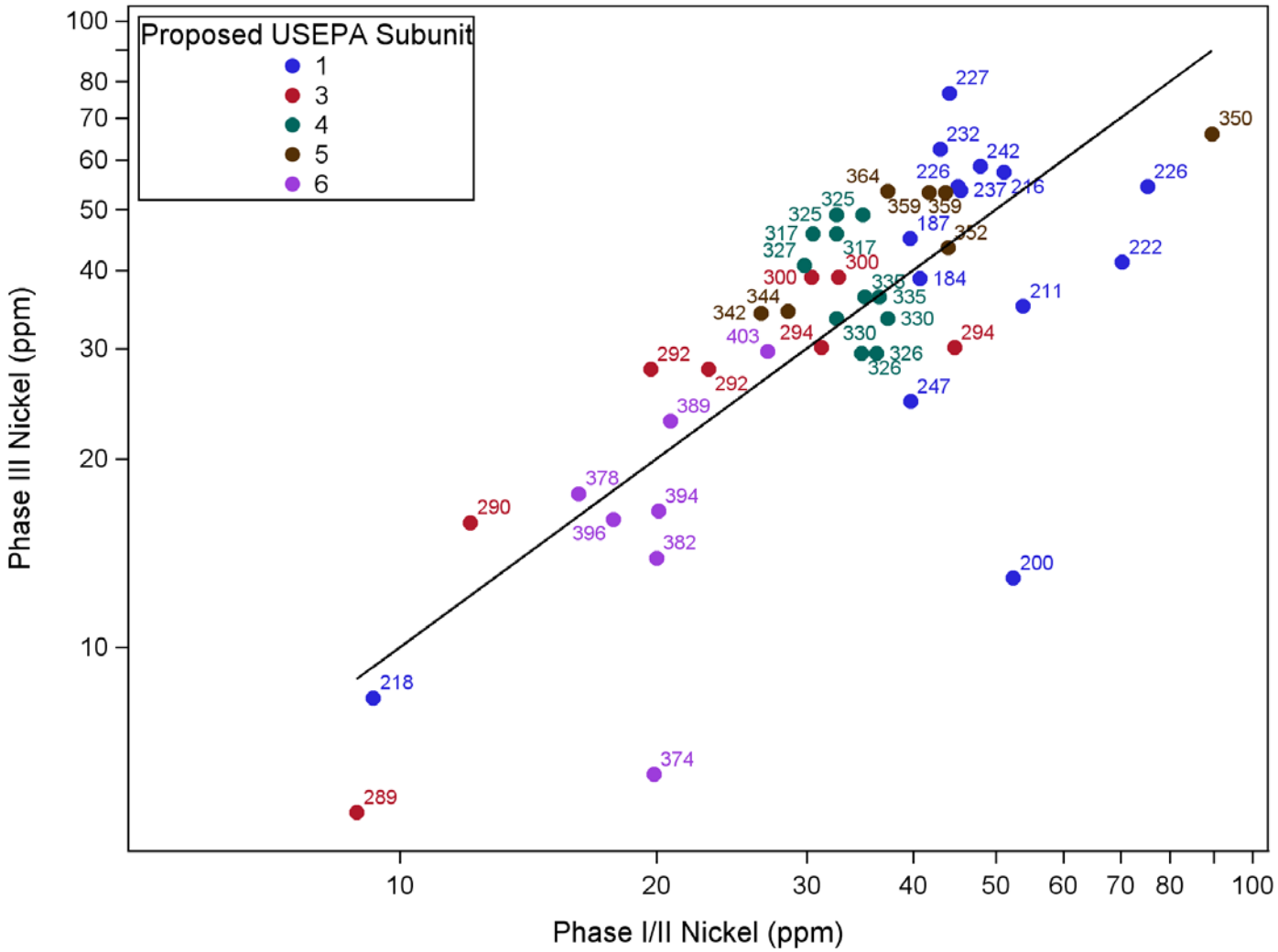
Notes:
Data labels indicate Phase III Station Identification. Black line is a 1:1 line along which concentrations would be in perfect agreement.
Only data detected in both programs are shown.
ppm = parts per million

NEWARK BAY STUDY AREA CONCEPTUAL SITE MODEL

Comparison of Phase I/II to Phase III Sediment Concentrations in Co-locates: Mercury

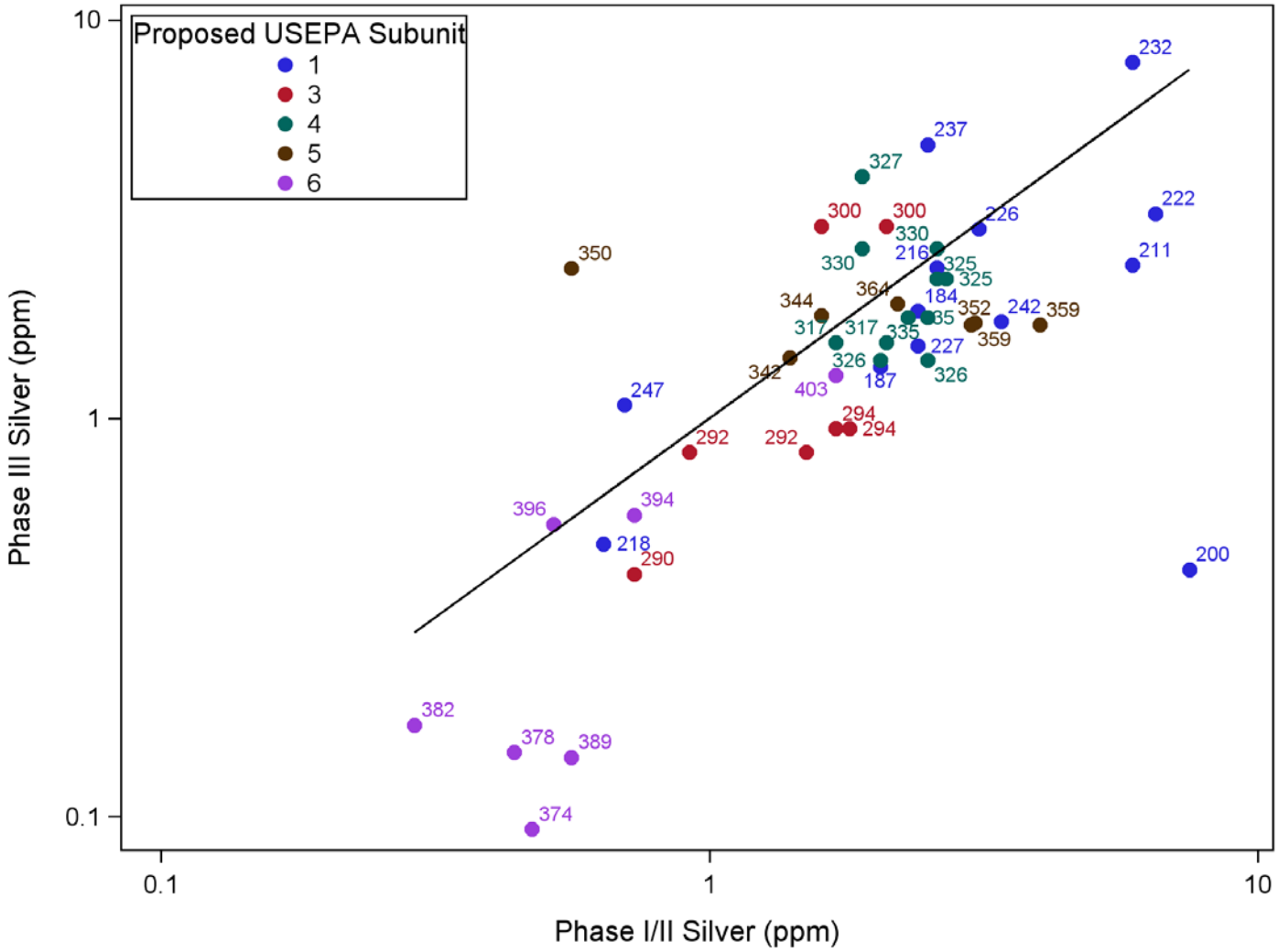
JANUARY 2019

FIGURE
G-7



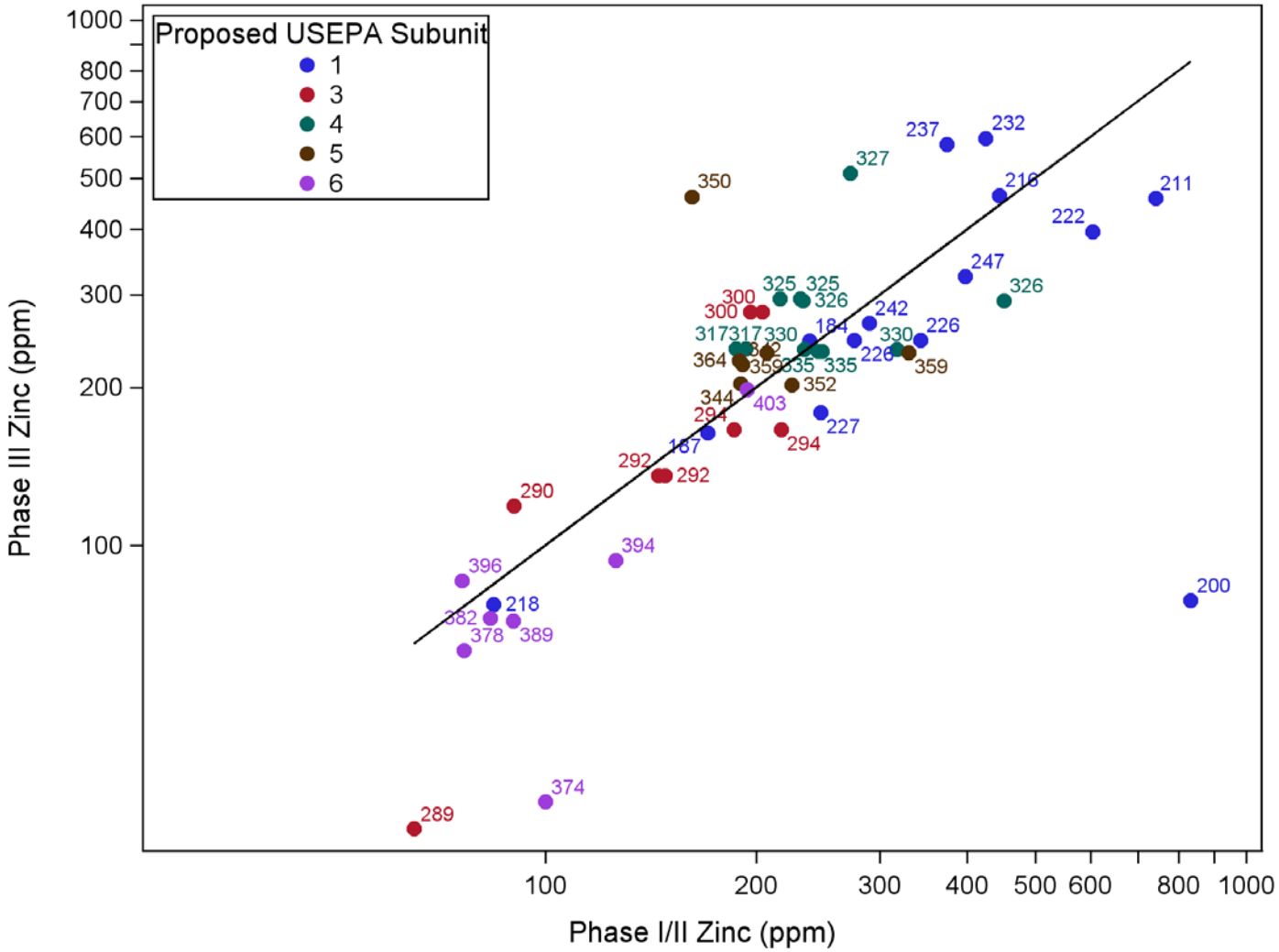
Notes:
Data labels indicate Phase III Station Identification. Black line is a 1:1 line along which concentrations would be in perfect agreement.
Only data detected in both programs are shown.
ppm = parts per million

NEWARK BAY STUDY AREA CONCEPTUAL SITE MODEL	
Comparison of Phase I/II to Phase III Sediment Concentrations in Co-locates: Nickel	
JANUARY 2019	FIGURE G-8



Notes:
Data labels indicate Phase III Station Identification. Black line is a 1:1 line along which concentrations would be in perfect agreement.
Only data detected in both programs are shown.
ppm = parts per million

NEWARK BAY STUDY AREA CONCEPTUAL SITE MODEL	
Comparison of Phase I/II to Phase III Sediment Concentrations in Co-locates: Silver	
JANUARY 2019	FIGURE G-9



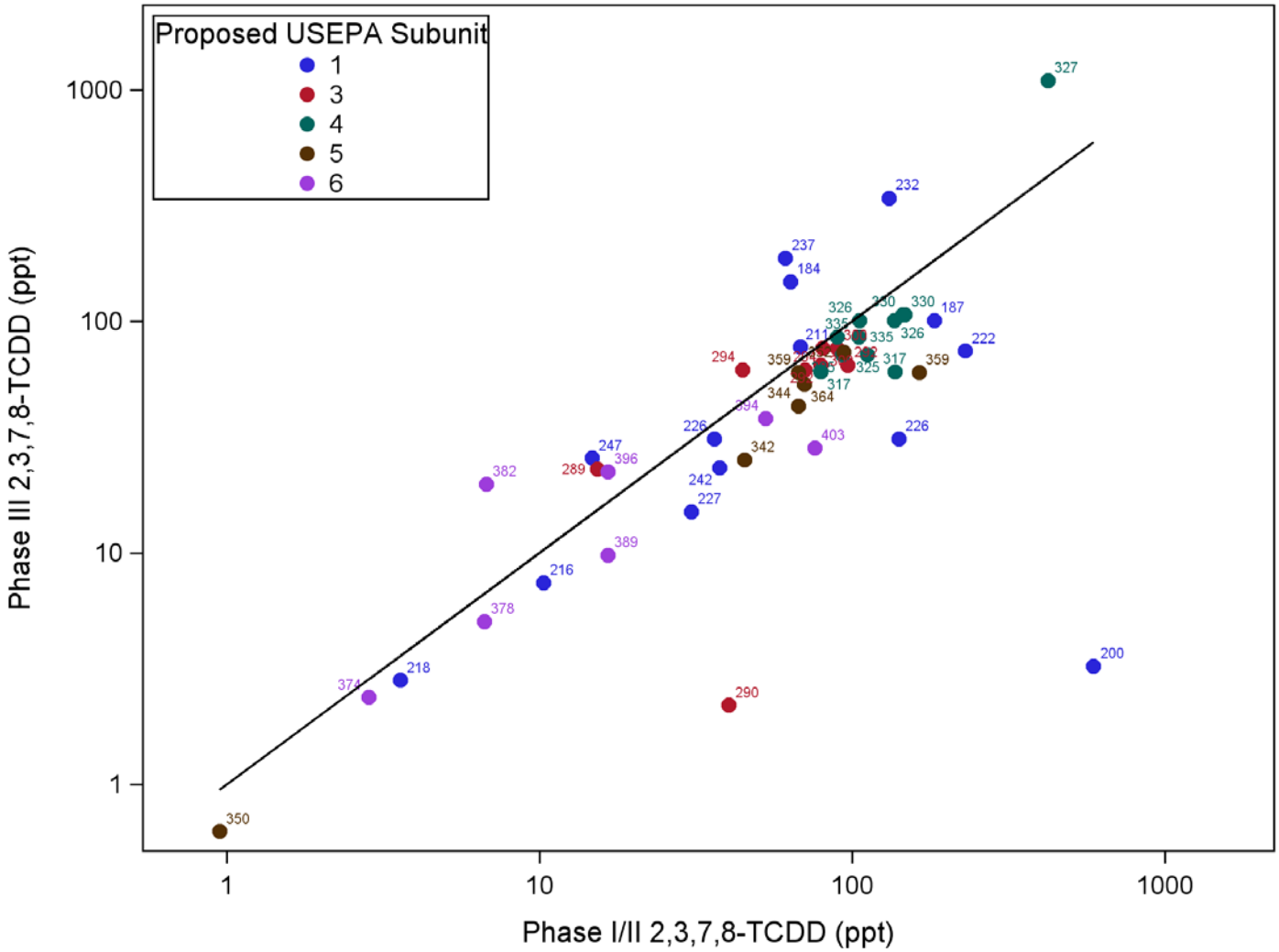
Notes:
Data labels indicate Phase III Station Identification. Black line is a 1:1 line along which concentrations would be in perfect agreement.
Only data detected in both programs are shown.
ppm = parts per million

NEWARK BAY STUDY AREA CONCEPTUAL SITE MODEL

Comparison of Phase I/II to Phase III Sediment Concentrations in Co-locates: Zinc

JANUARY 2019

FIGURE
G-10



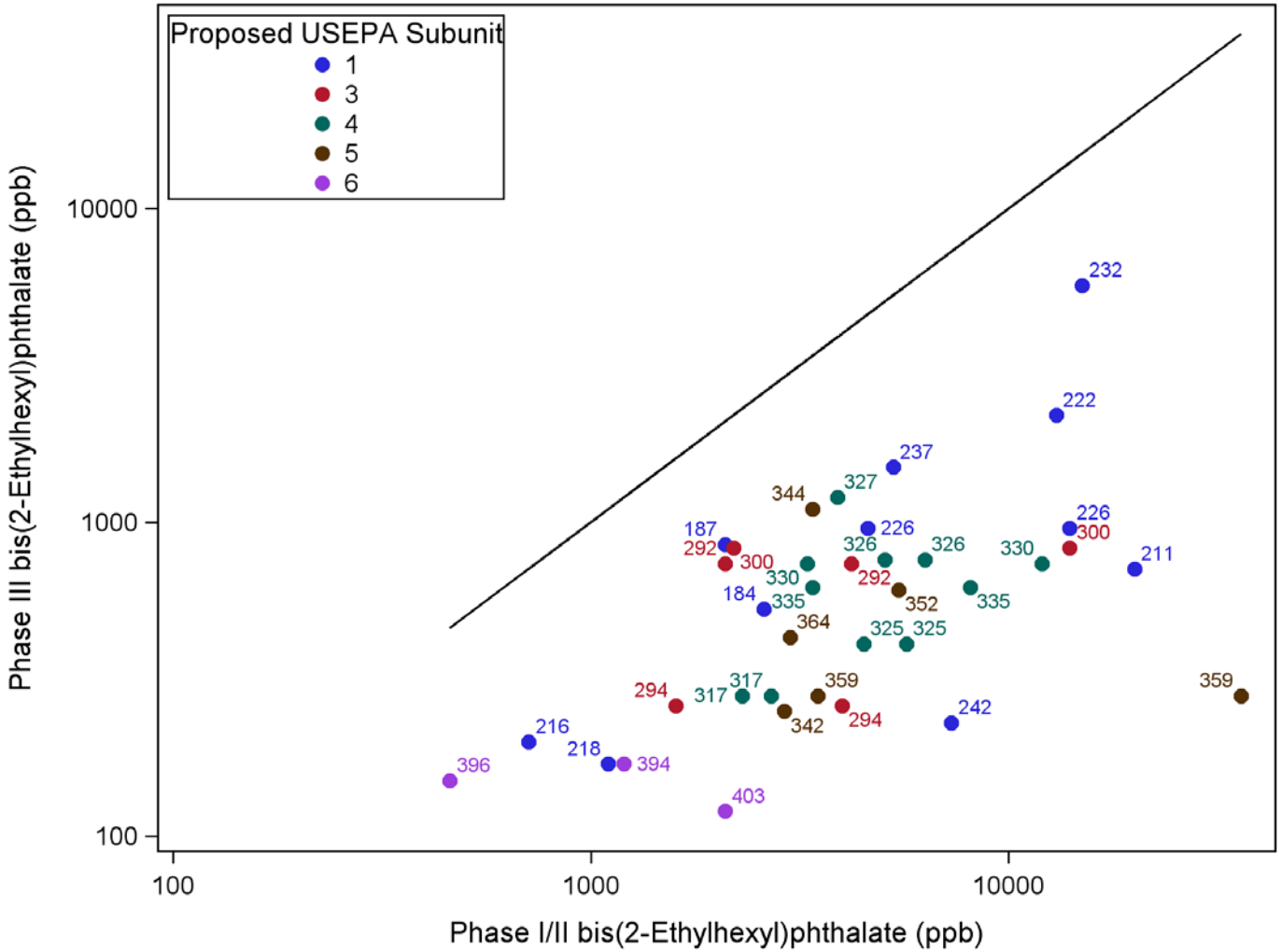
Notes:
Data labels indicate Phase III Station Identification. Black line is a 1:1 line along which concentrations would be in perfect agreement.
Only data detected in both programs are shown.
ppt = parts per trillion

NEWARK BAY STUDY AREA CONCEPTUAL SITE MODEL

Comparison of Phase I/II to Phase III Sediment Concentrations in Co-locates: 2,3,7,8-TCDD

JANUARY 2019

FIGURE
G-11



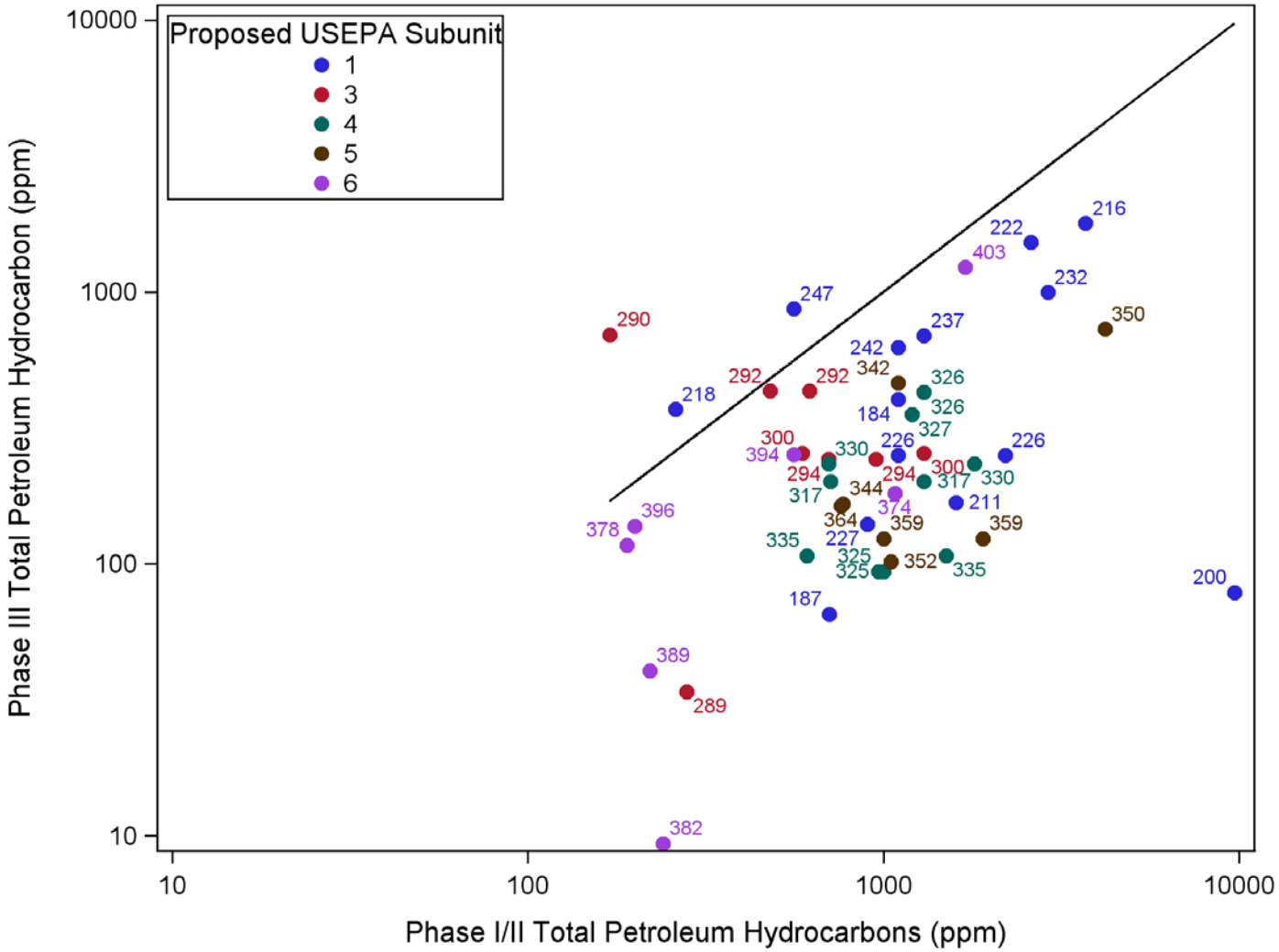
Notes:
Data labels indicate Phase III Station Identification. Black line is a 1:1 line along which concentrations would be in perfect agreement.
Only data detected in both programs are shown.
ppb = parts per billion

NEWARK BAY STUDY AREA CONCEPTUAL SITE MODEL

Comparison of Phase I/II to Phase III Sediment Concentrations in Co-locates: Bis(2-Ethylhexyl)phthalate

JANUARY 2019

FIGURE
G-12



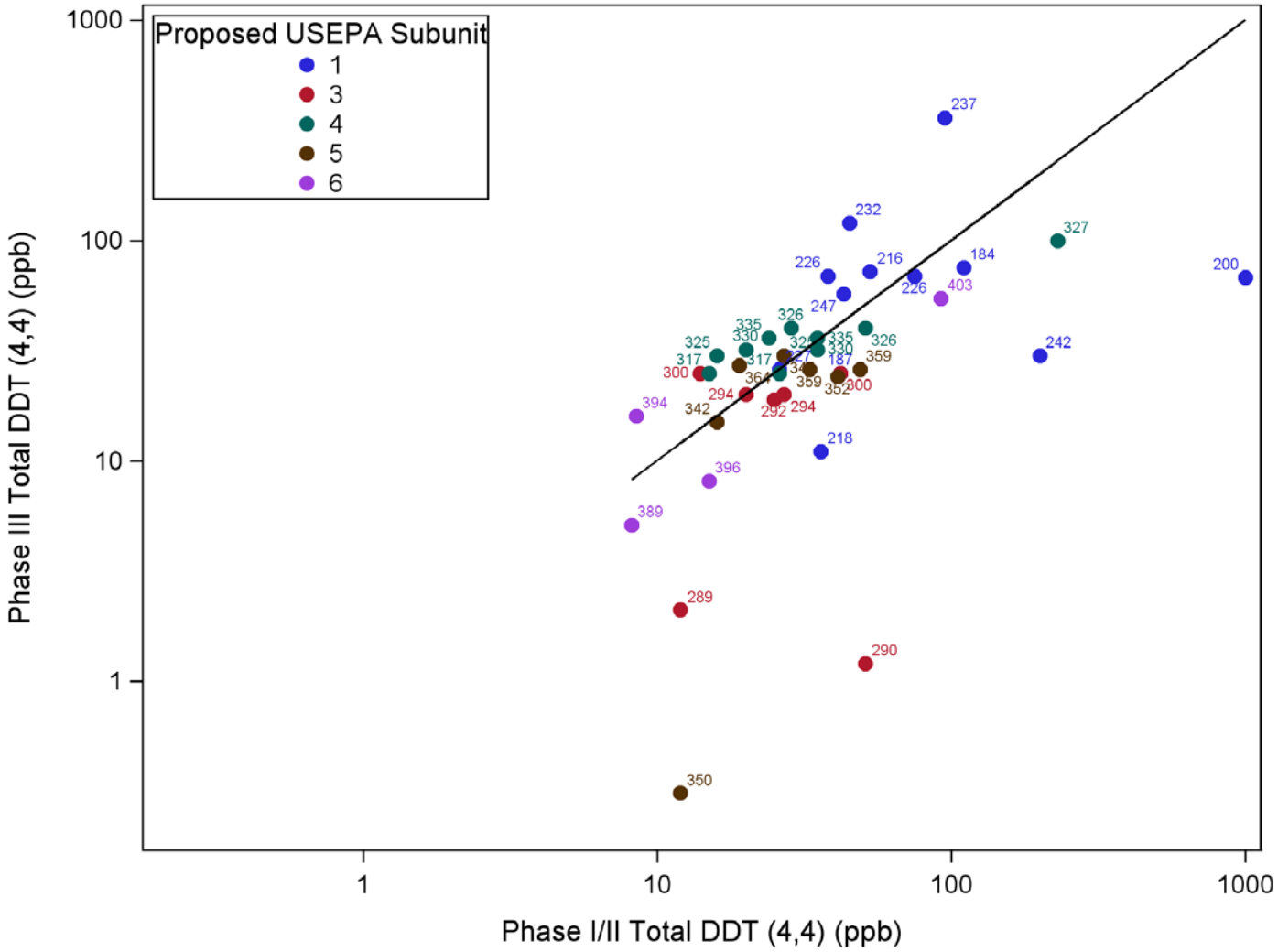
Notes:
Data labels indicate Phase III Station Identification. Black line is a 1:1 line along which concentrations would be in perfect agreement.
Only data detected in both programs are shown.
ppm = parts per million

NEWARK BAY STUDY AREA CONCEPTUAL SITE MODEL

Comparison of Phase I/II to Phase III Sediment Concentrations in Co-locates: TPH

JANUARY 2019

FIGURE
G-13



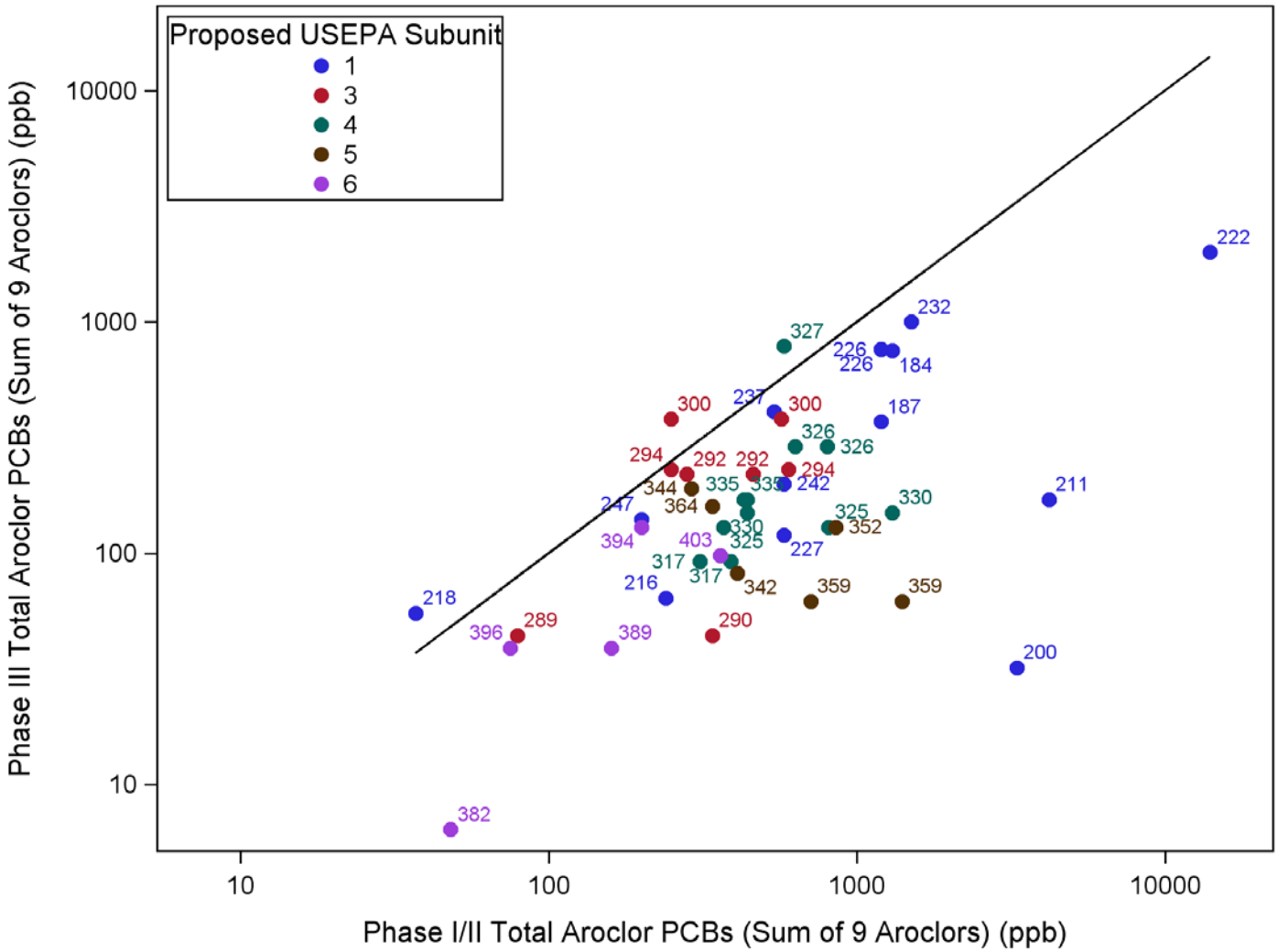
Notes:
Data labels indicate Phase III Station Identification. Black line is a 1:1 line along which concentrations would be in perfect agreement.
Only data detected in both programs are shown.
ppb = parts per billion

NEWARK BAY STUDY AREA CONCEPTUAL SITE MODEL

Comparison of Phase I/II to Phase III Sediment Concentrations in Co-locates: Total DDT

JANUARY 2019

FIGURE
G-14



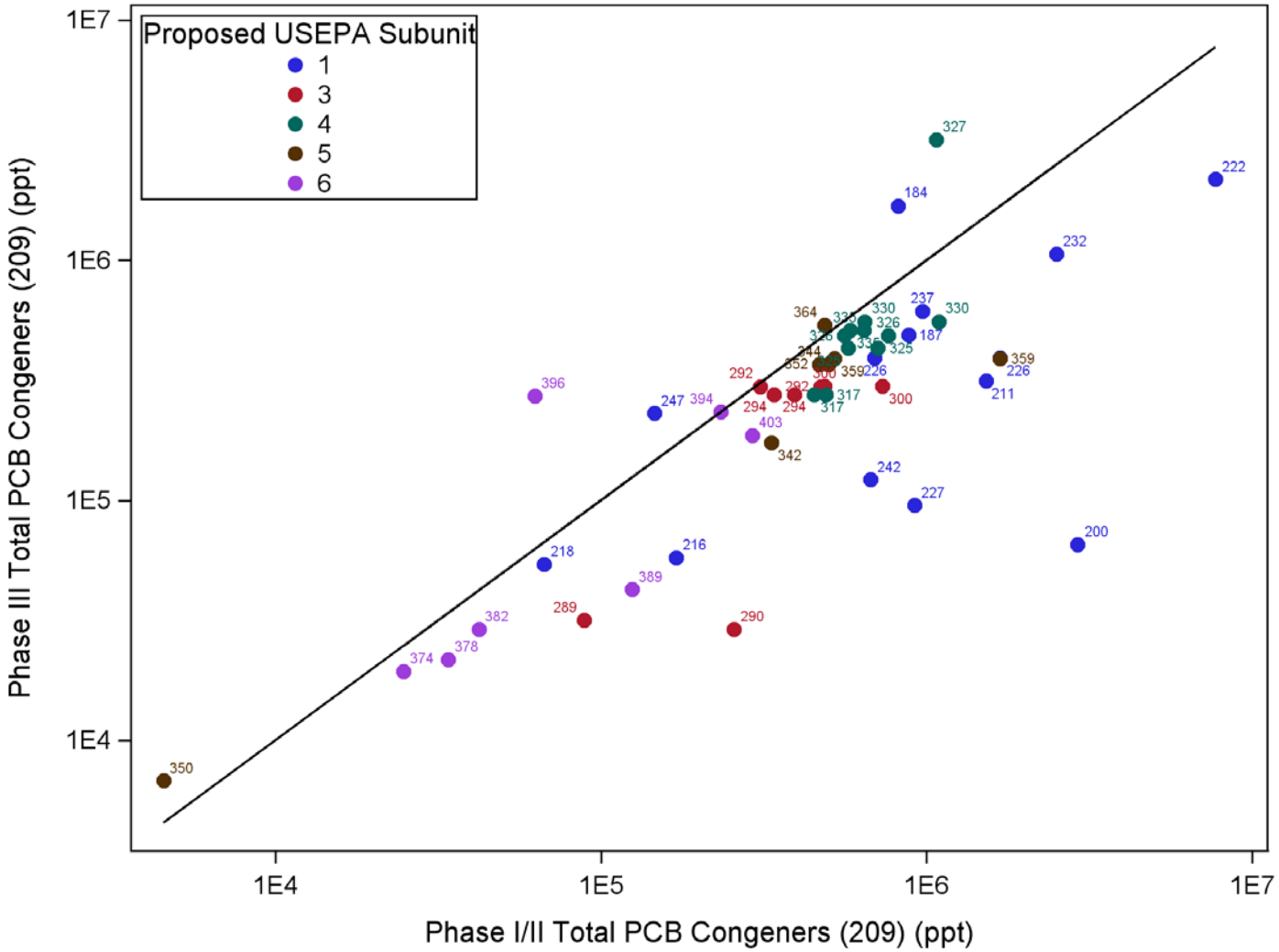
Notes:
Data labels indicate Phase III Station Identification. Black line is a 1:1 line along which concentrations would be in perfect agreement.
Only data detected in both programs are shown.
ppb = parts per billion

NEWARK BAY STUDY AREA CONCEPTUAL SITE MODEL

Comparison of Phase I/II to Phase III Sediment Concentrations in Co-locates: Total Aroclor PCBs

JANUARY 2019

FIGURE
G-15



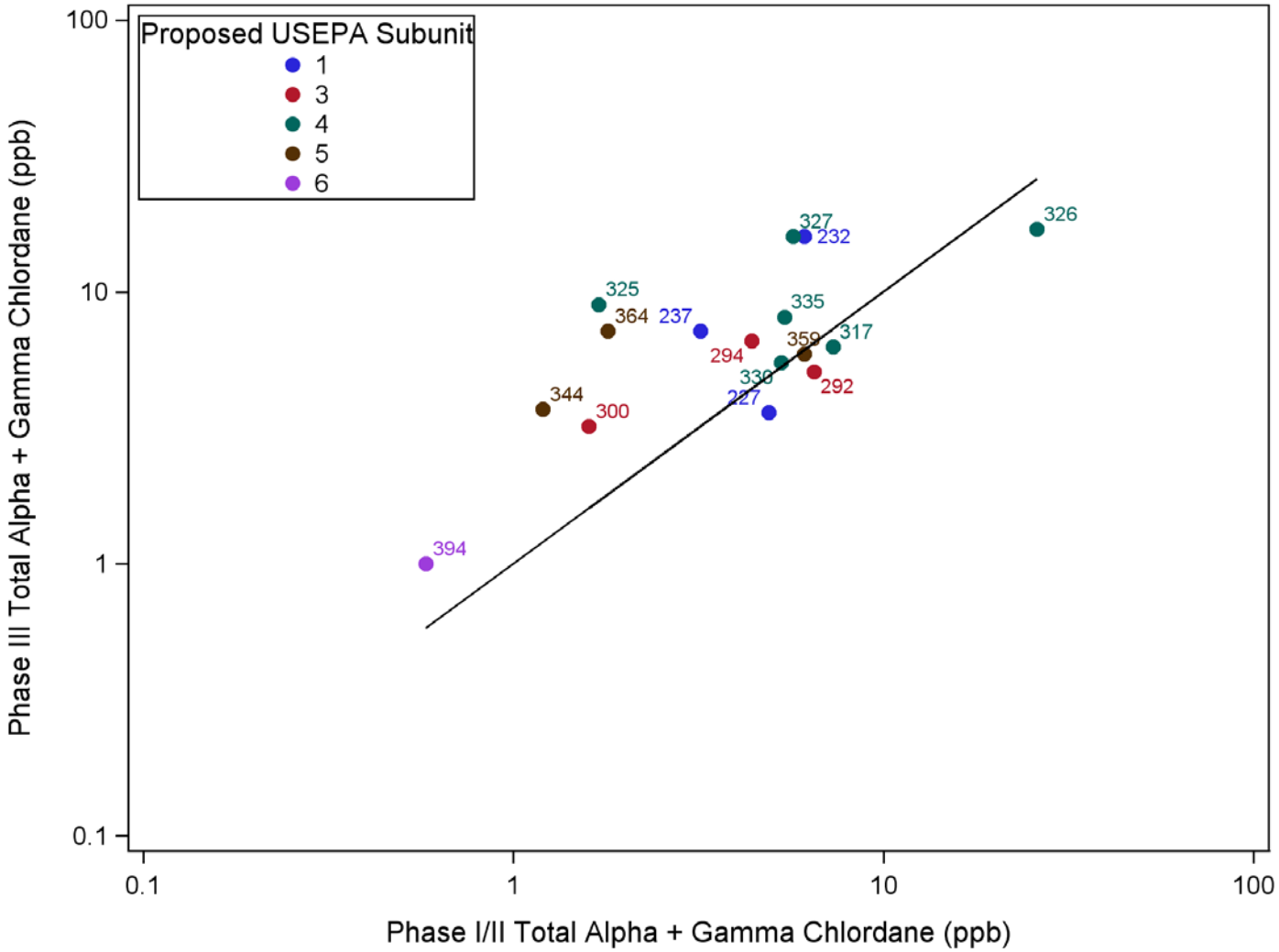
Notes:
Data labels indicate Phase III Station Identification. Black line is a 1:1 line along which concentrations would be in perfect agreement.
Only data detected in both programs are shown.
ppt = parts per trillion

NEWARK BAY STUDY AREA CONCEPTUAL SITE MODEL

Comparison of Phase I/II to Phase III Sediment Concentrations in Co-locates: Total PCB Congeners

JANUARY 2019

FIGURE
G-16



Notes:
Data labels indicate Phase III Station Identification. Black line is a 1:1 line along which concentrations would be in perfect agreement. Not detected during Phase I Sampling Program. Only data detected in both programs are shown.
ppb = parts per billion

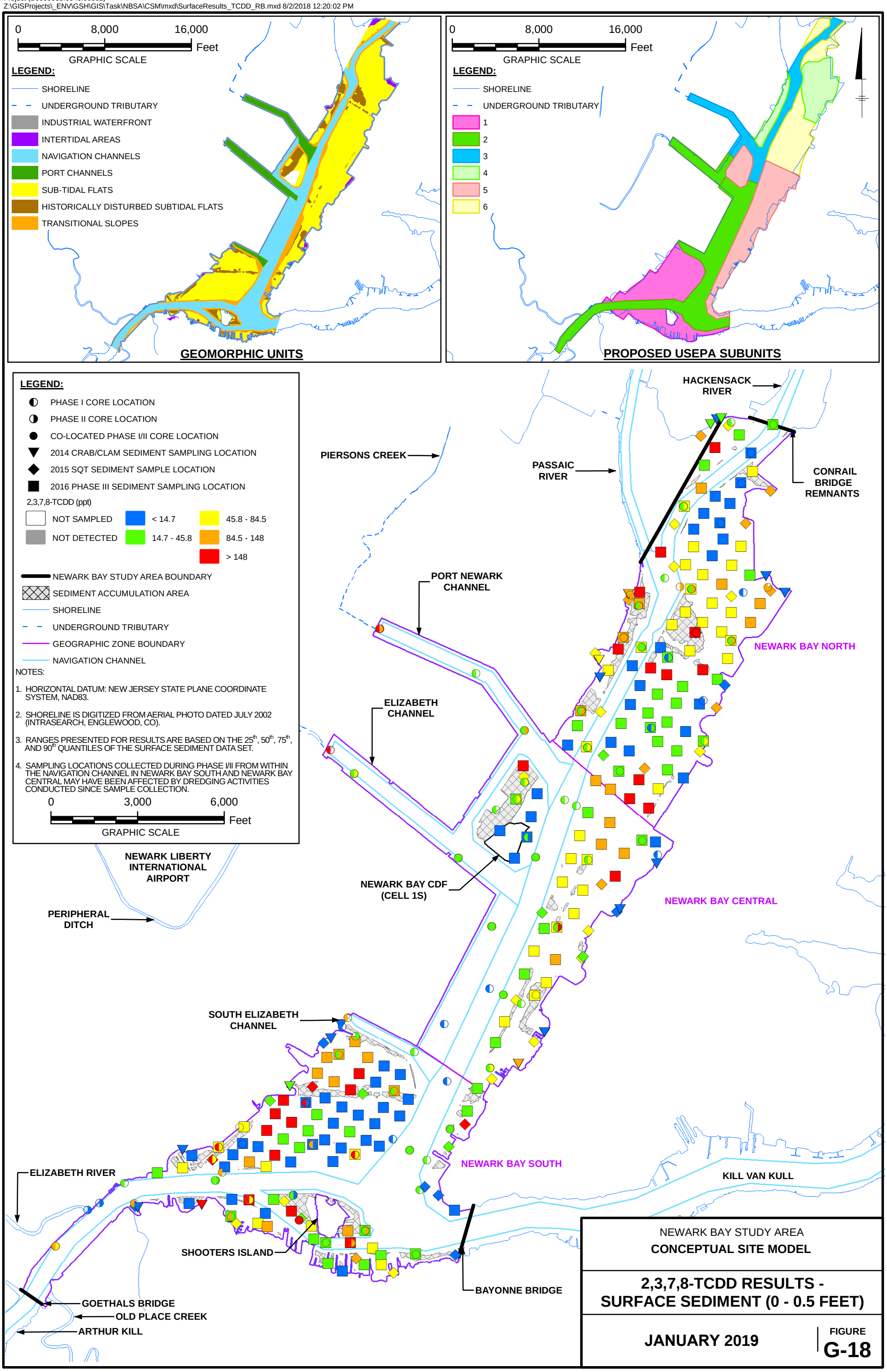
NEWARK BAY STUDY AREA CONCEPTUAL SITE MODEL

Comparison of Phase I/II to Phase III Sediment Concentrations in Co-locates: Total Alpha+Gamma Chlordane

JANUARY 2019

FIGURE
G-17

City: Citrix Div/Group: IM/DV Created By: K. Sinsabaugh Last Saved By: ksinsabaugh
Project (B0009989.0045.00002)
Z:\GISProjects_ENV\GSH\GIS\Task\NBSA\CSM\mxd\SurfaceResults_TCDD_RB.mxd 8/2/2018 12:20:02 PM



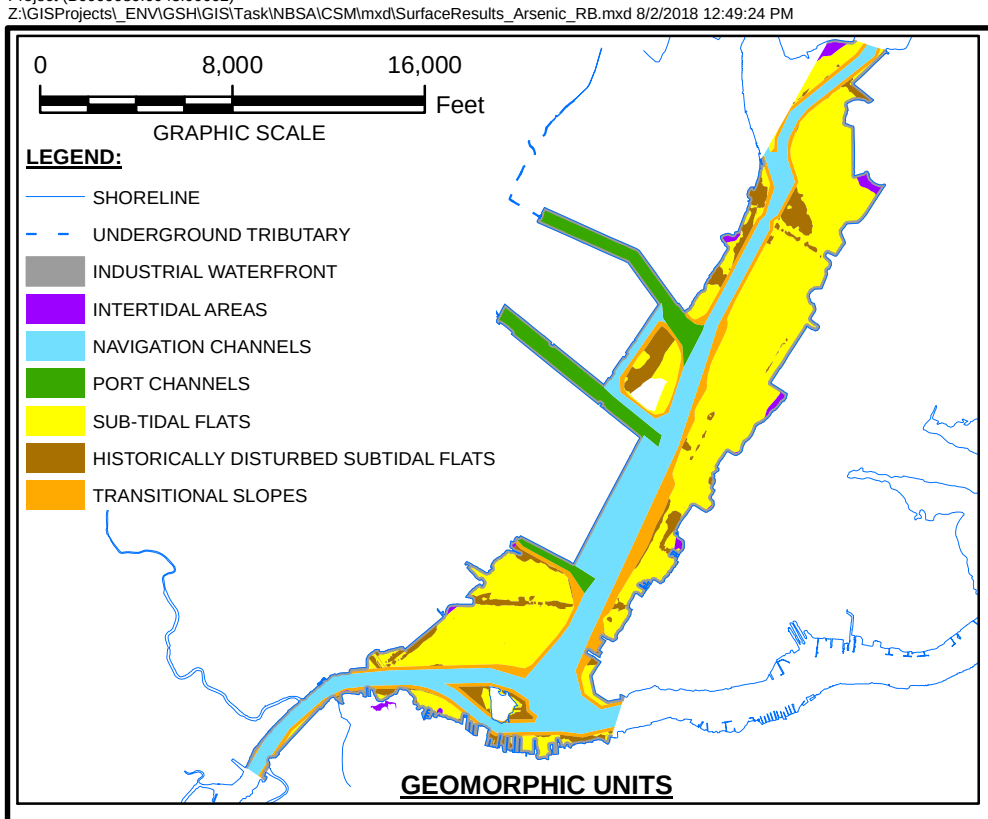
NEWARK BAY STUDY AREA
CONCEPTUAL SITE MODEL

2,3,7,8-TCDD RESULTS - SURFACE SEDIMENT (0 - 0.5 FEET)

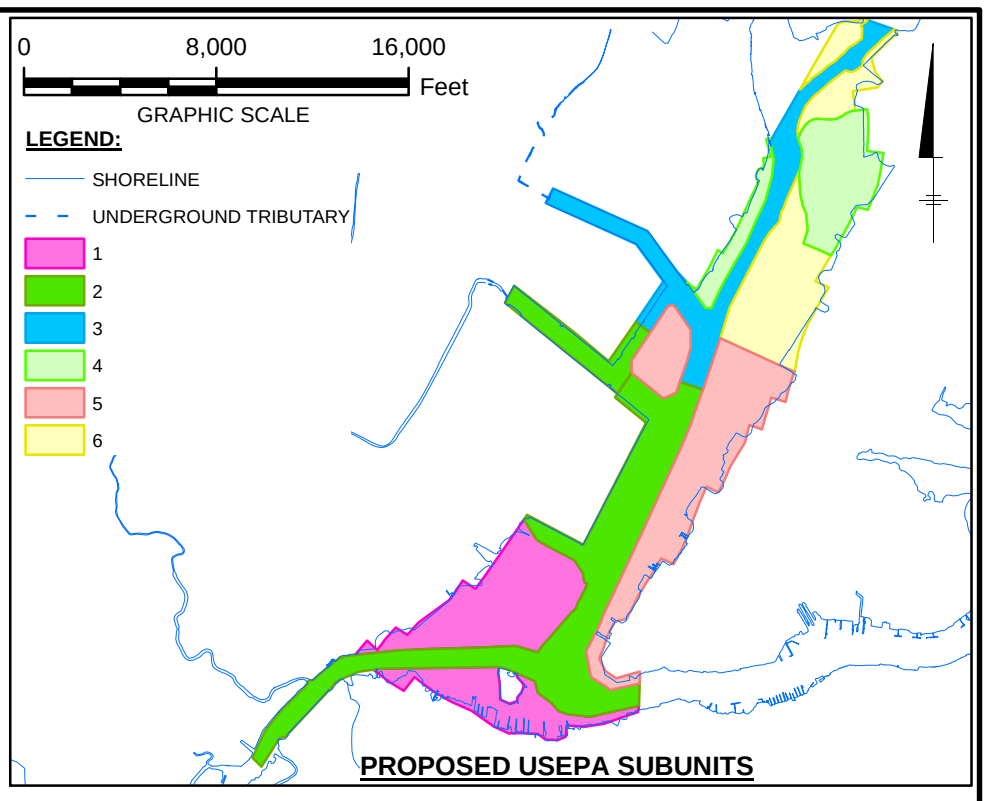
JANUARY 2019

FIGURE
G-18

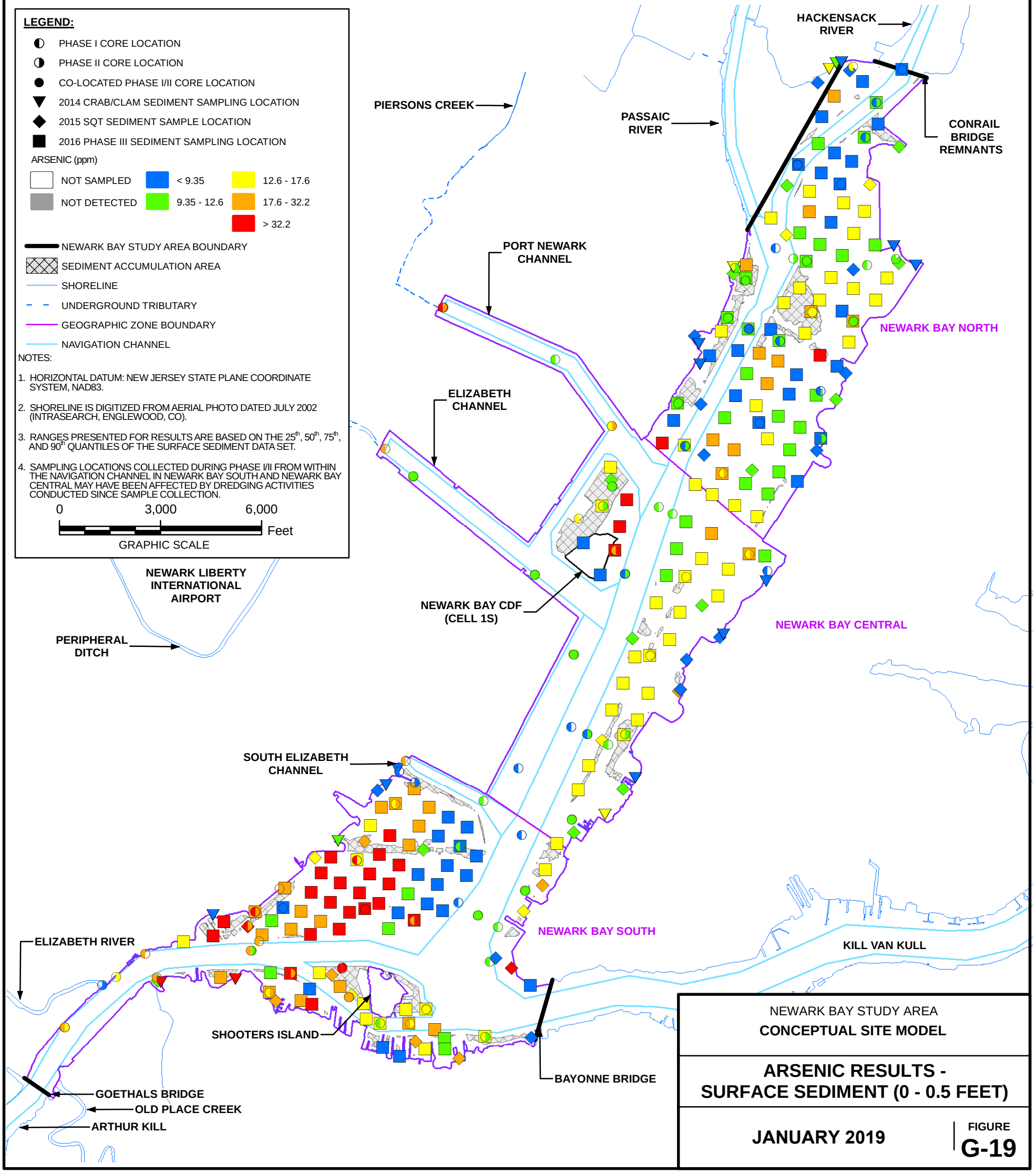
City: Citrix Div/Group: IM/DV Created By: K. Sinsabaugh Last Saved By: ksinsabaugh
Project (B0009989.0045.00002)
Z:\GISProjects_ENV\GSH\GIS\Task\NBSA\CSM\mxd\SurfaceResults_Arsenic_RB.mxd 8/2/2018 12:49:24 PM



GEOMORPHIC UNITS



PROPOSED USEPA SUBUNITS



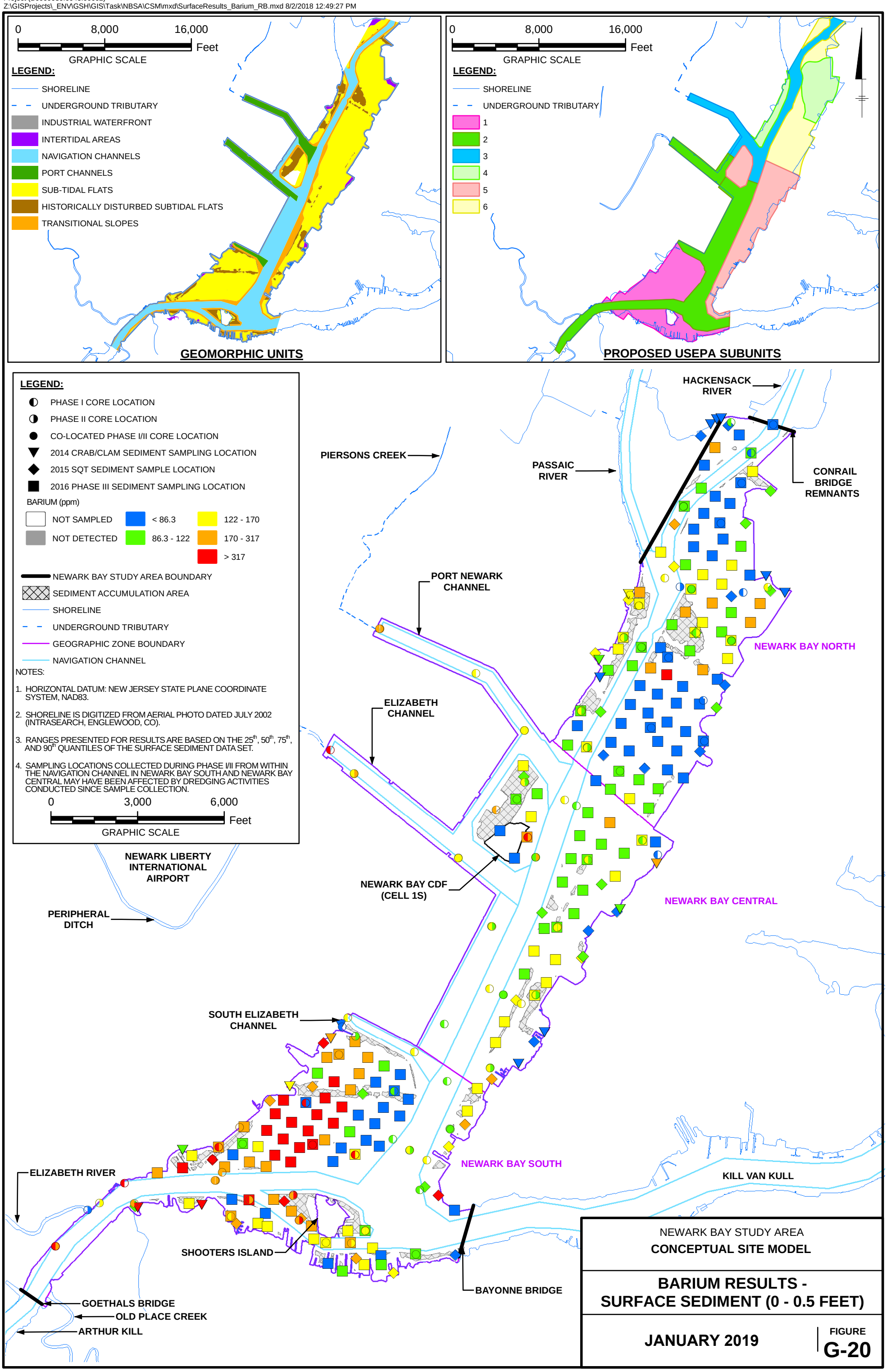
NEWARK BAY STUDY AREA
CONCEPTUAL SITE MODEL

ARSENIC RESULTS - SURFACE SEDIMENT (0 - 0.5 FEET)

JANUARY 2019

FIGURE
G-19

City: Citrix Div/Group: IM/DV Created By: K. Sinsabaugh Last Saved By: ksinsabaugh
Project (B0009989.0045.00002)
Z:\GISProjects_ENV\GSH\GIS\Task\NBSA\CSM\mxd\SurfaceResults_Barium_RB.mxd 8/2/2018 12:49:27 PM



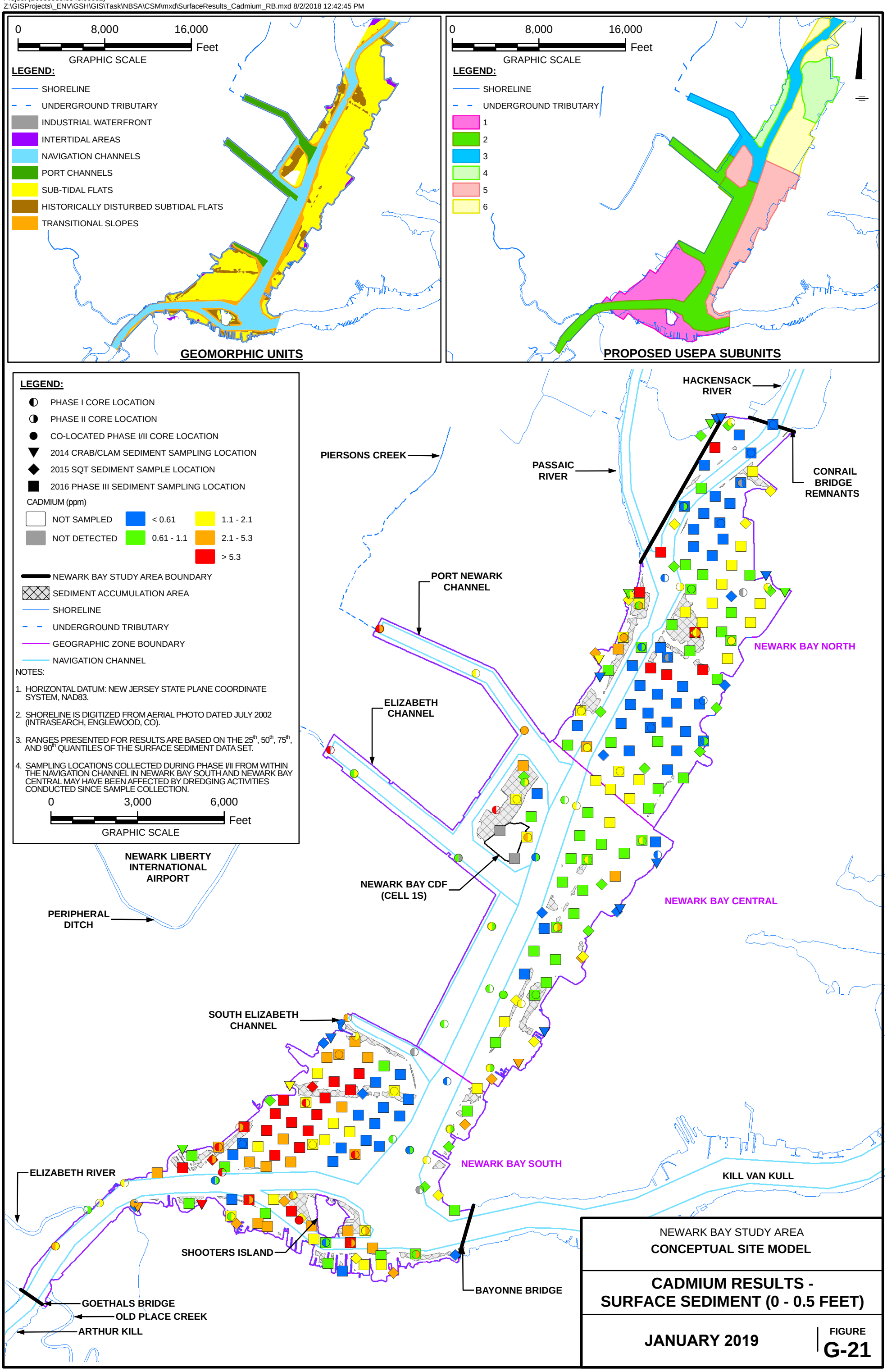
NEWARK BAY STUDY AREA
CONCEPTUAL SITE MODEL

BARIUM RESULTS - SURFACE SEDIMENT (0 - 0.5 FEET)

JANUARY 2019

FIGURE
G-20

City: Citrix Div/Group: IM/DV Created By: K. Sinsabaugh Last Saved By: ksinsabaugh
Project (B0009989.0045.00002)
Z:\GISProjects_ENV\GSH\GIS\Task\NBSA\CSM\mxd\SurfaceResults_Cadmium_RB.mxd 8/2/2018 12:42:45 PM



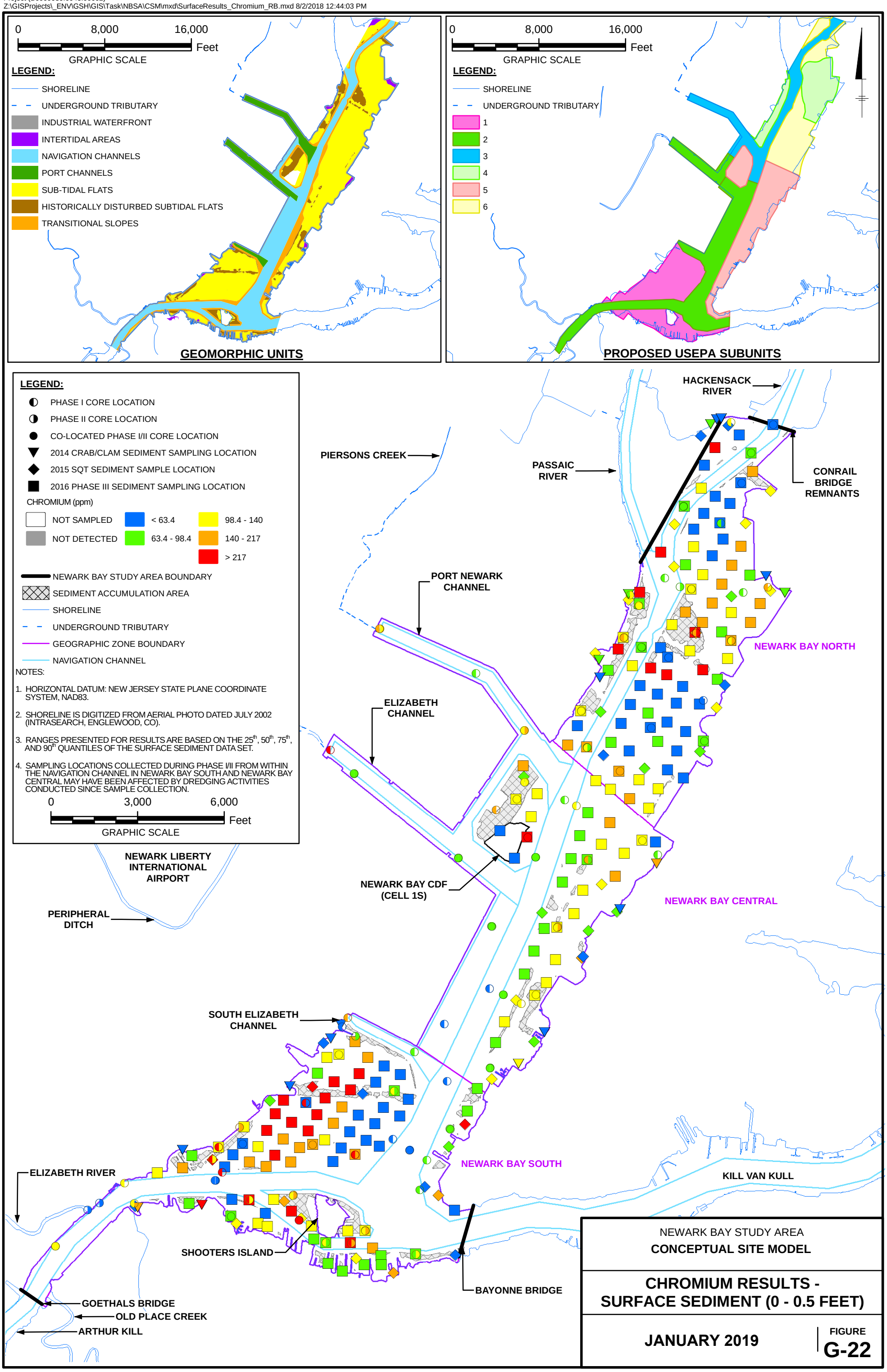
NEWARK BAY STUDY AREA
CONCEPTUAL SITE MODEL

CADMIUM RESULTS - SURFACE SEDIMENT (0 - 0.5 FEET)

JANUARY 2019

FIGURE
G-21

City: Citrix Div/Group: IM/DV Created By: K. Sinsabaugh Last Saved By: ksinsabaugh
Project (B0009989.0045.00002)
Z:\GISProjects_ENV\GSH\GIS\Task\NBSA\CSM\mxd\SurfaceResults_Chromium_RB.mxd 8/2/2018 12:44:03 PM



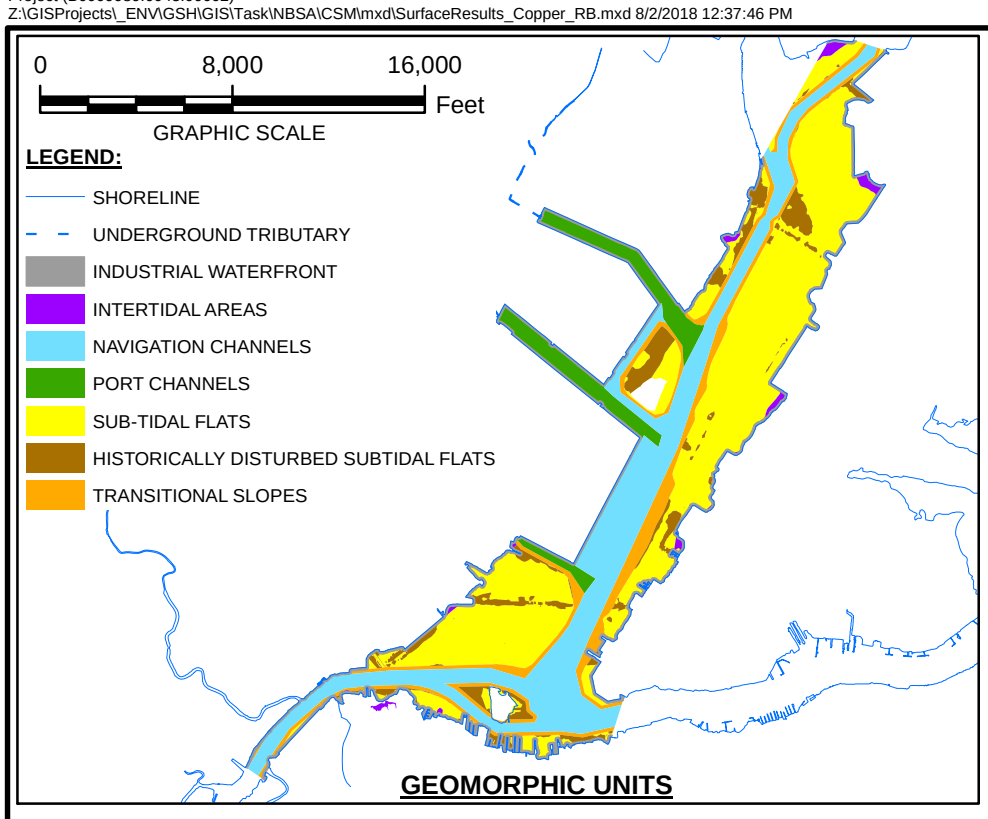
NEWARK BAY STUDY AREA
CONCEPTUAL SITE MODEL

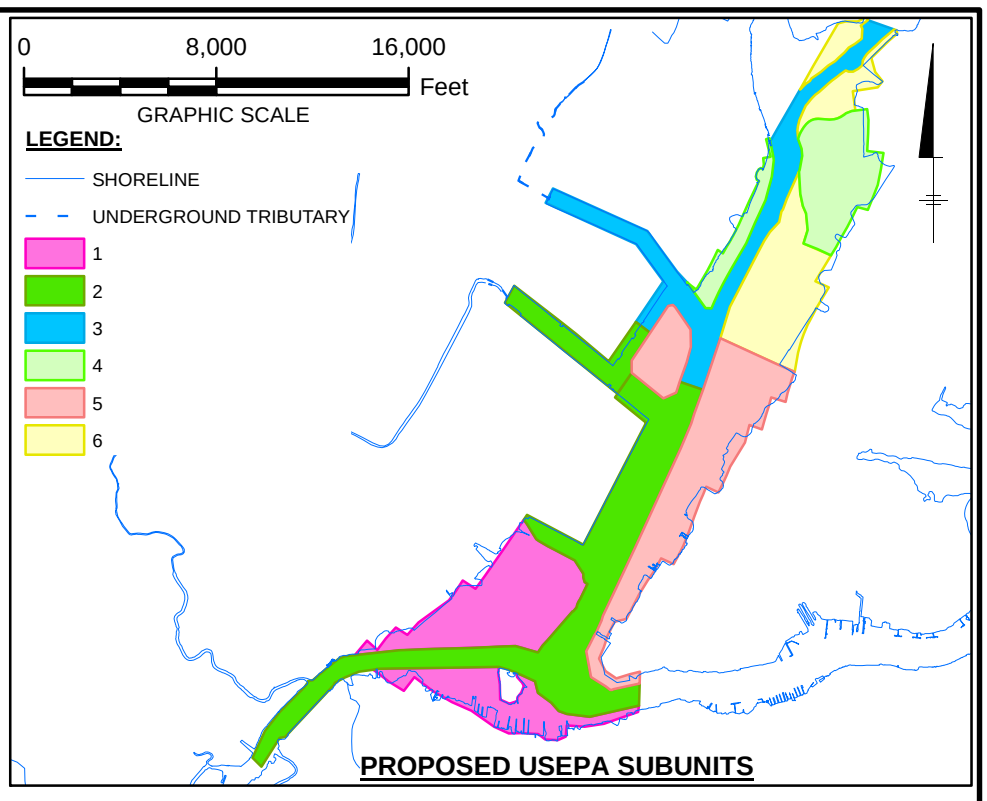
CHROMIUM RESULTS - SURFACE SEDIMENT (0 - 0.5 FEET)

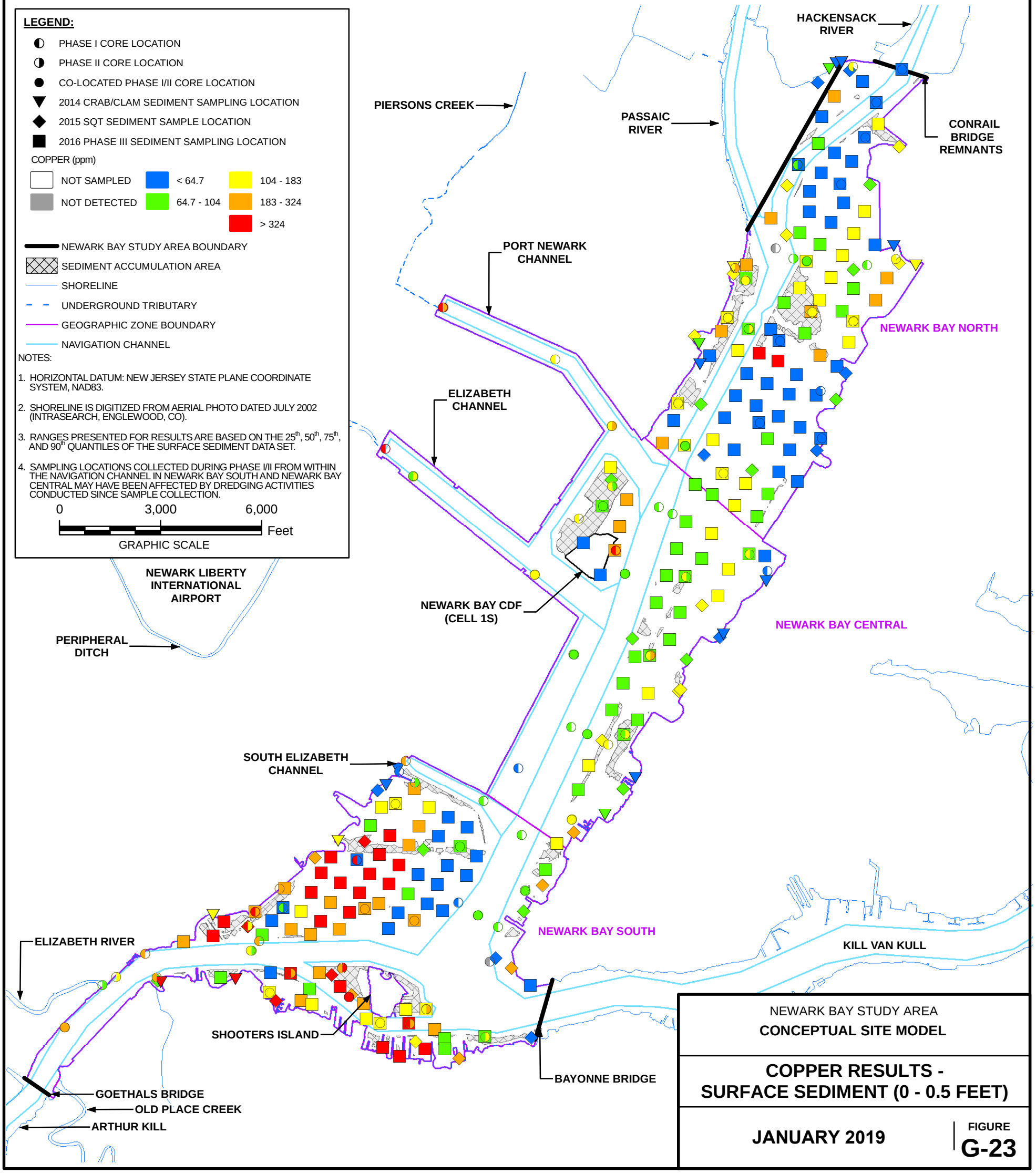
JANUARY 2019

FIGURE
G-22

City: Citrix Div/Group: IM/DV Created By: K. Sinsabaugh Last Saved By: ksinsabaugh
Project (B0009989.0045.00002)
Z:\GISProjects_ENV\GSH\GIS\Task\NBSA\CSM\mxd\SurfaceResults_Copper_RB.mxd 8/2/2018 12:37:46 PM







NEWARK BAY STUDY AREA
CONCEPTUAL SITE MODEL

COPPER RESULTS - SURFACE SEDIMENT (0 - 0.5 FEET)

JANUARY 2019

FIGURE
G-23

City: Citrix Div/Group: IM/DV Created By: K. Sinsabaugh Last Saved By: ksinsabaugh
Project (B0009989.0045.00002)
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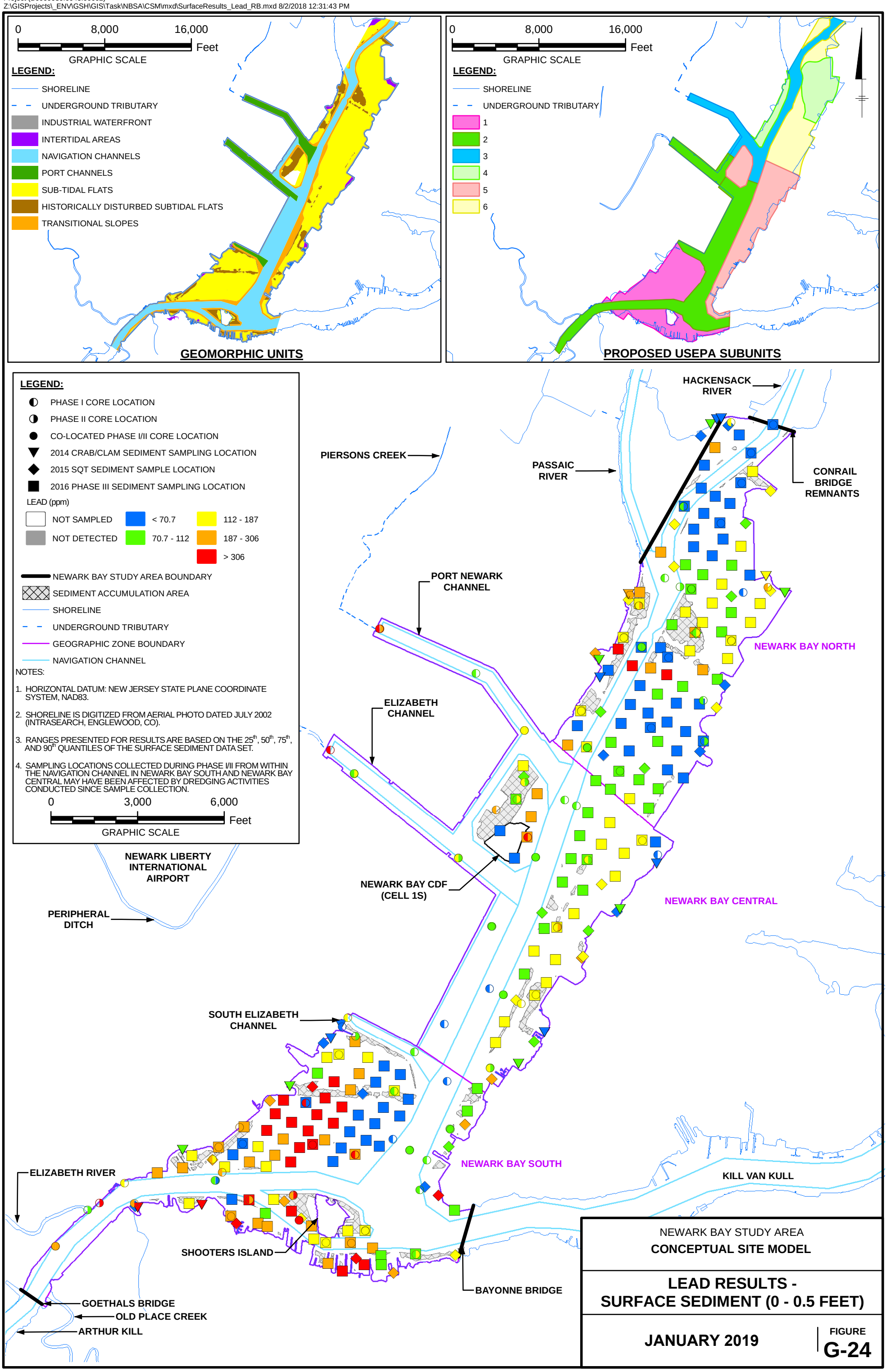


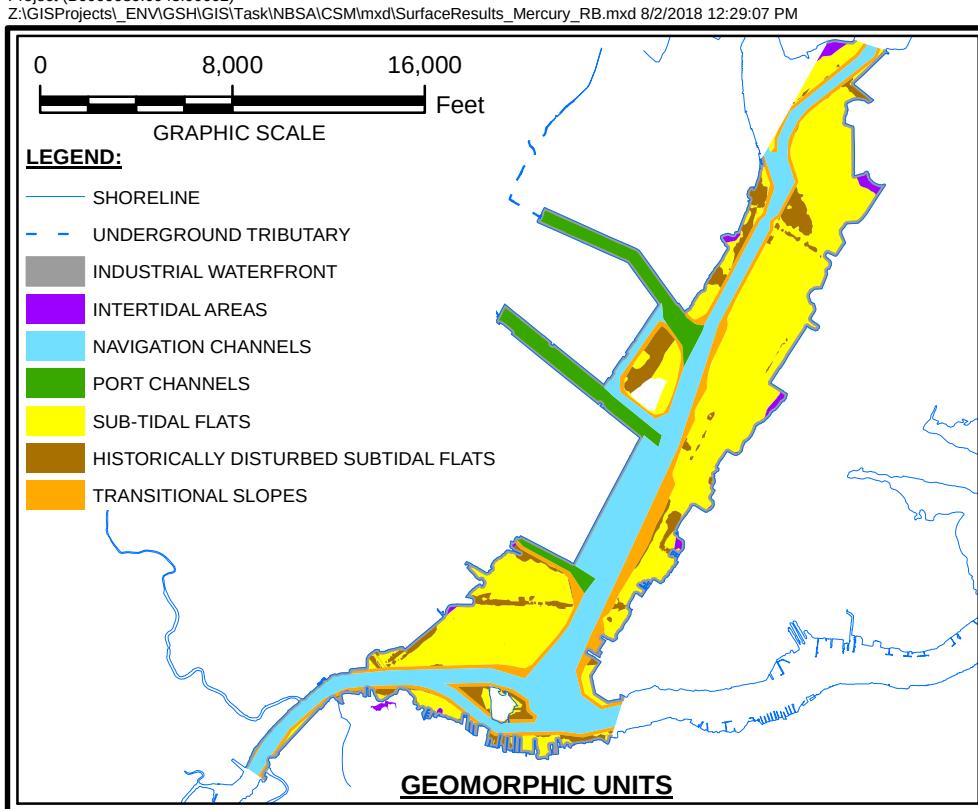
NEWARK BAY STUDY AREA
CONCEPTUAL SITE MODEL

LEAD RESULTS - SURFACE SEDIMENT (0 - 0.5 FEET)

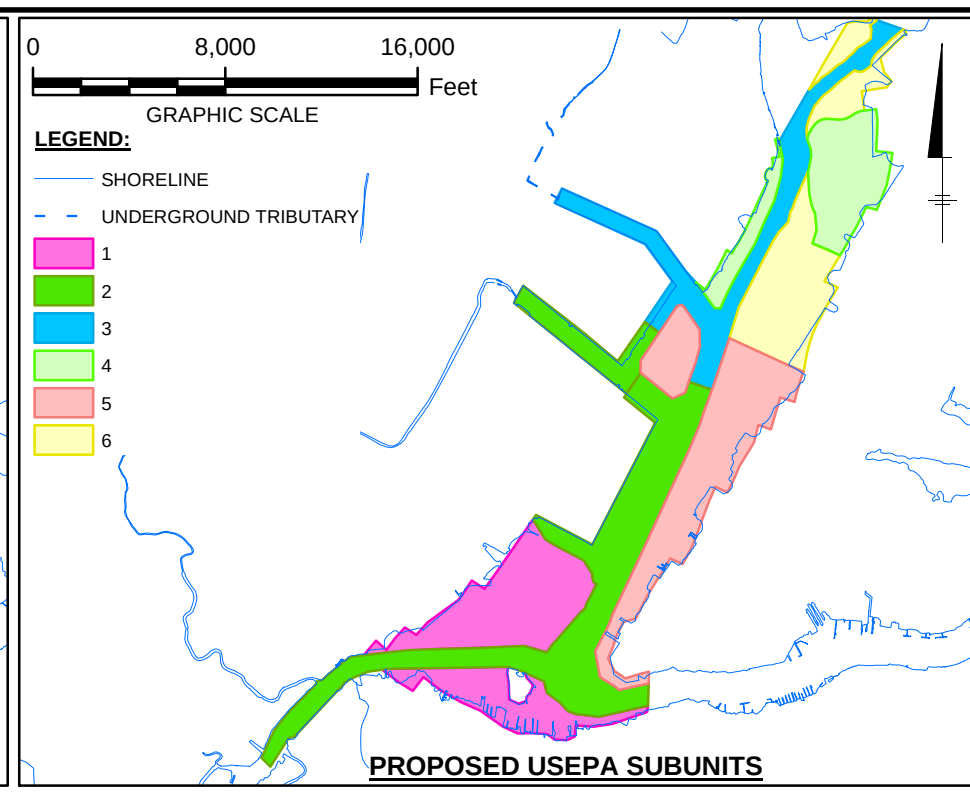
JANUARY 2019

FIGURE
G-24

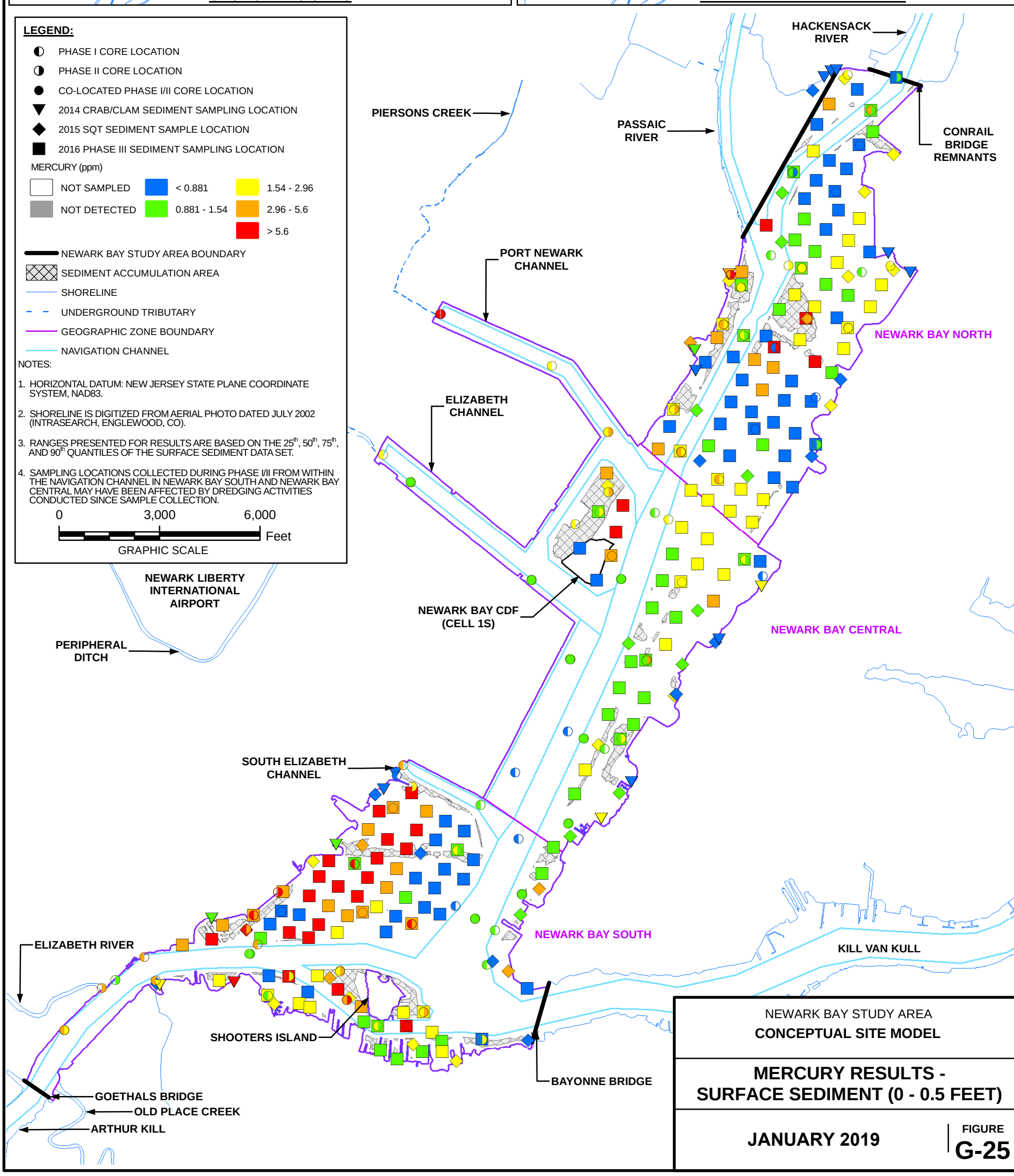
City: Citrix Div/Group: IM/DV Created By: K. Sinsabaugh Last Saved By: ksinsabaugh
Project (B0009989.0045.00002)
Z:\GISProjects_ENV\GSH\GIS\Task\NBSA\CSM\mxd\SurfaceResults_Mercury_RB.mxd 8/2/2018 12:29:07 PM



GEOMORPHIC UNITS



PROPOSED USEPA SUBUNITS



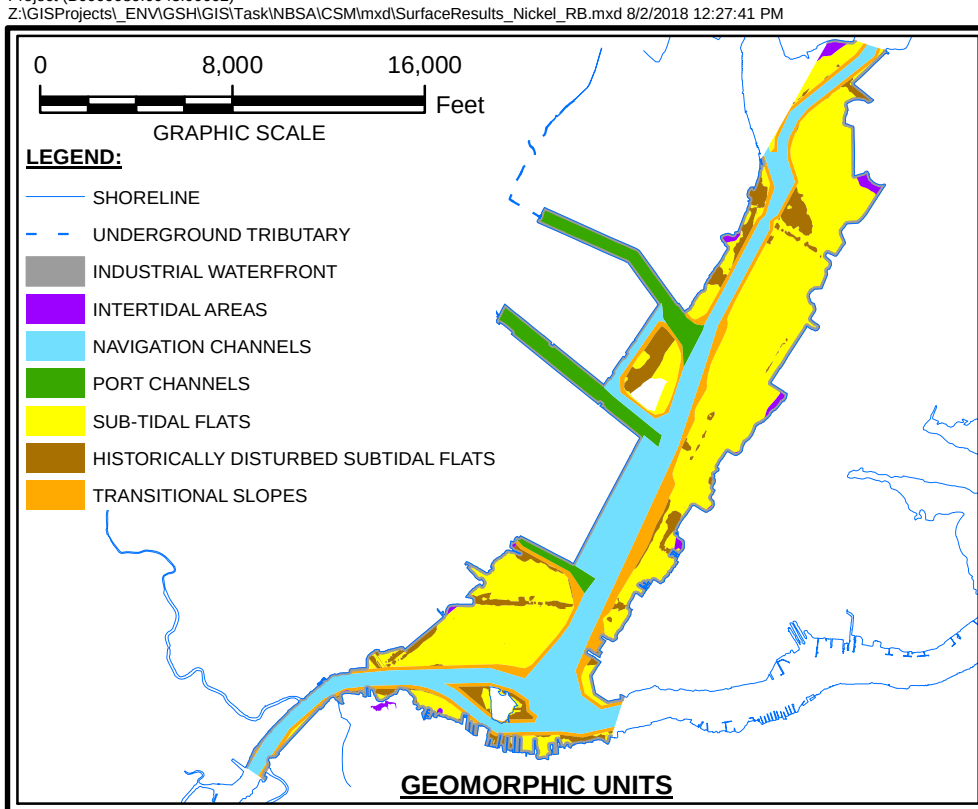
NEWARK BAY STUDY AREA
CONCEPTUAL SITE MODEL

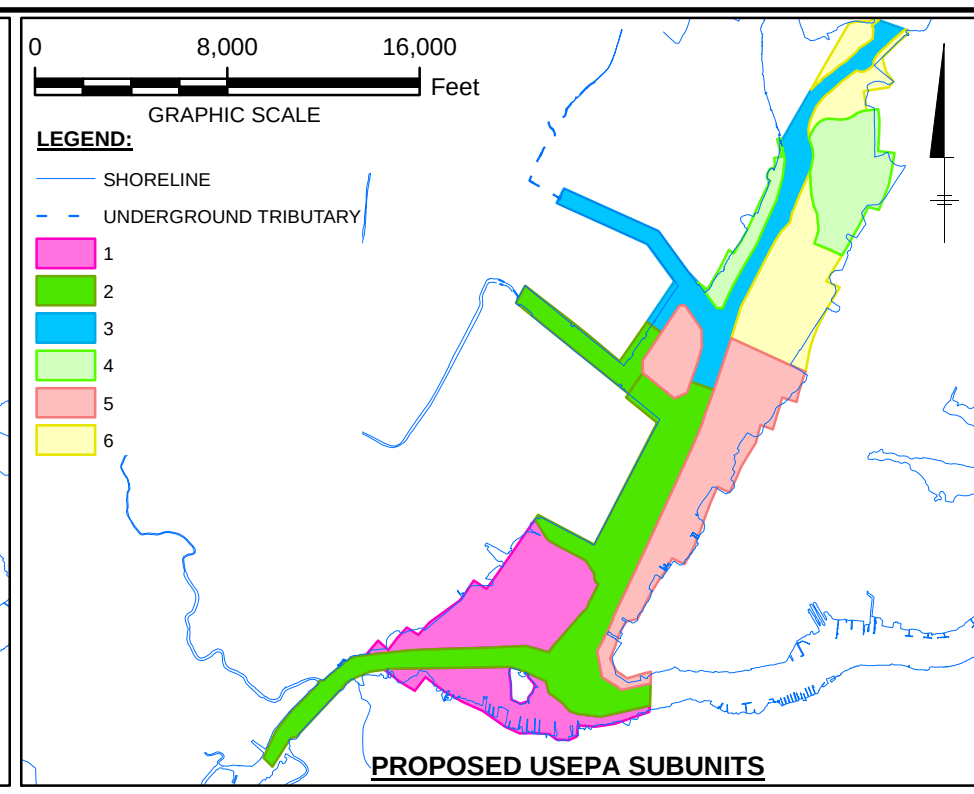
MERCURY RESULTS - SURFACE SEDIMENT (0 - 0.5 FEET)

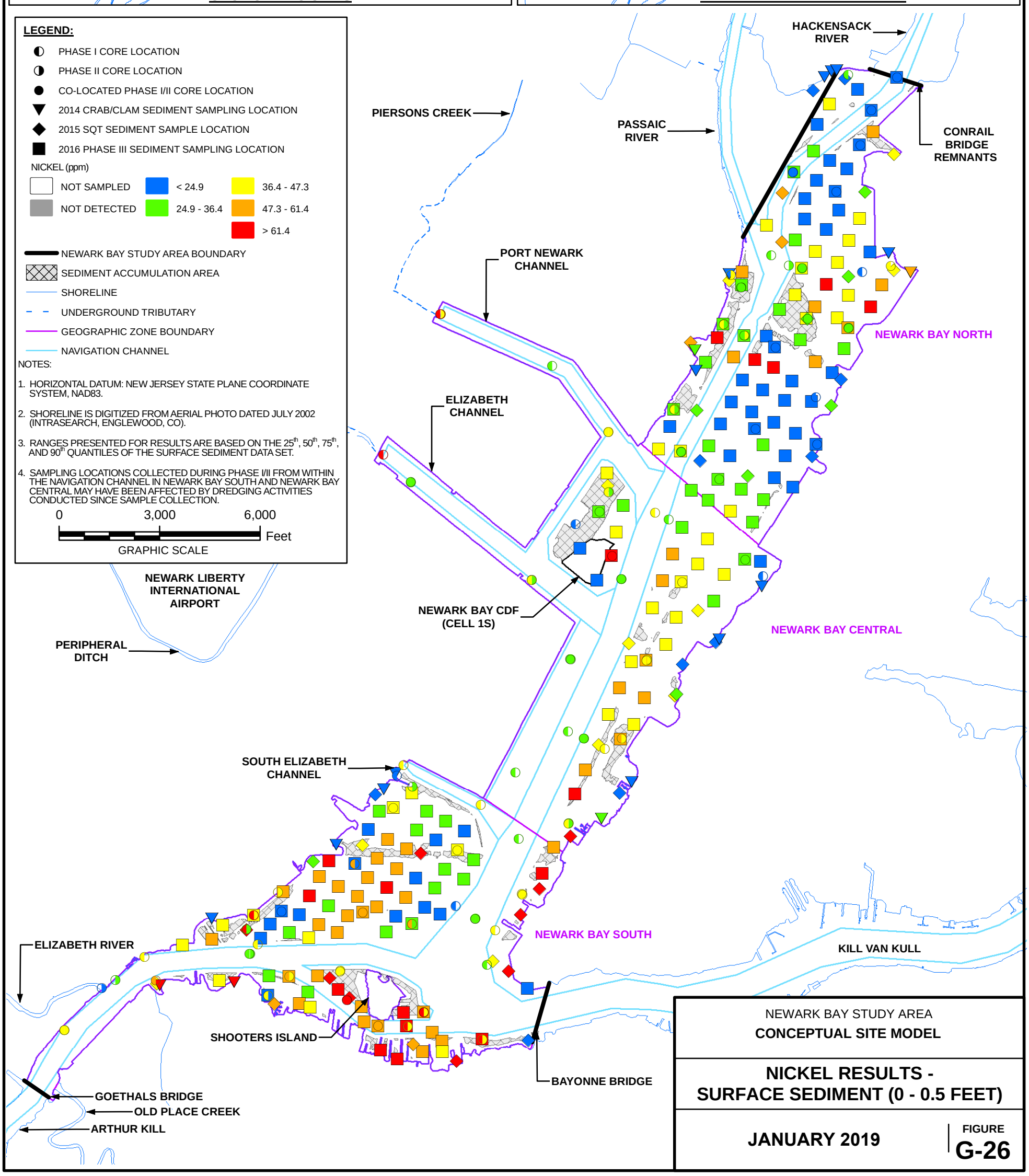
JANUARY 2019

FIGURE
G-25

City: Citrix Div/Group: IM/DV Created By: K. Sinsabaugh Last Saved By: ksinsabaugh
Project (B0009989.0045.00002)
Z:\GISProjects_ENV\GSH\GIS\Task\NBSA\CSM\mxd\SurfaceResults_Nickel_RB.mxd 8/2/2018 12:27:41 PM







NEWARK BAY STUDY AREA
CONCEPTUAL SITE MODEL

NICKEL RESULTS - SURFACE SEDIMENT (0 - 0.5 FEET)

JANUARY 2019

FIGURE
G-26

City: Citrix Div/Group: IM/DV Created By: K. Sinsabaugh Last Saved By: ksinsabaugh
Project (B0009989.0045.00002)
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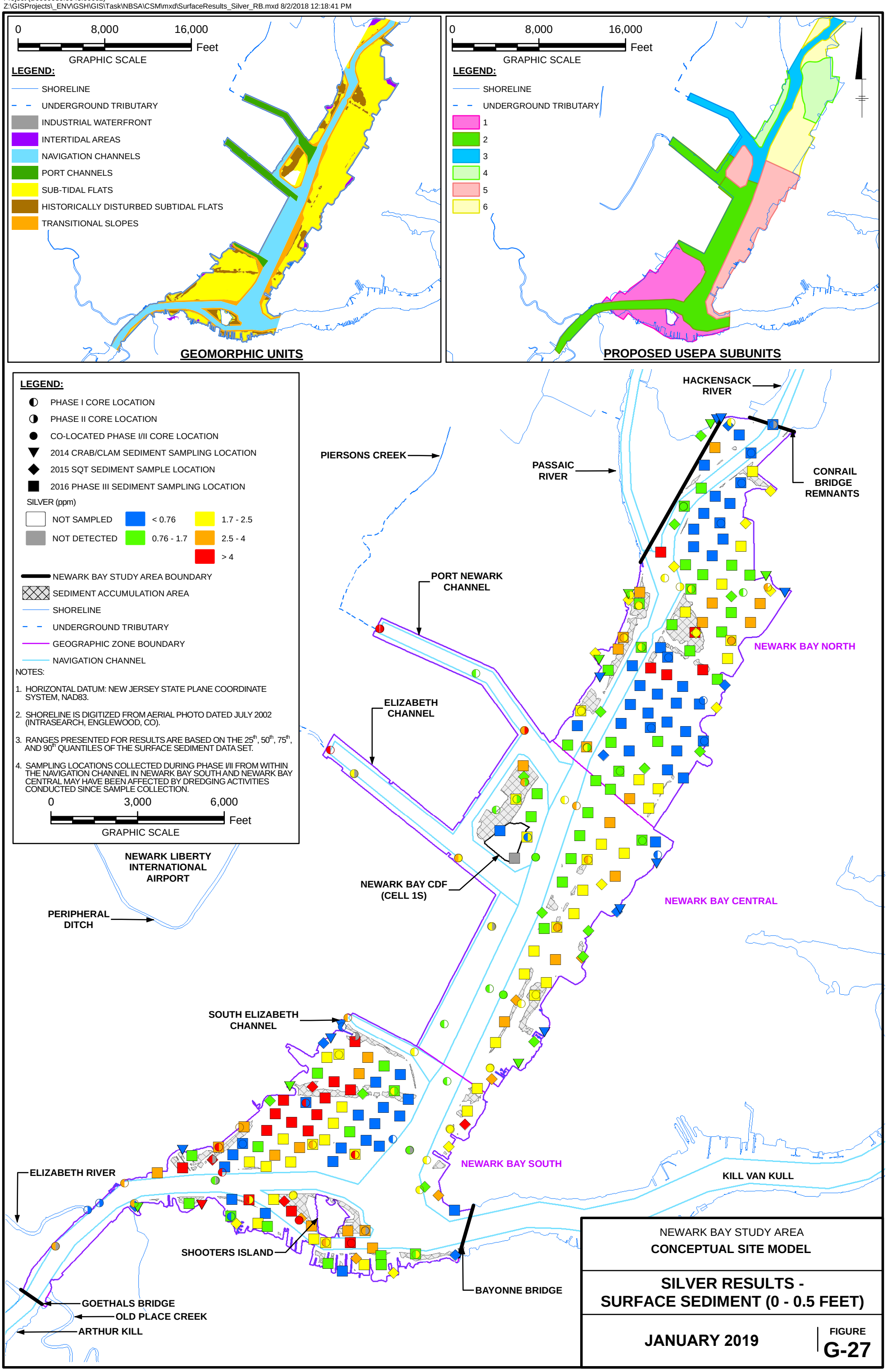


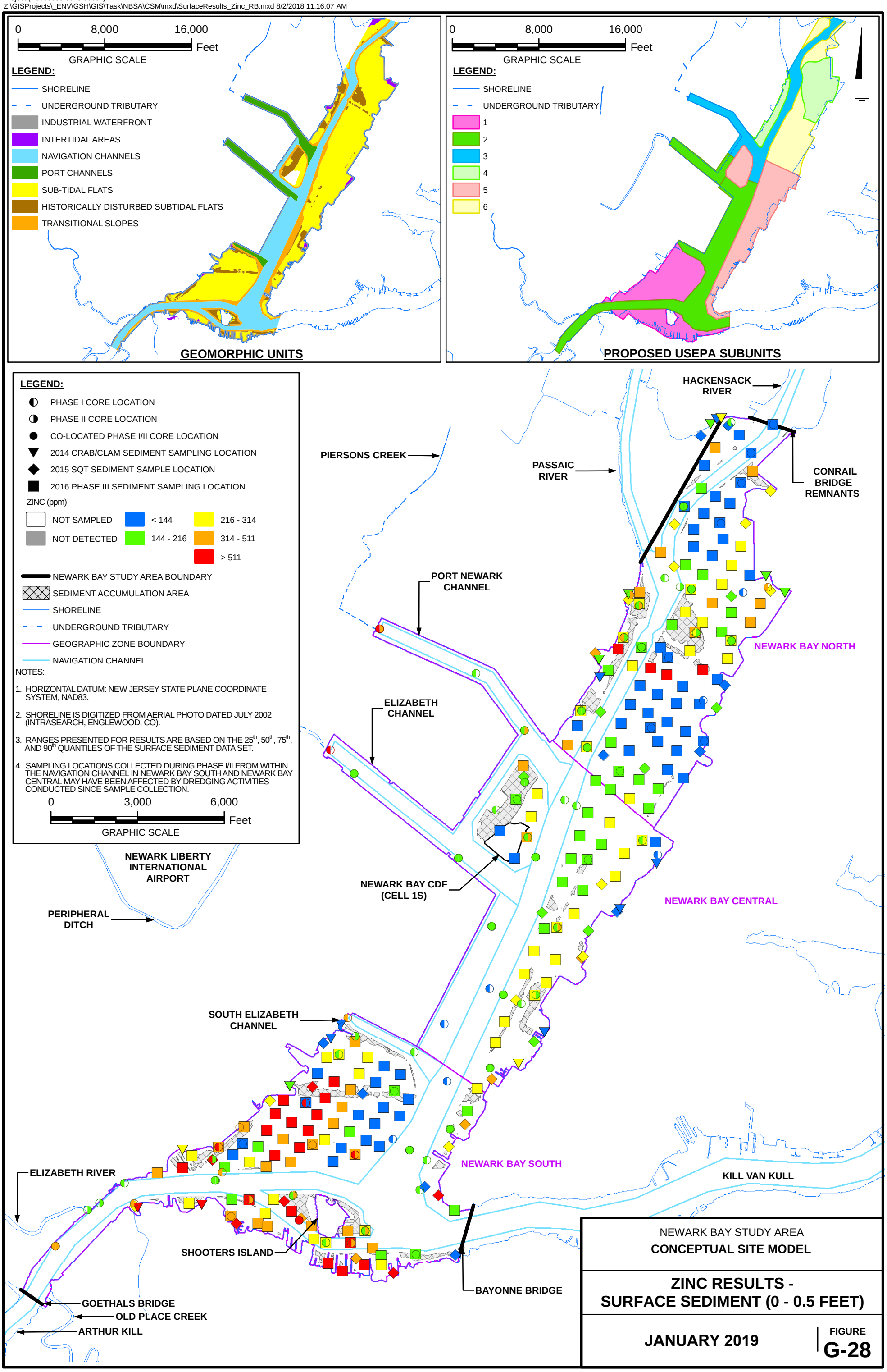
NEWARK BAY STUDY AREA
CONCEPTUAL SITE MODEL

SILVER RESULTS - SURFACE SEDIMENT (0 - 0.5 FEET)

JANUARY 2019

FIGURE
G-27

City: Citrix Div/Group: IM/DV Created By: K. Sinsabaugh Last Saved By: ksinsabaugh
Project (B0009989.0045.00002)
Z:\GISProjects_ENV\GSH\GIS\Task\NBSA\CSM\mxd\SurfaceResults_Zinc_RB.mxd 8/2/2018 11:16:07 AM



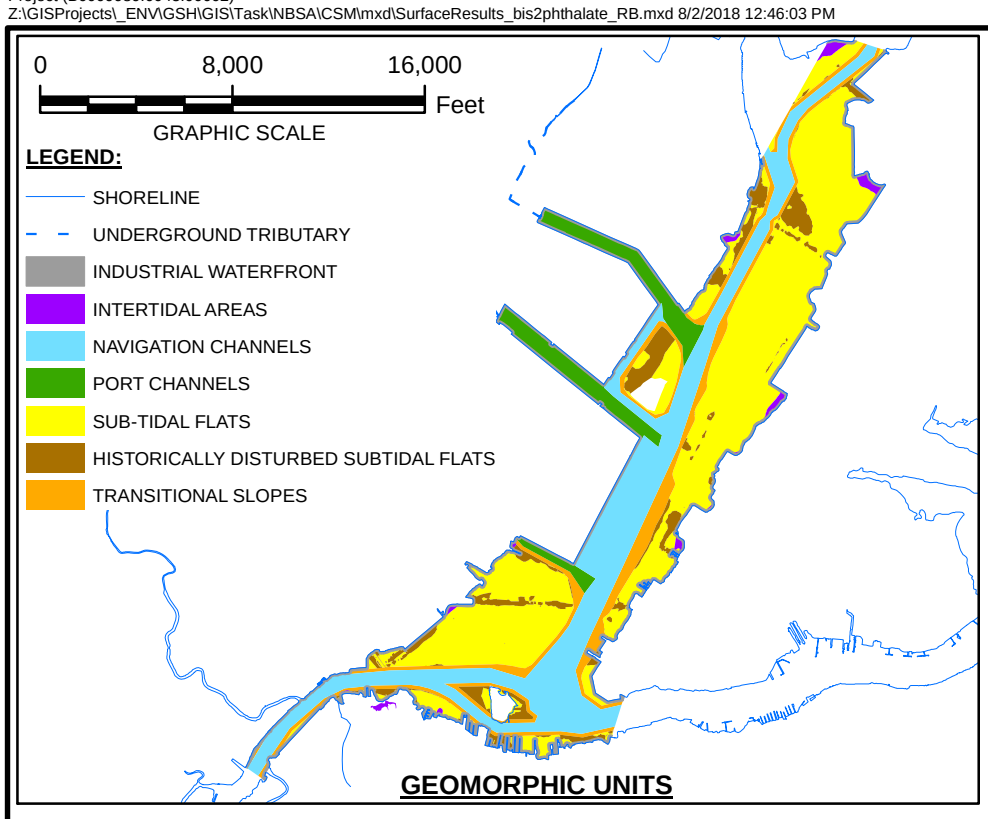
NEWARK BAY STUDY AREA
CONCEPTUAL SITE MODEL

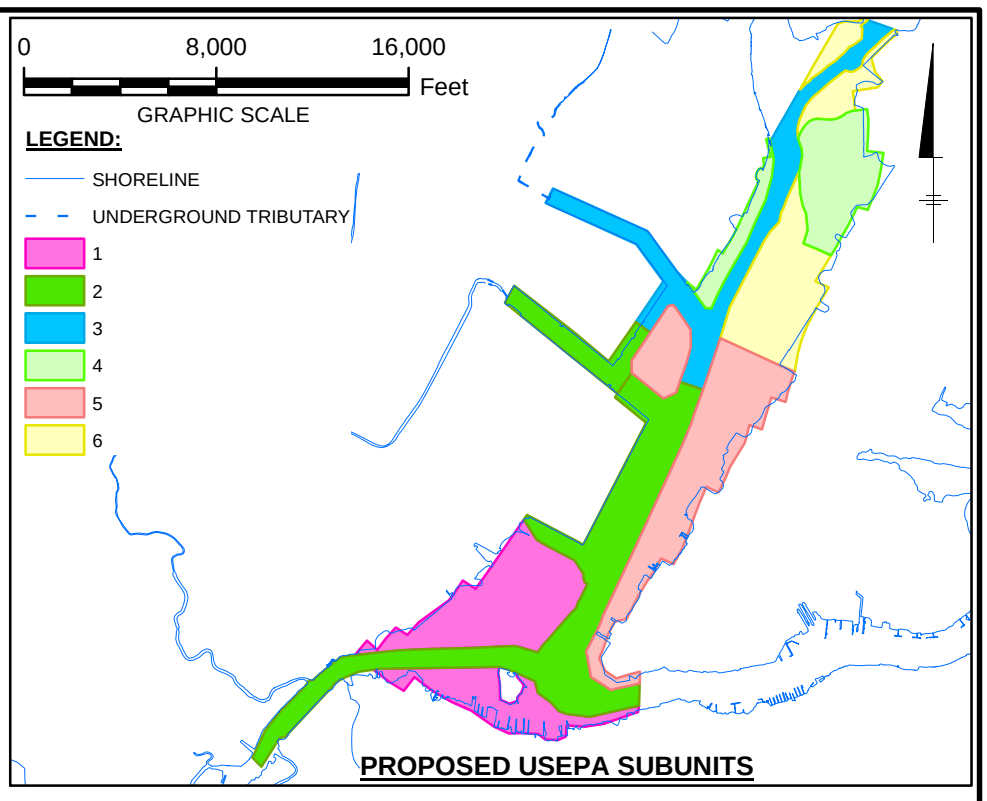
ZINC RESULTS - SURFACE SEDIMENT (0 - 0.5 FEET)

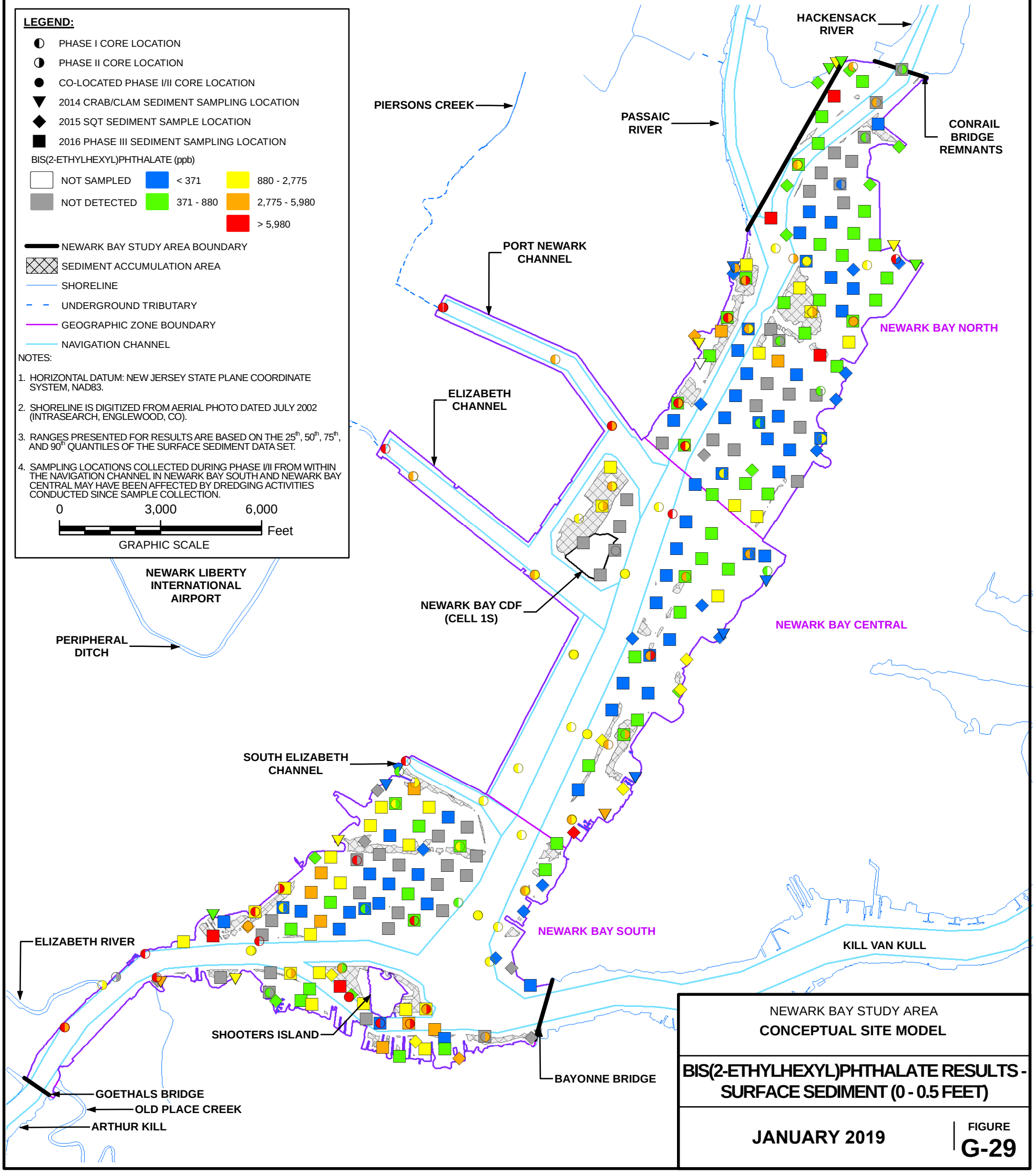
JANUARY 2019

FIGURE
G-28

City: Citrix Div/Group: IM/DV Created By: K. Sinsabaugh Last Saved By: ksinsabaugh
Project (B0009989.0045.00002)
Z:\GISProjects_ENV\GSH\GIS\Task\NBSA\CSM\mxd\SurfaceResults_bis2phthalate_RB.mxd 8/2/2018 12:46:03 PM







NEWARK BAY STUDY AREA
CONCEPTUAL SITE MODEL

BIS(2-ETHYLHEXYL)PHTHALATE RESULTS - SURFACE SEDIMENT (0 - 0.5 FEET)

JANUARY 2019

FIGURE
G-29

City: Citrix Div/Group: IM/DV Created By: K. Sinsabaugh Last Saved By: ksinsabaugh
Project (B0009989.0045.00002)
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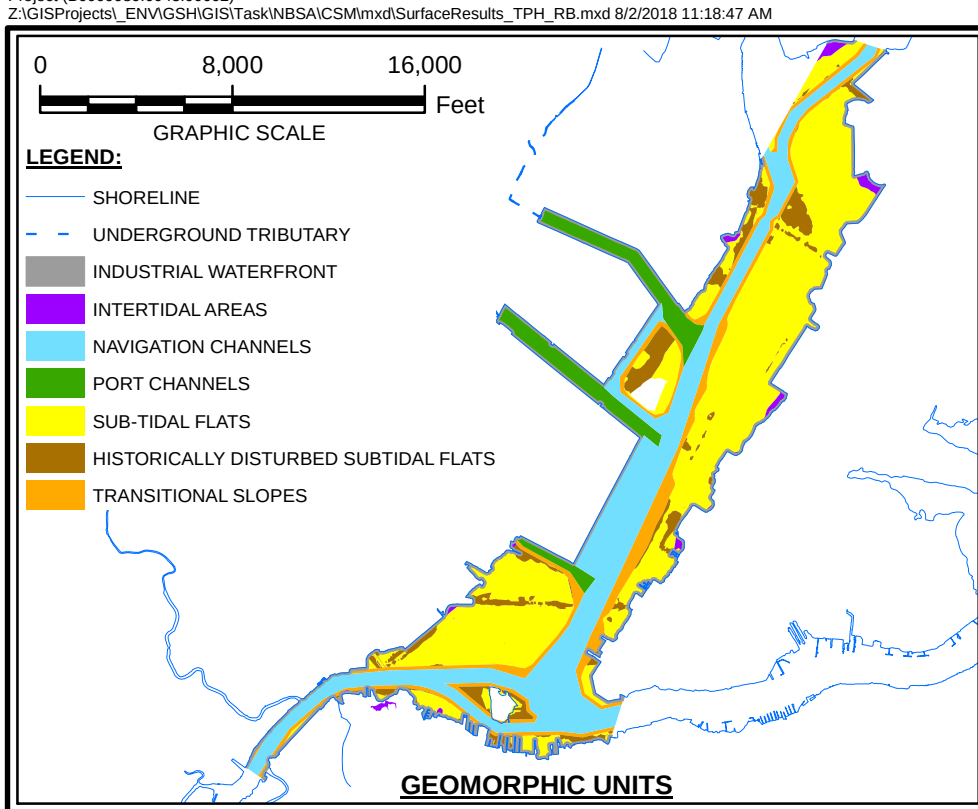
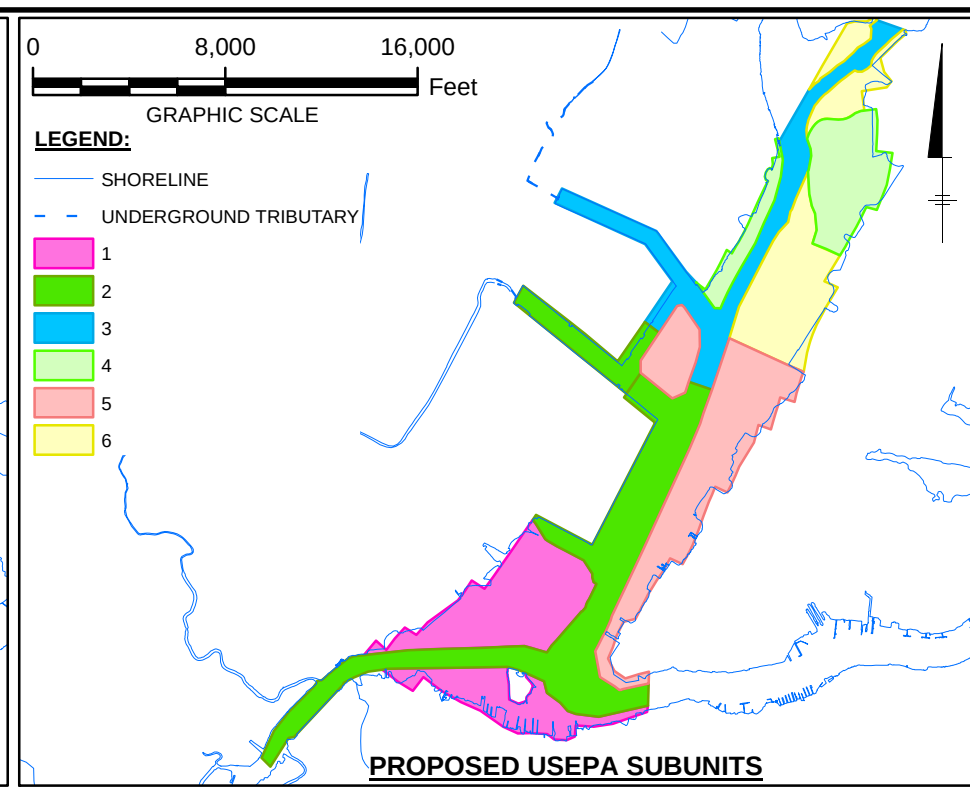


GEOMORPHIC UNITS



PROPOSED USEPA SUBUNITS

LEGEND:

- PHASE I CORE LOCATION
- PHASE II CORE LOCATION
- CO-LOCATED PHASE I/II CORE LOCATION
- 2014 CRAB/CLAM SEDIMENT SAMPLING LOCATION
- 2015 SQT SEDIMENT SAMPLE LOCATION
- 2016 PHASE III SEDIMENT SAMPLING LOCATION

TPH (ppb)

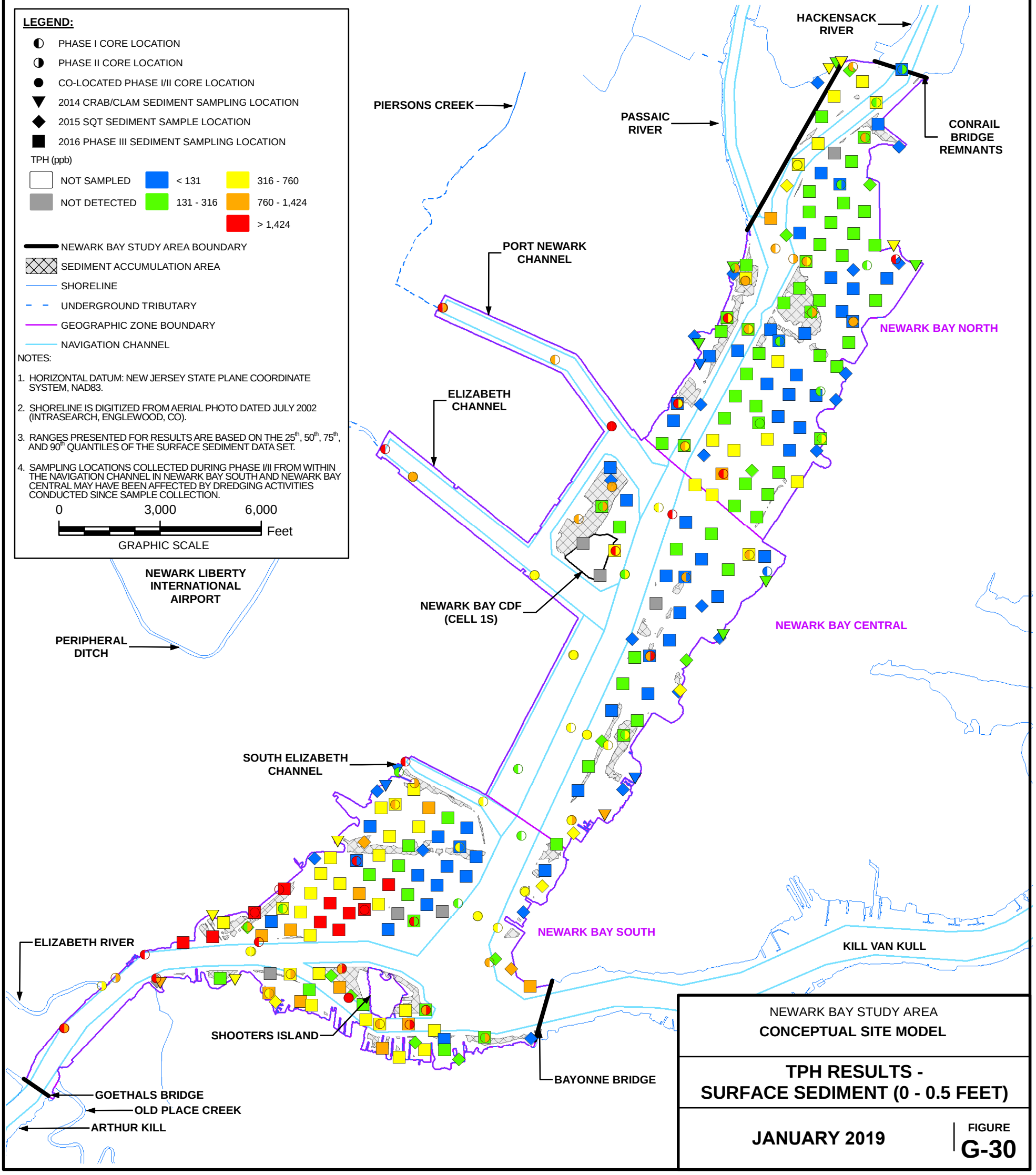
- NOT SAMPLED
- NOT DETECTED
- < 131
- 131 - 316
- 316 - 760
- 760 - 1,424
- > 1,424

- NEWARK BAY STUDY AREA BOUNDARY
- SEDIMENT ACCUMULATION AREA
- SHORELINE
- UNDERGROUND TRIBUTARY
- GEOGRAPHIC ZONE BOUNDARY
- NAVIGATION CHANNEL

NOTES:

1. HORIZONTAL DATUM: NEW JERSEY STATE PLANE COORDINATE SYSTEM, NAD83.
2. SHORELINE IS DIGITIZED FROM AERIAL PHOTO DATED JULY 2002 (INTRASEARCH, ENGLEWOOD, CO).
3. RANGES PRESENTED FOR RESULTS ARE BASED ON THE 25th, 50th, 75th, AND 90th QUANTILES OF THE SURFACE SEDIMENT DATA SET.
4. SAMPLING LOCATIONS COLLECTED DURING PHASE I/II FROM WITHIN THE NAVIGATION CHANNEL IN NEWARK BAY SOUTH AND NEWARK BAY CENTRAL MAY HAVE BEEN AFFECTED BY DREDGING ACTIVITIES CONDUCTED SINCE SAMPLE COLLECTION.

0 3,000 6,000 Feet
GRAPHIC SCALE



NEWARK BAY STUDY AREA
CONCEPTUAL SITE MODEL

TPH RESULTS - SURFACE SEDIMENT (0 - 0.5 FEET)

JANUARY 2019

FIGURE
G-30

City: Citrix Div/Group: IM/DV Created By: K. Sinsabaugh Last Saved By: ksinsabaugh
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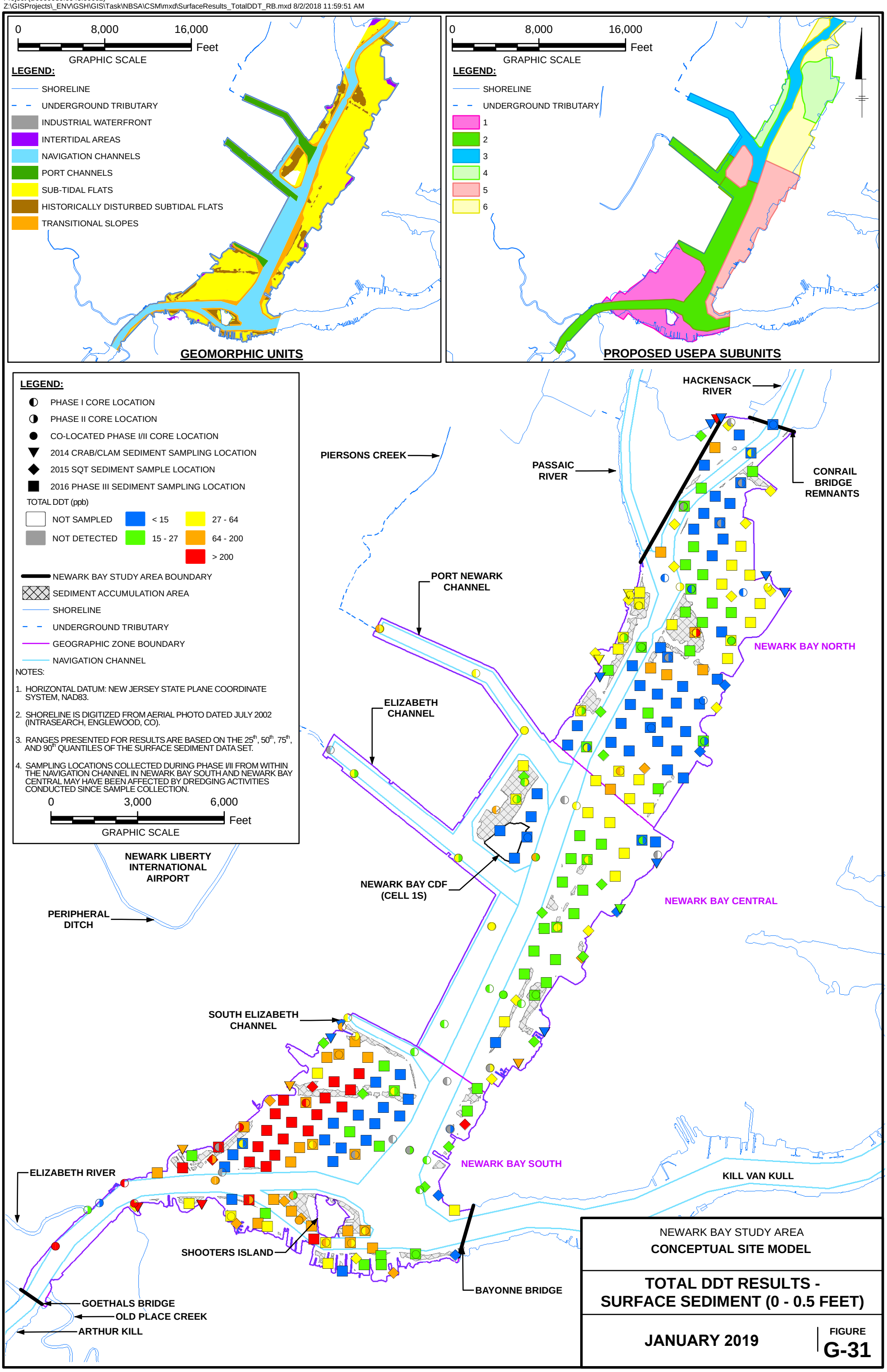

NEWARK BAY STUDY AREA
CONCEPTUAL SITE MODEL

TOTAL DDT RESULTS - SURFACE SEDIMENT (0 - 0.5 FEET)

JANUARY 2019

FIGURE
G-31

City: Citrix Div/Group: IM/DV Created By: K. Sinsabaugh Last Saved By: ksinsabaugh
Project (B0009989.0045.00002)
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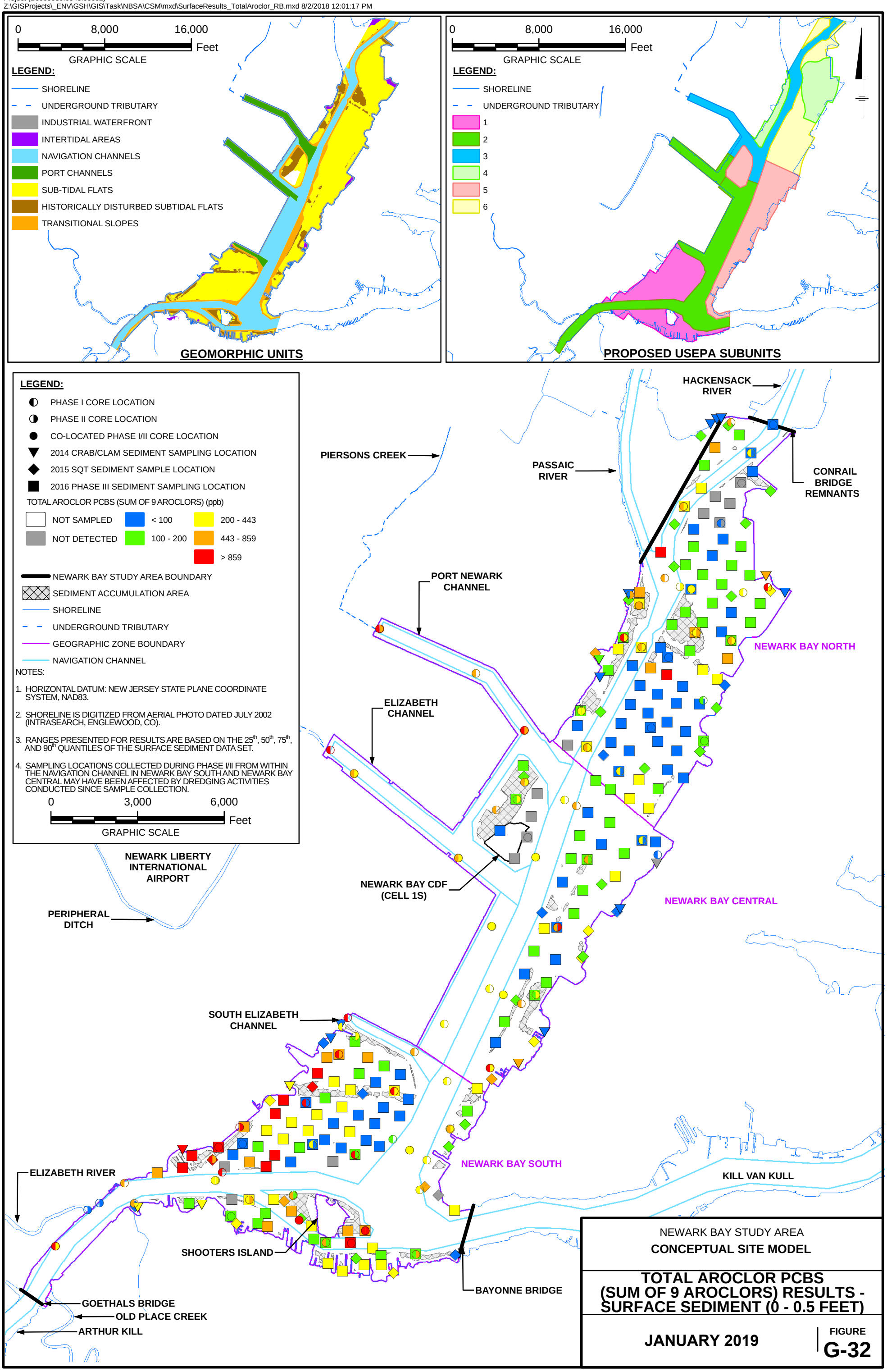

NEWARK BAY STUDY AREA

CONCEPTUAL SITE MODEL

TOTAL AROCLOR PCBS (SUM OF 9 AROCLORS) RESULTS - SURFACE SEDIMENT (0 - 0.5 FEET)

JANUARY 2019

FIGURE **G-32**

City: Citrix Div/Group: IM/DV Created By: K. Sinsabaugh Last Saved By: ksinsabaugh
Project (B0009989.0045.00002)
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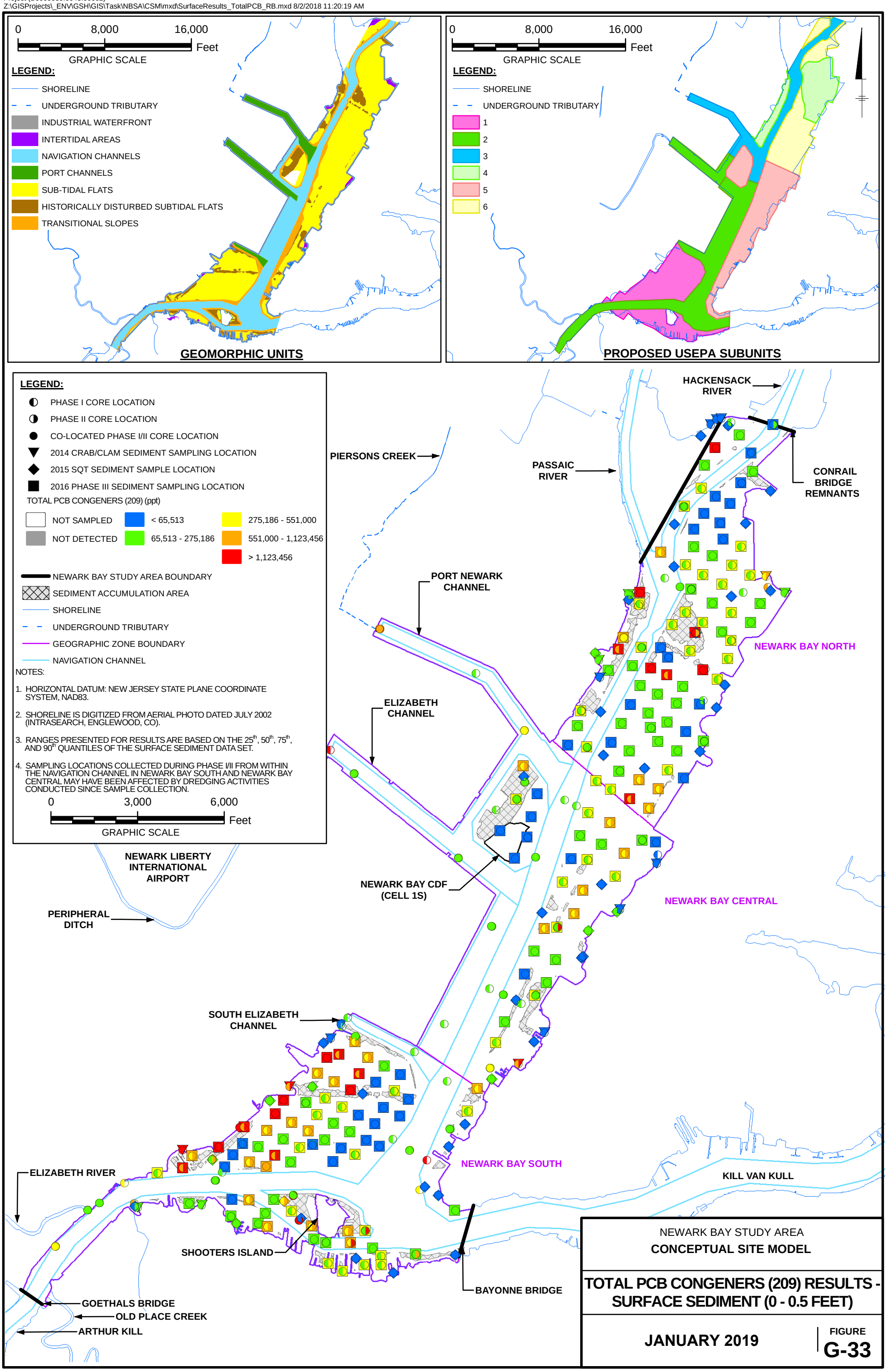


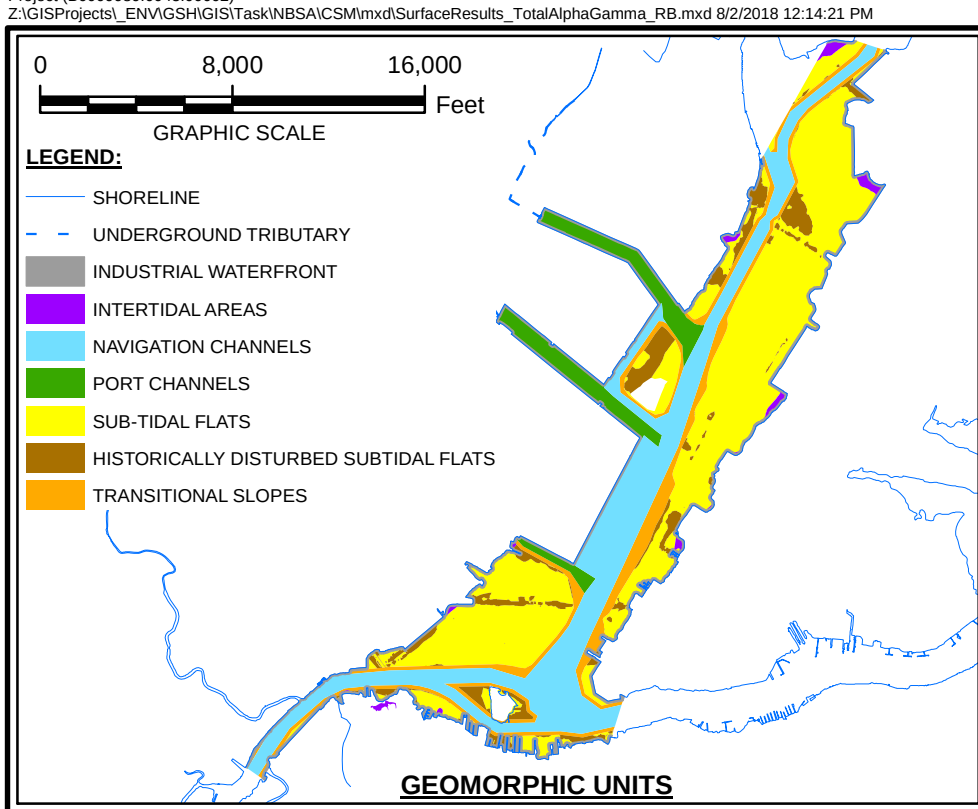
NEWARK BAY STUDY AREA
CONCEPTUAL SITE MODEL

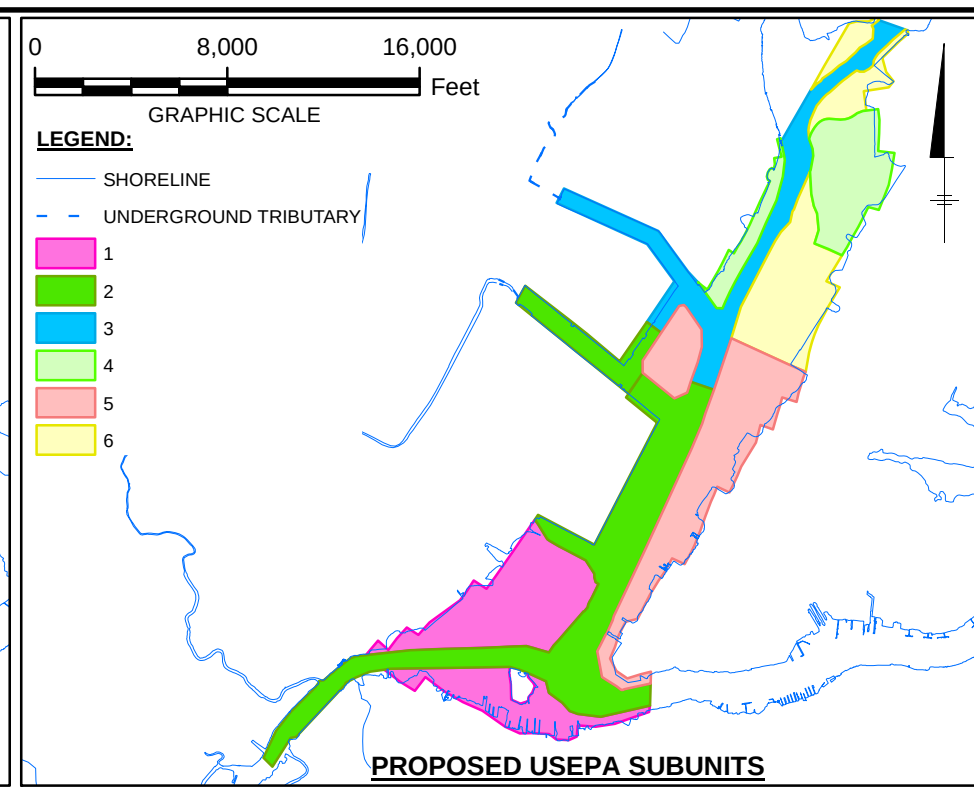
TOTAL PCB CONGENERS (209) RESULTS - SURFACE SEDIMENT (0 - 0.5 FEET)

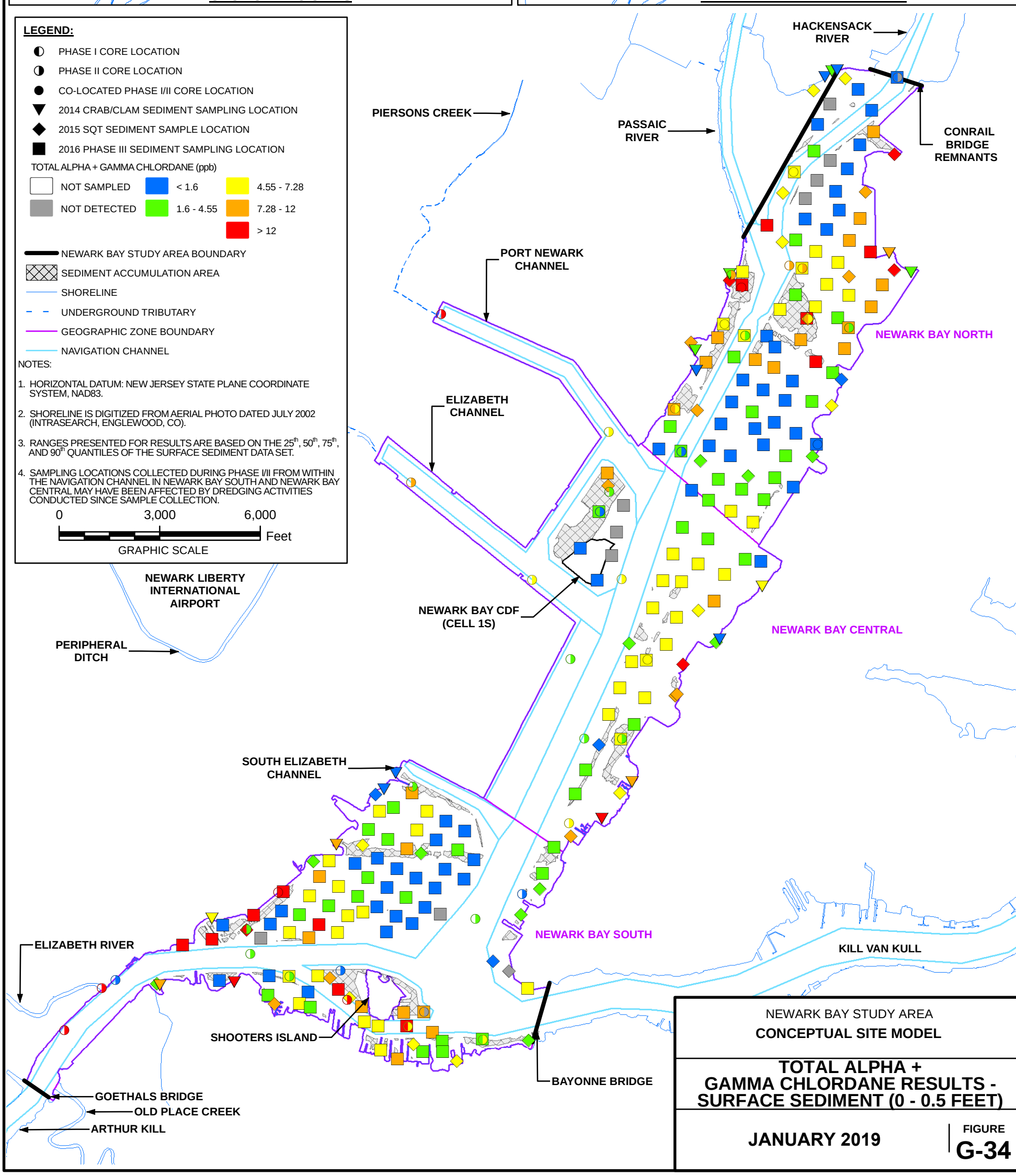
JANUARY 2019

FIGURE
G-33

City: Citrix Div/Group: IM/DV Created By: K. Sinsabaugh Last Saved By: ksinsabaugh
Project (B0009989.0045.00002)
Z:\GISProjects_ENV\GSH\GIS\Task\NBSA\CSM\mxd\SurfaceResults_TotalAlphaGamma_RB.mxd 8/2/2018 12:14:21 PM







NEWARK BAY STUDY AREA

CONCEPTUAL SITE MODEL

TOTAL ALPHA + GAMMA CHLORDANE RESULTS - SURFACE SEDIMENT (0 - 0.5 FEET)

JANUARY 2019

FIGURE
G-34

Appendix H

Table H-1
Mean Concentrations of COPCs in Phase III Crab and Clam Tissue

Species	Tissue Type	N	Mean Concentration																	
			Arsenic	Barium	Cadmium	Chromium	Copper	Lead	Mercury	Methyl Mercury	Nickel	Silver	Zinc	2,3,7,8-TCDD	bis(2-Ethyl-hexyl) phthalate	Total DDT (4,4)	Total Aroclor PCBs (Sum of 9 Aroclors)	Total PCB Congeners (209)	TOTAL PAHs	Total Alpha + Gamma Chlordane
			ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppt	ppb	ppb	ppb	ppt	ppb	ppb
Newark Bay North																				
Blue Crab	Carcass	12	1.82	5.88	0.253	0.595	35.1	1.67	0.0601	0.0398	0.657	1.1	30.3	29.3	<780	93	43	431,000	140	2.6
	Hepatopancreas	12	2.55	1.7	0.687	0.202	52.5	0.745	0.0717	0.0553	0.399	1.66	38.2	106	<960	320	240	1,580,000	140	7.7
	Muscle	12	1.98	1.2	0.0869	0.0742	19.2	0.0851	0.199	0.205	0.15	0.472	49.4	5.37	<460	16	13	43,900	5	0.42
	Whole body	12	2.05	2.56	0.246	0.239	29.8	0.64	0.137	0.131	0.334	0.868	42.1	31	<460	94	62	440,000	66	2.4
Softshell Clam	Whole body	8	5.42	9.85	0.203	3.62	8.54	16	0.121	0.0369	2.47	0.388	28.7	6.19	150	5.8	44	70,500	380	1.8
Newark Bay Central																				
Blue Crab	Carcass	12	2.16	2.63	0.244	0.303	37.4	1.42	0.0419	0.0374	0.261	1.05	31.7	18.7	<1140	60	33	227,000	110	2
	Hepatopancreas	12	2.97	1.16	1.17	0.15	50.2	0.235	0.0738	0.0581	0.39	1.58	45.5	83.4	<1340	300	250	1,260,000	74	6.5
	Muscle	12	2.4	0.435	0.0983	0.0543	14	0.025	0.179	0.193	0.115	0.388	39.7	2.73	<780	14	20	19,500	60	0.46
	Whole body	12	2.44	1.16	0.341	0.139	27.2	0.441	0.122	0.126	0.207	0.794	38.7	22.4	<780	81	51	311,000	76	2
Softshell Clam	Whole body	4	2.16	6.03	0.21	4.06	9.65	8.45	0.0734	0.0361	2.03	0.515	27.8	4.96	<260	6.2	57	61,700	230	1.8
Newark Bay South																				
Blue Crab	Carcass	13	2.19	2.73	0.241	0.35	35.9	2.95	0.0347	0.0269	0.379	0.867	28.1	9.61	<980	83	14	163,000	27	1.1
	Hepatopancreas	13	3.94	0.708	1.26	0.143	68.3	0.264	0.0606	0.0469	0.442	1.64	43.7	59	<1160	510	210	1,080,000	29	5.1
	Muscle	13	2.97	0.681	<0.0448	0.136	13.1	0.0508	0.132	0.186	<0.183	0.285	45.5	1.65	<980	22	15	20,300	3.8	0.28
	Whole body	13	2.96	1.25	0.323	0.198	30.2	0.915	0.0922	0.117	0.23	0.713	40.9	14.7	<980	130	50	259,000	15	1.4
Softshell Clam	Whole body	6	5.29	11.6	0.185	2.6	14.1	22.2	0.102	0.0329	1.79	0.249	52.7	3.98	<260	27	110	170,000	450	2.2

Notes:
1. One-half the detection limit substituted for non-detects in mean calculations.
2. Field duplicate results averaged with parent sample results.
3. Whole body crab concentration was calculated using estimated fractional mass of each individual tissue type (i.e. carcass, muscle, hepatopnacreas) which were analyzed separately. If a chemical was not detected, the lowest detection limit was used.

< = COPC not detected, average detection limit reported.
2,3,7,8-TCDD = 2,3,7,8-tetrachlorodibenzo-p-dioxin
COPC = chemical of potential concern
DDT = dichlorodiphenyl-trichloroethane
N = sample size
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
ppb = parts per billion
ppm = parts per million
ppt = parts per trillion

Table H-2
Mean Concentrations of COPCs in Phase III Fish Tissue

				Mean Concentration																	
Group	Species	Tissue Type	N	Arsenic ppm	Barium ppm	Cadmium ppm	Chromium ppm	Copper ppm	Lead ppm	Mercury ppm	Methyl Mercury ppm	Nickel ppm	Silver ppm	Zinc ppm	2,3,7,8-TCDD ppt	bis(2-Ethyl-hexyl) phthalate ppb	Total DDT (4,4) ppb	Total Aroclor PCBs (Sum of 9 Aroclors) ppb	Total PCB Congeners (209) ppt	TOTAL PAHs ppb	Total Alpha + Gamma Chlordane ppb
Newark Bay North																					
Demersal	American Eel	Fillet	6	0.906	<0.162	<0.0405	0.439	0.1	0.0194	0.489	0.522	0.101	<0.0176	24.9	8.16	<1300	200	360	490,000	46	16
Demersal	American Eel	Whole body	6	0.784	0.198	<0.0454	0.139	0.75	0.231	0.223	0.268	0.171	0.0189	31	7.45	<1300	180	350	617,000	20	16
Demersal	*Fundulus spp.*	Whole body	8	0.92	1.84	<0.0453	0.555	4.75	0.642	0.0518	0.0541	0.176	0.102	45.1	29.5	<1200	150	1,300	1,200,000	41	15
Demersal	Summer Flounder	Fillet	6	1.18	<0.18	<0.045	0.267	0.167	<0.0254	0.141	0.168	0.153	<0.0196	6.49	4.73	<1300	16	74	76,200	3.2	1.9
Demersal	Summer Flounder	Whole body	2	0.693	0.352	<0.0445	0.104	0.69	0.0474	0.108	0.113	0.405	<0.0193	15.1	10.5	<1300	34	64	536,000	6.1	1.9
Demersal	Winter Flounder	Whole body	4	1.75	0.865	<0.0446	0.481	1.38	0.931	0.0368	0.0341	0.214	0.013	27.9	7.87	<1300	27	57	155,000	<11	6.7
Pelagic	Atlantic Menhaden	Whole body	2	0.907	0.462	<0.0449	0.245	0.905	0.383	0.0537	0.0831	<0.184	<0.0195	15.8	4.33	<1300	170	400	533,000	49	12
Pelagic	Atlantic Silverside	Whole body	1	0.423	0.55	<0.0442	<0.0962	0.781	0.124	0.0717	0.11	<0.181	<0.0192	37.7	14.5	<1300	83	330	483,000	4	2.8
Pelagic	Bluefish	Fillet	3	0.42	<0.162	<0.0405	<0.088	0.727	1.62	0.268	0.328	<0.166	<0.0176	16.8	1.68	<1300	22	140	161,000	8.1	10
Pelagic	White Perch	Fillet	6	0.753	0.123	<0.0403	0.094	0.646	0.0373	0.244	0.321	<0.165	<0.0175	11.3	15.3	<610	250	460	444,000	<13	18
Pelagic	White Perch	Liver	3	1.19	<0.28	0.161	0.133	765	0.118	0.212	0.102	0.216	17.4	63.3	86.6	<950	260	1,000	2,170,000	20	43
Pelagic	White Perch	Whole body	9	0.412	1.49	<0.0451	0.453	11.4	0.2	0.124	0.178	<0.184	0.209	27.9	85.2	<1300	310	2,600	1,690,000	170	66
Newark Bay Central																					
Demersal	American Eel	Fillet	6	1.09	<0.155	<0.0388	<0.0844	0.216	0.0145	0.344	0.36	<0.159	<0.0169	27.3	8.47	<1300	240	420	725,000	23	17
Demersal	American Eel	Whole body	6	0.953	0.154	<0.0451	0.0643	0.748	0.182	0.153	0.155	0.312	0.0274	31.5	4.2	<1300	200	390	490,000	8.3	15
Demersal	*Fundulus spp.*	Whole body	3	0.728	2.86	<0.0451	0.343	2.5	0.396	0.0295	0.039	0.201	0.0399	32.3	16	<1300	160	890	724,000	9.2	17
Demersal	Summer Flounder	Fillet	6	1.49	<0.172	<0.043	0.0713	0.166	<0.0243	0.156	0.176	<0.176	<0.0187	6.14	3.35	<1300	22	200	148,000	27	2.2
Demersal	Summer Flounder	Whole body	2	1.3	0.443	<0.0447	<0.0971	0.747	0.0571	0.0712	0.0725	<0.183	<0.0194	19.5	6.34	<1300	23	47	193,000	<13	2.2
Demersal	Winter Flounder	Whole body	4	1.96	0.696	<0.0446	0.324	1.01	0.44	0.0712	0.0293	0.188	0.0162	25	4.18	<1300	30	150	135,000	<7.2	6.1
Pelagic	Atlantic Silverside	Whole body	3	0.482	0.55	<0.0455	0.184	0.625	0.277	0.0741	0.128	<0.186	0.0138	37.2	7.18	<950	82	200	533,000	9.1	3.8
Pelagic	Bluefish	Fillet	13	0.586	0.0935	<0.0397	0.0567	0.754	0.0144	0.29	0.342	<0.162	<0.0172	16.6	0.871	<1300	14	68	86,200	29	2.2
Pelagic	White Perch	Fillet	6	0.499	0.11	<0.0427	0.148	0.593	0.0446	0.324	0.448	<0.174	<0.0185	11.9	15.3	<780	140	790	508,000	<13	28
Pelagic	White Perch	Liver	3	1.26	<0.173	0.167	0.088	897	0.119	0.199	0.105	0.118	21.1	63	46.1	<950	240	1,200	1,460,000	18	24
Pelagic	White Perch	Whole body	9	0.465	1.63	<0.0449	0.282	7.9	0.205	0.121	0.141	0.204	0.171	30.1	43.2	<1300	210	1,400	1,140,000	9.5	45
Newark Bay South																					
Demersal	American Eel	Fillet	6	1.06	<0.18	<0.0449	<0.0978	0.171	0.0149	0.235	0.281	<0.184	<0.0195	26.9	4.46	<1300	530	280	656,000	9.5	11
Demersal	American Eel	Whole body	6	0.689	0.144	<0.045	0.0583	1.12	0.265	0.17	0.185	0.323	0.0229	31.6	5.06	<1300	380	710	704,000	66	9
Demersal	*Fundulus spp.*	Whole body	6	0.965	3.63	<0.0453	0.326	3.19	0.659	0.03	0.0347	0.492	0.0528	50.1	11	<1100	340	1,000	1,480,000	40	12
Demersal	Summer Flounder	Fillet	6	1.9	<0.169	<0.0422	<0.0919	0.226	<0.0239	0.152	0.198	<0.173	<0.0184	6.54	4.98	<1300	47	200	130,000	34	2.4
Demersal	Summer Flounder	Whole body	4	2.01	0.434	0.0317	0.137	0.59	0.0316	0.087	0.0976	<0.184	0.0128	18.9	2.56	<1300	17	120	209,000	<9.1	1.5
Demersal	Winter Flounder	Whole body	2	1.86	0.346	<0.0449	0.324	0.88	0.365	0.0291	0.0297	0.201	<0.0195	18.7	3.08	<1300	40	110	142,000	<9.2	6.3
Pelagic	Striped Bass	Fillet	18	1.16	0.102	<0.0425	0.0821	0.507	0.0133	0.25	0.294	<0.174	<0.0184	6.72	3	<1300	93	370	346,000	5.4	12
Pelagic	Atlantic Silverside	Whole body	3	0.694	0.561	<0.0454	0.125	0.942	0.327	0.0538	0.0938	<0.185	<0.0197	43.5	6.74	<1300	200	710	903,000	5.3	2.4
Pelagic	Bluefish	Fillet	2	0.835	<0.172	<0.0428	<0.093	0.708	<0.0242	0.356	0.417	<0.175	<0.0186	15.6	0.49	<1300	89	91	146,000	<5.2	2.8
Pelagic	White Perch	Fillet	6	0.76	0.145	<0.0411	0.085	0.582	0.0291	0.239	0.268	<0.168	<0.0178	10.4	8.93	<950	250	810	417,000	<13	23
Pelagic	White Perch	Liver	5	4.9	1.63	0.394	1.4	3050	0.225	0.198	0.0746	<3.02	67.7	163	26.8	<1400	510		1,670,000	61	35
Pelagic	White Perch	Whole body	9	0.62	1.2	<0.0446	0.16	27.4	0.117	0.136	0.126	<0.183	0.483	20.6	17	<1300	490	1,600	1,280,000	57	45

Notes:
1. One-half the detection limit substituted for non-detects in mean calculations.
2. Field duplicate results averaged with parent sample results.
3. *Fundulus spp.* includes mummichog and striped killifish.

< = COPC not detected, average detection limit reported.
2,3,7,8-TCDD = 2,3,7,8-tetrachlorodibenzo-p-dioxin
COPC = chemical of potential concern
DDT = dichlorodiphenyl-trichloroethane
N = sample size
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
ppb = parts per billion
ppm = parts per million
ppt = parts per trillion

Appendix I

Table I-1
Statistical Summary of Surface Water Chemistry Data in the NBSA

Analyte	Result Unit	Number of Samples	Number of Detects	Frequency of Detection	Minimum Detect	Maximum Detect	Mean	Standard Deviation	Median
Dioxins/Furans									
1,2,3,4,6,7,8-Heptachlorodibenzofuran	pg/l	233	178	76%	0.623	44	4.32	4.73	2.77
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	pg/l	233	162	70%	1.05	19.8	4.48	3.43	3.51
1,2,3,4,6,7,9-Heptachlorodibenzofuran	pg/l	115	1	1%	4.06	4.06	0.585	0.447	<0.94
1,2,3,4,6,7,9-Heptachlorodibenzo-p-dioxin	pg/l	115	115	100%	1.71	27.3	7.84	4.84	6.3
1,2,3,4,6,7-Hexachlorodibenzofuran	pg/l	115	3	3%	1.02	5.03	0.508	0.49	<0.86
1,2,3,4,6,7-Hexachlorodibenzo-p-dioxin	pg/l	115	0	0%	--	--	<1.29	NA	<1.22
1,2,3,4,6,8,9-Heptachlorodibenzofuran	pg/l	115	85	74%	0.542	7.68	1.96	1.54	1.44
1,2,3,4,6,8-Hexachlorodibenzofuran	pg/l	115	11	10%	0.441	1.95	0.526	0.33	<0.892
1,2,3,4,6,8-Hexachlorodibenzo-p-dioxin	pg/l	115	4	3%	0.433	8.95	0.733	0.829	<1.23
1,2,3,4,6,9-Hexachlorodibenzofuran	pg/l	115	0	0%	--	--	<0.904	NA	<0.842
1,2,3,4,6,9-Hexachlorodibenzo-p-dioxin	pg/l	115	0	0%	--	--	<1.29	NA	<1.22
1,2,3,4,6-Pentachlorodibenzofuran	pg/l	115	2	2%	0.852	2.58	0.457	0.295	<0.794
1,2,3,4,6-Pentachlorodibenzo-p-dioxin	pg/l	115	0	0%	--	--	<1.238	NA	<1.13
1,2,3,4,7,8,9-Heptachlorodibenzofuran	pg/l	233	5	2%	0.554	4.71	0.659	0.428	<1.16
1,2,3,4,7,8-Hexachlorodibenzofuran	pg/l	233	107	46%	0.408	8.01	1.07	1.08	<1.348
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	pg/l	233	1	0%	0.625	0.625	0.607	0.29	<1.17
1,2,3,4,7,9-Hexachlorodibenzofuran	pg/l	115	0	0%	--	--	<0.904	NA	<0.842
1,2,3,4,7-Pentachlorodibenzofuran	pg/l	115	2	2%	3.38	10.3	0.546	0.981	<0.794
1,2,3,4,7-pentachlorodibenzo-p-Dioxin	pg/l	115	0	0%	--	--	<1.238	NA	<1.13
1,2,3,4,8,9-hexachlorodibenzofuran	pg/l	115	0	0%	--	--	<0.904	NA	<0.842
1,2,3,4,8-Pentachlorodibenzofuran	pg/l	115	2	2%	1.39	5.86	0.49	0.555	<0.794
1,2,3,4,9-Pentachlorodibenzofuran	pg/l	115	0	0%	--	--	<0.868	NA	<0.784
1,2,3,4-Tetrachlorodibenzofuran	pg/l	115	17	15%	0.363	5.38	0.582	0.593	<0.854
1,2,3,4-Tetrachlorodibenzo-p-Dioxin	pg/l	115	0	0%	--	--	<1.136	NA	<1.07
1,2,3,6,7,8-Hexachlorodibenzofuran	pg/l	233	28	12%	0.192	1.88	0.467	0.263	<0.87
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	pg/l	233	8	3%	0.43	1.16	0.632	0.301	<1.22
1,2,3,6,7,9-Hexachlorodibenzofuran	pg/l	115	0	0%	--	--	<0.904	NA	<0.842
1,2,3,6,7,9-Hexachlorodibenzo-p-dioxin	pg/l	115	24	21%	0.663	4.95	1.01	0.858	<1.34
1,2,3,6,7-Pentachlorodibenzofuran	pg/l	115	1	1%	2.98	2.98	0.455	0.319	<0.784
1,2,3,6,7-Pentachlorodibenzo-p-dioxin	pg/l	115	0	0%	--	--	<1.238	NA	<1.13
1,2,3,6,8,9-Hexachlorodibenzofuran	pg/l	115	0	0%	--	--	<0.904	NA	<0.842
1,2,3,6,8,9-Hexachlorodibenzo-p-dioxin	pg/l	115	24	21%	0.663	4.95	1.01	0.858	<1.34
1,2,3,6,8-Pentachlorodibenzofuran	pg/l	115	20	17%	0.714	13.4	0.796	1.39	<0.87
1,2,3,6,8-Pentachlorodibenzo-p-dioxin	pg/l	115	0	0%	--	--	<1.238	NA	<1.13
1,2,3,6,9-Pentachlorodibenzofuran	pg/l	115	1	1%	2.53	2.53	0.452	0.29	<0.784
1,2,3,6,9-Pentachlorodibenzo-p-dioxin	pg/l	115	0	0%	--	--	<1.238	NA	<1.13
1,2,3,6-Tetrachlorodibenzofuran	pg/l	115	17	15%	0.363	5.38	0.582	0.593	<0.854
1,2,3,6-Tetrachlorodibenzo-p-dioxin	pg/l	115	0	0%	--	--	<1.136	NA	<1.07
1,2,3,7,8,9-Hexachlorodibenzofuran	pg/l	233	1	0%	0.495	0.495	0.53	0.257	<0.998
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	pg/l	233	44	19%	0.662	1.89	0.807	0.317	<1.52
1,2,3,7,8-Pentachlorodibenzofuran	pg/l	233	3	1%	0.309	1.66	0.468	0.24	<0.856
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	pg/l	233	2	1%	0.557	0.706	0.622	0.3	<1.16
1,2,3,7,9-Pentachlorodibenzofuran	pg/l	115	0	0%	--	--	<0.868	NA	<0.784
1,2,3,7,9-Pentachlorodibenzo-p-dioxin	pg/l	115	0	0%	--	--	<1.238	NA	<1.13
1,2,3,7-Tetrachlorodibenzofuran	pg/l	115	1	1%	1.37	1.37	0.444	0.198	<0.804
1,2,3,7-Tetrachlorodibenzo-p-dioxin	pg/l	115	10	9%	0.448	2.24	0.643	0.324	<1.11
1,2,3,8,9-Pentachlorodibenzofuran	pg/l	115	0	0%	--	--	<0.868	NA	<0.784
1,2,3,8,9-Pentachlorodibenzo-p-dioxin	pg/l	115	0	0%	--	--	<1.238	NA	<1.13
1,2,3,8-Tetrachlorodibenzofuran	pg/l	115	17	15%	0.363	5.38	0.582	0.593	<0.854
1,2,3,8-Tetrachlorodibenzo-p-dioxin	pg/l	115	10	9%	0.448	2.24	0.643	0.324	<1.11
1,2,3,9-Tetrachlorodibenzofuran	pg/l	115	0	0%	--	--	<0.874	NA	<0.804
1,2,3,9-Tetrachlorodibenzo-p-dioxin	pg/l	115	0	0%	--	--	<1.136	NA	<1.07
1,2,4,6,7,8-Hexachlorodibenzofuran	pg/l	115	65	57%	0.434	6.97	1.32	1.23	0.874
1,2,4,6,7,9-Hexachlorodibenzofuran	pg/l	115	1	1%	1.46	1.46	0.458	0.235	<0.842
1,2,4,6,7,9-Hexachlorodibenzo-p-dioxin	pg/l	115	22	19%	0.654	3.8	0.935	0.715	<1.32
1,2,4,6,7-Pentachlorodibenzofuran	pg/l	115	3	3%	0.923	11.2	0.543	1.03	<0.794
1,2,4,6,7-Pentachlorodibenzo-p-dioxin	pg/l	115	0	0%	--	--	<1.238	NA	<1.13

Table I-1
Statistical Summary of Surface Water Chemistry Data in the NBSA

Analyte	Result Unit	Number of Samples	Number of Detects	Frequency of Detection	Minimum Detect	Maximum Detect	Mean	Standard Deviation	Median
1,2,4,6,8,9-Hexachlorodibenzofuran	pg/l	115	18	16%	0.326	3.01	0.58	0.424	<0.912
1,2,4,6,8,9-Hexachlorodibenzo-p-dioxin	pg/l	115	22	19%	0.654	3.8	0.935	0.715	<1.32
1,2,4,6,8-Pentachlorodibenzofuran	pg/l	115	11	10%	1.13	3.93	0.645	0.59	<0.908
1,2,4,6,8-Pentachlorodibenzo-p-dioxin	pg/l	115	0	0%	--	--	<1.238	NA	<1.13
1,2,4,6,9-Pentachlorodibenzofuran	pg/l	115	13	11%	0.477	3.73	0.535	0.418	<0.844
1,2,4,6,9-Pentachlorodibenzo-p-dioxin	pg/l	115	2	2%	1.97	2.17	0.644	0.346	<1.13
1,2,4,6-Tetrachlorodibenzofuran	pg/l	115	1	1%	6.84	6.84	0.492	0.623	<0.804
1,2,4,6-Tetrachlorodibenzo-p-dioxin	pg/l	115	0	0%	--	--	<1.136	NA	<1.07
1,2,4,7,8-Pentachlorodibenzofuran	pg/l	115	20	17%	0.714	13.4	0.796	1.39	<0.87
1,2,4,7,8-Pentachlorodibenzo-p-dioxin	pg/l	115	0	0%	--	--	<1.238	NA	<1.13
1,2,4,7,9-Pentachlorodibenzofuran	pg/l	115	0	0%	--	--	<0.868	NA	<0.784
1,2,4,7,9-Pentachlorodibenzo-p-dioxin	pg/l	115	0	0%	--	--	<1.238	NA	<1.13
1,2,4,7-Tetrachlorodibenzofuran	pg/l	115	6	5%	0.359	23.8	0.691	2.2	<0.814
1,2,4,7-Tetrachlorodibenzo-p-dioxin	pg/l	115	0	0%	--	--	<1.136	NA	<1.07
1,2,4,8,9-Pentachlorodibenzofuran	pg/l	115	0	0%	--	--	<0.868	NA	<0.784
1,2,4,8,9-Pentachlorodibenzo-p-dioxin	pg/l	115	0	0%	--	--	<1.238	NA	<1.13
1,2,4,8-Tetrachlorodibenzofuran	pg/l	115	17	15%	0.625	15.7	0.745	1.5	<0.868
1,2,4,8-Tetrachlorodibenzo-p-dioxin	pg/l	115	0	0%	--	--	<1.136	NA	<1.07
1,2,4,9-Tetrachlorodibenzofuran	pg/l	115	1	1%	2.07	2.07	0.45	0.234	<0.804
1,2,4,9-Tetrachlorodlbenzo-p-dioxin	pg/l	115	0	0%	--	--	<1.136	NA	<1.07
1,2,6,7,8-Pentachlorodibenzofuran	pg/l	115	1	1%	2.98	2.98	0.455	0.319	<0.784
1,2,6,7,9-Pentachlorodibenzofuran	pg/l	115	0	0%	--	--	<0.868	NA	<0.784
1,2,6,7-Tetrachlorodibenzofuran	pg/l	115	1	1%	3.04	3.04	0.459	0.301	<0.804
1,2,6,7-Tetrachlorodibenzo-p-dioxin	pg/l	115	0	0%	--	--	<1.136	NA	<1.07
1,2,6,8-Tetrachlorodibenzofuran	pg/l	115	1	1%	3.33	3.33	0.461	0.323	<0.804
1,2,6,8-Tetrachlorodibenzo-p-dioxin	pg/l	115	0	0%	--	--	<1.136	NA	<1.07
1,2,6,9-Tetrachlorodibenzofuran	pg/l	115	0	0%	--	--	<0.874	NA	<0.804
1,2,6,9-Tetrachlorodibenzo-p-dloxin	pg/l	115	0	0%	--	--	<1.136	NA	<1.07
1,2,7,8-Tetrachlorodibenzofuran	pg/l	115	1	1%	3.95	3.95	0.467	0.373	<0.804
1,2,7,8-Tetrachlorodibenzo-p-dioxin	pg/l	115	0	0%	--	--	<1.136	NA	<1.07
1,2,7,9-Tetrachlorodibenzofuran	pg/l	115	2	2%	0.621	8.08	0.506	0.734	<0.814
1,2,7,9-Tetrachlorodibenzo-p-dioxin	pg/l	115	0	0%	--	--	<1.136	NA	<1.07
1,2,8,9-Tetrachlorodibenzofuran	pg/l	115	0	0%	--	--	<0.874	NA	<0.804
1,2,8,9-Tetrachlorodibenzo-p-dioxin	pg/l	115	0	0%	--	--	<1.136	NA	<1.07
1,3,4,6,7,8-Hexachlorodibenzofuran	pg/l	115	65	57%	0.434	6.97	1.32	1.23	0.874
1,3,4,6,7,9-Hexachlorodibenzofuran	pg/l	115	0	0%	--	--	<0.904	NA	<0.842
1,3,4,6,7-Pentachlorodibenzofuran	pg/l	115	3	3%	0.923	11.2	0.543	1.03	<0.794
1,3,4,6,8-Pentachlorodibenzofuran	pg/l	115	11	10%	1.13	3.93	0.645	0.59	<0.908
1,3,4,6,9-Pentachlorodibenzofuran	pg/l	115	0	0%	--	--	<0.868	NA	<0.784
1,3,4,6-Tetrachlorodibenzofuran	pg/l	115	1	1%	6.84	6.84	0.492	0.623	<0.804
1,3,4,7,8-Pentachlorodibenzofuran	pg/l	115	20	17%	0.714	13.4	0.796	1.39	<0.87
1,3,4,7,9-Pentachlorodibenzofuran	pg/l	115	0	0%	--	--	<0.868	NA	<0.784
1,3,4,7-Tetrachlorodibenzofuran	pg/l	115	6	5%	0.359	23.8	0.691	2.2	<0.814
1,3,4,8-Tetrachlorodibenzofuran	pg/l	115	1	1%	2.01	2.01	0.45	0.231	<0.804
1,3,4,9-Tetrachlorodibenzofuran	pg/l	115	0	0%	--	--	<0.874	NA	<0.804
1,3,6,7,8-Pentachlorodibenzofuran	pg/l	115	3	3%	0.923	11.2	0.543	1.03	<0.794
1,3,6,7-Tetrachlorodibenzofuran	pg/l	115	17	15%	0.625	15.7	0.745	1.5	<0.868
1,3,6,8-Tetrachlorodibenzofuran	pg/l	115	2	2%	0.353	1.48	0.447	0.201	<0.804
1,3,6,8-Tetrachlorodibenzo-P-Dioxin	pg/l	115	64	56%	0.925	12.9	1.48	1.36	1.19
1,3,6,9-Tetrachlorodibenzofuran	pg/l	115	1	1%	1.37	1.37	0.444	0.198	<0.804
1,3,6,9-Tetrachlorodibenzo-p-dioxin	pg/l	115	0	0%	--	--	<1.136	NA	<1.07
1,3,7,8-Tetrachlorodibenzofuran	pg/l	115	6	5%	0.359	23.8	0.691	2.2	<0.814
1,3,7,8-Tetrachlorodibenzo-P-Dioxin	pg/l	115	0	0%	--	--	<1.136	NA	<1.07
1,3,7,9-Tetrachlorodibenzofuran	pg/l	115	17	15%	0.625	15.7	0.745	1.5	<0.868
1,3,7,9-Tetrachlorodibenzo-p-dioxin	pg/l	115	7	6%	0.785	8.29	0.669	0.758	<1.1
1,4,6,7,8-Pentachlorodibenzofuran	pg/l	115	1	1%	1.4	1.4	0.442	0.232	<0.784
1,4,6,7-Tetrachlorodibenzofuran	pg/l	115	1	1%	2.35	2.35	0.453	0.252	<0.804
1,4,6,8-Tetrachlorodibenzofuran	pg/l	115	1	1%	4.19	4.19	0.469	0.393	<0.804

Table I-1
Statistical Summary of Surface Water Chemistry Data in the NBSA

Analyte	Result Unit	Number of Samples	Number of Detects	Frequency of Detection	Minimum Detect	Maximum Detect	Mean	Standard Deviation	Median
1,4,6,9-Tetrachlorodibenzofuran	pg/l	115	17	15%	0.363	5.38	0.582	0.593	<0.854
1,4,6,9-Tetrachlorodibenzo-p-dioxin	pg/l	115	0	0%	--	--	<1.136	NA	<1.07
1,4,7,8-Tetrachlorodibenzofuran	pg/l	115	2	2%	1.5	3.13	0.468	0.323	<0.804
1,4,7,8-Tetrachlorodibenzo-p-dioxin	pg/l	115	0	0%	--	--	<1.136	NA	<1.07
1,6,7,8-Tetrachlorodibenzofuran	pg/l	115	17	15%	0.363	5.38	0.582	0.593	<0.854
2,3,4,6,7,8-Hexachlorodibenzofuran	pg/l	233	10	4%	0.149	1.76	0.449	0.258	<0.838
2,3,4,6,8-Pentachlorodibenzofuran	pg/l	115	13	11%	0.477	3.73	0.535	0.418	<0.844
2,3,4,6-Tetrachlorodibenzofuran	pg/l	115	1	1%	2.07	2.07	0.45	0.234	<0.804
2,3,4,7,8-Pentachlorodibenzofuran	pg/l	233	13	6%	0.321	6.46	0.472	0.452	<0.81
2,3,4,7-Tetrachlorodibenzofuran	pg/l	115	2	2%	0.621	8.08	0.506	0.734	<0.814
2,3,4,8-Tetrachlorodibenzofuran	pg/l	115	17	15%	0.601	5.23	0.622	0.641	<0.868
2,3,6,7-Tetrachloro-Dibenzofuran	pg/l	115	4	3%	0.552	4.18	0.477	0.391	<0.824
2,3,6,8-Tetrachlorodibenzofuran	pg/l	115	10	9%	0.431	11.8	0.581	1.08	<0.852
2,3,7,8-Tetrachlorodibenzofuran	pg/l	233	13	6%	0.267	2.73	0.469	0.261	<0.842
2,3,7,8-Tetrachlorodibenzo-p-dioxin	pg/l	233	84	36%	0.219	7.98	1.02	1.02	<1.37
2,4,6,7-Tetrachlorodibenzofuran	pg/l	115	1	1%	5.9	5.9	0.484	0.54	<0.804
2,4,6,8-Tetrachlorodibenzofuran	pg/l	115	5	4%	0.513	2.44	0.476	0.283	<0.818
3,4,6,7-Tetrachlorodibenzofuran	pg/l	72	0	0%	--	--	<0.922	NA	<0.854
3,4,6,7-tetrachloro-Dibenzofuran	pg/l	43	4	9%	0.552	4.18	0.503	0.587	<0.784
Heptachlorinated Dibenzofurans, (Total)	pg/l	233	186	80%	1.04	45.9	5.97	5.9	3.79
Heptachlorinated Dibenzo-p-dioxins, (Total)	pg/l	233	160	69%	1.48	47.1	10.4	7.97	8.2
Hexachlorinated Dibenzofurans, (Total)	pg/l	233	131	56%	0.434	21.1	2.43	3.09	1.16
Hexachlorinated Dibenzo-p-dioxins, (Total)	pg/l	233	70	30%	0.651	19.6	1.62	2.01	<1.712
Octachlorodibenzofuran	pg/l	233	171	73%	1.39	115	7.71	9.71	4.89
Octachlorodibenzo-p-dioxin	pg/l	233	204	88%	14.1	230	53.8	39.1	41.7
Pentachlorinated Dibenzofurans, (Total)	pg/l	233	48	21%	0.379	62.3	1.29	4.35	<1.05
Pentachlorinated Dibenzo-p-dioxins, (Total)	pg/l	233	5	2%	1.29	2.61	0.651	0.361	<1.17
Pentachlorodibenzofuran; 2,3,4,6,7-	pg/l	115	1	1%	2.53	2.53	0.452	0.29	<0.784
Tetrachlorinated Dibenzofurans, (Total)	pg/l	233	52	22%	0.314	119	1.59	7.95	<1.05
Tetrachlorinated Dibenzo-p-dioxins, (Total)	pg/l	233	62	27%	0.925	24.2	1.74	2.22	<2.1
Metals - Dissolved									
Aluminum (Dissolved)	ug/l	158	97	61%	1.3	355	28.3	42.5	15
Antimony (Dissolved)	ug/l	158	13	8%	0.248	1.06	0.507	0.0604	<1
Arsenic (Dissolved)	ug/l	158	158	100%	0.67	1.65	1.15	0.241	1.1
Barium (Dissolved)	ug/l	158	158	100%	11.5	36.9	22.4	4.87	21.8
Beryllium (Dissolved)	ug/l	158	36	23%	0.0006	0.204	0.0102	0.0163	<0.02
Cadmium (Dissolved)	ug/l	274	273	100%	0.006	0.101	0.0543	0.0144	0.053
Calcium (Dissolved)	ug/l	158	158	100%	143000	321000	239000	35100	246000
Chromium (Dissolved)	ug/l	158	156	99%	0.11	2.7	0.371	0.278	0.3
Chromium, Hexavalent (Dissolved)	ug/l	157	54	34%	0.044	0.83	0.161	0.21	<0.1
Cobalt (Dissolved)	ug/l	158	158	100%	0.041	0.3	0.105	0.0367	0.098
Copper (Dissolved)	ug/l	274	274	100%	0.832	4.48	1.77	0.474	1.74
Iron (Dissolved)	ug/l	158	142	90%	3	905	58.4	105	23.5
Lead (Dissolved)	ug/l	274	274	100%	0.035	3.85	0.268	0.343	0.161
Magnesium (Dissolved)	ug/l	158	158	100%	376000	980000	693000	117000	724000
Manganese (Dissolved)	ug/l	158	158	100%	11.2	106	48.5	20.2	44.8
Mercury (Dissolved)	ng/l	274	248	91%	0.25	53.5	3.15	5.13	1.45
Methyl Mercury (Dissolved)	ng/l	158	49	31%	0.021	0.102	0.0278	0.0109	<0.05
Nickel (Dissolved)	ug/l	158	158	100%	0.62	1.92	1.14	0.312	1.08
Potassium (Dissolved)	ug/l	158	158	100%	126000	295000	225000	32700	232000
Selenium (Dissolved)	ug/l	158	12	8%	0.2	0.6	0.485	0.0585	<1
Silver (Dissolved)	ug/l	158	93	59%	0.003	0.056	0.00959	0.00564	0.01
Sodium (Dissolved)	ug/l	158	158	100%	3250000	7730000	5820000	927000	5920000
Thallium (Dissolved)	ug/l	158	62	39%	0.005	0.019	0.00897	0.00189	<0.02
Titanium (Dissolved)	ug/l	158	45	28%	0.7	16.4	4.46	5.89	<1.2
Vanadium (Dissolved)	ug/l	158	131	83%	1.4	6.2	2.74	1.09	2.8
Zinc (Dissolved)	ug/l	158	158	100%	2.2	13.9	6.32	1.88	6.07

Table I-1
Statistical Summary of Surface Water Chemistry Data in the NBSA

Analyte	Result Unit	Number of Samples	Number of Detects	Frequency of Detection	Minimum Detect	Maximum Detect	Mean	Standard Deviation	Median
Metals - Total									
Aluminum (Total)	ug/l	158	158	100%	41.6	974	191	146	148
Antimony (Total)	ug/l	158	32	20%	0.41	2.55	0.582	0.273	<1
Arsenic (Total)	ug/l	158	158	100%	0.73	2.3	1.28	0.28	1.22
Barium (Total)	ug/l	158	158	100%	12.4	51.7	24	5.3	23.4
Beryllium (Total)	ug/l	158	43	27%	0.0038	0.124	0.0135	0.0153	<0.02
Cadmium (Total)	ug/l	274	274	100%	0.027	0.233	0.0676	0.0241	0.062
Calcium (Total)	ug/l	158	158	100%	143000	320000	242000	35700	250000
Chromium (Total)	ug/l	158	158	100%	0.43	5.61	1.17	0.811	0.895
Cobalt (Total)	ug/l	158	158	100%	0.098	0.55	0.188	0.0788	0.167
Copper (Total)	ug/l	274	274	100%	1.29	13.1	2.92	1.32	2.59
Iron (Total)	ug/l	158	158	100%	116	2320	414	342	296
Lead (Total)	ug/l	274	274	100%	0.533	12	1.81	1.52	1.31
Magnesium (Total)	ug/l	158	158	100%	386000	974000	699000	116000	718000
Manganese (Total)	ug/l	158	158	100%	28.9	117	61.3	20.4	55
Mercury (Total)	ng/l	274	274	100%	0.38	296	21.4	23.4	14.5
Methyl Mercury (Total)	ng/l	158	142	90%	0.021	0.294	0.0517	0.0365	0.0415
Nickel (Total)	ug/l	158	158	100%	0.85	5.05	1.45	0.497	1.31
Potassium (Total)	ug/l	158	158	100%	127000	293000	224000	32500	228000
Selenium (Total)	ug/l	158	25	16%	0.2	2.1	0.484	0.163	<1
Silver (Total)	ug/l	158	139	88%	0.004	0.838	0.0315	0.0676	0.021
Sodium (Total)	ug/l	158	158	100%	3250000	7400000	5830000	931000	5960000
Thallium (Total)	ug/l	158	77	49%	0.006	0.048	0.0112	0.00577	<0.02
Titanium (Total)	ug/l	158	124	78%	0.7	43.3	8.81	6.95	7.4
Vanadium (Total)	ug/l	158	137	87%	1.7	8.4	3.34	1.36	3.4
Zinc (Total)	ug/l	158	158	100%	3.56	28.9	8.53	3.18	7.85
Organotins									
Dibutyltin	ug/l	158	2	1%	0.0096	0.013	0.025	0.0015	<0.05
Monobutyltin	ug/l	158	2	1%	0.029	0.084	0.025	0.0047	<0.05
Tetrabutyltin	ug/l	158	0	0%	--	--	<0.05	NA	<0.05
Tributyltin cation	ug/l	81	0	0%	--	--	<0.05	NA	<0.05
Tri-n-butyltin hydride	ug/l	77	0	0%	--	--	<0.05	NA	<0.05
PAHs									
1,6,7-Trimethylnapthalene	ng/l	157	97	62%	1.61	55.1	4.41	4.47	4.96
1-Methylnaphthalene	ng/l	157	67	43%	4.13	88.7	9	9.22	<10
1-Methylphenanthrene	ng/l	157	144	92%	0.713	47.2	3.73	4.73	2.59
2,6-Dimethylnapthalene	ng/l	157	110	70%	2.2	70.7	5.47	5.93	5
2-Methylnaphthalene	ng/l	157	57	36%	8.36	106	14.2	10.7	<20
Acenaphthene	ng/l	157	156	99%	2.69	76.8	12.3	10.3	8.55
Acenaphthylene	ng/l	157	111	71%	0.595	25.2	3.52	2.93	2.76
Anthracene	ng/l	157	98	62%	1.08	55.7	6.07	6.85	5
Benzo(a)anthracene	ng/l	157	119	76%	2.16	151	9.29	15.5	5.32
Benzo(a)pyrene	ng/l	157	92	59%	3.79	207	11.9	21.4	5.93
Benzo(b)fluoranthene	ng/l	157	97	62%	5.08	210	15	23.5	8.93
Benzo(g,h,i)perylene	ng/l	157	100	64%	2.88	128	9.55	13	5.07
Benzo(k)fluoranthene	ng/l	157	106	68%	1.98	108	7.31	10.6	5
Benzo[e]pyrene	ng/l	157	121	77%	3.09	116	9.56	12.3	5.57
C1 Phenanthrenes/Anthracenes	ng/l	157	67	43%	10.2	162	11.6	16.5	<10
C1-Benzo[a]anthracenes/Chrysenes	ng/l	157	58	37%	10.1	158	11.5	17.2	<10
C1-Dibenzothiophenes	ng/l	157	4	3%	11.9	94.5	5.9	7.73	<10
C1-Fluoranthenes/Pyrenes	ng/l	157	124	79%	10	198	18	20.5	13.2
C1-Fluorenes	ng/l	157	8	5%	10	56.6	5.78	4.68	<10
C2 Phenanthrenes/Anthracenes	ng/l	157	88	56%	10.1	132	12.7	13.8	10.7
C2-Benzo[a]anthracenes/Chrysenes	ng/l	157	14	9%	10.4	68.2	6.7	7.28	<10
C2-Dibenzothiophenes	ng/l	157	12	8%	10.8	55.1	6.16	5.69	<10
C2-Fluorenes	ng/l	157	24	15%	10.2	79.9	7.02	7.22	<10
C2-Naphthalenes	ng/l	157	57	36%	10.1	168	10.9	15.1	<10
C3-Benzo[a]anthracenes/Chrysenes	ng/l	157	6	4%	10.2	27.3	5.39	2.28	<10

Table I-1
Statistical Summary of Surface Water Chemistry Data in the NBSA

Analyte	Result Unit	Number of Samples	Number of Detects	Frequency of Detection	Minimum Detect	Maximum Detect	Mean	Standard Deviation	Median
C3-Dibenzothiophenes	ng/l	157	12	8%	11.4	39.5	5.9	3.78	<10
C3-Fluorenes	ng/l	157	17	11%	10.2	58.5	6.42	5.42	<10
C3-Naphthalenes	ng/l	157	51	32%	10	146	9.03	12.4	<10
C3-Phenanthrenes/Anthracenes	ng/l	157	36	23%	10	75.7	8.42	8.88	<10
C4-Benzo[a]anthracenes/Chrysenes	ng/l	157	1	1%	12.1	12.1	5.05	0.567	<10
C4-Dibenzothiophenes	ng/l	157	5	3%	10.3	50.3	5.51	3.88	<10
C4-Naphthalenes	ng/l	157	74	47%	10.1	133	10.4	11.7	<10
C4-Phenanthrenes/Anthracenes	ng/l	157	12	8%	10.1	32.8	5.89	3.55	<10
Chrysene	ng/l	157	144	92%	3.62	194	15.5	19.8	10.6
Dibenz(a,h)anthracene	ng/l	157	99	63%	0.788	31.8	3.5	3.43	2.69
Dibenzothiophene (Synfuel)	ng/l	157	113	72%	0.693	46.6	3.13	4.03	2.2
Fluoranthene	ng/l	157	147	94%	10.1	282	32.3	29.9	25.2
Fluorene	ng/l	157	71	45%	2	56	6.54	5.33	<10
Indeno(1,2,3-c,d)pyrene	ng/l	157	114	73%	1.86	112	7.96	11.2	5
Naphthalene	ng/l	157	68	43%	16	196	30.6	17.1	<50
Perylene	ng/l	157	109	69%	1.79	63.8	6.04	6.57	5
Phenanthrene	ng/l	157	76	48%	11.5	166	17.7	16.7	<23
Pyrene	ng/l	157	157	100%	11.2	266	35.9	29	27.8
Total PAHs	ng/l	157	157	100%	20.9	1960	194	221	134
PCB Congeners									
Dichlorobiphenyl	ng/l	233	233	100%	0.207	1.52	0.457	0.181	0.42
Chlorobiphenyl; 2- (PCB 1)	ng/l	233	208	89%	0.00422	0.187	0.0213	0.017	0.0188
Chlorobiphenyl; 3- (PCB 2)	ng/l	233	59	25%	0.00107	0.00716	0.00155	0.00116	<0.00316
Chlorobiphenyl; 4- (PCB 3)	ng/l	233	67	29%	0.00169	0.027	0.00337	0.00258	<0.00552
Dichlorobiphenyl; 2,2'- (PCB 4)	ng/l	233	233	100%	0.0785	0.797	0.167	0.0831	0.155
Dichlorobiphenyl; 2,3- (PCB 5)	ng/l	233	46	20%	0.000542	0.00623	0.00114	0.00136	<0.00194
Dichlorobiphenyl; 2,3'- (PCB 6)	ng/l	233	198	85%	0.00633	0.11	0.0182	0.0114	0.0171
Dichlorobiphenyl; 2,4- (PCB 7)	ng/l	233	95	41%	0.000965	0.0182	0.00256	0.00226	<0.00372
Dichlorobiphenyl; 2,4'- (PCB 8)	ng/l	233	217	93%	0.0162	0.29	0.0603	0.034	0.0584
Dichlorobiphenyl; 2,5- (PCB 9)	ng/l	233	116	50%	0.000766	0.0269	0.00363	0.00304	<0.00536
Dichlorobiphenyl; 2,6- (PCB 10)	ng/l	233	232	100%	0.00894	0.154	0.0243	0.0121	0.0224
Dichlorobiphenyl; 3,3'- (PCB 11)	ng/l	233	76	33%	0.0476	0.224	0.0477	0.0366	<0.0618
Dichlorobiphenyl; 3,4- (PCB 12)	ng/l	233	182	78%	0.00653	0.0673	0.016	0.00941	0.0143
Dichlorobiphenyl; 3,4'- (PCB 13)	ng/l	0	--	--	--	--	--	--	--
Dichlorobiphenyl; 3,5- (PCB 14)	ng/l	233	14	6%	0.000405	0.00252	0.000852	0.00108	<0.00146
Dichlorobiphenyl; 4,4'- (PCB 15)	ng/l	233	233	100%	0.0395	0.36	0.0953	0.0384	0.0877
Trichlorobiphenyl; 2,2',3- (PCB 16)	ng/l	233	233	100%	0.0253	0.219	0.0768	0.0376	0.0641
Trichlorobiphenyl; 2,2',4- (PCB 17)	ng/l	233	233	100%	0.0445	0.362	0.127	0.0501	0.119
Trichlorobiphenyl; 2,2',5- (PCB 18)	ng/l	233	233	100%	0.0855	0.588	0.229	0.0968	0.2
Trichlorobiphenyl; 2,2',6- (PCB 19)	ng/l	233	232	100%	0.0276	0.184	0.066	0.025	0.0631
Trichlorobiphenyl; 2,3,3'- (PCB 20)	ng/l	233	233	100%	0.128	0.94	0.327	0.131	0.301
Trichlorobiphenyl; 2,3,4- (PCB 21)	ng/l	233	228	98%	0.0159	0.284	0.0519	0.0302	0.0451
Trichlorobiphenyl; 2,3,4'- (PCB 22)	ng/l	233	233	100%	0.0231	0.23	0.0659	0.0289	0.0581
Trichlorobiphenyl; 2,3',4- (PCB 25)	ng/l	233	233	100%	0.0153	0.118	0.0398	0.0171	0.0367
Trichlorobiphenyl; 2',3,4- (PCB 33)	ng/l	0	--	--	--	--	--	--	--
Trichlorobiphenyl; 2,3,5- (PCB 23)	ng/l	233	1	0%	0.000398	0.000398	0.00038	0.000413	<0
Trichlorobiphenyl; 2,3',5- (PCB 26)	ng/l	233	233	100%	0.0249	0.233	0.0683	0.027	0.0641
Trichlorobiphenyl; 2',3,5- (PCB 34)	ng/l	233	176	76%	0.00059	0.00775	0.00172	0.00118	0.00162
Trichlorobiphenyl; 2,3,6- (PCB 24)	ng/l	233	199	85%	0.000765	0.00984	0.00309	0.00195	0.00283
Trichlorobiphenyl; 2,3',6- (PCB 27)	ng/l	233	233	100%	0.018	0.102	0.0402	0.0136	0.0395
Trichlorobiphenyl; 2,4,4'- (PCB 28)	ng/l	0	--	--	--	--	--	--	--
Trichlorobiphenyl; 2,4,5- (PCB 29)	ng/l	0	--	--	--	--	--	--	--
Trichlorobiphenyl; 2,4',5- (PCB 31)	ng/l	233	233	100%	0.0912	0.757	0.253	0.1	0.233
Trichlorobiphenyl; 2,4,6- (PCB 30)	ng/l	0	--	--	--	--	--	--	--
Trichlorobiphenyl; 2,4',6- (PCB 32)	ng/l	233	232	100%	0.0466	0.262	0.105	0.0398	0.0977
Trichlorobiphenyl; 3,3',4- (PCB 35)	ng/l	233	213	91%	0.0016	0.0207	0.00478	0.00276	0.00408
Trichlorobiphenyl; 3,3',5- (PCB 36)	ng/l	233	93	40%	0.000327	0.00229	0.000639	0.00052	<0.00094
Trichlorobiphenyl; 3,4,4'- (PCB 37)	ng/l	233	233	100%	0.0248	0.188	0.064	0.0286	0.0557

Table I-1
Statistical Summary of Surface Water Chemistry Data in the NBSA

Analyte	Result Unit	Number of Samples	Number of Detects	Frequency of Detection	Minimum Detect	Maximum Detect	Mean	Standard Deviation	Median
Trichlorobiphenyl; 3,4,5- (PCB 38)	ng/l	233	14	6%	0.000468	0.00126	0.000427	0.000436	<0.00071
Trichlorobiphenyl; 3,4',5- (PCB 39)	ng/l	233	170	73%	0.00065	0.00507	0.00158	0.00108	0.0014
Tetrachlorobiphenyl; 2,2',3,3'- (PCB 40)	ng/l	233	233	100%	0.0639	0.466	0.159	0.0642	0.145
Tetrachlorobiphenyl; 2,2',3,4- (PCB 41)	ng/l	0	--	--	--	--	--	--	--
Tetrachlorobiphenyl; 2,2',3,4'- (PCB 42)	ng/l	233	233	100%	0.027	0.222	0.0759	0.0324	0.0678
Tetrachlorobiphenyl; 2,2',3,5- (PCB 43)	ng/l	233	232	100%	0.00284	0.026	0.00968	0.00446	0.00863
Tetrachlorobiphenyl; 2,2',3,5'- (PCB 44)	ng/l	233	233	100%	0.116	0.982	0.314	0.136	0.279
Tetrachlorobiphenyl; 2,2',3,6- (PCB 45)	ng/l	233	233	100%	0.0246	0.266	0.0883	0.0437	0.0776
Tetrachlorobiphenyl; 2,2',3,6'- (PCB 46)	ng/l	233	232	100%	0.00581	0.0567	0.0211	0.00948	0.0192
Tetrachlorobiphenyl; 2,2',4,4'- (PCB 47)	ng/l	0	--	--	--	--	--	--	--
Tetrachlorobiphenyl; 2,2',4,5- (PCB 48)	ng/l	233	232	100%	0.0147	0.141	0.0431	0.0197	0.0383
Tetrachlorobiphenyl; 2,2',4,5'- (PCB 49)	ng/l	233	233	100%	0.0845	0.608	0.207	0.0841	0.191
Tetrachlorobiphenyl; 2,2',4,6- (PCB 50)	ng/l	233	233	100%	0.0231	0.176	0.0655	0.0277	0.0597
Tetrachlorobiphenyl; 2,2',4,6'- (PCB 51)	ng/l	0	--	--	--	--	--	--	--
Tetrachlorobiphenyl; 2,2',5,5'- (PCB 52)	ng/l	233	233	100%	0.131	0.954	0.331	0.134	0.302
Tetrachlorobiphenyl; 2,2',5,6'- (PCB 53)	ng/l	0	--	--	--	--	--	--	--
Tetrachlorobiphenyl; 2,2',6,6'- (PCB 54)	ng/l	233	139	60%	0.00168	0.0216	0.00506	0.00451	0.00388
Tetrachlorobiphenyl; 2,3,3',4- (PCB 55)	ng/l	233	200	86%	0.000642	0.0149	0.00422	0.0027	0.00379
Tetrachlorobiphenyl; 2,3,3',4'- (PCB 56)	ng/l	233	233	100%	0.0293	0.296	0.0861	0.0418	0.0734
Tetrachlorobiphenyl; 2,3,3',5- (PCB 57)	ng/l	233	112	48%	0.000439	0.00508	0.00115	0.000915	<0.001824
Tetrachlorobiphenyl; 2,3,3',5'- (PCB 58)	ng/l	233	146	63%	0.000308	0.00716	0.0011	0.000955	0.000837
Tetrachlorobiphenyl; 2,3,3',6- (PCB 59)	ng/l	233	233	100%	0.0106	0.08	0.0268	0.0111	0.0242
Tetrachlorobiphenyl; 2,3,4,4'- (PCB 60)	ng/l	233	232	100%	0.00926	0.109	0.0299	0.0153	0.0243
Tetrachlorobiphenyl; 2,3',4,4'- (PCB 66)	ng/l	233	233	100%	0.0695	0.672	0.196	0.0954	0.159
Tetrachlorobiphenyl; 2,3,4,5- (PCB 61)	ng/l	233	232	100%	0.0942	1.09	0.302	0.149	0.25
Tetrachlorobiphenyl; 2,3,4',5- (PCB 63)	ng/l	233	232	100%	0.00276	0.0258	0.00798	0.00384	0.00697
Tetrachlorobiphenyl; 2,3',4,5- (PCB 67)	ng/l	233	230	99%	0.00194	0.0227	0.00618	0.00328	0.00537
Tetrachlorobiphenyl; 2,3',4,5'- (PCB 68)	ng/l	233	158	68%	0.000785	0.0104	0.00267	0.00158	0.00244
Tetrachlorobiphenyl; 2,3',4',5- (PCB 70)	ng/l	0	--	--	--	--	--	--	--
Tetrachlorobiphenyl; 2',3,4,5- (PCB 76)	ng/l	0	--	--	--	--	--	--	--
Tetrachlorobiphenyl; 2,3,4,6- (PCB 62)	ng/l	0	--	--	--	--	--	--	--
Tetrachlorobiphenyl; 2,3,4',6- (PCB 64)	ng/l	233	233	100%	0.0376	0.298	0.099	0.0433	0.0856
Tetrachlorobiphenyl; 2,3',4,6- (PCB 69)	ng/l	0	--	--	--	--	--	--	--
Tetrachlorobiphenyl; 2,3',4',6- (PCB 71)	ng/l	0	--	--	--	--	--	--	--
Tetrachlorobiphenyl; 2,3',5,5'- (PCB 72)	ng/l	233	210	90%	0.00129	0.0119	0.00354	0.00183	0.00335
Tetrachlorobiphenyl; 2,3,5,6- (PCB 65)	ng/l	0	--	--	--	--	--	--	--
Tetrachlorobiphenyl; 2,3',5',6- (PCB 73)	ng/l	0	--	--	--	--	--	--	--
Tetrachlorobiphenyl; 2,4,4',5- (PCB 74)	ng/l	0	--	--	--	--	--	--	--
Tetrachlorobiphenyl; 2,4,4',6- (PCB 75)	ng/l	0	--	--	--	--	--	--	--
Tetrachlorobiphenyl; 3,3',4,4'- (PCB 77)	ng/l	233	232	100%	0.0047	0.0705	0.0184	0.0104	0.0155
Tetrachlorobiphenyl; 3,3',4,5- (PCB 78)	ng/l	233	0	0%	--	--	<0.001006	NA	<0.000914
Tetrachlorobiphenyl; 3,3',4,5'- (PCB 79)	ng/l	233	145	62%	0.000808	0.00677	0.00169	0.00133	0.00143
Tetrachlorobiphenyl; 3,3',5,5'- (PCB 80)	ng/l	233	0	0%	--	--	<0.000862	NA	<0.000782
Tetrachlorobiphenyl; 3,4,4',5- (PCB 81)	ng/l	233	50	21%	0.000366	0.00254	0.000611	0.000532	<0.00095
Pentachlorobiphenyl; 2,2',3,3',4- (PCB 82)	ng/l	233	231	99%	0.00557	0.0819	0.0224	0.0136	0.0183
Pentachlorobiphenyl; 2,2',3,3',5- (PCB 83)	ng/l	233	233	100%	0.0355	0.381	0.128	0.0663	0.106
Pentachlorobiphenyl; 2,2',3,3',6- (PCB 84)	ng/l	233	233	100%	0.0144	0.174	0.0563	0.0282	0.0478
Pentachlorobiphenyl; 2,2',3,4,4'- (PCB 85)	ng/l	233	231	99%	0.0105	0.111	0.032	0.0191	0.0256
Pentachlorobiphenyl; 2,2',3,4,5- (PCB 86)	ng/l	233	232	100%	0.0446	0.375	0.119	0.0637	0.0981
Pentachlorobiphenyl; 2,2',3,4,5'- (PCB 87)	ng/l	0	--	--	--	--	--	--	--
Pentachlorobiphenyl; 2,2',3,4',5- (PCB 90)	ng/l	233	233	100%	0.0585	0.583	0.189	0.0979	0.158
Pentachlorobiphenyl; 2,2',3',4,5- (PCB 97)	ng/l	0	--	--	--	--	--	--	--
Pentachlorobiphenyl; 2,2',3,4,6- (PCB 88)	ng/l	233	232	100%	0.0106	0.117	0.0373	0.0195	0.0315
Pentachlorobiphenyl; 2,2',3,4,6'- (PCB 89)	ng/l	233	58	25%	0.00169	0.0104	0.00174	0.00204	<0.00167
Pentachlorobiphenyl; 2,2',3,4',6- (PCB 91)	ng/l	0	--	--	--	--	--	--	--
Pentachlorobiphenyl; 2,2',3',4,6- (PCB 98)	ng/l	233	226	97%	0.0035	0.0433	0.0115	0.00679	0.00983
Pentachlorobiphenyl; 2,2',3,5,5'- (PCB 92)	ng/l	233	233	100%	0.0112	0.108	0.034	0.0178	0.0285
Pentachlorobiphenyl; 2,2',3,5,6- (PCB 93)	ng/l	233	222	95%	0.000558	0.0373	0.00749	0.00633	0.00574

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Pentachlorobiphenyl; 2,2',3,5,6'- (PCB 94)	ng/l	233	71	30%	0.00119	0.0113	0.00196	0.00219	<0.00175
Pentachlorobiphenyl; 2,2',3,5',6- (PCB 95)	ng/l	233	233	100%	0.0537	0.504	0.168	0.0792	0.141
Pentachlorobiphenyl; 2,2',3,6,6'- (PCB 96)	ng/l	233	110	47%	0.00127	0.00969	0.00203	0.00194	<0.002
Pentachlorobiphenyl; 2,2',4,4',5- (PCB 99)	ng/l	0	--	--	--	--	--	--	--
Pentachlorobiphenyl; 2,2',4,4',6- (PCB 100)	ng/l	0	--	--	--	--	--	--	--
Pentachlorobiphenyl; 2,2',4,5,5'- (PCB 101)	ng/l	0	--	--	--	--	--	--	--
Pentachlorobiphenyl; 2,2',4,5,6'- (PCB 102)	ng/l	0	--	--	--	--	--	--	--
Pentachlorobiphenyl; 2,2',4,5',6- (PCB 103)	ng/l	233	150	64%	0.00164	0.016	0.00364	0.00317	0.00302
Pentachlorobiphenyl; 2,2',4,6,6'- (PCB 104)	ng/l	233	13	6%	0.00147	0.00403	0.000636	0.000706	<0.001
Pentachlorobiphenyl; 2,3,3',4,4'- (PCB 105)	ng/l	233	226	97%	0.0156	0.197	0.0555	0.0343	0.0436
Pentachlorobiphenyl; 2,3,3',4,5- (PCB 106)	ng/l	233	4	2%	0.000333	5	0.0219	0.328	<0.000722
Pentachlorobiphenyl; 2,3,3',4',5- (PCB 107)	ng/l	233	231	99%	0.00363	0.0388	0.0114	0.00691	0.00901
Pentachlorobiphenyl; 2,3,3',4,5'- (PCB 108)	ng/l	233	202	87%	0.00137	0.0177	0.00474	0.00334	0.00367
Pentachlorobiphenyl; 2',3,3',4,5- (PCB 122)	ng/l	233	146	63%	0.000683	0.00883	0.00201	0.00175	0.00163
Pentachlorobiphenyl; 2,3,3',4,6- (PCB 109)	ng/l	0	--	--	--	--	--	--	--
Pentachlorobiphenyl; 2,3,3',4',6- (PCB 110)	ng/l	233	233	100%	0.0304	0.661	0.213	0.112	0.176
Pentachlorobiphenyl; 2,3,3',5,5'- (PCB 111)	ng/l	233	0	0%	--	--	<0.000988	NA	<0.000916
Pentachlorobiphenyl; 2,3,3',5,6- (PCB 112)	ng/l	233	0	0%	--	--	<0.001074	NA	<0.000996
Pentachlorobiphenyl; 2,3,3',5',6- (PCB 113)	ng/l	0	--	--	--	--	--	--	--
Pentachlorobiphenyl; 2,3,4,4',5- (PCB 114)	ng/l	233	187	80%	0.000794	0.0124	0.00273	0.00216	0.00214
Pentachlorobiphenyl; 2,3',4,4',5- (PCB 118)	ng/l	233	233	100%	0.0455	0.473	0.143	0.0821	0.113
Pentachlorobiphenyl; 2',3,4,4',5- (PCB 123)	ng/l	233	203	87%	0.000573	0.0129	0.00258	0.00193	0.00205
Pentachlorobiphenyl; 2,3,4,4',6- (PCB 115)	ng/l	0	--	--	--	--	--	--	--
Pentachlorobiphenyl; 2,3',4,4',6- (PCB 119)	ng/l	0	--	--	--	--	--	--	--
Pentachlorobiphenyl; 2,3',4,5,5'- (PCB 120)	ng/l	233	15	6%	0.000852	0.00427	0.000613	0.000665	<0.000976
Pentachlorobiphenyl; 2',3,4,5,5'- (PCB 124)	ng/l	0	--	--	--	--	--	--	--
Pentachlorobiphenyl; 2,3,4,5,6- (PCB 116)	ng/l	1	0	0%	--	--	<0.0013	NA	<0.0013
Pentachlorobiphenyl; 2,3,4',5,6- (PCB 117)	ng/l	1	0	0%	--	--	<0.0013	NA	<0.0013
Pentachlorobiphenyl; 2,3',4,5',6- (PCB 121)	ng/l	233	0	0%	--	--	<0.001026	NA	<0.00095
Pentachlorobiphenyl; 2',3,4,5,6'- (PCB 125)	ng/l	0	--	--	--	--	--	--	--
Pentachlorobiphenyl; 3,3',4,4',5- (PCB 126)	ng/l	233	40	17%	0.000372	0.00524	0.000575	0.000575	<0.000884
Pentachlorobiphenyl; 3,3',4,5,5'- (PCB 127)	ng/l	233	2	1%	0.000446	0.000449	0.000408	0.000402	<0.000716
Hexachlorobiphenyl; 2,2',3,3',4,4'- (PCB 128)	ng/l	233	224	96%	0.00484	0.0901	0.0224	0.0143	0.0178
Hexachlorobiphenyl; 2,2',3,3',4,5- (PCB 129)	ng/l	233	231	99%	0.0415	0.662	0.17	0.0987	0.134
Hexachlorobiphenyl; 2,2',3,3',4,5'- (PCB 130)	ng/l	233	229	98%	0.00284	0.0358	0.00932	0.00586	0.00772
Hexachlorobiphenyl; 2,2',3,3',4,6- (PCB 131)	ng/l	233	49	21%	0.000993	0.00822	0.00142	0.00147	<0.00181
Hexachlorobiphenyl; 2,2',3,3',4,6'- (PCB 132)	ng/l	233	228	98%	0.0112	0.216	0.053	0.0321	0.0436
Hexachlorobiphenyl; 2,2',3,3',5,5'- (PCB 133)	ng/l	233	132	57%	0.00114	0.0101	0.00241	0.00207	0.00179
Hexachlorobiphenyl; 2,2',3,3',5,6- (PCB 134)	ng/l	233	229	98%	0.00176	0.046	0.00929	0.00612	0.00753
Hexachlorobiphenyl; 2,2',3,3',5,6'- (PCB 135)	ng/l	233	232	100%	0.0124	0.208	0.0565	0.0353	0.0437
Hexachlorobiphenyl; 2,2',3,3',6,6'- (PCB 136)	ng/l	233	232	100%	0.00316	0.0748	0.0205	0.0126	0.0163
Hexachlorobiphenyl; 2,2',3,4,4',5- (PCB 137)	ng/l	233	222	95%	0.00161	0.023	0.00564	0.00392	0.00426
Hexachlorobiphenyl; 2,2',3,4,4',5'- (PCB 138)	ng/l	0	--	--	--	--	--	--	--
Hexachlorobiphenyl; 2,2',3,4,4',6- (PCB 139)	ng/l	233	120	52%	0.000711	0.0125	0.0023	0.0022	0.00152
Hexachlorobiphenyl; 2,2',3,4,4',6'- (PCB 140)	ng/l	3	0	0%	--	--	<0.001224	NA	<0.00129
Hexachlorobiphenyl; 2,2',3,4,5,5'- (PCB 141)	ng/l	233	225	97%	0.00629	0.12	0.0263	0.0176	0.0206
Hexachlorobiphenyl; 2,2',3,4',5,5'- (PCB 146)	ng/l	233	232	100%	0.00672	0.104	0.027	0.0157	0.0217
Hexachlorobiphenyl; 2,2',3,4,5,6- (PCB 142)	ng/l	233	0	0%	--	--	<0.00169	NA	<0.00147
Hexachlorobiphenyl; 2,2',3,4,5,6'- (PCB 143)	ng/l	0	--	--	--	--	--	--	--
Hexachlorobiphenyl; 2,2',3,4,5',6- (PCB 144)	ng/l	233	173	74%	0.00146	0.0263	0.0051	0.00449	0.00388
Hexachlorobiphenyl; 2,2',3,4',5,6- (PCB 147)	ng/l	233	233	100%	0.0354	0.6	0.148	0.0842	0.124
Hexachlorobiphenyl; 2,2',3,4',5,6'- (PCB 148)	ng/l	233	0	0%	--	--	<0.001676	NA	<0.00153
Hexachlorobiphenyl; 2,2',3,4',5',6- (PCB 149)	ng/l	0	--	--	--	--	--	--	--
Hexachlorobiphenyl; 2,2',3,4,6,6'- (PCB 145)	ng/l	233	0	0%	--	--	<0.001198	NA	<0.00109
Hexachlorobiphenyl; 2,2',3,4',6,6'- (PCB 150)	ng/l	233	4	2%	0.000853	0.00319	0.000615	0.00074	<0.00107
Hexachlorobiphenyl; 2,2',3,5,5',6- (PCB 151)	ng/l	0	--	--	--	--	--	--	--
Hexachlorobiphenyl; 2,2',3,5,6,6'- (PCB 152)	ng/l	233	1	0%	0.00259	0.00259	0.000604	0.000724	<0
Hexachlorobiphenyl; 2,2',4,4',5,5'- (PCB 153)	ng/l	233	233	100%	0.0362	0.571	0.151	0.0863	0.123

Table I-1
Statistical Summary of Surface Water Chemistry Data in the NBSA

Analyte	Result Unit	Number of Samples	Number of Detects	Frequency of Detection	Minimum Detect	Maximum Detect	Mean	Standard Deviation	Median
Hexachlorobiphenyl; 2,2',4,4',5',6- (PCB 154)	ng/l	233	200	86%	0.000948	0.044	0.00405	0.00418	0.00284
Hexachlorobiphenyl; 2,2',4,4',6,6'- (PCB 155)	ng/l	233	21	9%	0.000881	0.00479	0.000756	0.000949	<0.00109
Hexachlorobiphenyl; 2,3,3',4,4',5- (PCB 156)	ng/l	233	209	90%	0.00435	0.0515	0.0142	0.00999	0.0103
Hexachlorobiphenyl; 2,3,3',4,4',5'- (PCB 157)	ng/l	0	--	--	--	--	--	--	--
Hexachlorobiphenyl; 2,3,3',4,4',6- (PCB 158)	ng/l	233	231	99%	0.00296	0.0594	0.0142	0.0093	0.0109
Hexachlorobiphenyl; 2,3,3',4,5,5'- (PCB 159)	ng/l	233	45	19%	0.000583	0.00425	0.000921	0.000954	<0.00117
Hexachlorobiphenyl; 2,3,3',4',5,5'- (PCB 162)	ng/l	233	34	15%	0.000633	0.00489	0.000782	0.000854	<0.00107
Hexachlorobiphenyl; 2,3,3',4,5,6- (PCB 160)	ng/l	0	--	--	--	--	--	--	--
Hexachlorobiphenyl; 2,3,3',4,5',6- (PCB 161)	ng/l	233	0	0%	--	--	<0.00112	NA	<0.00097
Hexachlorobiphenyl; 2,3,3',4',5,6- (PCB 163)	ng/l	0	--	--	--	--	--	--	--
Hexachlorobiphenyl; 2,3,3',4',5',6- (PCB 164)	ng/l	233	232	100%	0.00251	0.0511	0.0105	0.00706	0.00812
Hexachlorobiphenyl; 2,3,3',5,5',6- (PCB 165)	ng/l	233	0	0%	--	--	<0.00123	NA	<0.00107
Hexachlorobiphenyl; 2,3',4,4',5,5'- (PCB 167)	ng/l	233	219	94%	0.000934	0.019	0.00494	0.00339	0.00386
Hexachlorobiphenyl; 2,3,4,4',5,6- (PCB 166)	ng/l	0	--	--	--	--	--	--	--
Hexachlorobiphenyl; 2,3',4,4',5',6- (PCB 168)	ng/l	0	--	--	--	--	--	--	--
Hexachlorobiphenyl; 3,3',4,4',5,5'- (PCB 169)	ng/l	233	4	2%	0.000347	0.00179	0.000482	0.000449	<0.000804
Heptachlorobiphenyl; 2,2',3,3',4,4',5- (PCB 170)	ng/l	233	219	94%	0.00667	0.133	0.0329	0.0241	0.0225
Heptachlorobiphenyl; 2,2',3,3',4,4',6- (PCB 171)	ng/l	233	227	97%	0.00249	0.0388	0.0101	0.00718	0.00752
Heptachlorobiphenyl; 2,2',3,3',4,5,5'- (PCB 172)	ng/l	233	196	84%	0.00116	0.0223	0.00512	0.00436	0.0036
Heptachlorobiphenyl; 2,2',3,3',4,5,6- (PCB 173)	ng/l	0	--	--	--	--	--	--	--
Heptachlorobiphenyl; 2,2',3,3',4,5,6'- (PCB 174)	ng/l	233	223	96%	0.00816	0.127	0.0338	0.0235	0.0241
Heptachlorobiphenyl; 2,2',3,3',4,5',6- (PCB 175)	ng/l	233	48	21%	0.000843	0.00544	0.000982	0.00126	<0.00112
Heptachlorobiphenyl; 2,2',3,3',4',5,6- (PCB 177)	ng/l	233	223	96%	0.00453	0.0796	0.0214	0.0143	0.0158
Heptachlorobiphenyl; 2,2',3,3',4,6,6'- (PCB 176)	ng/l	233	216	93%	0.00127	0.0198	0.00437	0.00322	0.00342
Heptachlorobiphenyl; 2,2',3,3',5,5',6- (PCB 178)	ng/l	233	227	97%	0.0029	0.0337	0.00883	0.00589	0.00678
Heptachlorobiphenyl; 2,2',3,3',5,6,6'- (PCB 179)	ng/l	233	232	100%	0.00438	0.0727	0.0194	0.0122	0.0146
Heptachlorobiphenyl; 2,2',3,4,4',5,5'- (PCB 180)	ng/l	233	219	94%	0.0204	0.274	0.0784	0.054	0.0569
Heptachlorobiphenyl; 2,2',3,4,4',5,6- (PCB 181)	ng/l	233	0	0%	--	--	<0.001148	NA	<0.000964
Heptachlorobiphenyl; 2,2',3,4,4',5,6'- (PCB 182)	ng/l	233	3	1%	0.000881	0.00155	0.000568	0.000847	<0.00095
Heptachlorobiphenyl; 2,2',3,4,4',5',6- (PCB 183)	ng/l	233	232	100%	0.00558	0.0973	0.0265	0.0178	0.0192
Heptachlorobiphenyl; 2,2',3,4,4',6,6'- (PCB 184)	ng/l	233	3	1%	0.00104	0.00384	0.000501	0.000768	<0.000804
Heptachlorobiphenyl; 2,2',3,4,5,5',6- (PCB 185)	ng/l	0	--	--	--	--	--	--	--
Heptachlorobiphenyl; 2,2',3,4',5,5',6- (PCB 187)	ng/l	233	232	100%	0.0147	0.194	0.0572	0.035	0.0429
Heptachlorobiphenyl; 2,2',3,4,5,6,6'- (PCB 186)	ng/l	233	0	0%	--	--	<0.00092	NA	<0.000772
Heptachlorobiphenyl; 2,2',3,4',5,6,6'- (PCB 188)	ng/l	233	1	0%	0.000721	0.000721	0.000402	0.00063	<0
Heptachlorobiphenyl; 2,3,3',4,4',5,5'- (PCB 189)	ng/l	233	57	24%	0.000561	0.0062	0.000848	0.000937	<0.00102
Heptachlorobiphenyl; 2,3,3',4,4',5,6- (PCB 190)	ng/l	233	211	91%	0.00115	0.0292	0.00581	0.00474	0.00442
Heptachlorobiphenyl; 2,3,3',4,4',5',6- (PCB 191)	ng/l	233	62	27%	0.000681	0.00513	0.000935	0.00117	<0.000882
Heptachlorobiphenyl; 2,3,3',4,5,5',6- (PCB 192)	ng/l	233	0	0%	--	--	<0.000976	NA	<0.00082
Heptachlorobiphenyl; 2,3,3',4',5,5',6- (PCB 193)	ng/l	0	--	--	--	--	--	--	--
Octachlorobiphenyl; 2,2',3,3',4,4',5,5'- (PCB 194)	ng/l	233	216	93%	0.00428	0.0996	0.0206	0.0162	0.0147
Octachlorobiphenyl; 2,2',3,3',4,4',5,6- (PCB 195)	ng/l	233	211	91%	0.00158	0.0363	0.0069	0.00586	0.00502
Octachlorobiphenyl; 2,2',3,3',4,4',5,6'- (PCB 196)	ng/l	233	223	96%	0.0021	0.0403	0.00948	0.0073	0.00656
Octachlorobiphenyl; 2,2',3,3',4,4',6,6'- (PCB 197)	ng/l	233	32	14%	0.00058	0.00257	0.000583	0.000619	<0.000758
Octachlorobiphenyl; 2,2',3,3',4,5,5',6- (PCB 198)	ng/l	233	221	95%	0.00696	0.105	0.0273	0.0195	0.0196
Octachlorobiphenyl; 2,2',3,3',4,5,5',6'- (PCB 199)	ng/l	0	--	--	--	--	--	--	--
Octachlorobiphenyl; 2,2',3,3',4,5,6,6'- (PCB 200)	ng/l	233	127	55%	0.000909	0.00928	0.00179	0.00178	0.00125
Octachlorobiphenyl; 2,2',3,3',4,5',6,6'- (PCB 201)	ng/l	233	181	78%	0.00098	0.0122	0.00284	0.00231	0.00225
Octachlorobiphenyl; 2,2',3,3',5,5',6,6'- (PCB 202)	ng/l	233	231	99%	0.00226	0.0419	0.00839	0.00542	0.00671
Octachlorobiphenyl; 2,2',3,4,4',5,5',6- (PCB 203)	ng/l	233	231	99%	0.00409	0.0652	0.0164	0.0118	0.0118
Octachlorobiphenyl; 2,2',3,4,4',5,6,6'- (PCB 204)	ng/l	233	0	0%	--	--	<0.000854	NA	<0.000712
Octachlorobiphenyl; 2,3,3',4,4',5,5',6- (PCB 205)	ng/l	233	45	19%	0.000524	0.00579	0.00072	0.000745	<0.000906
Nonachlorobiphenyl; 2,2',3,3',4,4',5,5',6- (PCB 206)	ng/l	233	217	93%	0.0063	0.084	0.0236	0.0159	0.0185
Nonachlorobiphenyl; 2,2',3,3',4,4',5,6,6'- (PCB 207)	ng/l	233	110	47%	0.000657	0.00816	0.0019	0.00183	<0.0021
Nonachlorobiphenyl; 2,2',3,3',4,5,5',6,6'- (PCB 208)	ng/l	233	229	98%	0.00253	0.0324	0.00902	0.00587	0.00701
Decachlorobiphenyl (PCB 209)	ng/l	233	231	99%	0.00611	0.888	0.027	0.0587	0.0183
Total Heptachlorobiphenyls	ng/l	233	226	97%	0.0661	1.1	0.305	0.206	0.222
Total Hexachlorobiphenyls	ng/l	233	233	100%	0.172	3	0.758	0.448	0.596

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Analyte	Result Unit	Number of Samples	Number of Detects	Frequency of Detection	Minimum Detect	Maximum Detect	Mean	Standard Deviation	Median
Total Monochlorobiphenyls	ng/l	233	175	75%	0.00492	0.221	0.0268	0.0209	0.0223
Total Nonochlorobiphenyls	ng/l	233	220	94%	0.00757	0.122	0.0343	0.0235	0.0267
Total Octachlorobiphenyls	ng/l	233	225	97%	0.0209	0.366	0.0944	0.0689	0.0683
Total Pentachlorobiphenyls	ng/l	233	233	100%	0.386	3.96	1.25	0.662	1.04
Total Tetrachlorobiphenyls	ng/l	233	233	100%	0.818	6.61	2.11	0.915	1.83
Total Trichlorobiphenyls	ng/l	233	233	100%	0.601	4.23	1.53	0.588	1.41
Total PCB Congeners (209)	ng/l	233	233	100%	2.2	20.4	6.54	2.96	5.8
Pesticides									
Aldrin	ng/l	158	25	16%	0.0071	0.6	0.081	0.097	<0.04
alpha-Chlordane	ng/l	158	156	99%	0.048	0.53	0.2	0.1	0.16
alpha-Endosulfan	ng/l	158	15	9%	0.063	0.85	0.13	0.1	<0.32
alpha-Hexachlorocyclohexane (alpha BHC)	ng/l	158	139	88%	0.049	4.6	0.15	0.37	0.11
beta-Chlordane	ng/l	158	143	91%	0.06	0.56	0.16	0.09	0.13
beta-Endosulfan	ng/l	158	10	6%	0.073	0.96	0.14	0.1	<0.38
beta-Hexachlorocyclohexane (beta BHC)	ng/l	158	108	68%	0.031	3.7	0.12	0.31	0.065
cis-Nonachlor	ng/l	158	84	53%	0.019	0.16	0.074	0.065	0.048
delta-Hexachlorocyclohexane (delta BHC)	ng/l	158	26	16%	0.012	2.1	0.13	0.24	<0.15
Dieldrin	ng/l	158	153	97%	0.1	2.1	0.33	0.22	0.27
Endosulfan sulfate	ng/l	158	86	54%	0.015	0.38	0.043	0.043	0.029
Endrin	ng/l	158	31	20%	0.016	2.3	0.13	0.21	<0.19
Endrin aldehyde	ng/l	158	10	6%	0.018	0.65	0.12	0.095	<0.36
Endrin ketone	ng/l	158	40	25%	0.016	0.72	0.13	0.091	<0.28
gamma-BHC (Lindane)	ng/l	158	119	75%	0.021	1.1	0.07	0.092	0.057
Heptachlor	ng/l	158	53	34%	0.0034	1.1	0.054	0.11	<0.016
Heptachlor epoxide	ng/l	158	143	91%	0.026	0.67	0.14	0.099	0.11
Hexachlorobenzene	ng/l	158	8	5%	0.1	6.8	0.12	0.61	<0.086
Methoxychlor	ng/l	158	38	24%	0.02	0.43	0.1	0.09	<0.126
o,p'-DDD	ng/l	158	125	79%	0.066	1.4	0.15	0.16	0.12
o,p'-DDE	ng/l	158	66	42%	0.041	2.2	0.15	0.24	<0.198
o,p'-DDT	ng/l	158	9	6%	0.016	0.13	0.11	0.083	<0.166
Oxychlordane	ng/l	158	13	8%	0.008	0.031	0.1	0.092	<0.182
p,p'-DDD	ng/l	158	135	85%	0.17	3.9	0.4	0.41	0.3
p,p'-DDE	ng/l	158	120	76%	0.17	3.9	0.4	0.48	0.28
p,p'-DDT	ng/l	158	75	47%	0.046	0.64	0.1	0.094	<0.158
trans-Nonachlor	ng/l	158	142	90%	0.022	0.33	0.088	0.052	0.077
Total Alpha + Gamma Chlordane	ng/l	158	158	100%	0.048	0.85	0.35	0.19	0.29
Total DDT (4,4)	ng/l	158	143	91%	0.17	8.1	0.84	0.92	0.62
Semivolatiles									
1,1'-Biphenyl	ug/l	157	0	0%	--	--	<0.98	NA	<0.98
1,2,4,5-Tetrachlorobenzene	ug/l	157	0	0%	--	--	<0.98	NA	<0.98
1,4-Dioxane (p-Dioxane)	ug/l	157	1	1%	0.21	0.21	0.97	0.068	<1.9
2,3,4,6-Tetrachlorophenol	ug/l	157	0	0%	--	--	<0.98	NA	<0.98
2,4,5-Trichlorophenol	ug/l	157	0	0%	--	--	<0.98	NA	<0.98
2,4,6-Trichlorophenol	ug/l	157	0	0%	--	--	<0.98	NA	<0.98
2,4-Dichlorophenol	ug/l	157	3	2%	0.038	0.047	0.096	0.0083	<0.19
2,4-Dimethylphenol	ug/l	157	0	0%	--	--	<0.98	NA	<0.98
2,4-Dinitrophenol	ug/l	157	0	0%	--	--	<4.8	NA	<5
2,4-Dinitrotoluene	ug/l	157	3	2%	0.2	0.23	0.48	0.04	<0.98
2,6-Dinitrotoluene	ug/l	157	0	0%	--	--	<0.98	NA	<0.98
2-Chloronaphthalene	ug/l	157	2	1%	0.035	0.043	0.097	0.0072	<0.19
2-Chlorophenol	ug/l	157	0	0%	--	--	<0.98	NA	<0.98
2-Methylnaphthalene	ug/l	157	8	5%	0.012	0.059	0.094	0.015	<0.19
2-Methylphenol (o-Cresol)	ug/l	157	0	0%	--	--	<0.98	NA	<0.98
2-Nitroaniline	ug/l	157	0	0%	--	--	<4.8	NA	<5
2-Nitrophenol	ug/l	157	0	0%	--	--	<0.98	NA	<0.98
3,3'-Dichlorobenzidine	ug/l	157	0	0%	--	--	<0.98	NA	<0.98
3-Nitroaniline	ug/l	157	0	0%	--	--	<4.8	NA	<5
4,6-Dinitro-2-methylphenol	ug/l	157	0	0%	--	--	<4.8	NA	<5
4-Bromophenyl phenyl ether	ug/l	157	0	0%	--	--	<0.98	NA	<0.98
4-Chloro-3-methylphenol	ug/l	157	0	0%	--	--	<0.98	NA	<0.98
4-Chloroaniline	ug/l	157	1	1%	0.52	0.52	0.49	0.013	<0.98

Table I-1
Statistical Summary of Surface Water Chemistry Data in the NBSA

Analyte	Result Unit	Number of Samples	Number of Detects	Frequency of Detection	Minimum Detect	Maximum Detect	Mean	Standard Deviation	Median
4-Chlorophenyl phenyl ether	ug/l	157	1	1%	0.053	0.053	0.48	0.037	<0.98
4-Methylphenol (p-Cresol)	ug/l	157	2	1%	0.089	0.12	0.48	0.045	<0.98
4-Nitroaniline	ug/l	157	0	0%	--	--	<4.8	NA	<5
4-Nitrophenol	ug/l	157	0	0%	--	--	<4.8	NA	<5
Acenaphthene	ug/l	157	6	4%	0.016	0.066	0.095	0.012	<0.19
Acenaphthylene	ug/l	157	2	1%	0.041	0.045	0.097	0.0068	<0.19
Acetophenone	ug/l	157	1	1%	0.092	0.092	0.48	0.034	<0.98
Anthracene	ug/l	157	5	3%	0.035	0.057	0.096	0.011	<0.19
Atrazine	ug/l	157	1	1%	0.42	0.42	0.49	0.014	<0.98
Benzaldehyde	ug/l	157	9	6%	0.22	0.62	0.49	0.037	<0.98
Benzo(a)anthracene	ug/l	157	15	10%	0.027	0.88	0.1	0.067	<0.19
Benzo(a)pyrene	ug/l	157	9	6%	0.033	0.73	0.1	0.053	<0.19
Benzo(b)fluoranthene	ug/l	157	14	9%	0.027	0.93	0.11	0.1	<0.19
Benzo(g,h,i)perylene	ug/l	157	10	6%	0.036	1.1	0.1	0.082	<0.19
Benzo(k)fluoranthene	ug/l	157	10	6%	0.054	0.89	0.1	0.065	<0.19
Benzyl butyl phthalate	ug/l	157	46	29%	0.14	0.73	0.41	0.13	<0.96
Bis(2-chloro-1-methylethyl) ether	ug/l	157	2	1%	0.045	0.072	0.097	0.0055	<0.19
Bis(2-chloroethoxy) methane	ug/l	157	0	0%	--	--	<0.98	NA	<0.98
Bis(2-chloroethyl) ether (2-Chloroethyl ether)	ug/l	157	0	0%	--	--	<0.194	NA	<0.19
Bis(2-ethylhexyl) phthalate	ug/l	157	5	3%	1.8	2.7	1	0.27	<1.9
Caprolactam	ug/l	157	4	3%	1.3	2.2	2.4	0.16	<5
Carbazole	ug/l	157	3	2%	0.047	0.064	0.097	0.0068	<0.19
Chrysene	ug/l	157	15	10%	0.018	0.91	0.1	0.07	<0.19
Dibenz(a,h)anthracene	ug/l	157	10	6%	0.039	1	0.11	0.083	<0.19
Dibenzofuran	ug/l	157	1	1%	0.064	0.064	0.48	0.036	<0.98
Diethyl phthalate	ug/l	157	21	13%	0.14	0.24	0.45	0.11	<0.98
Dimethyl phthalate	ug/l	157	0	0%	--	--	<0.98	NA	<0.98
Di-n-butyl phthalate	ug/l	157	6	4%	0.13	0.48	0.48	0.047	<0.98
Di-n-octylphthalate	ug/l	157	1	1%	0.5	0.5	0.49	0.013	<0.98
Fluoranthene	ug/l	157	40	25%	0.018	0.45	0.089	0.044	<0.19
Fluorene	ug/l	157	3	2%	0.042	0.062	0.097	0.0073	<0.19
Hexachlorobenzene	ug/l	157	2	1%	0.042	0.052	0.097	0.0065	<0.19
Hexachlorobutadiene	ug/l	157	2	1%	0.035	0.041	0.097	0.0073	<0.19
Hexachlorocyclopentadiene	ug/l	157	0	0%	--	--	<0.98	NA	<0.98
Hexachloroethane	ug/l	157	0	0%	--	--	<0.98	NA	<0.98
Indeno(1,2,3-c,d)pyrene	ug/l	157	10	6%	0.048	1.1	0.11	0.086	<0.19
Isophorone	ug/l	157	1	1%	0.065	0.065	0.48	0.036	<0.98
Naphthalene	ug/l	157	15	10%	0.017	0.12	0.092	0.018	<0.19
Nitrobenzene	ug/l	157	0	0%	--	--	<1.94	NA	<1.9
n-Nitrosodi-n-propylamine	ug/l	157	0	0%	--	--	<0.194	NA	<0.19
n-Nitrosodiphenylamine	ug/l	157	0	0%	--	--	<0.98	NA	<0.98
Pentachlorophenol	ug/l	157	0	0%	--	--	<0.98	NA	<0.98
Phenanthrene	ug/l	157	15	10%	0.043	0.097	0.094	0.012	<0.19
Phenol	ug/l	157	4	3%	0.055	0.14	0.097	0.0065	<0.19
Pyrene	ug/l	157	35	22%	0.021	0.32	0.09	0.034	<0.19
Volatiles									
1,1,1-Trichloroethane	ug/l	158	13	8%	0.08	0.15	0.24	0.043	<0.5
1,1,2,2-Tetrachloroethane	ug/l	158	0	0%	--	--	<0.5	NA	<0.5
1,1,2-Trichloroethane	ug/l	158	0	0%	--	--	<0.5	NA	<0.5
1,1-Dichloroethane	ug/l	158	0	0%	--	--	<0.5	NA	<0.5
1,1-Dichloroethene	ug/l	158	0	0%	--	--	<0.5	NA	<0.5
1,2,3-Trichlorobenzene	ug/l	158	0	0%	--	--	<2	NA	<2
1,2,4-Trichlorobenzene	ug/l	158	1	1%	0.13	0.13	0.99	0.069	<2
1,2-Dibromo-3-chloropropane	ug/l	158	0	0%	--	--	<2	NA	<2
1,2-Dibromoethane (Ethylene dibromide)	ug/l	158	0	0%	--	--	<2	NA	<2
1,2-Dichlorobenzene	ug/l	158	0	0%	--	--	<0.5	NA	<0.5
1,2-Dichloroethane	ug/l	158	0	0%	--	--	<0.5	NA	<0.5
1,2-Dichloropropane	ug/l	158	0	0%	--	--	<0.5	NA	<0.5

Table I-1
Statistical Summary of Surface Water Chemistry Data in the NBSA

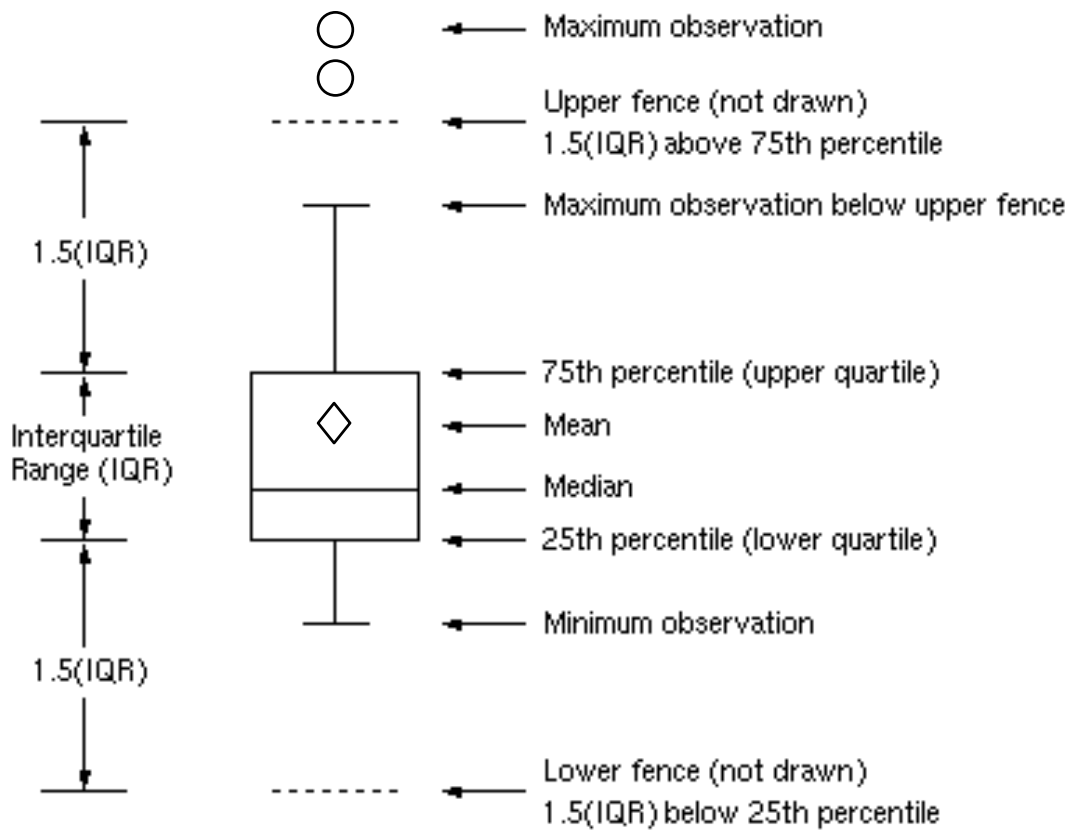
Analyte	Result Unit	Number of Samples	Number of Detects	Frequency of Detection	Minimum Detect	Maximum Detect	Mean	Standard Deviation	Median
1,3-Dichlorobenzene	ug/l	158	0	0%	--	--	<0.5	NA	<0.5
1,4-Dichlorobenzene	ug/l	158	1	1%	0.12	0.12	0.25	0.01	<0.5
2-Hexanone	ug/l	158	0	0%	--	--	<20	NA	<20
Acetone	ug/l	158	1	1%	3.4	3.4	10	0.53	<20
Benzene	ug/l	158	2	1%	0.07	0.07	0.25	0.02	<0.5
Bromochloromethane	ug/l	158	0	0%	--	--	<0.5	NA	<0.5
Bromodichloromethane	ug/l	158	0	0%	--	--	<0.5	NA	<0.5
Bromoform	ug/l	158	1	1%	0.19	0.19	0.25	0.0048	<0.5
Bromomethane	ug/l	158	1	1%	0.11	0.11	0.25	0.011	<0.5
Carbon disulfide	ug/l	158	0	0%	--	--	<0.5	NA	<0.5
Carbon tetrachloride	ug/l	158	0	0%	--	--	<0.5	NA	<0.5
Chlorobenzene	ug/l	158	0	0%	--	--	<0.5	NA	<0.5
Chloroethane	ug/l	158	0	0%	--	--	<0.5	NA	<0.5
Chloroform	ug/l	158	56	35%	0.09	0.23	0.21	0.061	<0.5
Chloromethane	ug/l	158	40	25%	0.07	0.18	0.21	0.073	<0.5
cis-1,2-Dichloroethylene	ug/l	158	158	100%	0.07	0.19	0.12	0.023	0.12
cis-1,3-Dichloropropene	ug/l	158	0	0%	--	--	<0.5	NA	<0.5
Cyclohexane	ug/l	158	0	0%	--	--	<1	NA	<1
Dibromochloromethane	ug/l	158	0	0%	--	--	<0.5	NA	<0.5
Dichlorodifluoromethane (Freon 12)	ug/l	158	0	0%	--	--	<0.5	NA	<0.5
Ethylbenzene	ug/l	158	6	4%	0.05	0.06	0.24	0.038	<0.5
Isopropylbenzene (Cumene)	ug/l	158	0	0%	--	--	<2	NA	<2
m,p-Xylenes	ug/l	158	18	11%	0.11	0.22	0.24	0.036	<0.5
Methyl acetate	ug/l	158	0	0%	--	--	<1	NA	<1
Methyl ethyl ketone (2-Butanone)	ug/l	158	0	0%	--	--	<20	NA	<20
Methyl isobutyl ketone (4-Methyl-2-pentanone)	ug/l	158	0	0%	--	--	<20	NA	<20
Methylcyclohexane	ug/l	158	0	0%	--	--	<1	NA	<1
Methylene chloride (Dichloromethane)	ug/l	158	4	3%	0.1	0.25	0.98	0.13	<2
o-Xylene (1,2-Dimethylbenzene)	ug/l	158	3	2%	0.08	0.1	0.25	0.022	<0.5
Styrene	ug/l	158	0	0%	--	--	<0.5	NA	<0.5
tert-Butyl methyl ether (MTBE)	ug/l	158	1	1%	0.13	0.13	0.25	0.0095	<0.5
Tetrachloroethylene (PCE)	ug/l	158	97	61%	0.1	0.33	0.19	0.062	0.21
Toluene	ug/l	158	8	5%	0.07	0.27	0.25	0.022	<0.5
trans-1,2-Dichloroethene	ug/l	158	0	0%	--	--	<0.5	NA	<0.5
trans-1,3-Dichloropropene	ug/l	158	0	0%	--	--	<0.5	NA	<0.5
Trichloroethylene (TCE)	ug/l	158	73	46%	0.1	0.25	0.2	0.062	<0.5
Trichlorofluoromethane (Freon 11)	ug/l	158	0	0%	--	--	<0.5	NA	<0.5
Trichlorotrifluoroethane	ug/l	158	0	0%	--	--	<0.5	NA	<0.5
Vinyl chloride	ug/l	158	0	0%	--	--	<0.5	NA	<0.5
Water Quality									
Salinity	ppt	273	273	100%	8.07	25.7	19.1	3.65	20
Dissolved Organic Carbon	mg/l	274	274	100%	0.77	4.23	2.25	0.546	2.3
Alkalinity, Total (As Caco3)	mg/l	274	273	100%	71.6	132	94.8	9.77	97.6
Hardness (As CaCO3)	mg/l	158	158	100%	1950	4810	3480	571	3610
Particulate Organic Carbon	mg/l	238	173	73%	0.4	3.7	0.957	0.514	0.7
Suspended Solids	mg/l	274	274	100%	4	80.5	14.3	10.2	10.7
Total Dissolved Solids (Residue, Filterable)	mg/l	274	274	100%	7830	77800	19200	5140	19800
Total Organic Carbon	mg/l	274	274	100%	0.8	3.56	2.09	0.473	2.1

Table I-1
Statistical Summary of Surface Water Chemistry Data in the NBSA

Analyte	Result Unit	Number of Samples	Number of Detects	Frequency of Detection	Minimum Detect	Maximum Detect	Mean	Standard Deviation	Median
Miscellaneous									
Chlorophyll-A	mg/m3	274	274	100%	0.58	7.7	2.3	1.2	2.1
Chloride (As Cl)	mg/l	274	274	100%	4100	15000	11000	2300	11000
Cyanide	mg/l	158	4	3%	0.003	0.009	0.005	0.00046	<0.01
Nitrogen, Ammonia	mg/l	201	201	100%	0.2	0.82	0.43	0.094	0.42
Phosphorus, Dissolved (as P)	mg/l	158	158	100%	0.011	0.29	0.14	0.053	0.14
Sulfate (As So4)	mg/l	274	274	100%	500	9000	1500	860	1500
Sulfide	mg/l	274	4	1%	0.4	2	1	0.087	<2
Total Kjeldahl Nitrogen	mg/l	201	201	100%	0.7	3.1	1.6	0.41	1.6

Notes:
1. PCB congeners with zero samples were reported as co-elutions with other congeners.
2. One-half the detection limit was used for non-detect values when calculating mean and standard deviation.
3. Where all data are non-detect, the mean is reported as < average detection limit.
4. When less than 50% detected, the median is reported as <median detection limit.
5. Statistics include data for the six sampling stations located in the Newark Bay Study Area (NNE, NBN, NNW, NBE, NBS, ARK).
6. Presented data are from the Chemical Water Column Monitoring Program (2011-2013) downloaded from ourpassaic.org.

mg/l = milligram per liter
mg/m3 = milligram per cubic meter
ng/l = nanogram per liter
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
pg/l = picograms per liter
ppt = parts per thousand
ug/l = micrograms per liter
-- = not applicable

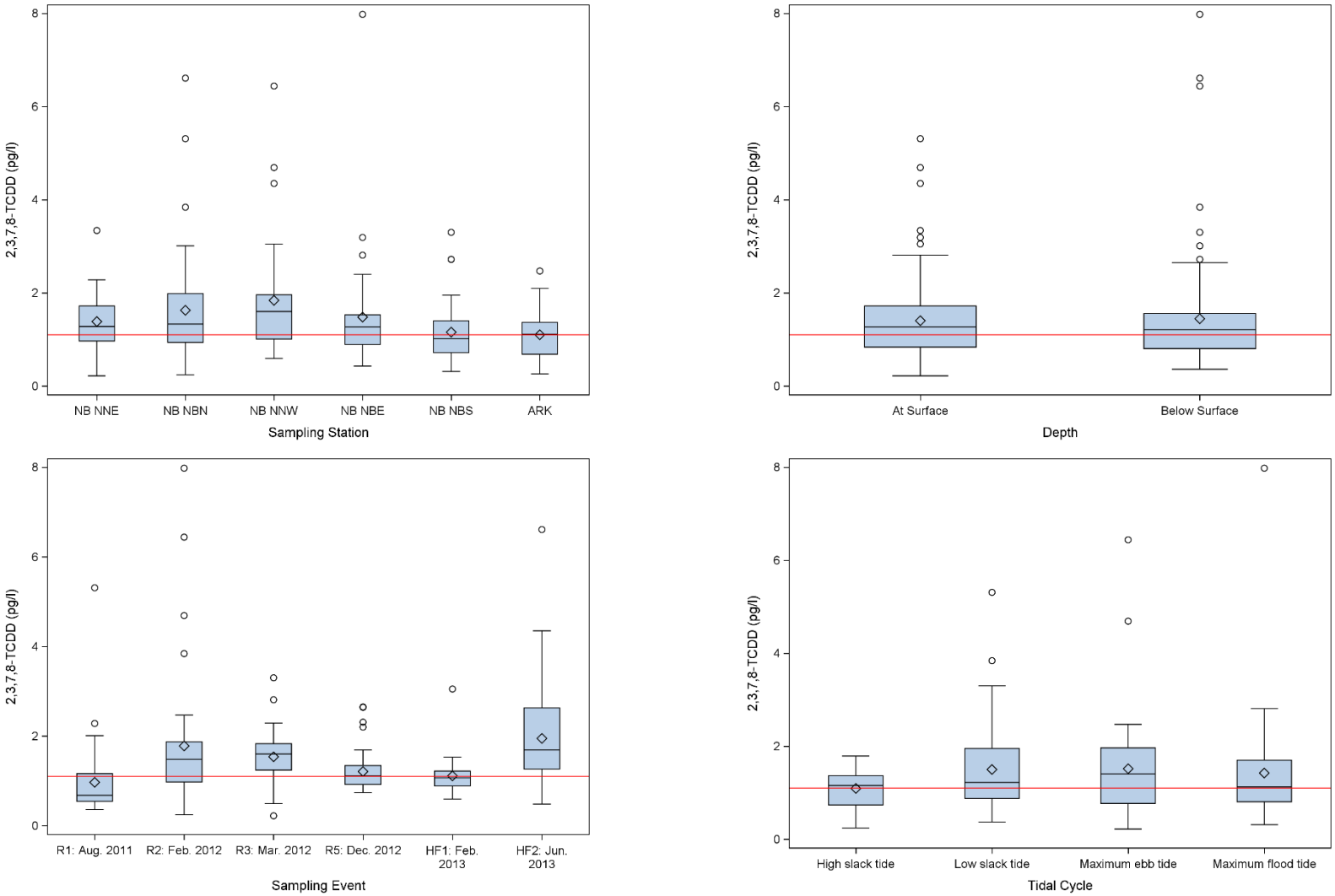


NEWARK BAY STUDY AREA
CONCEPTUAL SITE MODEL

Key to Box Plots

JANUARY 2019

FIGURE
I-1



Notes:
Surface water sampling conducted under the Chemical Water Column Monitoring Program (2011-2013). Data were downloaded from ourpassaic.org

Box plots show distribution of water concentrations by sampling station (north to south), sampling depth, sampling event, and tidal cycle.

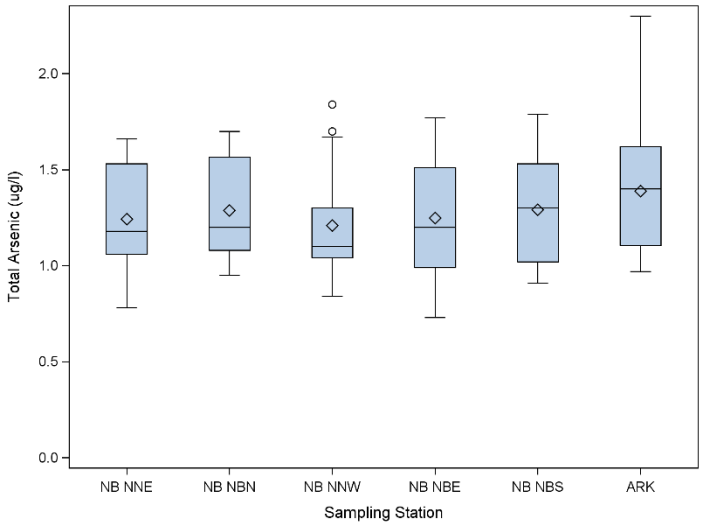
µg/l = micrograms per liter
ng/l = nanograms per liter
pg/l = picograms per liter
Full detection limit substituted for non-detects. Horizontal red line indicates average detection limit (1.1 pg/L).

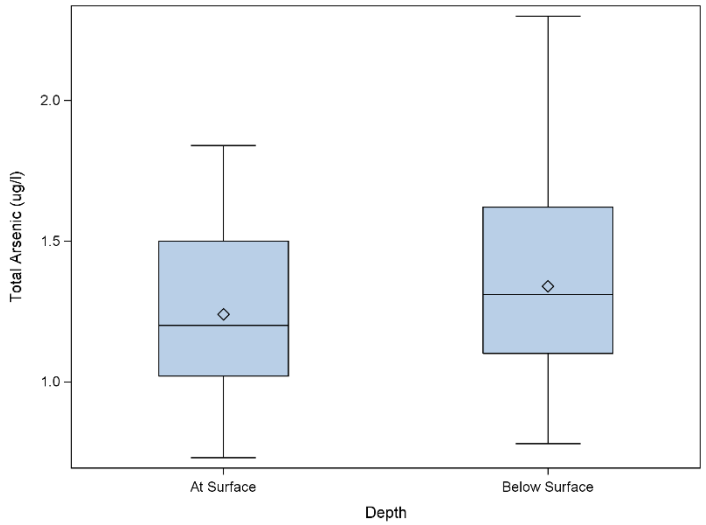
NEWARK BAY STUDY AREA CONCEPTUAL SITE MODEL

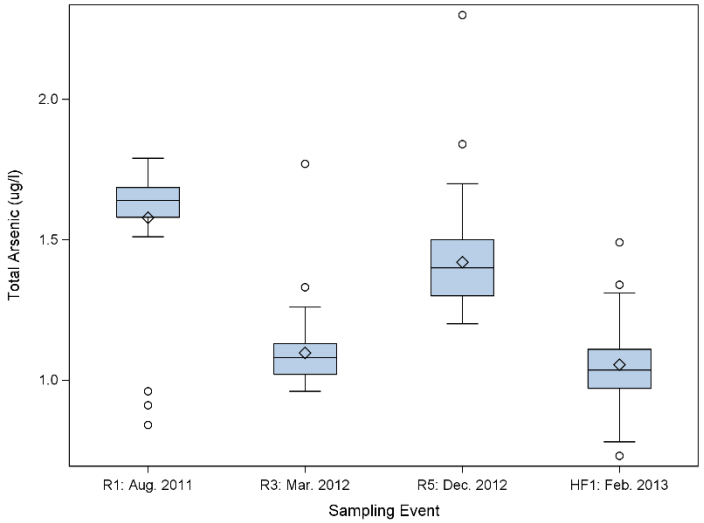
2,3,7,8-TCDD in Surface Water

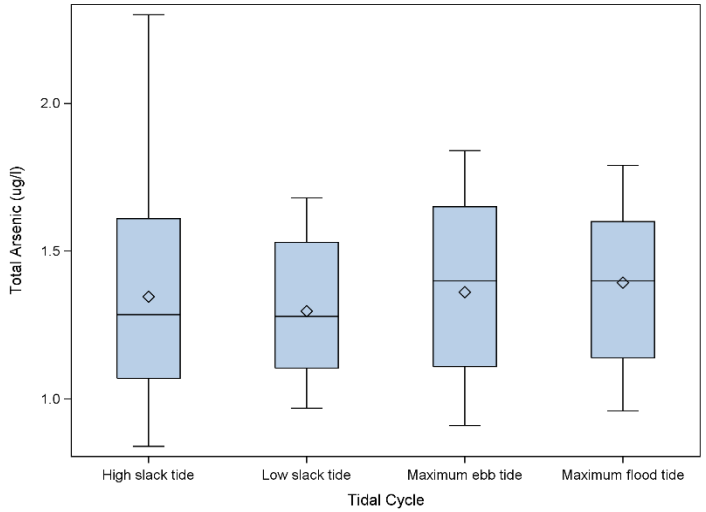
JANUARY 2019

FIGURE
I-2









Notes:
Surface water sampling conducted under the Chemical Water Column Monitoring Program (2011-2013). Data were downloaded from ourpassaic.org

Box plots show distribution of water concentrations by sampling station (north to south), sampling depth, sampling event, and tidal cycle.

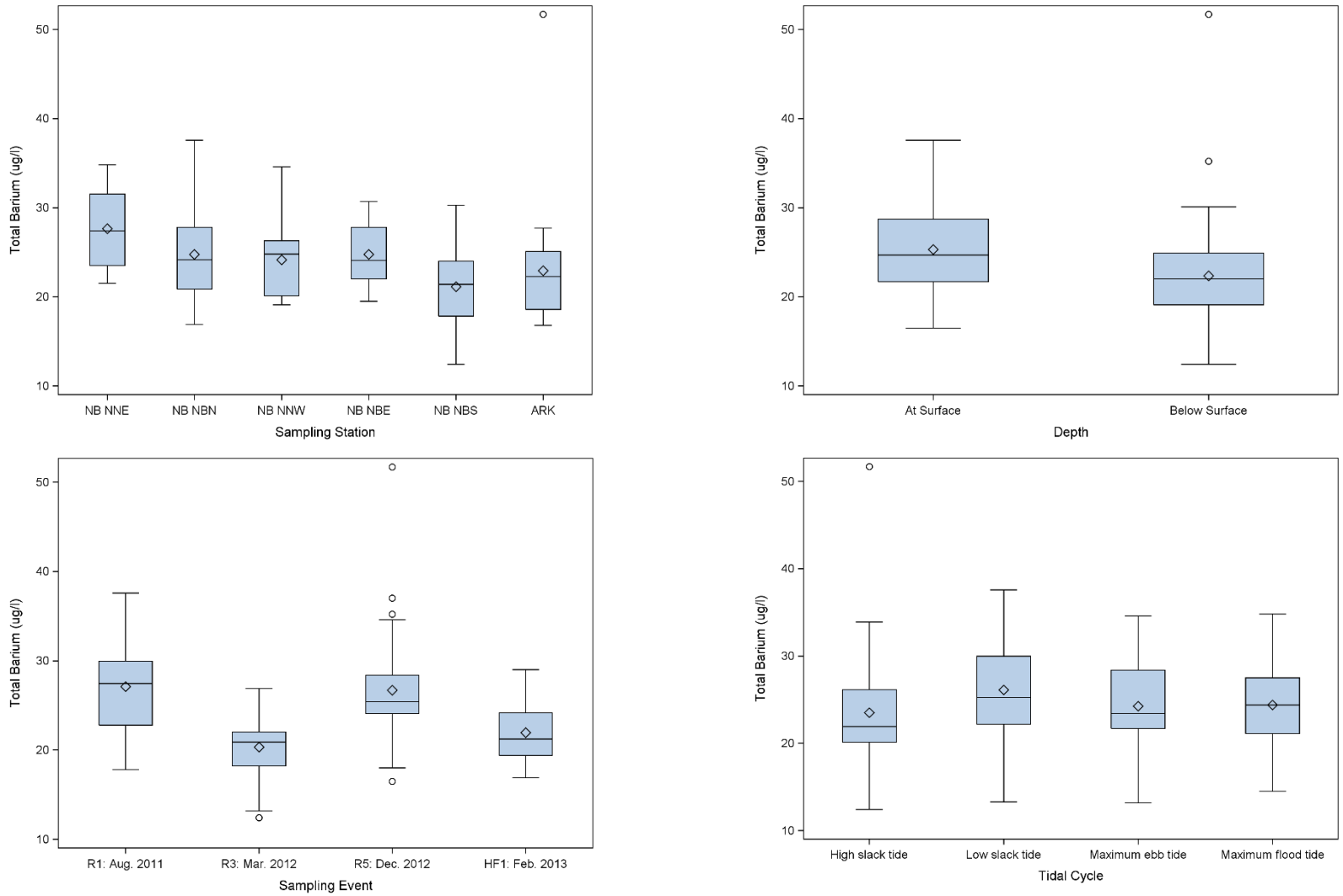
µg/l = micrograms per liter
ng/l = nanograms per liter
pg/l = picograms per liter

NEWARK BAY STUDY AREA CONCEPTUAL SITE MODEL

Arsenic in Surface Water

JANUARY 2019

FIGURE
I-3



Notes:
Surface water sampling conducted under the Chemical Water Column Monitoring Program (2011-2013). Data were downloaded from ourpassaic.org

Box plots show distribution of water concentrations by sampling station (north to south), sampling depth, sampling event, and tidal cycle.

µg/l = micrograms per liter
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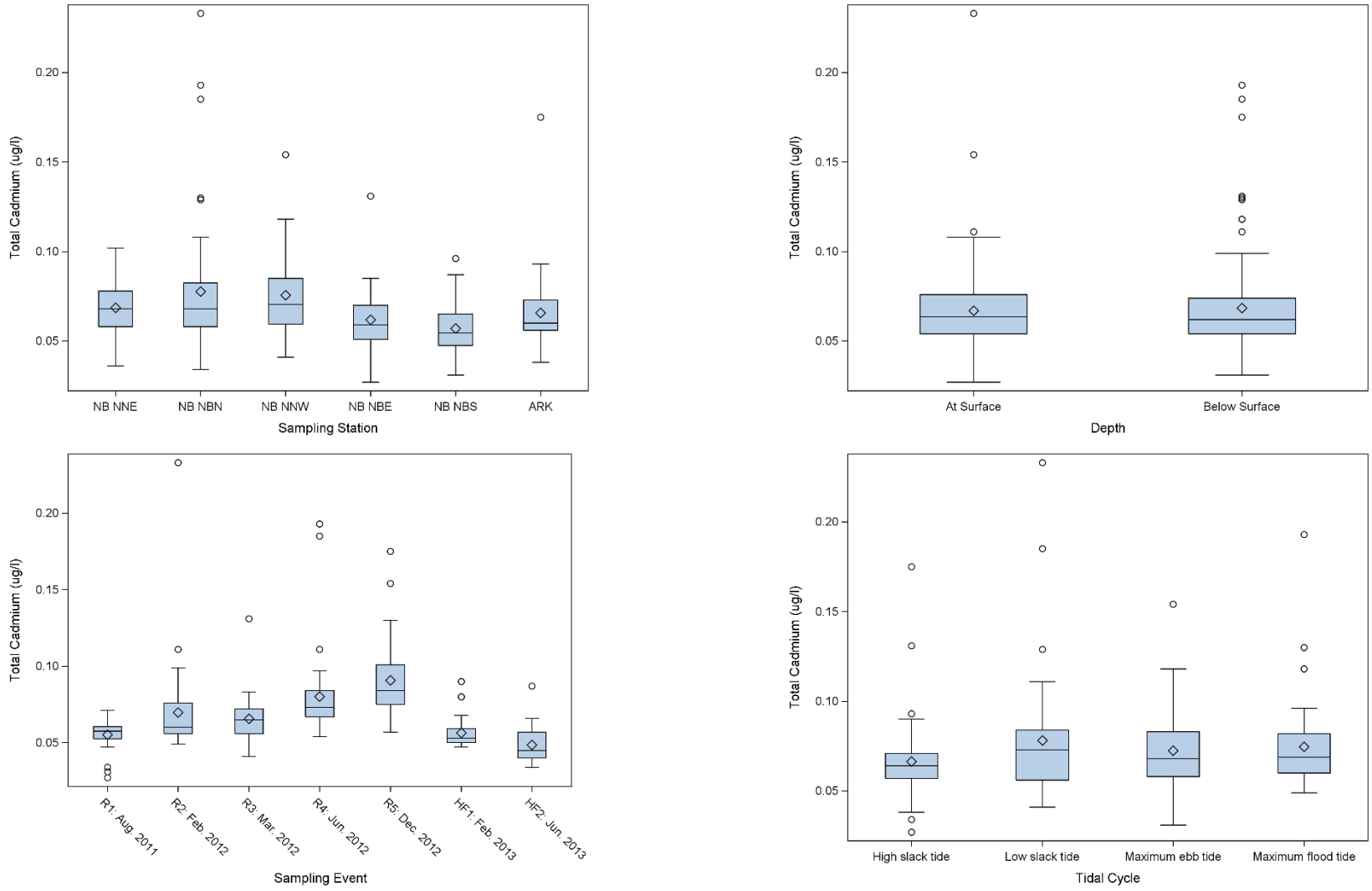
pg/l = picograms per liter

NEWARK BAY STUDY AREA CONCEPTUAL SITE MODEL

Barium in Surface Water

JANUARY 2019

FIGURE
I-4



Notes:
Surface water sampling conducted under the Chemical Water Column Monitoring Program (2011-2013). Data were downloaded from ourpassaic.org

Box plots show distribution of water concentrations by sampling station (north to south), sampling depth, sampling event, and tidal cycle.

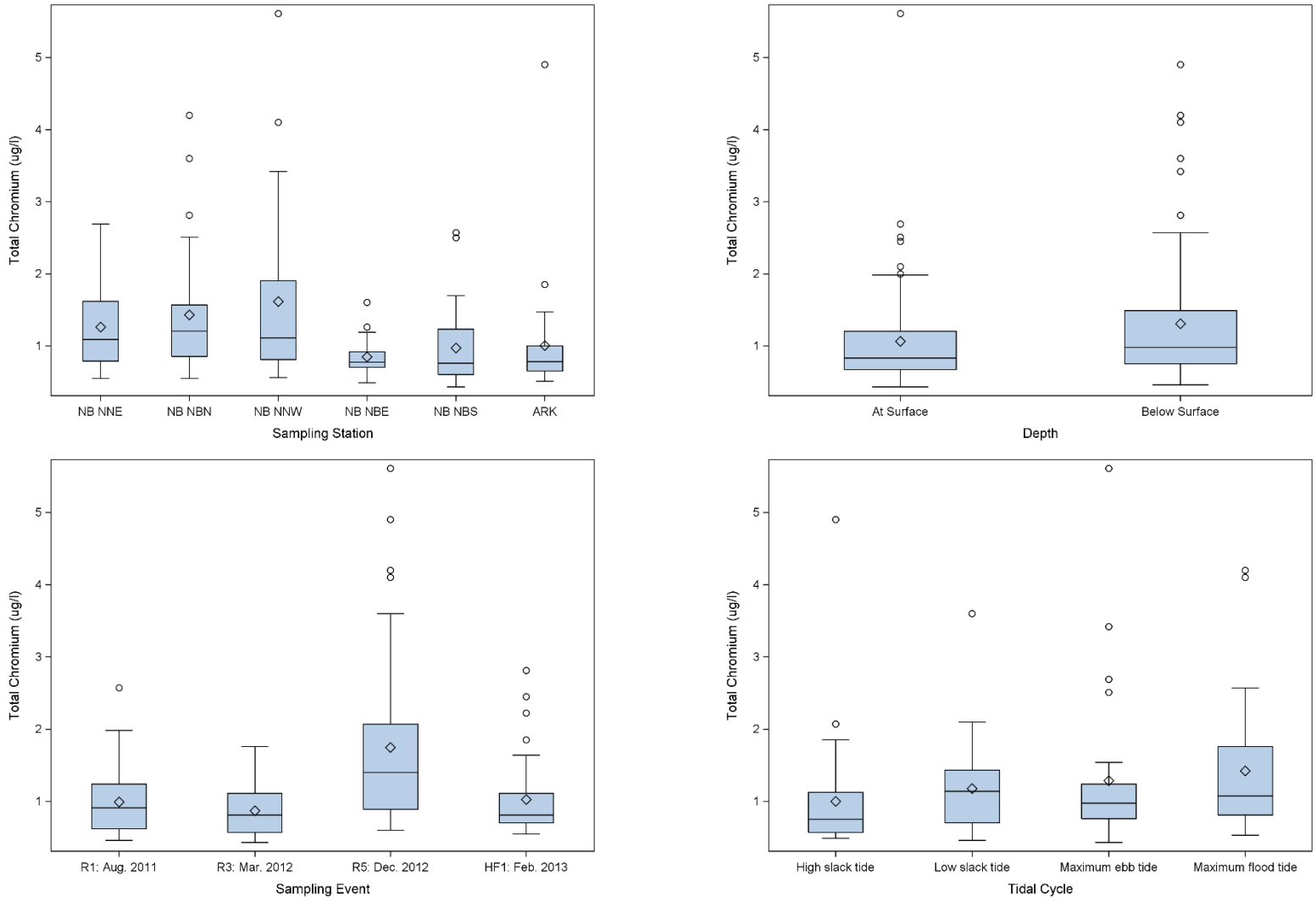
µg/l = micrograms per liter
ng/l = nanograms per liter
pg/l = picograms per liter

NEWARK BAY STUDY AREA CONCEPTUAL SITE MODEL

Cadmium in Surface Water

JANUARY 2019

FIGURE
I-5



Notes:
Surface water sampling conducted under the Chemical Water Column Monitoring Program (2011-2013). Data were downloaded from ourpassaic.org

Box plots show distribution of water concentrations by sampling station (north to south), sampling depth, sampling event, and tidal cycle.

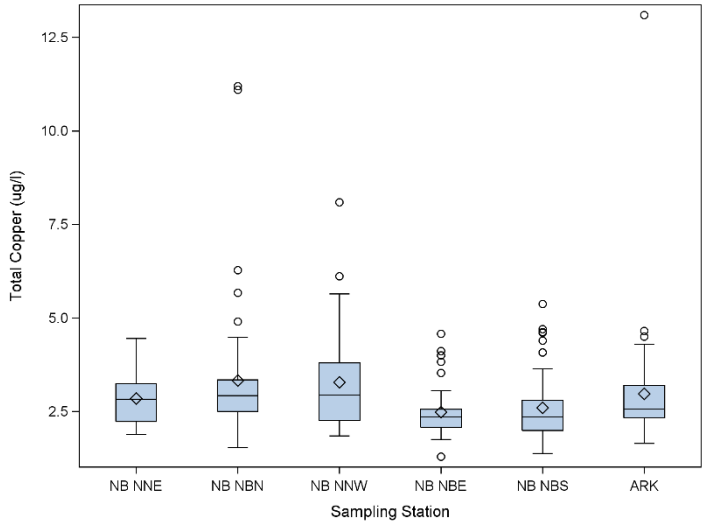
µg/l = micrograms per liter
ng/l = nanograms per liter
pg/l = picograms per liter

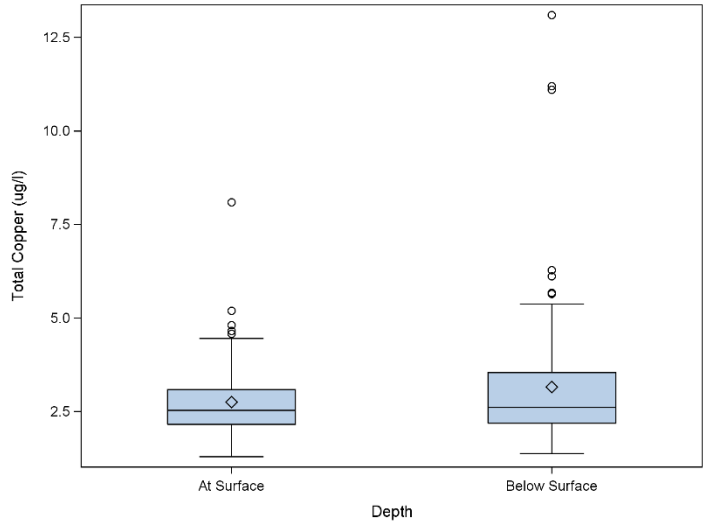
NEWARK BAY STUDY AREA CONCEPTUAL SITE MODEL

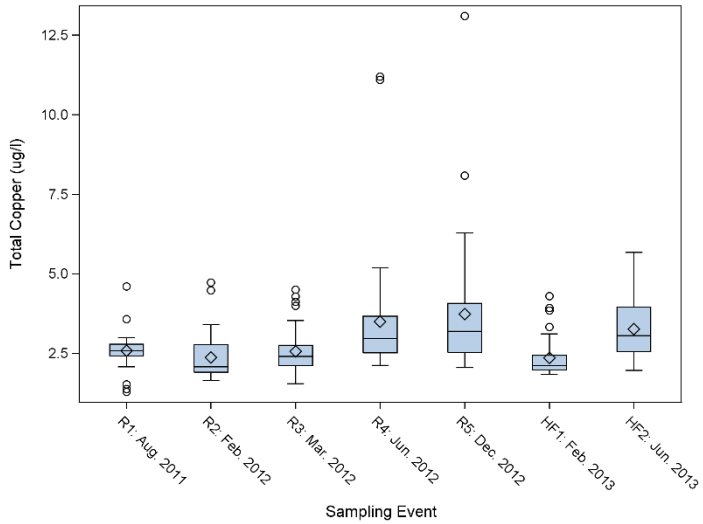
Chromium in Surface Water

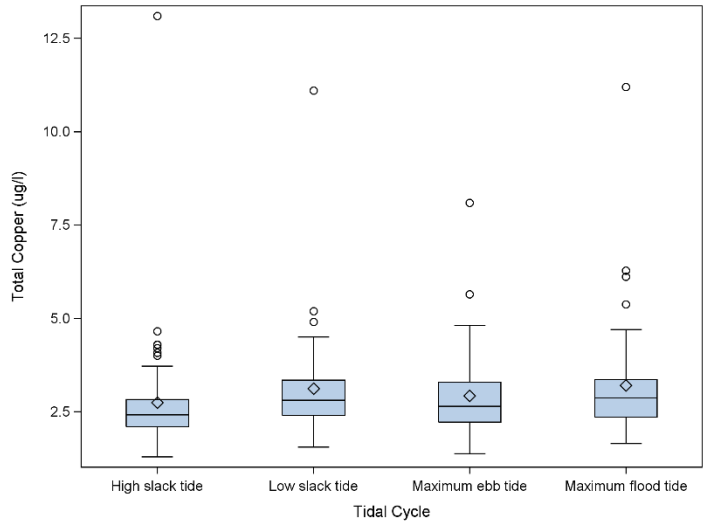
JANUARY 2019

FIGURE
I-6









Notes:
Surface water sampling conducted under the Chemical Water Column Monitoring Program (2011-2013). Data were downloaded from ourpassaic.org

Box plots show distribution of water concentrations by sampling station (north to south), sampling depth, sampling event, and tidal cycle.

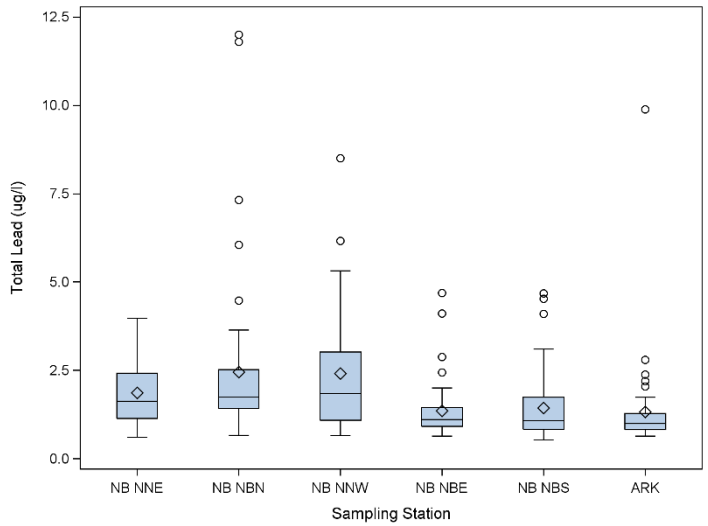
µg/l = micrograms per liter
ng/l = nanograms per liter
pg/l = picograms per liter

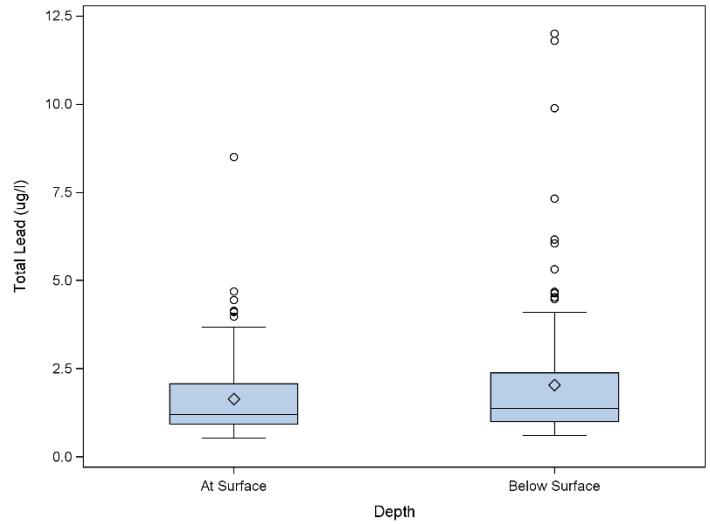
NEWARK BAY STUDY AREA CONCEPTUAL SITE MODEL

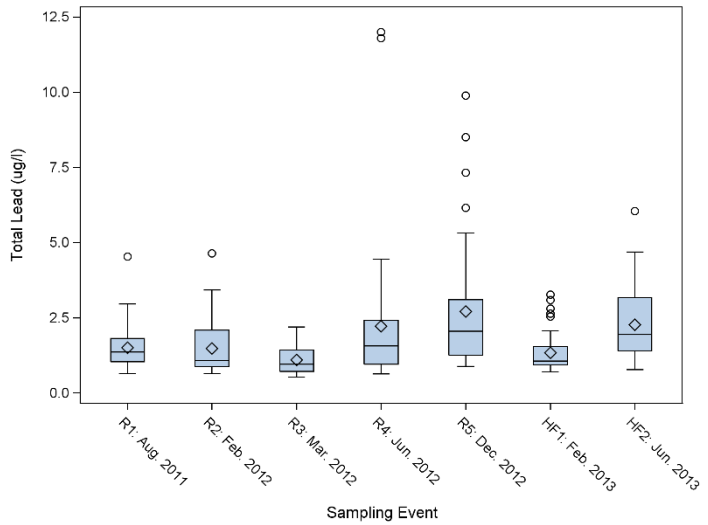
Copper in Surface Water

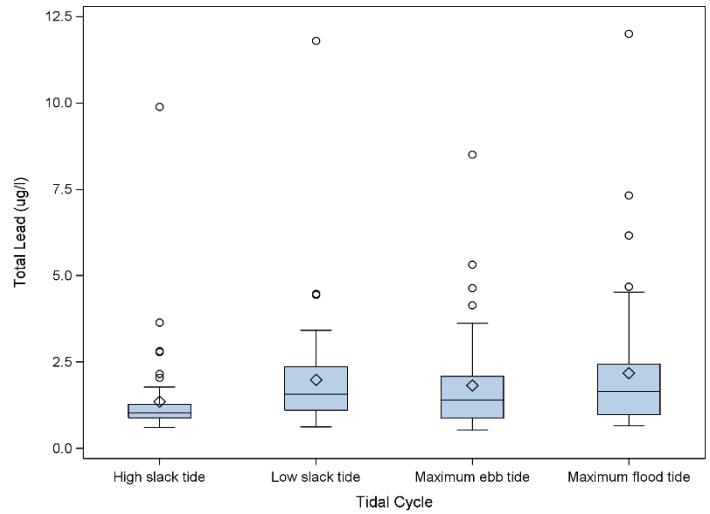
JANUARY 2019

FIGURE
I-7









Notes:
Surface water sampling conducted under the Chemical Water Column Monitoring Program (2011-2013). Data were downloaded from ourpassaic.org

Box plots show distribution of water concentrations by sampling station (north to south), sampling depth, sampling event, and tidal cycle.

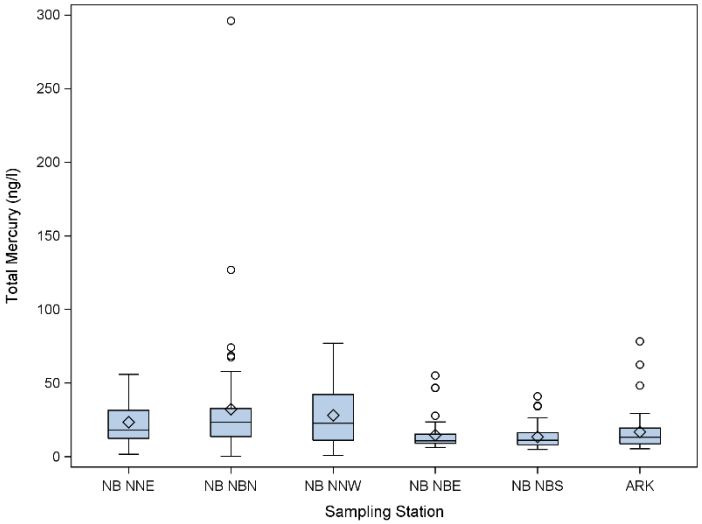
µg/l = micrograms per liter
ng/l = nanograms per liter
pg/l = picograms per liter

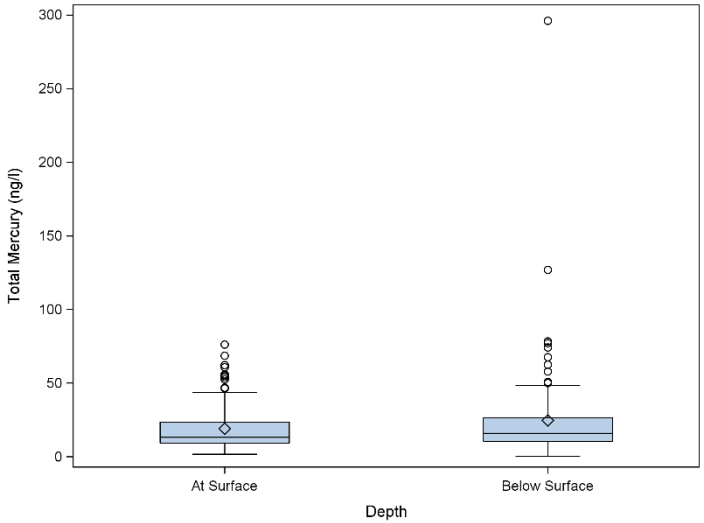
NEWARK BAY STUDY AREA CONCEPTUAL SITE MODEL

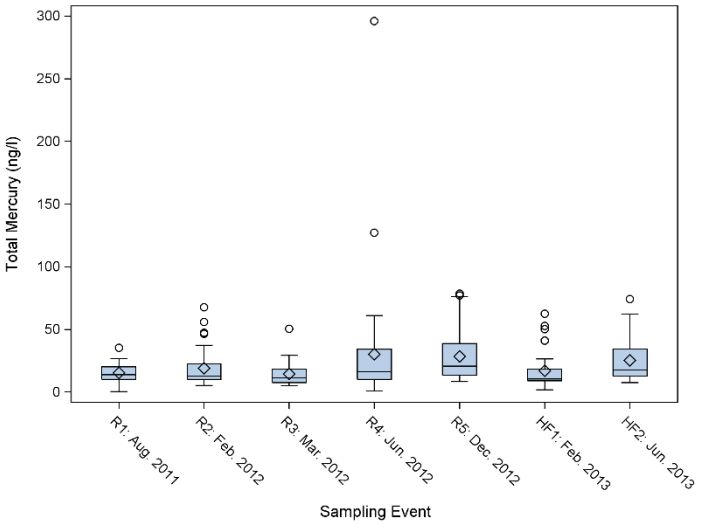
Lead in Surface Water

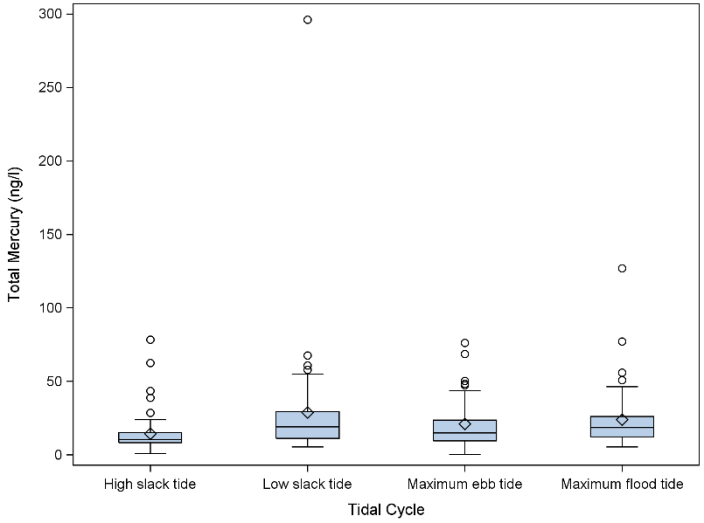
JANUARY 2019

FIGURE
I-8









Notes:
Surface water sampling conducted under the Chemical Water Column Monitoring Program (2011-2013). Data were downloaded from ourpassaic.org

Box plots show distribution of water concentrations by sampling station (north to south), sampling depth, sampling event, and tidal cycle.

µg/l = micrograms per liter
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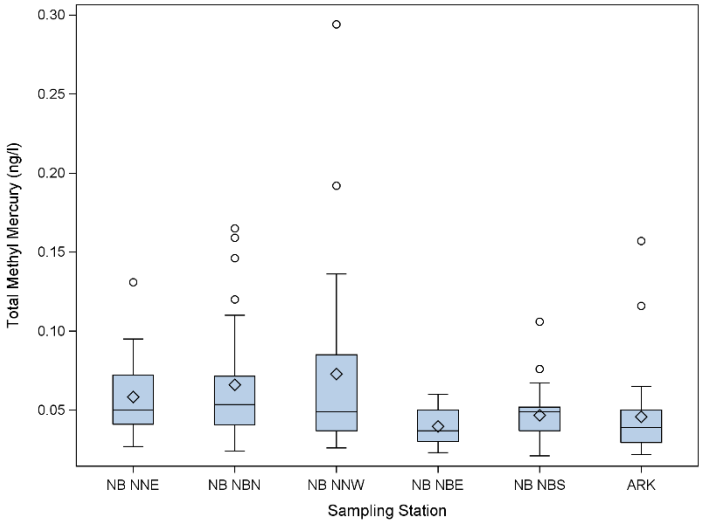
pg/l = picograms per liter

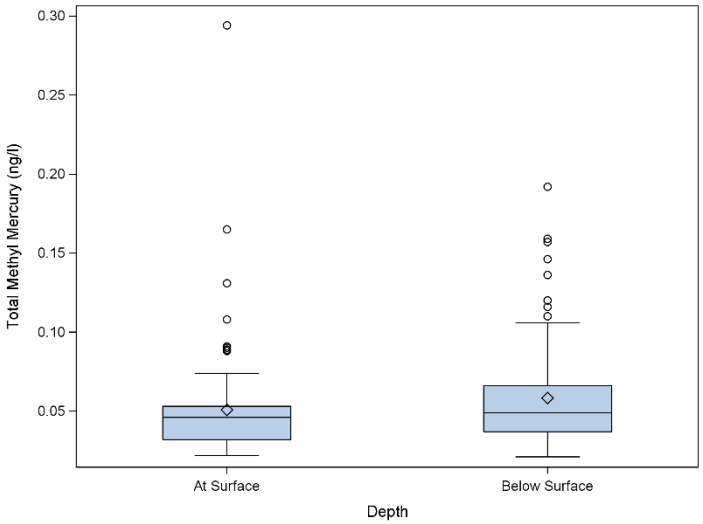
NEWARK BAY STUDY AREA CONCEPTUAL SITE MODEL

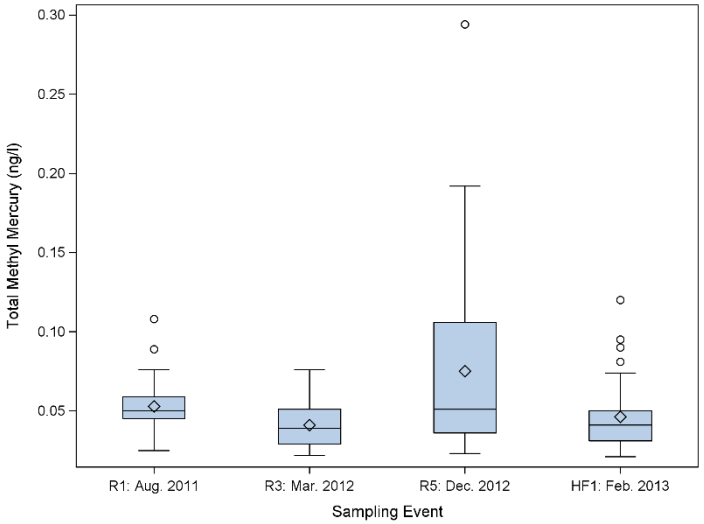
Mercury in Surface Water

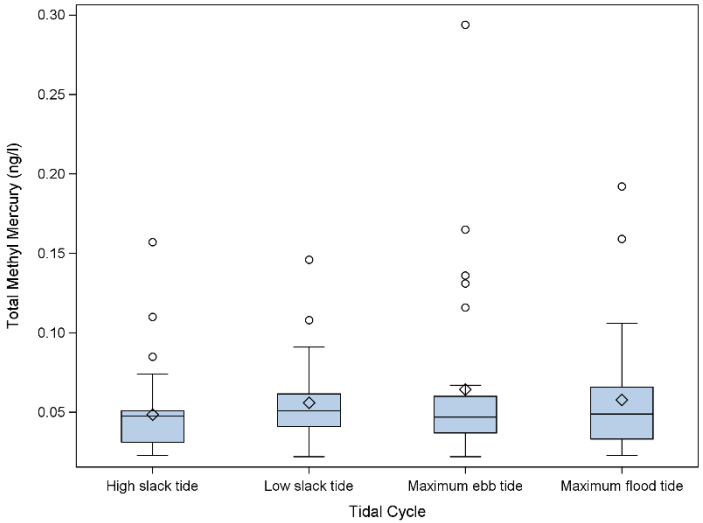
JANUARY 2019

FIGURE
I-9









Notes:
Surface water sampling conducted under the Chemical Water Column Monitoring Program (2011-2013). Data were downloaded from ourpassaic.org

Box plots show distribution of water concentrations by sampling station (north to south), sampling depth, sampling event, and tidal cycle.

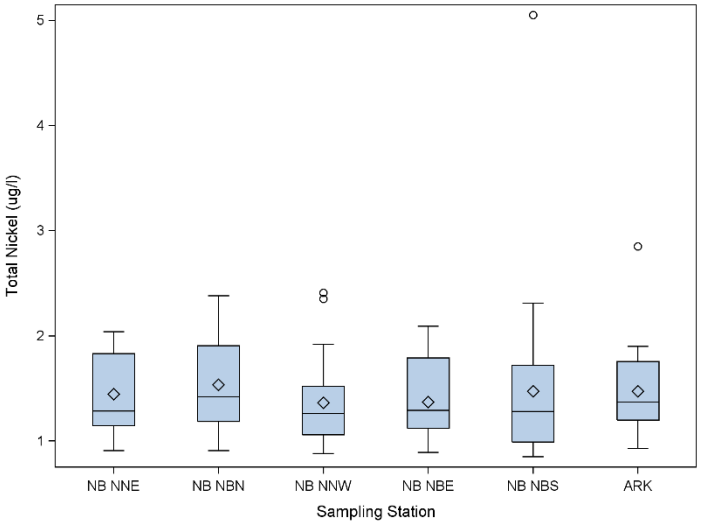
µg/l = micrograms per liter
ng/l = nanograms per liter
pg/l = picograms per liter

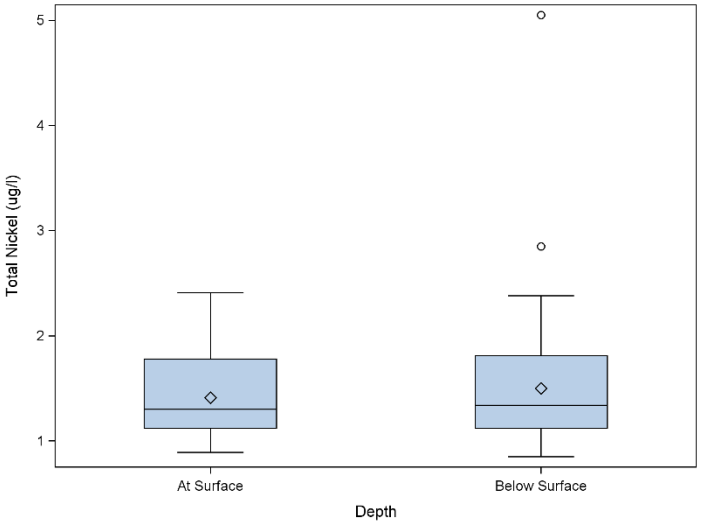
NEWARK BAY STUDY AREA CONCEPTUAL SITE MODEL

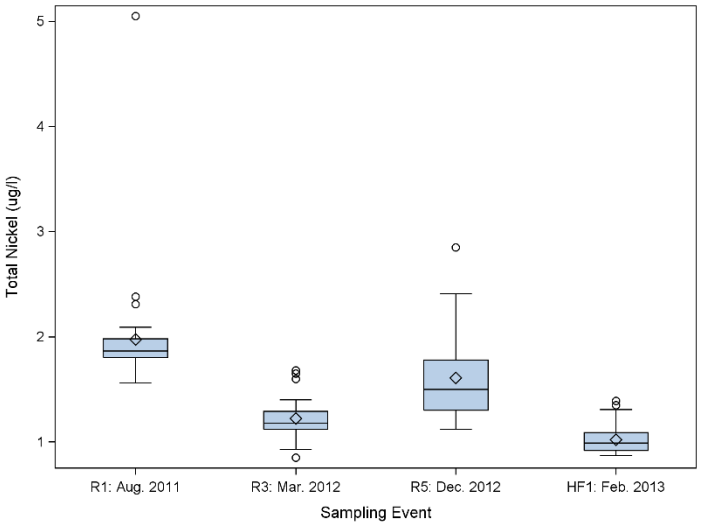
Methyl Mercury in Surface Water

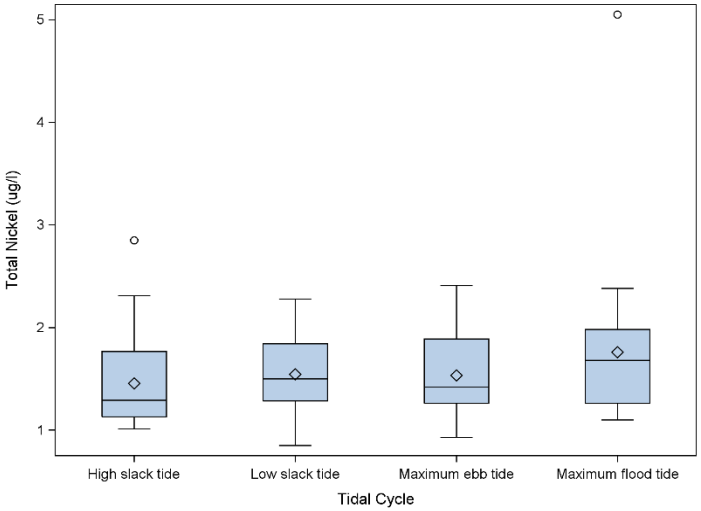
JANUARY 2019

FIGURE
I-10









Notes:
Surface water sampling conducted under the Chemical Water Column Monitoring Program (2011-2013). Data were downloaded from ourpassaic.org

Box plots show distribution of water concentrations by sampling station (north to south), sampling depth, sampling event, and tidal cycle.

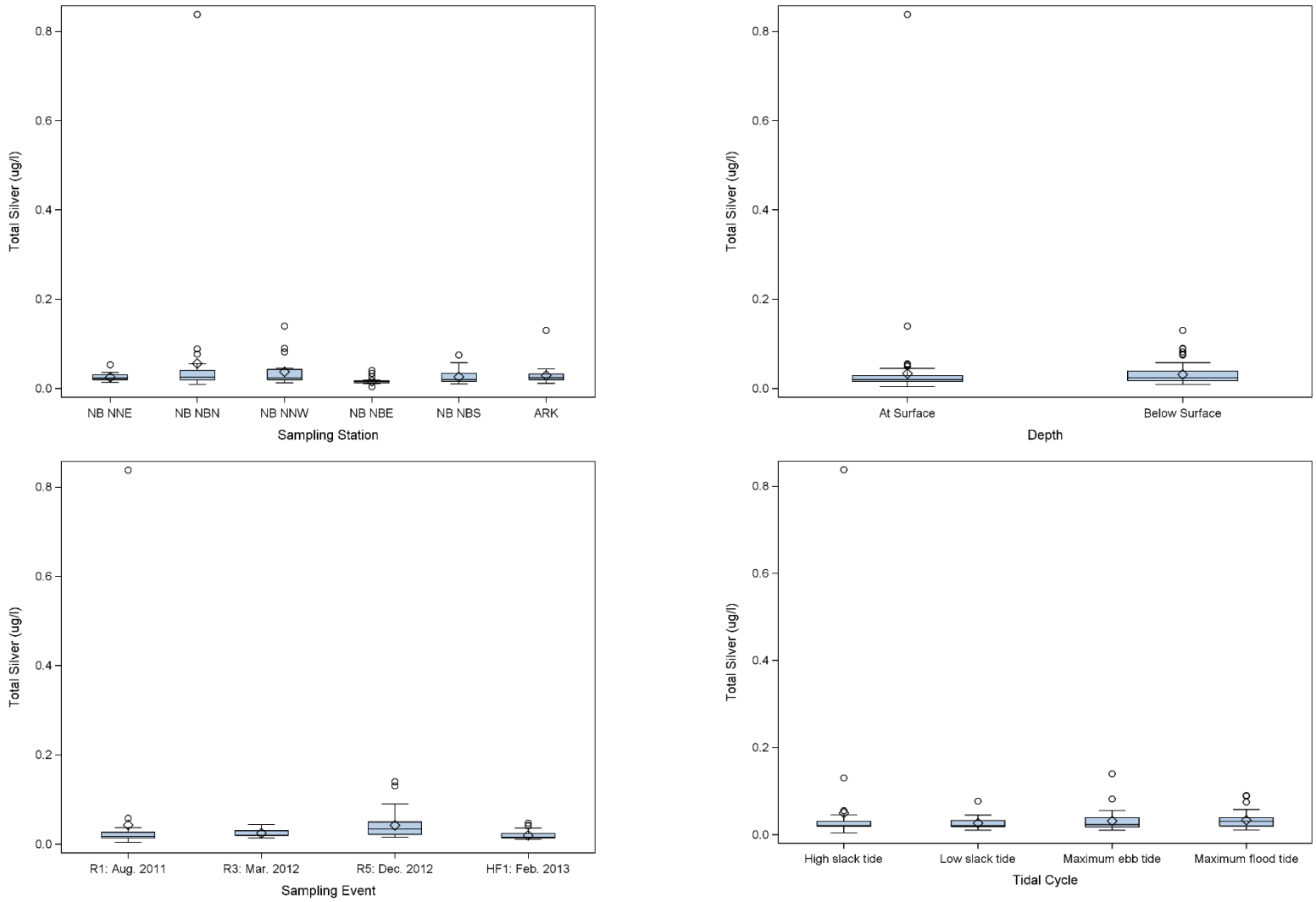
µg/l = micrograms per liter
ng/l = nanograms per liter
pg/l = picograms per liter

NEWARK BAY STUDY AREA CONCEPTUAL SITE MODEL

Nickel in Surface Water

JANUARY 2019

FIGURE
I-11



Notes:
Surface water sampling conducted under the Chemical Water Column Monitoring Program (2011-2013). Data were downloaded from ourpassaic.org

Box plots show distribution of water concentrations by sampling station (north to south), sampling depth, sampling event, and tidal cycle.

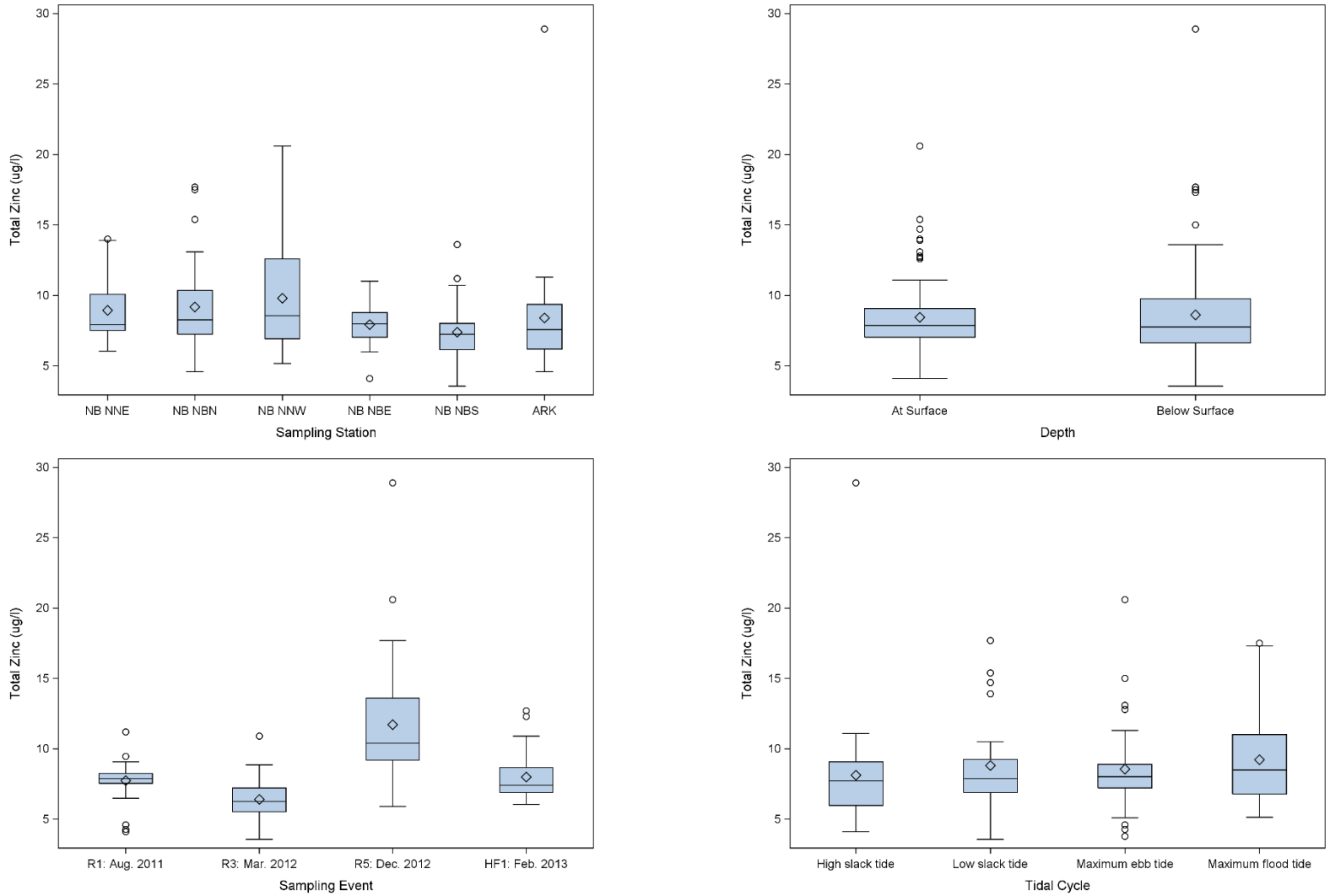
µg/l = micrograms per liter
ng/l = nanograms per liter
pg/l = picograms per liter

NEWARK BAY STUDY AREA CONCEPTUAL SITE MODEL

Silver in Surface Water

JANUARY 2019

FIGURE
I-12



Notes:
Surface water sampling conducted under the Chemical Water Column Monitoring Program (2011-2013). Data were downloaded from ourpassaic.org

Box plots show distribution of water concentrations by sampling station (north to south), sampling depth, sampling event, and tidal cycle.

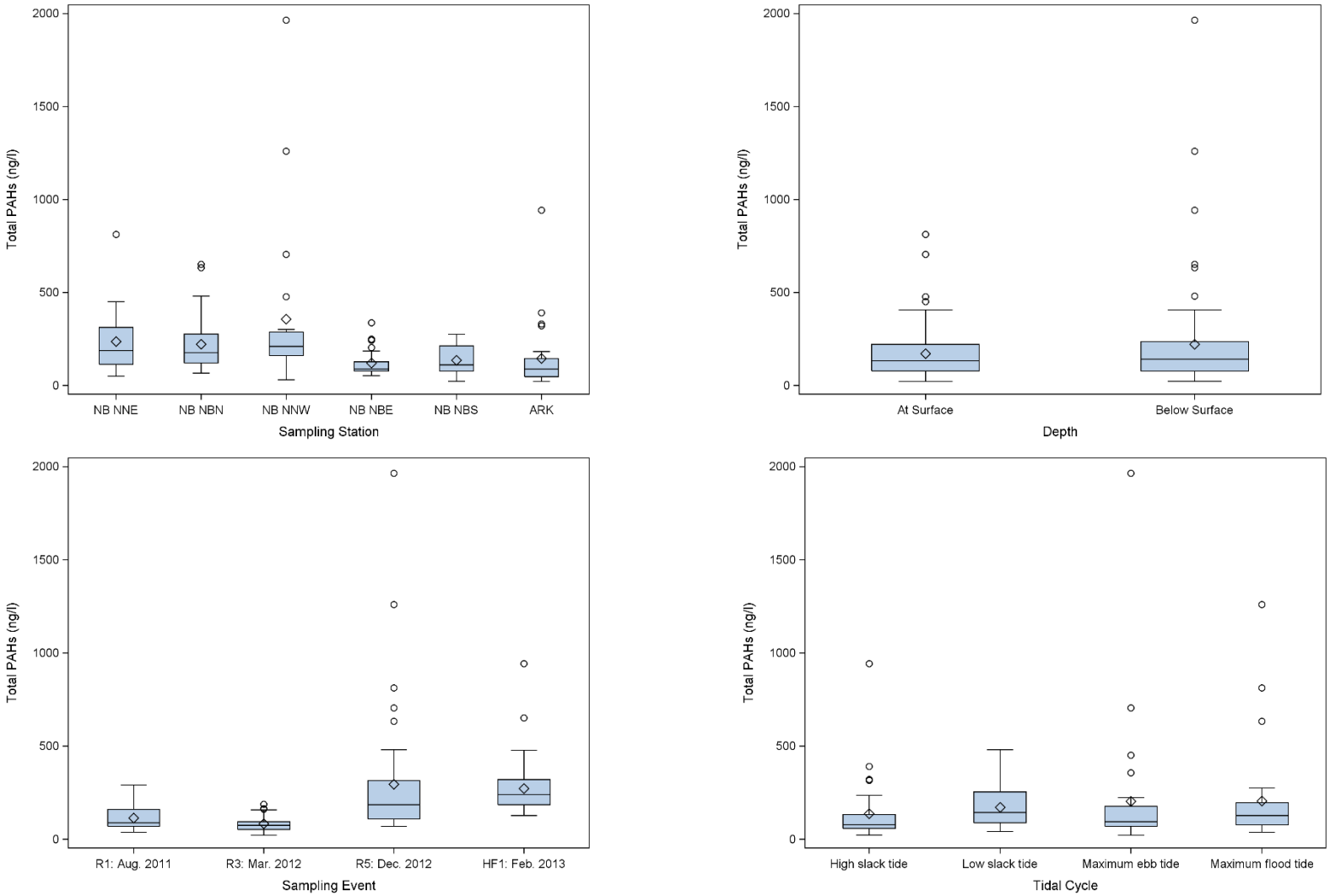
µg/l = micrograms per liter
ng/l = nanograms per liter
pg/l = picograms per liter

NEWARK BAY STUDY AREA CONCEPTUAL SITE MODEL

Zinc in Surface Water

JANUARY 2019

FIGURE
I-13



Notes:
Surface water sampling conducted under the Chemical Water Column Monitoring Program (2011-2013). Data were downloaded from ourpassaic.org

Box plots show distribution of water concentrations by sampling station (north to south), sampling depth, sampling event, and tidal cycle.

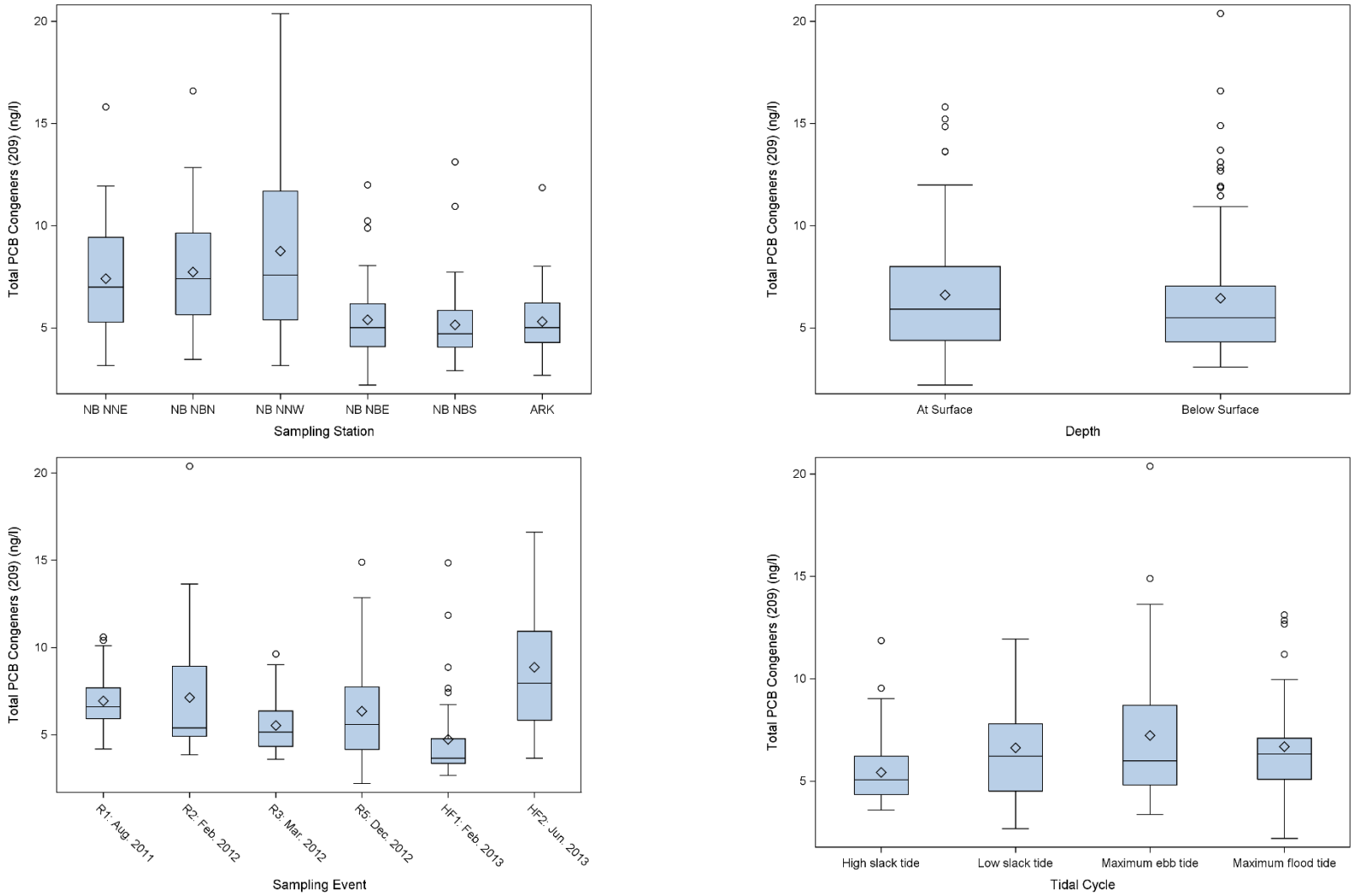
µg/l = micrograms per liter
ng/l = nanograms per liter
pg/l = picograms per liter

NEWARK BAY STUDY AREA CONCEPTUAL SITE MODEL

Total PAHs in Surface Water

JANUARY 2019

FIGURE
I-14



Notes:
Surface water sampling conducted under the Chemical Water Column Monitoring Program (2011-2013). Data were downloaded from ourpassaic.org

Box plots show distribution of water concentrations by sampling station (north to south), sampling depth, sampling event, and tidal cycle.

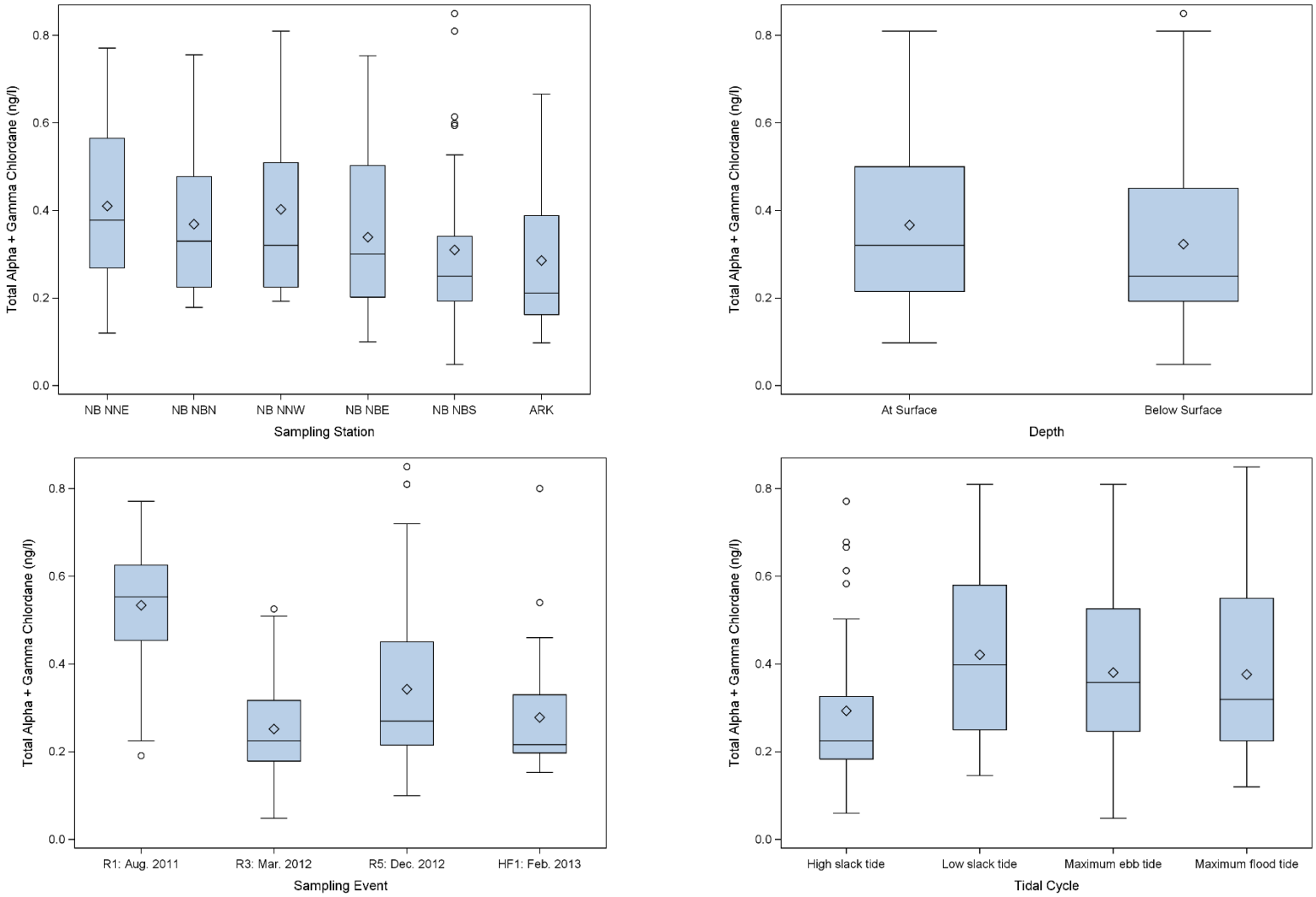
µg/l = micrograms per liter
ng/l = nanograms per liter
pg/l = picograms per liter

NEWARK BAY STUDY AREA CONCEPTUAL SITE MODEL

Total PCB Congeners (209) in Surface Water

JANUARY 2019

FIGURE
I-15



Notes:
Surface water sampling conducted under the Chemical Water Column Monitoring Program (2011-2013). Data were downloaded from ourpassaic.org

Box plots show distribution of water concentrations by sampling station (north to south), sampling depth, sampling event, and tidal cycle.

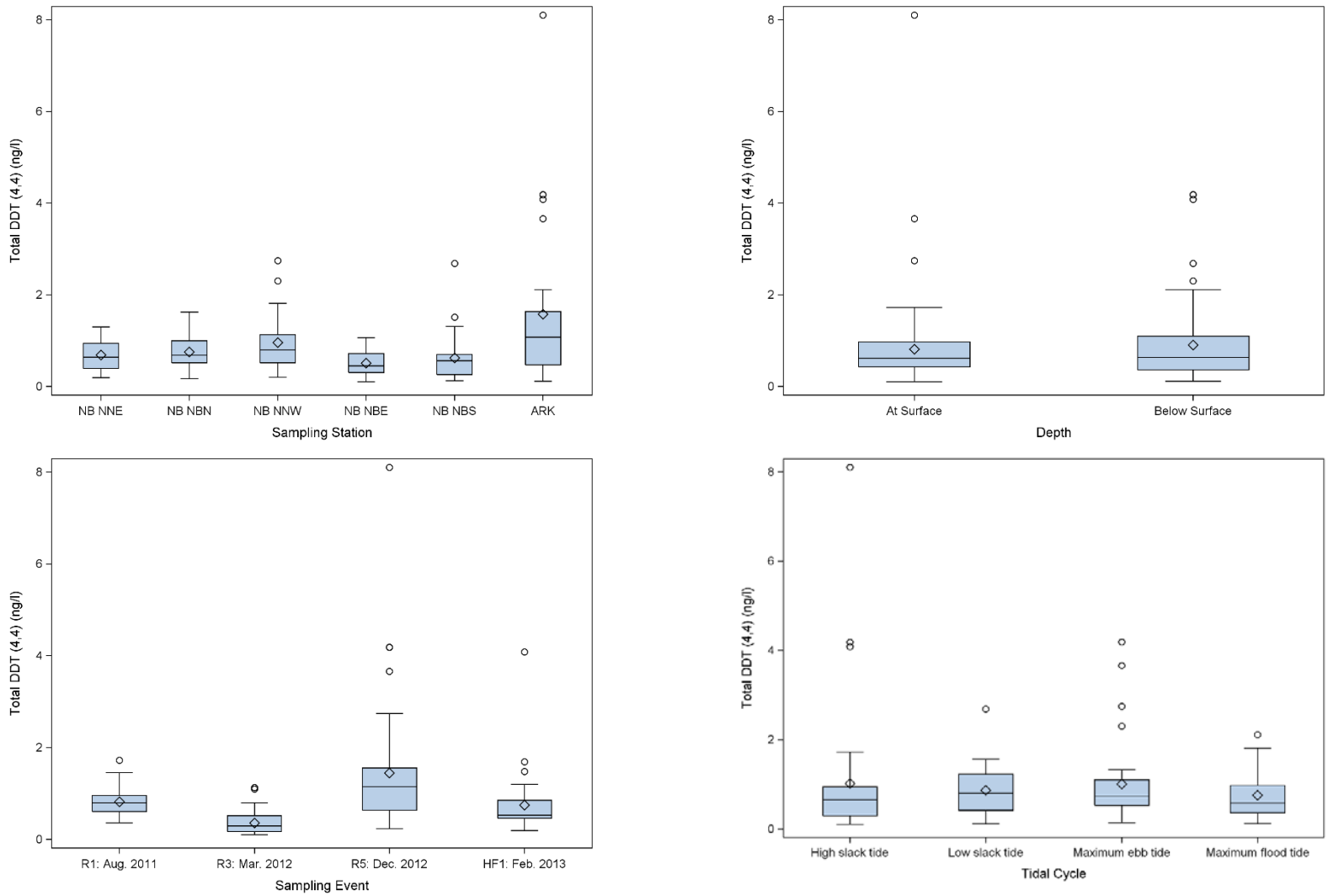
µg/l = micrograms per liter
ng/l = nanograms per liter
pg/l = picograms per liter

NEWARK BAY STUDY AREA CONCEPTUAL SITE MODEL

Total Alpha + Gamma Chlordane in Surface Water

JANUARY 2019

FIGURE
I-16



Notes:
Surface water sampling conducted under the Chemical Water Column Monitoring Program (2011-2013). Data were downloaded from ourpassaic.org

Box plots show distribution of water concentrations by sampling station (north to south), sampling depth, sampling event, and tidal cycle.

µg/l = micrograms per liter
ng/l = nanograms per liter
pg/l = picograms per liter

NEWARK BAY STUDY AREA CONCEPTUAL SITE MODEL

Total DDT in Surface Water

JANUARY 2019

FIGURE
I-17

Appendix J

Table J-1
Statistical Summary of Porewater Chemistry in the NBSA

Parameter Group	Analyte	Units	Number of Samples	Number of Detects	Frequency of Detection	Mean	Standard Deviation	Median	Minimum Detected Value	Maximum Detected Value
Dioxins/Furans	2,3,7,8-TCDD	pg/L	30	30	100%	0.761	1.65	0.423	0.119	9.35
Metals	Arsenic	mg/L	29	9	31%	0.0123	0.0176	<0.0054	0.0183	0.0748
	Barium	mg/L	29	29	100%	0.0757	0.031	0.0707	0.0476	0.179
	Cadmium	mg/L	29	0	0%	<0.00188	0.000272	<0.0023	NA	NA
	Chromium	mg/L	29	26	90%	0.00619	0.00291	0.0058	0.0036	0.0148
	Copper	mg/L	29	5	17%	0.00191	0.00292	<0.002	0.0021	0.0155
	Lead	mg/L	29	6	21%	0.00106	0.00189	<0.00065	0.00097	0.0076
	Mercury	ng/L	30	29	97%	139	62.2	130	52.9	348
	Methyl mercury	ng/L	30	30	100%	137	71.5	114	33.1	368
	Nickel	mg/L	29	0	0%	<0.0047	NA	<0.0047	NA	NA
	Silver	mg/L	29	0	0%	<0.00055	NA	<0.00055	NA	NA
	Zinc	mg/L	29	3	10%	0.0399	0.0767	<0.037	0.0967	0.402
PAHs	Total PAHs	µg/L	30	30	100%	0.801	1.17	0.18	0.06	4.1
PCB Congeners	Total PCB Congeners (209)	ng/L	30	30	100%	15.5	27.1	7.13	3.99	152
Pesticides	Total DDT (4,4)	µg/L	30	30	100%	0.00167	0.00206	0.000989	0.000467	0.0105
	Total alpha + gamma chlordane	µg/L	30	30	100%	0.00029	0.0000866	0.00029	0.00014	0.00047

Notes:
1. Porewater samples were collected as part of the SQT and Porewater Sampling Program in 2015.
2. One-half the detection limit was used for non-detect values when calculating mean and standard deviation.
3. Where all data are non-detect, the mean is reported as < average detection limit.
4. When less than 50% detected, the median is reported as <median detection limit.
5. Total Petroleum Hydrocarbons, bis(2-Ethylhexyl)phthalate, and Aroclor PCBs were not analyzed in porewater.

2,3,7,8-TCDD = 2,3,7,8-tetrachlorodibenzo-p-dioxin
COI = contaminant of interest
DDT = dichlorodiphenyl-trichloroethane
mg/L = milligrams per liter
NA = not applicable
ND = not detected
ng/L = nanograms per liter
ng/mL = nanograms per mililiter
PAHs = polycyclic aromatic hydrocarbons
PCB = polychlorinated biphenyl
pg/L = picograms per liter

Appendix K

Table K-1
Summary of 10-day and 28-day *Leptocheirus plumulosus* Sediment Toxicity Test Results

Sample Identification	10-Day Mean Percent Survival	28-Day Mean Percent Survival	Growth Rate (mg/Organism/Day) (±S.D.)	Mean Reproduction (Young per Surviving Adult)
Control	***90***	***81***	***0.045 (±0.002)***	***1.97***
Newark Bay North				
NB03SED-TOX136	92	63	0.028 (±0.017)	0.69
NB03SED-TOX137	96	75	0.029 (±0.010)	0.28
NB03SED-TOX138	89	46	0.017 (±0.012)	0.33
NB03SED-TOX139	92	92	0.033 (±0.013)	0.56
NB03SED-TOX140	81	79	0.032 (±0.015)	0.77
NB03SED-TOX158	93	39	0.01 (±0.013)	0
NB03SED-TOX159	90	62	0.029 (±0.022)	0.67
NB03SED-TOX160	90	0	--	--
NB03SED-TOX161	95	96	0.034 (±0.007)	0.71
NB03SED-TOX162	92	86	0.037 (±0.004)	0.95
NB03SED-TOX163	94	69	0.031 (±0.016)	1.02
NB03SED-TOX164	96	84	0.021 (±0.009)	0.83
NB03SED-TOX165	95	88	0.028 (±0.007)	0.68
Minimum	81	0	0.01	0
Maximum	96	96	0.037	1.02
Mean	91.9	67.6	0.027	0.62
Newark Bay Central				
NB03SED-TOX141	92	67	0.036 (±0.015)	0.8
NB03SED-TOX142	98	53	0.05 (±0.006)	1.93
NB03SED-TOX143	90	30	0.012 (±0.007)	0.21
NB03SED-TOX144	93	65	0.021 (±0.014)	1.13
NB03SED-TOX145	97	59	0.04 (±0.016)	0.58
NB03SED-TOX156	96	86	0.035 (±0.008)	0.79
NB03SED-TOX157	92	80	0.024 (±0.016)	0.94
Minimum	90	30	0.012	0.21
Maximum	98	86	0.050	1.93
Mean	94	62.9	0.031	0.91
Newark Bay South				
NB03SED-TOX146	83	54	0.029 (±0.014)	0.6
NB03SED-TOX147	90	79	0.035 (±0.013)	0.28
NB03SED-TOX148	97	92	0.032 (±0.007)	0.84
NB03SED-TOX149	98	63	0.02 (±0.009)	0.64
NB03SED-TOX150	89	73	0.03 (±0.019)	0.67
NB03SED-TOX151	39	0	--	--
NB03SED-TOX152	97	86	0.025 (±0.014)	0.37
NB03SED-TOX153	98	83	0.037 (±0.019)	0.73
NB03SED-TOX154	32	7	0.001 (±0.002)	0.96
NB03SED-TOX155	95	70	0.035 (±0.017)	0.6
Minimum	32	0	0.001	0.28
Maximum	98	92	0.037	0.96
Mean	81.8	60.7	0.027	0.63
Overall				
Minimum	32	0	0.001	0.00
Maximum	98	96	0.050	1.93
Mean	89.0	64.2	0.028	0.70

Notes:
Samples were collected as part of the Sediment Quality Triad program (GSH 2017b).
Shaded cells indicate significantly different than the control (p=0.05).

-- not calculable for no surviving organisms.
mg = milligrams
S.D. = standard deviation

Table K-2
Benthic Community Metrics

Station	Total Taxa (Richness)[1]	Total Mean Density (no./m²)[2]	Shannon Wiener Diversity Index[3]	Pielou's Evenness[4]	Swartz's Dominance[5]
North					
136	22	6,363	2.2	0.7	6
137	21	7,739	2.1	0.7	4
138	20	5,985	2.4	0.8	5
139	22	6,232	2.2	0.7	5
140	22	6,826	2.1	0.7	4
158	46	10,756	2.1	0.6	4
159	23	1,974	2.3	0.7	6
160	16	3,167	2.2	0.8	6
161	18	2,667	1.5	0.5	3
162	15	1,406	2.1	0.8	5
163	21	2,899	2.0	0.7	4
164	21	11,101	1.8	0.6	3
165	22	9,725	2.4	0.8	6
Summary					
Minimum	*15*	*1,406*	*1.5*	*0.5*	*3*
Maximum	*46*	*11,101*	*2.4*	*0.8*	*6*
Average	*22*	*5,911*	*2.1*	*0.7*	*5*
Median	*21*	*6,232*	*2.1*	*0.7*	*5*
Standard Deviation	*8*	*3,321*	*0.24*	*0.1*	*1*
Central					
141	19	3,870	2.1	0.7	5
142	29	11,237	2.0	0.6	4
143	25	5,870	2.3	0.7	5
144	11	710	2.1	0.9	5
145	28	8,870	2.1	0.6	4
156	16	1,812	2.2	0.8	5
157	19	1,218	2.4	0.8	8
Summary					
Minimum	*11*	*710*	*2.0*	*0.6*	4
Maximum	*29*	*11,237*	*2.4*	*0.9*	8
Average	*21*	*4,798*	*2.2*	*0.7*	5
Median	*19*	*3,870*	*2.1*	*0.7*	5
Standard Deviation	*7*	*4,052*	*0.14*	*0.1*	1
South					
146	42	2,788	2.7	0.7	8
147	14	2,116	1.9	0.7	5
148	8	406	1.5	0.7	3
149	15	7,019	1.8	0.6	3
150	23	2,276	2.6	0.8	7
151	22	1,667	2.2	0.7	5
152	43	7,186	2.2	0.6	4
153	42	5,595	2.7	0.7	8
154	33	1,301	3.0	0.9	12
155	20	2,340	1.9	0.7	4
Summary					
Minimum	*8*	*406*	*1.5*	*0.6*	*3*
Maximum	*43*	*7,186*	*3.0*	*0.9*	*12*
Average	*26*	*3,269*	*2.3*	*0.7*	*6*
Median	*23*	*2,308*	*2.2*	*0.7*	*5*
Standard Deviation	*13*	*2,423*	*0.48*	*0.1*	*3*

Table K-2
Benthic Community Metrics

Station	Total Taxa (Richness)[1]	Total Mean Density (no./m²)[2]	Shannon Wiener Diversity Index[3]	Pielou's Evenness[4]	Swartz's Dominance[5]
Overall					
Summary					
Minimum	*8*	*406*	*1.5*	*0.5*	*3*
Maximum	*46*	*11,237*	*3.0*	*0.9*	*12*
Average	*23*	*4,771*	*2.2*	*0.7*	*5*
Median	*22*	*3,518*	*2.2*	*0.7*	*5*
Standard Deviation	*9*	*3,338*	*0.32*	*0.1*	*2*

Notes:
[1] Total Taxa (Richness) is the total number of species [or higher order taxa, if not identified to species] in a sample.
[2] Total Mean Density is the number of individual organisms found per sample area. The values are prepared by counting the number of distinct individual organisms in a given sample.
[3] Shannon Wiener Diversity Index is a measure of the species diversity of a sample and takes into account species richness and evenness of each species within the community.
[4] Pielou's Evenness is related to the Shannon Wiener Diversity Index in that it also examines the distribution of individuals among taxa relative to an idealized distribution.
[5] Swartz's Dominance is an indicator of whether a small number of taxa dominate the sample.
no./m² = number of organisms per square meter
Benthic metrics derived from samples collected as part of the Sediment Quality Triad program (GSH 2017b).

Table K-3
Benthic Index of Biotic Integrity Metrics in the NBSA: 2015

Station	Salinity (bottom)	Salinty Class	Grain Size (% silt/clay)	Sediment Type	Total Taxa	B-IBI Taxa Score	Total Mean Density (no./m²)	B-IBI Density Score	Pollution Indicative Species (no./m²)	% Abundance Pollution Indicative Species	B-IBI Pollution Indicative Species Score	Pollution Sensitive Species (no./m²)	% Abundance Pollution Sensitive Species	B-IBI Pollution Sensitive Species Score	Biomass (g/m^2)	B-IBI Biomass Score	Overall B-IBI Score
Newark Bay North																	
136	22.4	polyhaline	95.9	mud	22	5	6363	5	2435	38%	3	0	0%	1	6.7	5	3.8
137	22.7	polyhaline	79.3	mud	21	5	7739	5	3290	43%	1	0	0%	1	6.4	5	3.4
138	24.52	polyhaline	75.1	mud	20	3	5985	5	2044	34%	3	116	1.9%	1	5.4	5	3.4
139	24.48	polyhaline	55	mud	22	5	6232	5	1319	21%	3	145	2.3%	1	13	3	3.4
140	23.7	polyhaline	28.9	sand	22	5	6826	5	2058	30%	3	0	0.0%	1	8.6	3	3.4
158	24.47	polyhaline	20.7	sand	46	5	10756	3	3917	36%	3	135	1.3%	1	34	3	3.0
159	24.5	polyhaline	52.9	mud	23	5	1974	3	321	16%	3	90	4.5%	3	1.6	3	3.4
160	23.7	polyhaline	56.8	mud	16	3	3167	5	513	16%	3	0	0%	1	14.9	3	3.0
161	23.14	polyhaline	86.9	mud	18	3	2667	3	1913	72%	1	0	0%	1	5.1	5	2.6
162	23.74	polyhaline	84.2	mud	15	3	1406	1	464	33%	3	145	10.3%	3	0.5	1	2.2
163	23.62	polyhaline	54.4	mud	21	5	2899	3	145	5.0%	5	145	5.0%	3	4.0	5	4.2
164	24.29	polyhaline	43.3	mud	21	5	11101	3	5971	54%	1	0	0%	1	32	3	2.6
165	23.68	polyhaline	91.5	mud	22	5	9725	5	2565	26%	3	0	0%	1	6.2	5	3.8
																Mean (Standard Deviation) B-IBI for North	***3.2 (0.6)***
Newark Bay Central																	
141	24.12	polyhaline	94.7	mud	19	3	3870	5	1464	37.8%	3	29	0.7%	1	12	3	3.0
142	24.07	polyhaline	13.7	sand	29	5	11237	3	2179	19.4%	3	51	0.5%	1	2.8	5	3.4
143	25.46	polyhaline	70.6	mud	25	5	5870	5	2319	39.5%	3	29	0.5%	1	4.2	5	3.8
144	23.97	polyhaline	79.5	mud	11	1	710	1	159	22.4%	3	58	8.2%	3	1.3	3	2.2
145	25.53	polyhaline	41.6	mud	28	5	8870	5	3551	40.0%	1	29	0.3%	1	12	3	3.0
156	24.52	polyhaline	89.9	mud	16	3	1812	3	478	26.4%	3	58	3.2%	3	1.4	3	3.0
157	24.32	polyhaline	90.3	mud	19	3	1218	1	102	8.3%	5	29	2.4%	1	3.5	5	3.0
																Mean (Standard Deviation) B-IBI for Central	***3.1 (0.5)***
Newark Bay South																	
146	24.91	polyhaline	26.9	sand	42	5	2788	5	519	19%	3	58	2.1%	1	6.3	5	3.8
147	24.64	polyhaline	40.5	mud	14	1	2116	3	652	31%	3	0	0%	1	1.5	3	2.2
148	24.69	polyhaline	66.9	mud	8	1	406	1	0	0%	5	0	0%	1	0.5	1	1.8
149	24.63	polyhaline	67	mud	15	3	7019	5	2795	40%	3	0	0%	1	5.0	5	3.4
150	24.67	polyhaline	67.1	mud	23	5	2276	3	696	31%	3	87	3.8%	3	2.5	3	3.4
151	24.91	polyhaline	69.7	mud	22	5	1667	3	841	50%	1	15	0.87%	1	12	3	2.6
152	24.03	polyhaline	29.8	sand	43	5	7186	5	3981	55%	1	58	0.80%	1	5.7	5	3.4
153	24.73	polyhaline	50.8	mud	42	5	5595	5	1841	33%	3	174	3.1%	3	5.1	5	4.2
154	24.86	polyhaline	64.9	mud	33	5	1301	1	212	16%	3	0	0%	1	19	3	2.6
155	24.71	polyhaline	17.4	sand	20	3	2340	3	962	41%	1	0	0%	1	3.3	5	2.6
																Mean (Standard Deviation) B-IBI for South	***3.0 (0.8)***

Notes
1. Bottom-most salinity included out of multiple depth readings.
2. Grainsize percentage from sieve size number 200 for silt/clay content.
3. Benthic samples collected in 2015 as part of the Sediment Quality Triad program (GSH 2017b).

B-IBI Score:
1 to <2 = impacted
2 to <3 = slightly impacted
3 to 5 = non-impacted

% = percent
B-IBI = Benthic Index of Biotic Integrity
g/m² = grams per square meter
no./m² = number per square meter

Table K-4
Benthic Index of Biotic Integrity Metrics and Toxicity in the NBSA: 1993/1994, 1998, 2003 REMAP

Station	B-IBI Score	Percent Survival[1,2]
REMAP 1993/1994 (USEPA 1998)		
NB025	2.4	91
NB027	2.2	90
NB036	3.0	86
NB039	2.6	101
NB044	2.4	87
NB045	2.6	86
NB052	2.6	92
NB053	2.0	85
NB065	2.4	87
NB102	1.8	8
NB103	2.6	93
NB104	2.4	98
NB105	2.0	86
NB106	2.6	62
NB110	2.8	103
NB112	2.2	86
NB113	2.4	18
1993/1994 Mean	**2.4**	**80**
REMAP 1998 (USEPA 2003)		
NB201	1.8	83
NB202	1.0	42
NB206	1.4	92
NB212	1.8	79
NB213	1.4	83
NB216	1.0	99
NB217	1.8	92
NB222	1.4	71
NB223	1.8	21
NB226	1.0	88
NB227	1.8	34
NB231	1.0	65
1998 Mean	**1.4**	**71**
REMAP 2003 (USEPA 2016b)		
NB301	1.4	94
NB305	1.8	85
NB306	3.4	94
NB307	3.0	3
NB309	1.8	91
NB310	2.6	94
NB312	1.4	96
NB325	2.2	97
NB326	2.2	95
NB327	2.2	95
NB329	3.0	97
2003 Mean	**2.3**	**85**

Notes:
[1]10-day Ampelisca abdita survival as a percent of the mean survival of laboratory control.
[2]Shading indicates survival was significantly different from control ($p<0.05$) for the 1998 and 2003 data. Significance was not reported for the 1993/1994 data.

B-IBI Score:
1 to <2 = impacted
2 to <3 = slightly impacted
3 to 5 = non-impacted

B-IBI = Benthic Index of Biotic Integrity
REMAP = Regional Environmental Monitoring and Assessment Program