East Branch Early Action Overview
Contaminated Sediments Technical Advisory Group (CSTAG)
Meeting No. 3
Newtown Creek Operable Unit 1 – East Branch Early Action
July 11 through July 13, 2023

This memorandum has been prepared by the U.S. Environmental Protection Agency (EPA) Region 2 for submission to the Contaminated Sediments Technical Advisory Group (CSTAG) for their review and consultation at a briefing planned to be held in EPA Region 2's New York office on July 11 through July 13, 2023, related to the potential East Branch Early Action for the Newtown Creek Superfund Site (site) located in New York City, New York.

The new CSTAG charter (2020) generally requires four milestone meetings prior to the release of any proposed plan for a Tier 2 sediment site. Based on consultation with CSTAG, this meeting is considered Site Milestone Meeting No. 3, as outlined in the charter, for a portion of Operable Unit 1 (OU1). The content will be specific to the consideration of a potential Early Action for the East Branch portion of the OU1 Study Area.

Figures and tables that accompany this document are provided in **Attachment 1**. Additional details about the work conducted to date and the status of OU1 (the entire Study Area), OU2 (volume of combined sewer overflow [CSO] discharges), and OU3 (evaluation of an early action for Creek Miles 0-2; terminated by EPA in July 2021) as well as the enforcement history of the site, can be found in the **Overall Sitewide Status Update Technical Memorandum** (also provided to CSTAG to support the meeting on June 6, 2023).

BACKGROUND AND BASIS FOR THE EAST BRANCH EARLY ACTION

Newtown Creek is a tidal arm of the New York-New Jersey Harbor Estuary and forms the northwestern-most border of the Borough of Brooklyn with the southwestern-most border of the Borough of Queens in New York City. It is a tributary of the East River and includes five branches (or tributaries) along its 3.8-mile reach. Currently, Newtown Creek is a navigable channel that is used by several companies.

The East Branch is one of the five tributaries to Newtown Creek. It is a tributary to the upper main stem of the creek, located between the creek head at the intersection of Metropolitan and Onderdonk Avenues and approximately Creek Mile 2.8 where it converges with the English Kills (Figure 1). The downstream extent of East Branch begins just upstream of the Turning Basin and continues upstream for approximately 0.16 mile before branching off into two lobes. The western lobe extends up to the CSOs located near Metropolitan Avenue, and the eastern lobe is referred to as the Western Beef slip (Figure 2).

Basis for the Early Action

As part of an adaptive management approach for the Site, EPA is proposing to conduct an early action in this portion of the Study Area so that remedial action can occur in this tributary while the OU1 sitewide feasibility study is being completed. It would be beneficial to move forward with conducting an early action in the East Branch for the following primary reasons:

- It would expedite the overall site response by implementing remedial action in one of the most upstream portions of the Study Area.
- It would result in immediate risk reduction and contaminant mass removal in this portion of the creek (and, to a lesser extent, within the Study Area as a whole).
- It would provide an opportunity to gain direct remedial experience working in the creek, which would help all parties involved gain experience with the logistics of conducting remedial work in the remainder of the site and help inform future efforts.
- Lessons learned from conducting the FFS and the East Branch Early Action (and associated pre-design investigation, remedial construction, and performance monitoring) would help inform the conduct of potential future early actions on other portions of the Creek and the OU1 sitewide feasibility study alternative development, evaluation, and remedy selection.
- It would provide an opportunity to validate and update the sitewide conceptual site model (CSM) that is being refined for the OU1 sitewide feasibility study. The early action would include a robust post-implementation performance monitoring program and, if the monitoring shows that the assumptions used to develop the East Branch CSM are not accurate, the CSM could then be updated accordingly.

A summary presentation of a framework for developing Remedial Action Objectives (RAOs) and Preliminary Remediation Goals (PRGs) for OU1 of the site (referred to herein as 'the Framework') was provided to CSTAG on June 6, 2023. Key points for how the Framework applies to the East Branch Early Action are:

- The East Branch Early Action will address the OU1 sitewide contaminants of concern (COCs) defined in the Framework, which are those found to cause unacceptable risk in the OU1 baseline human health and ecological risk assessments. As such, the Early Action COCs are total polychlorinated biphenyls (TPCBs), total polycyclic aromatic hydrocarbons 34 (TPAH34),[1] copper, dioxins/furans (D/Fs), lead, and C19-C36 aliphatic hydrocarbons. Risk-based PRGs have been determined for the COCs and will be the PRGs for the East Branch Early Action.

[1] TPAH(34) includes the summation of the following polycyclic aromatic hydrocarbons (PAHs): naphthalene, C1-naphthalenes, acenaphthylene, acenaphthene, C2-naphthalenes, fluorene, C3-naphthalenes, anthracene, phenanthrene, C1-fluorenes, C4-naphthalenes, C1-phenanthrene/anthracenes, C2-fluorenes, pyrene, fluoranthene, C2-phenanthrene/anthracenes, C3-fluorenes, C1-pyrene/fluoranthenes, C3-phenanthrene/anthracenes, benz(a)anthracene, chrysene, C4-phenanthrenes/anthracenes, C1-benzanthracene/chrysenes, benzo(a)pyrene, perylene, benzo(e)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, C2-benzanthracene/chrysenes, benzo(ghi)perylene, C3-benzanthracene/chrysenes, indeno(1,2,3-cd)pyrene, dibenz(a,h)anthracene, and C4-benzanthracene/chrysenes.

- The Early Action will address sources of contamination within the Study Area, where the Study Area is as defined in the 2011 Administrative Order on Consent between EPA, the New York City Department of Environmental Protection (NYCDEP), and the five Newtown Creek Group (NCG) respondents[2] (CERCLA Docket No. CERCLA 02-2011-2011). In-Creek processes that may lead to the spread of contamination present within the Creek include, but are not limited to, sediment resuspension, gas ebullition-facilitated contaminant/NAPL transport, non-aqueous phase liquid (NAPL) dissolution and migration, and vertical groundwater discharge within the Study Area.
- External sources of contamination to the creek will not be addressed directly by the early action, but robust post-implementation monitoring will be used to help identify external sources of contamination that may need further control in order for the remedy to remain protective, either through federal Superfund and/or State pf New York enforcement authorities. These external sources of contamination include, but are not limited to, stormwater and point source discharges (including, but not limited to, combined sewer overflows, permitted and non-permitted discharges, and overland flow), and lateral groundwater from upland properties.
- As part of the adaptive management framework, interim performance measures will be used to assess whether the East Branch Early Action is trending toward achieving the overall OU1 sitewide RAOs and remediation goals, or whether additional measures are needed to address internal and/or external ongoing sources of contamination, again through either federal Superfund or State of New York enforcement authorities. Interim performance measures will be established at a future date (see Approaches for Evaluation of Remedy Success section).

The process for integrating the effects and effectiveness of the interim remedy with future interim remedies or the final action will be discussed in future documents.

Early Action Work Completed to Date

Anchor QEA, consultant for the Newtown Creek Group (NCG), is currently completing the East Branch Early Action FFS. The components of the East Branch Early Action FFS include a work plan, an annotated outline, an alternatives memorandum, and an overall FFS document.

East Branch Early Action Work Plan: The FFS efforts began in June 2022 with the development of the East Branch Early Action Work Plan that was completed by the NCG and approved by EPA in December 2022.

East Branch Early Action FFS Annotated Outline: The annotated outline is intended to achieve consensus from EPA on the FFS structure and main content prior to FFS development. It was submitted in December 2022, and EPA provided comments in January 2023. EPA instructed the NCG to incorporate the comments into the FFS report as opposed to revising and reissuing the outline.

East Branch Early Action Alternatives Memorandum: The East Branch Early Action Alternatives Memorandum documents the proposed remedial alternatives to be evaluated in the FFS. It was initially submitted in November 2022 and a revised version was submitted in April 2023. EPA sent comments on the revised alternatives memorandum to the NCG on April 28, 2023, and the revisions to the

[2]The NCG respondents include Phelps Dodge Refining Corporation, Texaco, Inc., BP Products North America Inc., the Brooklyn Union Gas Company D/B/A National Grid NY, and ExxonMobil Oil Corporation.

memorandum are in progress. Additional detail summarizing the alternatives memorandum is provided in the East Branch Early Action Alternatives Memorandum Summary section.

East Branch Early Action FFS: The draft East Branch Early Action FFS is expected to be submitted to EPA in July 2023.

The following discussion documents salient information related to the development of the East Branch Early Action cleanup strategy and evaluation of remedial alternatives for the July 11 to 13, 2023, CSTAG milestone meeting.

EAST BRANCH DATA SUMMARY AND CONTAMINANT CHARACTERIZATION

Physical Setting

The East Branch was created in 1884 by cutting into the previously marshy edges of the waterway to increase distribution of building materials to supply the residential population near this area of the creek. Similar to other areas of Newtown Creek, the East Branch is a highly engineered water body that was almost entirely bulkheaded by the early 1900s. Approximately 80% of the shoreline within East Branch currently contains bulkheads, with nearly all of the remaining shorelines containing riprap or other armoring (Figure 3).

A federally authorized navigation channel is present in a majority of the East Branch, similar to the main stem of Newtown Creek and three of its tributaries – Dutch Kills, Maspeth Creek, and English Kills. The federally authorized navigation channel in the East Branch extends to the head of the western lobe, with an authorized channel depth of 20 feet deep relative to mean low water but has a current constructed depth of 16 feet. The federal authorized channel width differs between the sections of the tributary upstream and downstream of Grand Street bridge. The upstream authorized width is 125 feet, and the downstream authorized width is 150 feet. The last time maintenance dredging was performed in the East Branch was 1974, which is the last time maintenance dredging was performed in the creek and any of its tributaries. U.S. Army Corps of Engineers (USACE) is currently conducting a navigational study of the entire creek and its tributaries as part of the OU1 Remedial Investigation/Feasibility Study (RI/FS) process. There is a possibility that the navigable channel in the East Branch will be deauthorized.

Important infrastructure located in the East Branch includes the Grand Street swing bridge, the New York City aeration system, submerged electrical cable crossings below the Grand Street bridge, stormwater outfalls including a CSO, a municipal separate storm sewer system outfall, and a stormwater outfall from private property (Figures 4 and 5). The Grand Street swing bridge is slated for replacement, during which a temporary bridge will be installed. Detailed information for the temporary bridge and the replacement bridge are not known at this time. However, it is assumed that the temporary bridge will have the same clearance as the current permanent bridge. The temporary bridge will likely not be a swing bridge. The timing of the design phases and construction phase has yet to be finalized; however, construction is currently anticipated to commence around 2025/2026.

Based on the 2022 bathymetric survey, the average bathymetric elevation in East Branch is -11 feet North American Vertical Datum of 1988 (NAVD88), with a minimum elevation of approximately -24 feet NAVD88 (Figure 6). Water depths extend to a maximum of approximately 21 feet below mean lower low water (MLLW); MLLW is +2.61 feet above NAVD88; Figure 6). Tidal ranges are approximately up to 5 feet. There are portions of the East Branch sediment that are exposed during low tide (Figure 6). The average width of East Branch is approximately 214 feet in the downstream portion and western lobe and 111 feet in the narrower Western Beef slip.

The sediment bed throughout East Branch is a cohesive (muddy) bed, with varying amounts of fine (clay- or silt-sized particles) and coarse (sand-sized particles) material, with an average sediment thickness of 13 feet (Figure 7), with significantly greater sediment thicknesses in the western lobe between 16 and 26 feet. The sediment bed is underlain by native materials, which consist of glacial (Upper Glacial Aquifer) and post-glacial (historical marsh, lacustrine, and fluvial creek deposits) deposits.

The natural hydrodynamics of East Branch (similar to other areas of Newtown Creek) are dominated by twice-daily tidal flows from the East River and by storm-driven freshwater inputs from over 35 individual point source discharges (direct discharges from individual sites, highway drains, municipal separate storm sewer system [MS4] discharges, and CSOs [Figure 5]) and overland flow, creating a dynamic local environment that exhibits a unique combination of solids loads and depositional characteristics. Freshwater also enters East Branch from groundwater discharge, which occurs vertically at the base of East Branch through the sediment bed and laterally through vertical permeable shorelines to the surface water (i.e., lateral discharge). EPA is currently investigating the groundwater entering the East Branch laterally from upland properties as part of the Supplemental Characterization of Shallow Groundwater Discharge investigation. During dry weather, salinity values in the East Branch range from approximately 12 to 24 practical salinity units (psu) and are slightly lower than those of the main stem and the East River. However, during wet weather, salinity values are more variable and are generally less than salinity values measured during dry weather (Figure 8).

Nature and Extent of Contamination

The following discussion on nature and extent of contamination in the East Branch is summarized from the final RI report (Anchor QEA 2023a) and the Treatability Study Pre-Design Investigation Data Summary Report (TS PDI DSR) (Natural Resource Technology, Inc. 2020a). The discussion is focused on the site contaminants of concern (COCs).

Surface sediment (sediment within the top 6 inches of the sediment column): In surface sediment, there is no clear spatial distribution pattern associated with measurements of TPAH(34), C19-C36 aliphatic hydrocarbons, and lead concentrations in the East Branch. However, concentrations of TPCBs, 2,3,7,8-TCDD, and copper in surface sediment decline from the East Branch's confluence with the main steam of the creek moving upstream to the head of the tributary (western lobe). Generally, COC concentrations in surface sediment in the East Branch are similar to or lower than COC concentrations in other areas of Newtown Creek. All COCs were detected in surface sediment at concentrations greater than their respective risk-based PRG.

Figures 9a through 9f and Table 2 summarize contaminant concentration data for surface sediment in the East Branch.

Subsurface sediment (sediment below the top 6 inches of the sediment column to the native material interface): COC concentrations in subsurface sediment in the East Branch are higher than surface sediment concentrations in nearly all cases. There is no clear spatial distribution pattern associated with measurements of TPCBs and lead concentrations in subsurface sediment in the East Branch. Generally, TPAH(34) and copper concentrations are elevated at the confluence with the main stem and in the eastern lobe and decrease upstream toward the head of the tributary (western lobe). Measurements of C19–C36 aliphatic hydrocarbons in the tributary are limited to two locations; however, the higher concentrations are observed at the head of the tributary (western lobe). Similarly, concentrations of 2,3,7,8-TCDD are higher at the head of the tributary (western lobe). Generally, COC concentrations in subsurface sediment in the East Branch are similar to or lower than COC concentrations in other areas of Newtown Creek. All COCs were detected in subsurface sediment at concentrations greater than their respective risk-based PRG.

Figures 10a through 10f, Figure 11, and Table 3 summarize COC concentrations in subsurface sediment in the East Branch.

Native Material: TPAH(34), C19-C36 aliphatic hydrocarbons, and lead concentrations in native material are generally two to three orders of magnitude less than those in subsurface sediment. TPCBs and copper concentrations are generally one to two orders of magnitude less than those in subsurface sediment. 2,3,7,8-TCDD was not detected in any native material samples collected during the RI; however, it was detected in a native material sample collected during the FS Other than one sample with a C19-C36 aliphatic hydrocarbons concentration greater than the risk-based PRG, all other COC concentrations detected in native material were less than their respective risk-based PRG.

Porewater: Shallow porewater samples (0 to 12 inches below sediment surface) were analyzed for all site COCs except for C19–C36 aliphatic hydrocarbons and 2,3,7,8-TCDD, because these COCs were not initially identified as preliminary COCs for the site. There is no clear spatial distribution pattern associated with measurements of TPAH(34) and lead concentrations in shallow porewater in the East Branch. Concentrations of TPCBs and copper in shallow porewater are higher near the East Branch's confluence with the main stem of the creek than at the locations closer to its head (western lobe). TPCB concentrations in porewater from 1 to 2 feet below sediment surface (collected during the FS) in the eastern lobe are higher than in shallow porewater at the confluence with the main stem. Only one sample (at EB047) was collected in the East Branch of mid-depth porewater, from a depth interval of 1.5 to 3.5 feet bgs. Mid-depth porewater samples are porewater samples collected from mid-depth within the subsurface sediment, at the approximate midpoint between the mudline and underlying native material. Since only one sample was collected, no spatial pattern could be determined. However, in the mid-depth porewater sample, TPCBs and copper concentrations were greater than, TPAH(34) concentrations were similar to, and lead concentrations were less than those concentrations in shallow porewater samples collected at this one location.

Figures 12a through 12d summarize contaminant concentration data for porewater in the East Branch.

Groundwater: Groundwater samples, collected from monitoring wells within the creek, were analyzed for all site COCs except for 2,3,7,8-TCDD. Dissolved lead was only detected in one groundwater sample; as such, no spatial pattern could be determined. There is no clear spatial distribution pattern associated with measurements of TPAH(34), C19–C36 aliphatic hydrocarbons, and dissolved copper in groundwater below the East Branch. The lowest concentrations of TPCBs in groundwater were observed at the head of the tributary (western lobe).

Figures 13a through 13e and Table 4 summarize contaminant concentration data for groundwater measured at the base of the East Branch sediment bed.

NAPL and sheen in sediment: Observations of NAPL blebs in sediment were located sporadically throughout the East Branch area and not clustered at a particular location. Similarly, visual observations of surface and subsurface sediment samples identified sheen throughout the East Branch. Visual observations of sediment samples performed during the FS in the East Branch eastern lobe identified sheen in every sample collected in the eastern lobe. NAPL blebs were observed in the shake tests of two subsurface sediment cores collected in the eastern lobe. Figures 14a through 14c show the presence and extent of sheen and NAPL, as determined through a combination of visual observations and shake testing for both the RI and FS investigations.

Particulate phase concentrations[3] in surface water: In Newtown Creek overall, spatial patterns in particulate phase TPAH(34), TPCB, copper, and lead concentrations show similar patterns to those in whole water samples, specifically that concentrations tend to increase with increasing distance upstream in the main stem of the creek. Particulate phase TPAH(34) and TPCB concentrations also tend to be higher in the more upstream tributaries, like the East Branch. These patterns tend to be more prevalent during wet weather conditions. Figure 15 and Table 5 show and summarize estimated particulate phase concentrations in surface water during dry and wet weather sampling.

Sources of Contaminants

East Branch has been affected by numerous known and potential sources of contamination throughout the past 200 years due to a long history of extensive urban and industrial development within the Newtown Creek watershed, dating back to the early 1800s. The current distribution of contaminants in East Branch is due to historical and ongoing sources, historical and ongoing dynamic fate and transport processes, and changes in contaminant loads over time. As such, not all of the locations of impacts observed today can necessarily be directly linked to proximate upland sites or sources, including point sources.

Historically, contaminant loads to surface sediment were much greater, as suggested by the generally higher contaminant concentrations in subsurface sediment. Surface sediment concentrations appear to have been declining over time, potentially because of the deposition and mixing of recently deposited, less-contaminated solids with previously deposited solids. The contaminants found within East Branch are also commonly present in the surrounding watershed and, as such, they can enter the system from multiple potential sources. Natural recovery assessments are not currently planned for the East Branch Early Action area because this area is outside of the extent of the most significant East River influences (the most likely contributor to any natural recovery). However, post-construction long-term monitoring is expected to be part of the East Branch Early Action and is discussed later in this memorandum.

[3] Particulate phase concentrations in surface water were calculated using either direct measurement of whole water samples and filtered water samples (for metals) or based on partitioning theory using site-specific partition coefficients with the measured total suspended solids concentration of each sample. The RI Report provides detail (Anchor QEA 2023a). Particulate phase concentrations for 2,3,7,8-TCDD were not calculated because site-specific partitioning calculations were not possible since 2,3,7,8-TCDD was not analyzed in porewater samples.

Current sources of contamination to the East Branch are a focus of the CSM, because of the importance of source control in remedial alternative development and selection. Figure 16 illustrates the current sources of contaminants to the East Branch, along with the fate and transport of these contaminants throughout the East Branch. Table 6 presents point source flows and particulate concentrations for the COCs. Sources of contamination to the East Branch include the following:

- Historical inputs from a variety of industrial and municipal sources
- Current point source discharges (Figures 5 and 17), including CSO, stormwater discharges including MS4s and major stormwater discharges, highway drains, and direct discharges from individual sites
- Twice-daily tides, through which the East River transports both East River and site-related surface waters and solids that contain contaminants[4]
- Groundwater discharge to East Branch, which occurs vertically at the base of East Branch (Figures 18, 19, and 20a through 20e) and laterally through vertical permeable shorelines to the surface water (i.e., lateral discharge)
- Dissolution of NAPL
- Ebullition-facilitated contaminant/NAPL transport from Study Area sediments (Figure 21)
- Other sources, including overland runoff, bank erosion, atmospheric deposition, overwater activities, and shoreline seeps

Fate and Transport of Contaminants

A variety of physical and chemical processes that influence the fate and transport of contaminants and NAPL in the Study Area, including East Branch, have been investigated during the RI/FS, as discussed in detail in Section 6 and associated appendices of the OU1 RI report (Anchor QEA 2023a), the *Feasibility Study Nonaqueous Phase Liquid Mobility Data Evaluation Report* (Anchor QEA 2022a), and the *Feasibility Study Gas Ebullition Data Evaluation Report* (Anchor QEA 2022b).The physical and chemical processes that influence the fate and transport of contaminants and NAPL in the Study Area are summarized as follows:

Fate and transport (F&T) processes in East Branch include the following:

- F&T to the surface water column
    - o Point source discharges and overland flow, lateral groundwater flow, discharge of surface porewater (driven by groundwater flow), and East River tidal waters enter the Study Area surface water column, where contaminants and solids are transported throughout the creek, including up into East Branch.

[4] Based on the final sediment transport model and the latest LTE model, the East River contributes approximately 30 percent of the solids depositing in East Branch on average, with the contribution being lower in the eastern and western lobes of the tributary and higher toward the downstream end of East Branch.

    - In East Branch, it is likely that the flux from surface sediment porewater contributes to the contaminant concentrations reported in surface water.
    - Under wet weather conditions, point source discharges and overland flow are a source of elevated contaminant concentrations in the water column in East Branch. Contaminant concentrations in surface water during wet weather may also be affected by localized sediment erosion in some locations, especially in the areas where the current velocities are higher and the water is shallow near the CSOs.
- F&T within the surface water column
    - The contaminant mass discharged into the water column following a wet weather event remains within East Branch for several tidal cycles. During this time, some contaminants disperse from their sources, partition between dissolved and particulate phases, and settle onto the sediment bed.
    - During dry water conditions, the two primary sources of contaminants to the East Branch surface water are tidal exchange with the East River and flux of contaminants from the sediment bed via surface porewater advection and diffusive and tidally driven exchange.
- F&T associated with surface sediment
    - Hydrodynamic processes (i.e., tidal currents and density driven circulation) generate relatively low near-bed current velocities in East Branch. The low-energy environment creates a net depositional environment throughout East Branch. Although episodic erosion and localized physical disturbances (e.g., higher velocities near CSO discharges during high-flow storm events and propeller wash, respectively) cause temporary resuspension of surface sediment in certain locations, and newly deposited solids can mix with previously deposited solids in the surface sediment, the subsurface sediment appears relatively stable.
    - The processes of resuspension and redeposition, in addition to mixing, likely contribute to the observed distribution of contaminants in sediment in areas near CSO discharges (primarily the head of the western lobe), where COC concentrations do not necessarily increase with depth compared to other areas within East Branch.
- F&T associated with subsurface sediment
    - Contaminants in the subsurface sediment can be transported to the surface water column via erosion of overlying sediment, resulting in exposure of the subsurface sediment.
    - Groundwater is an ongoing source of dissolved contaminants to subsurface sediment, where it can affect concentrations via transport through the interstitial spaces (as porewater) and sorption onto the solid matrix. This can ultimately impact overlying surface sediments and surface water via migration of contaminated porewater.

- Dissolution of NAPL present in subsurface sediment is likely to affect contaminant concentrations in porewater and sediment. Contamination resulting from NAPL dissolution would be expected to enter porewater and migrate with groundwater advection or sorb onto the solid matrix.
- Gas ebullition originates primarily in surface and shallow subsurface sediment when water/sediment temperatures are highest and water depths are shallowest (near the hours of lowest tides) and organic content in sediments is high enough to support the bacterial production of methane gas. When gas ebullition occurs in the presence of sheen-bearing material (NAPL or other materials), or below these materials, those constituents may be transported with gas bubbles to the water column, creating dynamic sheens[5] (the extent of these dynamic sheens are shown in Figure 21).
- NAPL advection is the movement of NAPL through pore spaces of sediment or native material as a result of the hydraulic and gravitational forces acting on the NAPL. NAPL advection can occur if the combination of driving forces is sufficient to overcome the capillary forces between sediment particles that resist NAPL movement. Under test conditions, NAPL within East Branch sediment is immobile and cannot migrate upward via advection at the two locations sampled in East Branch based on laboratory testing results (Anchor QEA 2022a). The mobility of NAPL in untested areas of the East Branch is unknown. Changes to in situ conditions and/or anthropogenic disturbances could potentially mobilize NAPL.
- The subsurface sediment bed is generally physically stable (i.e., net erosion that exposes subsurface sediment and deeper depths is not occurring in significantly large areas). Over time, as deposition continues, historically deposited solids and contaminants are covered, and surface sediment concentrations are likely diluted by less-contaminated, newly deposited materials.

- F&T associated with the native material
  - Chemicals that migrate via groundwater through vertical groundwater flow within the native material into subsurface sediment subsequently partition between the sediment and porewater based on sediment characteristics and chemical properties.

EAST BRANCH CONCEPTUAL SITE MODEL

The land use history and urban landscape in which East Branch exists shapes the CSM and informs the nature and extent of contamination. Figure 16 illustrates both the current sources to East Branch and the F&T processes driving contaminant movement within East Branch. The East Branch CSM elements most important in the development and selection of remedial alternatives are as follows:

- Nature and extent of contamination

[5] Dynamic sheens are sheen blossoms (developing or expanding sheen area) with a breaking gas bubble or expanding sheens without a breaking gas bubble.

- COC concentrations in the sediment generally increase with depth, whereas COC concentrations in native material are generally one or more orders of magnitude lower than COC concentrations in the surface and subsurface sediment. Areas of sediment where COC concentrations do not increase with depth (e.g., near CSO discharges at the head of the western lobe) have likely been affected by resuspension, redeposition, and mixing.
- COCs are detected and elevated in media other than sediments, including surface water and groundwater.
- Sheens have been observed intermittently throughout surface and subsurface sediment; NAPL blebs have been occasionally observed in subsurface sediment.
- Dynamic sheens have been observed in surface water due to ebullition.
- NAPL has been observed to be immobile (under conservative laboratory test conditions) at two locations tested in the East Branch, but this does not preclude changes to in situ conditions and/or anthropogenic disturbances potentially mobilizing NAPL.

- Contaminant sources and F&T
  - The East Branch reach is net depositional.
  - Depositing solids and COC load originate primarily from point sources (i.e., CSO and stormwater outfalls).
  - East River solids comprise approximately 30 percent of the deposited sediment and COC load in East Branch.
  - There are less significant contributions to COC loads from other sources (e.g., ebullition, atmospheric deposition).
  - Remediation of East Branch sediments will likely address current contamination present in the East Branch and mitigate internal F&T processes.
  - Ongoing external sources of contamination will continue post-remedy. However, there is an expectation that the overall external loading to the creek will decrease over time because of improved best management practices, ongoing cleanup actions (such as at upland sites), and additional regulatory control (including the long-term control plan both for Newtown Creek and for the East River overall). As part of the adaptive management approach for the site, robust post-remedy implementation monitoring will be conducted and impacts from external sources of contamination that need to be addressed will be addressed by the appropriate party and/or under the oversight of the appropriate entity (such as EPA or NYSDEC).

The existing site information and CSM were used to estimate the mass of a subset of the COCs that were the focus[6] of the RI (i.e., hydrocarbons as TPAH [34], TPCB, and Cu). These estimates were developed for COC mass in the sediments in East Branch and the loadings of those COCs to the sediments and surface water in East Branch (Figures 22 through 24). While not presented on these figures, estimated annual loads of NAPL via gas ebullition were also developed and range from 28 kg/year to 130 kg/year (lower- and upper-bound scenarios, respectively) (Anchor QEA, 2022b). Incomplete information for the other COCs precludes these calculations because they were not measured as extensively as the three focus COCs.

FOCUSED FEASIBILITY STUDY DRAFT INTERIM REMEDY REMEDIAL ACTION OBJECTIVES

EPA has developed tentative RAOs for the entire Study Area in the Draft Final Memorandum for the Framework for the Operable Unit 1 RAO/PRG Approach. These RAOs were developed for the OU1 sitewide RI/FS using the information contained in the RI and other EPA-approved site documents, including the risk assessments. These RAOs will set Study Area-wide remedial expectations for OU1, and any early actions need to be consistent with the OU1 RAOs.

The OU1 sitewide RAOs are as follows:

Exposure-Based Remedial Action Objectives

- Reduce human exposure to fish and crab ingestion risks above protective levels by reducing the concentrations of COCs in contaminated sediment to protective PRGs/RGs.
- Reduce ecological exposure to site COCs in sediment to protective PRGs/RGs.

Source Control Remedial Action Objectives

- Reduce migration of site-related Non-aqueous Phase Liquid (NAPL) and other sources within the Study Area to sediment and surface water above levels that are protective for human health and ecological exposure.

The RAOs for the East Branch Early Action are proposed as follows:

Exposure-Based Remedial Action Objectives

- Reduce human exposure to fish and crab ingestion risks above protective levels by reducing the concentrations of COCs in contaminated sediment in the East Branch to protective PRGs/RGs.
- Reduce ecological exposure to site COCs in sediment in the East Branch to protective PRGs/RGs.

Source Control Remedial Action Objectives

[6] Hydrocarbons, TPCB, and copper contribute to unacceptable risks to human health and/or ecological receptors and represent three broad classes of contaminants. Lead and 2,3,7,8-TCDD also contribute to unacceptable risk to human health and/or ecological receptors but to a lesser degree than copper and TPCB, respectively. Additionally, detail regarding the determination of contaminants used for evaluations of sources, fate and transport, and quantitative aspects of the CSM can be found in the RI Report (Anchor QEA 2023a).

- Reduce migration of site-related Non-aqueous Phase Liquid (NAPL) and other sources within the East Branch to sediment and surface water above levels that are protective for human health and ecological exposure.

In addition, as has been noted, there are many ongoing sources of contamination to the Creek that are not part of the Study Area and some of these may impact the protectiveness of the remedy for the East Branch. EPA will continue to work with the NYSDEC to identify and address any such ongoing sources. As part of an adaptive management approach, identification of upland sources that may affect the protectiveness of the remedy may occur at multiple stages, including during remedy implementation or during post-remedy operation, maintenance, and monitoring.

CONTAMINANTS OF CONCERN AND RISK-BASED PRELIMINARY REMEDIATION GOALS

The COCs for the East Branch Early Action have been selected based on the outcomes of the risk analyses presented in the EPA-approved OU1 Human Health Risk Assessment (HHRA) (Anchor QEA 2017) and Baseline Ecological Risk Assessment (BERA) (Anchor QEA 2018). These risk assessments were completed as part of the OU1 RI/FS activities and were developed on a Study Area–wide basis. Exposures and risks for some receptor/COC/exposure pathways were evaluated on a smaller scale than the entire Study Area where relevant, based on the type of receptor and the specific exposure pathway (e.g., mummichog home range of 38 meters).

Risk-based sediment PRGs were developed for all the human health and ecological receptors, exposure pathways, and COCs for which there are unacceptable risks (e.g., recreational crabber and polychlorinated biphenyls [PCBs], mummichog and copper, etc.). From those, the most protective risk-based PRG for each COC was selected as the risk-based PRG. The risk-based PRGs have been developed for the following five contaminants for a total of 6 PRGs. PRGs were developed for two classes of hydrocarbons as shown in the table below. Development of Risk-based PRGs Technical Memorandum provides additional detail (Anchor QEA 2021).

Contaminants of Concern and Preliminary Risk-Based PRGs

Contaminants of Concern	Risk-Based PRG	Most Sensitive Receptor and Exposure Pathway
TPCBs	0.30 mg/kg	Humans via crab consumption
Dioxins/Furans TEQ	18 ng/kg	Humans via crab consumption
Copper	490 mg/kg	Mummichog via dietary intake
Lead	340 mg/kg	Spotted sandpiper via dietary intake
TPAH(34)	100 mg/kg	Benthic macroinvertebrates via sediment toxicity
C19-C36 Aliphatic Hydrocarbons	200 mg/kg	Benthic macroinvertebrates via sediment toxicity

Notes:
mg/kg – milligram per kilogram
ng/kg – nanogram per kilogram

Exposure to TPCBs and D/Fs through consumption of fish and crab by recreational anglers and crabbers drives risks to human health. Risks were assessed on a Study Area–wide basis; however, tissue concentrations in fish and crab are generally higher in the East Branch compared to the rest of the Study Area. As a result, exposure to COCs through consumption of fish and crab caught in East Branch will be higher than in the rest of the Study Area. From an ecological risk perspective, an overall conclusion of the ecological risk assessment indicates that exposure to COCs is similar in the East Branch to exposure in other areas of the Creek and tributaries, including Dutch Kills, English Kills, Maspeth Creek, and the Turning Basin. The multiple lines of evidence contributing to exceedances within these areas are also generally associated with the highest concentration of contaminants in both sediment and porewater.

EAST BRANCH EARLY ACTION ALTERNATIVES MEMORANDUM SUMMARY

The East Branch Early Action Alternatives Memorandum (in development) documents at a high-level the proposed remedial alternatives to be evaluated in the East Branch Early Action FFS. The identification process for general response actions, remedial technologies, and process options to be included in remedy development for the FFS considers those general response actions, remedial technologies, and process options that are proven technologies in sediment remediation projects that have been implemented at other similar sites and aligns with EPA's *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites*. A more detailed description of each alternative, including supporting information regarding the development of alternatives and subsequent analysis of the alternatives, will be provided in the East Branch FFS report. Six alternatives have been developed to address the East Branch in addition to the required No Action option. The alternatives are as follows:

- Alternative EB-A: No Action.
- Alternative EB-B: Remove sediments above -3 feet MLLW and place a 3-foot-thick armored/reactive cap to have the cap installed entirely at (or below) 0 feet MLLW.
- Alternative EB-C: Dredge 3 feet and place a 3-foot-thick armored/reactive cap to maintain the existing water depth.
- Alternative EB-D: Dredge 3 feet and place a 3-foot-thick armored/reactive cap to maintain the existing water depth. In select areas, remove soft sediments to native material to optimize the remedy.
- Alternative EB-E: Dredge the federally authorized navigation channel to a depth necessary to accommodate a cap below the current authorized depth plus a buffer or to native material, whichever is shallower. Areas dredged to native material would include backfill, if necessary. Dredge and/or cap outside of the navigation channel.
- Alternative EB-F: Dredge all soft sediments and backfill if necessary. Place sand or armored reactive caps over areas with high groundwater dissolved phase contaminant concentrations and/or high rates of advection in native material.

The alternatives memorandum has not been finalized and is therefore not included with this package. The summary provided herein is based on the April 14, 2023 draft version of the memorandum modified as needed to be consistent with the revisions expected by EPA at this time.

Common Elements of Alternatives EB-B, EB-C, EB-D, EB-E, EB-F

The alternatives are a combination of dredging and capping approaches and vary in terms of how much sediment will be removed as part of dredging. As such, each active alternative includes the following common elements.

Pre-Design Investigation and Treatability Study

A pre-design investigation (PDI) and, if needed, a treatability study (TS) will be conducted to obtain any additional required information to inform the design of the early action remedy. These activities may include collection of additional surveys, further delineation of COCs, additional geotechnical investigations, and the evaluation of treatment methods and constructability techniques. Results from the TS PDI conducted from November 2019 to January 2020 under an EPA-approved work plan (Natural Resource Technology, Inc. 2020b) will be incorporated into the design, as appropriate.

Institutional Controls

Institutional controls will be established, as needed, at least until the RAOs for the Early Action are met. Appropriate institutional controls will be developed during the FFS process.

Dredging

Each of the active alternatives includes dredging. Both mechanical and hydraulic dredging could be effective and implementable in East Branch. However, the presence of debris in East Branch would reduce the technical implementability of hydraulic dredging due to entanglement within equipment, as well as pipeline blockage concerns, and separate debris removal equipment would likely be needed to accomplish debris removal necessary for the dredging operations. Additionally, hydraulic dredging would require a significant upland support area for dewatering and water treatment. Therefore, mechanical dredging is used herein as a representative process option for the remedial alternatives. That said, other dredging process options, including hydraulic dredging and specialty dredging approaches (e.g., diver-assisted dredging), could still be considered for use, if needed, as part of the detailed design of the remedy.

Capping

The FFS assumes that the area dredged will be capped. The type of cap used (sand cap, armored cap, reactive cap, or armored/reactive cap) and the cap thickness will vary depending on site-specific characteristics. The type of cap will be based on the following: 1) modeling of dissolved phase COC F&T, 2) gas ebullition-facilitated NAPL/COC transport, and 3) chemical and/or physical site conditions affecting cap design on a location-specific basis, which may result in variation in the cap composition in portions of East Branch. A 3-foot-cap thickness is assumed in the draft alternatives memorandum; however, cap thickness may be revised in the FFS pending further evaluations. Further, more refined cap details would be developed during the remedial design. If the cap thickness is adjusted based on evaluations to be performed for the FFS (or the RD), the dredge depth in areas of capping would be adjusted similarly to maintain the intent of the alternative. It is assumed that caps placed over sediment will require a chemical isolation layer and an erosion protection layer to be protective of human health and ecological receptors over time. In areas where sediment is dredged to native material, the composition of the cap, or backfill layer, will vary based on whether high groundwater dissolved phase contaminant concentrations and/or high rates of advection in native material are observed.

In Situ Treatment

In situ stabilization and solidification (ISS) will be used as needed to reduce contaminant dissolution from NAPL, reduce the potential for ebullition-facilitated NAPL transport, and potentially assist in the control of groundwater flow through heavily contaminated soils and sediments. To evaluate a range of options to address NAPL, ISS will be incorporated into a set of alternatives to be compared against other alternatives that only include dredging and capping. The alternatives also include consideration for ISS as necessary to address concerns associated with unstable shorelines and structures, as discussed below.

Slope or Shoreline Stabilization Measures

Where a remedial alternative could negatively impact shoreline or sediment slope stability, the remedial alternative will include stabilization measures that may be applicable depending on the site-specific conditions. These stabilization measures may include the use of ISS, placing limits on the means and methods of dredging (e.g., prescribing slot dredging in some areas), and temporary or permanent structural support (i.e., repair or replacement of a bulkhead).

Dredged Material Management and Disposal

For the purposes of the FFS, landfill disposal will be used as the representative process option based on the existence of multiple facilities in the region that would be able to accept the material. Dredged material disposal will be in a Subtitle C, Subtitle D, and/or Toxic Substances Control Act waste landfill, depending on the waste profile in each dredging area. However, beneficial use will be retained for consideration during the detailed design phase if opportunities are available. Dredged material stabilization/solidification before offsite transportation and disposal may be implemented through the addition of one or more amendments to meet transportation and disposal requirements. The FFS will provide more detailed description of dredged material management, sediment handling, and processing operations in the alternatives.

Performance Monitoring

A robust performance monitoring plan (PMP) would be implemented to evaluate interim remedy success and determine whether additional remedial action within the East Branch may be necessary and/or if additional external source control measures are needed to reach RAOs. The performance monitoring data will be evaluated against interim performance measures to determine whether the remedy is trending toward achieving the OU1 sitewide RAOs and goals and, consistent with the adaptive management approach being used at this site, performance monitoring will be conducted on an iterative basis. The appropriate entity to conduct any additional source control actions will be determined on a case-by-case basis, and these additional actions may occur under federal Superfund authority and/or under the authority of the State of New York. The PMP will continue at least until the OU1 sitewide ROD is signed, and possibly until the OU1 sitewide ROD-selected remedy is fully implemented. The East Branch Early Action remedy would then be subsumed by the OU1 sitewide remedy.

The monitoring for the early action is anticipated to occur in the following phases: baseline monitoring; construction-phase monitoring during and directly after construction; operations, maintenance, and monitoring after remedy implementation; and long-term monitoring. Long-term monitoring would include necessary monitoring to determine remedy achievement of the OU1 sitewide RAOs over time. This monitoring would include, at a minimum, monitoring of COC concentrations in the sediment and surface water. Detailed monitoring specifics would be developed following completion of the FFS during the design phase.

Variations Between the Alternatives

Alternative EB-B: Under this alternative, sediments above elevation -3 feet MLLW would be removed, and a 3-foot-thick armored/reactive cap would be installed entirely at (or below) 0 feet MLLW to maintain cap saturation. This would result in sediment removal in some areas to depths shallow than 3 feet below the mudline. Therefore, this alternative would raise mudline elevations and reduce water depths in the East Branch following remedy implementation.

Alternative EB-C: Under this alternative, 3 feet of sediment would be removed, and a 3-foot-thick armored/reactive cap would be installed. This alternative would maintain current mudline elevations and ensure current water depths in the East Branch are unaltered following remedy implementation.

Alternative EB-D: As with EB-C, 3 feet of sediment would be removed before placement of a 3-foot-thick armored/reactive cap to maintain the existing water depth. Under this alternative, additional sediment would be removed down to native material in select areas to optimize the remedy. These areas would be covered with a sand backfill layer, if necessary, to manage residuals or with armored/reactive caps in areas with high groundwater dissolved phase contaminant concentrations and/or high rates of advection in native material. It is expected that this may result in a mudline elevation that is deeper on average than the current mudline.

Alternative EB-E: Since it is not known at this time whether the portion of the navigation channel in the East Branch will be deauthorized, this alternative is included as the only alternative that accounts for the federally authorized navigation channel. To the maintain the current federally authorized navigation channel depth, sediment would be removed under this alternative to a depth necessary to accommodate a 3-foot-thick armored/reactive cap below the authorized depth (plus a buffer) or to native material, whichever is shallower. If necessary, areas that are dredged to native material would be covered with a sand backfill layer to manage residuals or with armored/reactive caps in areas with high groundwater dissolved phase contaminant concentrations and/or high rates of advection in native material. To remove sediment to the authorized depth, stable side slopes may need to be dredged outside the navigation channel limits, which would likely remove nearly all contaminated sediment outside of the navigation channel, except for sediment in the eastern lobe/Western Beef slip. In the eastern lobe/Western Beef slip, a combination of dredging and capping would be performed. The shoreline stabilization measures will likely be more extensive (e.g., ISS and temporary or permanent structural support) than under Alternatives EB-B, EB-C, and EB-D, due to the anticipated depth of dredging under this alternative.

Alternative EB-F: All sediment would be removed down to native material. As with EB-D, native material would be covered with a sand backfill layer, if necessary, to manage residuals or with armored/reactive caps in areas with high groundwater dissolved phase contaminant concentrations and/or high rates of advection in native material. In addition, the shoreline stabilization measures will likely be more extensive than under Alternative EB-E, because of the anticipated depth of dredging under this alternative.

APPROACHES FOR EVALUATION OF REMEDY EFFECTIVENESS

Development of Interim Performance Measures

To support the development of remedial alternatives for the FFS, it is important to consider the contribution of ongoing external inputs of contaminants to the East Branch, their relative importance, and how those inputs result in future post-remedy surface sediment concentrations. Additionally, it is important to note that past and current sources of contamination to the creek have changed and will continue to change over time through the use of improved best management practices in the watershed, implementation of the NYC long-term control plan, and development/reuse of land adjacent to the creek, under various sediment-based remedial scenarios, and it is anticipated that these trends will continue.

In the FFS, a number of models will inform, in part, evaluations of remedy effectiveness. To evaluate remedy effectiveness and determine whether risk-based PRGs may be achievable in the future, EPA will follow an iterative approach to post-remedy monitoring. As part of this approach, EPA will determine interim performance measures using empirical data and information from the long-term equilibrium (LTE) model and contaminant fate and transport (CFT) model as discussed below. An overview of the LTE model is presented following this section.

Following early action remedy implementation and during the long-term monitoring phase of the early action, EPA anticipates that the LTE model and the interim performance measures will be updated over time as empirical monitoring data is collected. EPA will compare long-term monitoring data to the interim performance measures to assess whether the East Branch Early Action is trending toward achieving the overall OU1 sitewide RAOs and remediation goals, or whether additional measures are needed to address internal and/or external ongoing sources of contamination, either through federal Superfund or State of New York enforcement authorities.

Overview of the Long-Term Equilibrium Model (LTE) Developed for OU1

As indicated in the Overall Sitewide Status Update Technical Memorandum, the OU1 RI/FS work includes a series of linked models (hydrodynamic, sediment transport, and CFT models) that are being used to support refinement of the site CSM and could be used to estimate long-term sediment COC concentrations under various sediment-based remedial scenarios and ongoing loading from various sources. As discussed below, the CSM developed using the RI data and supported by application of the various numerical models has led to the development of an alternative, non-proprietary analytical framework, referred to as the LTE model.

As described in the CSM included in the RI report, Newtown Creek is a relatively low-energy system. The hydrodynamics of the system are dominated by the twice-daily tides entering from the East River, influenced periodically by stormwater and CSO discharges during wet weather events, and, to a lesser degree, by groundwater advection (entering the water column vertically through the sediment bed and laterally via permeable shorelines) and treated groundwater effluent discharges. Sources of suspended sediment and/or COCs to the creek include, but are not limited to, the East River, stormwater and CSO discharges, wastewater treatment plant overflow, and groundwater discharge. Hydrodynamic currents in the creek are relatively low, which results in minimal or near-zero erosion of the sediment bed. However, there are localized areas of erosion caused by propwash, near larger CSO discharges, and similar small-scale occurrences. Nonetheless, based on empirical evidence as well as the results of the sediment transport model, the creek is net depositional, with erosional processes having minimal impact on sedimentation at larger, reach-average or tributary-average scales.

Because of the depositional nature of the creek, and the lack of significant erosional dynamics such as those present in riverine systems (e.g., during high-flow conditions), the long-term COC transport dynamics and resulting equilibrium COC concentrations in the sediment can be estimated using simpler analytical formulations of the LTE model in a similar manner as the more computationally intensive numerical contaminant F&T model that is under development. Briefly, the LTE model estimates the COC concentration associated with the depositing sediments in a given reach as the sum of the source-dependent COC concentrations weighted by the relative contribution of the individual sources to net deposition in the reach. Although the LTE model primarily represents the solids-based COC sources (East River, stormwater and CSO discharges, and wastewater treatment plant overflow), which represent the majority of the COC loadings to the creek under current conditions, it also includes the somewhat minor primarily dissolved phase COC sources (groundwater advection, atmospheric deposition, treated groundwater effluent, and bank erosion). The particulate phase concentration contributions of the dissolved phase loadings are approximated and accounted for in the LTE model based on site-specific partitioning relationships. The resulting COC concentration on the depositing solids represents the LTE concentration expected in the sediment bed over the long term. Because it does not account for in-bed mixing processes such as diffusion and bioturbation, the LTE concentration is an appropriate estimate of the post-remedial equilibrium concentration that results from deposition of ongoing sources.

The inputs to the LTE model include various data sets collected as part of the RI (flow rates, suspended sediment concentrations, and COC concentrations), and the long-term sedimentation rate estimated using the EPA-approved sediment transport model. COCs currently included in the LTE model are TPAH(34), TPCB, copper, C19-C36 aliphatic hydrocarbons, and D/F toxic equivalence quotient (mammal). The LTE model is applied over the reach and tributary scale (CM 0-1, CM 1-2, CM 2+, Dutch Kills, Whale Creek, Maspeth Creek, East Branch, and English Kills). The NCG originally implemented the analytical formulation of the LTE model in a spreadsheet format. EPA is currently revising the NCG's LTE model implementation with alternative assumptions for the statistical methods used to derive model inputs and is also implementing the model within a probabilistic Monte Carlo framework. The resulting LTE concentration estimates will characterize the uncertainty associated with this metric.

In brief, this model can be used to perform the following:

- Estimate the future LTE surface sediment COC concentrations under various sediment-based remedial scenarios and under the influence of a range of loadings from various ongoing sources for the entire Study Area.
- Develop the interim performance measures

- Assess changes in LTE concentrations in response to natural or anthropogenic changes that may result in changes to COC loadings to the system, (e.g., the CSO discharge reductions planned under OU2).
- Assess the need for additional source control measures that could be implemented to reduce LTE concentrations and potentially achieve the risk-based PRGs.

A draft Interim Estimates of Post-Remedy Surface Sediment Concentrations report documents the approach developed for estimating LTE surface sediment concentrations and is currently under review by EPA.

REFERENCES

Anchor QEA, 2023a. Remedial Investigation Report. Remedial Investigation/Feasibility Study, Newtown Creek. March 2023.

Anchor QEA, 2022a. Feasibility Study Nonaqueous Phase Liquid Mobility Data Evaluation Report. Remedial Investigation/Feasibility Study, Newtown Creek. March 2022.

Anchor QEA, 2022b. Feasibility Study Gas Ebullition Data Evaluation Report. Remedial Investigation/Feasibility Study, Newtown Creek. September 2022.

Anchor QEA, 2021. Development of Risk-Based Preliminary Remediation Goals, Newtown Creek. December 2021.

Anchor QEA, 2018. Baseline Ecological Risk Assessment. Remedial Investigation/Feasibility Study, Newtown Creek. October 2018.

Anchor QEA, 2017. Baseline Human Health Risk Assessment. Remedial Investigation/Feasibility Study, Newtown Creek. June 2017.

Natural Resource Technology, Inc., 2020a. Treatability Study Pre-Design Investigation Data Summary Report, Newtown Creek. November 19, 2020.

Natural Resource Technology, Inc., 2020b. Treatability Study Work Plan, Newtown Creek. December 14, 2020.

Newtown Creek Superfund Site

East Branch Early Action Overview

July 11 – 13, 2023

Attachment 1: Tables and Figures

Tables

Summary of Studies Used in the RI/FS Investigation Work

Title/Study	Date	Author	Description
Site-Specific Studies Included in RI Database			
Pre-Design Investigation Work Plan – Cutoff Wall Interim Remedial Measure, Greenpoint Energy Center	2009–2010	GEI	National Grid In-Creek Surface Sediment, Subsurface Sediment
Phase 1 Remedial Investigation Interim Data Report – Newtown Creek RI/FS	June 2012	Anchor QEA	Hydrographic Surveys (Bathymetric, Sonar, and Magnetometer)
			Aerial Photography Survey
			Shoreline Survey
			Opportunistic Sampling
			Submerged Utilities
Phase 1 Remedial Investigation Field Program Data Summary Report – Submittal No. 1 – Newtown Creek RI/FS	January 2013	Anchor QEA	Shoreline Survey
			Opportunistic Water
			Current Meters (2/2012–6/2012)
			Tidal Survey (2/2012–6/2012)
			Surface Water (2/2012–6/2012)
			Sedflume
			Surface Sediment (Event 1)
			Air
			Habitat Survey
			Benthic (Spring 2012)
			Fish Community
			LiDAR
			Aerial Imagery
			TIR
Phase 1 Remedial Investigation Field Program Data Summary Report – Submittal No. 2 – Newtown Creek RI/FS	April 2013	Anchor QEA	Current Meters (7/2012–1/2013)
			Surface Water (7/2012–8/2012)
			Surface Sediment (Event 2 and Phase 1 Reference Areas)
			Subsurface Sediment and Native Material
			Benthic (Summer 2012)
Phase 1 Remedial Investigation Field Program Data Summary Report – Submittal No. 3 – Newtown Creek RI/FS	July 2013	Anchor QEA	Current Meters (1/2013–3/2013)
			Surface Water (9/2012–1/2013)
			Post-Sandy Surface Sediment
			Subsurface Sediment and Native Material (Additional Results)
			Post-Sandy Bathymetry
			Phase 1 Reference Areas (Additional Results)
Phase 2 Remedial Investigation Field Program Data Summary Report – Newtown Creek RI/FS	March 2023 (Appendix Bi)	Anchor QEA	Surface Water
			Surface Water during Point Source Discharge
			Current Meters
			Continuous Surface Water Monitoring
			Surface Sediment
			Benthic
			Metals Speciation
			Subsurface Sediment and Native Material
			In-creek Sediment Traps
			Tissue
			Fish and Crab Community Survey
			Caged Bivalves
			Habitat and Wildlife Survey
			Groundwater
			Porewater
			Point Sources
			Gas Ebullition
			Hydrogeology
Feasibility Study Data Summary Report Part 1 – Newtown Creek RI/FS	March 2023 (Appendix Bii)	Anchor QEA	Groundwater Seepage
			Shoreline Sediment and Opportunistic Seeps
			Gas Ebullition Pilot Study
			NAPL Distribution Refinement
			NAPL Mobility (CM 0–2)
Site-Specific Studies Included in FS Database			
Feasibility Study Data Summary Report Part 2 – Newtown Creek RI/FS	April 2020	Anchor QEA	Geotechnical
			Gas Ebullition
			NAPL Mobility (CM 2+ and Tributaries)
			Fish and Crab Tissue
			Caged Bivalves
Sediment Characterization Study Data Summary Report	May 2020	Anchor QEA	Sediment
			Bulkhead and Shoreline Survey
Treatability Study Pre-Design Investigation Data Summary Report	November 2020	NRT	Sediment
			Upland Geotechnical
			Porewater
			Vertical Hydraulic Gradient
			Terrestrial, Bulkhead Inspection, and Hydrographic Surveys
Supplemental FS Sampling	June 2022	Anchor QEA	Bathymetric Survey
Additional Studies			
Surface Water Elevation Data	1994–2013	NOAA	Tidal Elevations
New York Harbor Water Sampling Program	2008–2016	NYCDEP	Water Sampling throughout New York City Waterways (June–September)
CARP	1990–present	CARP	Sediment, Surface Water, Tissue
NYSDEC	1990–present	NYSDEC	Tissue
Con Edison East 21st Street Study	2007, 2008, 2010	RETEC, ENSR/AECOM, AECOM	Sediment
Fish tracking study of Gahagan et al. (2015)	2015	Gahagan et al.	Striped Bass Migration Information
Regional Ambient Air Quality Data	2006–2011	NYSDEC	Ambient Air Background

Summary of Studies Used in the RI/FS Investigation Work

Notes:
The Phase 2 DSR does not list all individual programs and generally lists programs by media. See Phase 2 DSR for complete list of programs.
Not all studies used in the RI/FS Investigation work may be relevant to the development of the East Branch CSM.

Abbreviations:
CARP: Contamination Assessment and Reduction Project
CM: creek mile
CSM: conceptual site model
ENSR: ENSR International Corporation
GEI: GEI Consultants, Inc.
LiDAR: Light Detection and Ranging
NAPL: nonaqueous phase liquid
NOAA: National Oceanic and Atmospheric Administration
NRT: Natural Resource Technology
NYCDEP: New York City Department of Environmental Protection
NYSDEC: New York State Department of Environmental Conservation
Phase 2 DSR: Phase 2 Remedial Investigation Field Program Data Summary Report
RETEC: The RETEC Group, Inc.
RI: Remedial Investigation
RI/FS: Remedial Investigation/Feasibility Study
TIR: thermal infrared

References:

Anchor QEA (Anchor QEA, LLC), 2012. *Phase 1 Remedial Investigation Interim Data Report.* Newtown Creek Remedial Investigation/Feasibility Study. June 2012.
Anchor QEA, 2013a. *Phase 1 Remedial Investigation Field Program Data Summary Report – Submittal No. 1.* Remedial Investigation/Feasibility Study, Newtown Creek. January 2013.
Anchor QEA, 2013b. *Phase 1 Remedial Investigation Field Program Data Summary Report – Submittal No. 2.* Remedial Investigation/Feasibility Study, Newtown Creek. April 2013.
Anchor QEA, 2013c. *Phase 1 Remedial Investigation Field Program Data Summary Report – Submittal No. 3.* Remedial Investigation/Feasibility Study, Newtown Creek. July 2013.
Anchor QEA, 2020a. *Feasibility Study Field Sampling Program Data Summary Report Part 2.* Remedial Investigation/Feasibility Study, Newtown Creek. April 2020.
Anchor QEA, 2020b. *Sediment Characterization Study Data Summary Report.* Newtown Creek Early Action Operable Unit 3, Newtown Creek. May 2020.
Anchor QEA, 2023. *Remedial Investigation Report.* Remedial Investigation/Feasibility Study, Newtown Creek. March 2023.
Gahagan et al. (Gahagan, B.I., D.A. Fox, and D.H. Secor), 2015. Partial Migration of Striped Bass: Revisiting the Contingent Hypothesis. *Marine Ecology Progress Series* 525:185–97.
GEI (GEI Consultants, Inc.), 2009a. *Pre-Design Investigation Work Plan – Cutoff Wall Interim Remedial Measure, Greenpoint Energy Center.* Prepared for National Grid. January 9, 2009.
NRT (Natural Resource Technology), 2020. *Treatability Study Pre-Design Investigation Data Summary Report.* Draft. Remedial Investigation/Feasibility Study, Newtown Creek. November 2020.

Surface Sediment in East Branch – Summary Statistics

Chemical	Count	Count Detect	Percent Detect	Minimum	Median	Arithmetic Average	Maximum	Standard Deviation
Total PAH (34) (mg/kg)	42	42	100	3.4	88	130	690	130
C19-C36 Aliphatics (mg/kg)	27	27	100	35	1,800	2,000	7,300	1,600
Total PCBs (mg/kg)	42	42	100	0.024	1.3	2.5	16	3.3
Total Dioxin/Furan TEQ 2005 (Mammal) (ng/kg)	34	34	100	4.1	85	95	290	64
Copper (mg/kg)	42	42	100	32	360	590	6,300	980
Lead (mg/kg)	42	42	100	39	390	420	1,100	230

Notes:
All statistics are calculated using detect and non-detect samples. Non-detect samples, if present, are set to the MDL.
Statistics show two significant figures, except where data were reported as one significant figure.
Depth range for surface sediment is 0 to 15 cm.
Totals reported using Kaplan-Meier, if applicable.

Abbreviations:
cm: centimeter
MDL: method detection limit
mg/kg: milligrams per kilogram
ng/kg: nanograms per kilogram
PAH: polycyclic aromatic hydrocarbon
PCB: polychlorinated biphenyl
TEQ: toxic equivalence quotient

Subsurface Sediment in East Branch – Summary Statistics

Chemical	Depth	Count	Count Detect	Percent Detect	Minimum	Median	Arithmetic Average	Maximum	Standard Deviation
Total PAH (34) (mg/kg)	15–60 cm	17	17	100	21	270	420	1,700	420
	60–100 cm	12	12	100	110	530	920	4,100	1,100
	100–200 cm	24	24	100	54	760	970	6,100	1,200
	200–300 cm	18	18	100	63	880	1,000	2,200	770
	300–400 cm	11	11	100	43	820	1,000	2,400	760
	400–500 cm	7	7	100	200	800	830	1,600	550
	500–600 cm	1	1	100	300	--	--	300	--
C19-C36 Aliphatics (mg/kg)	15–60 cm	3	3	100	640	700	910	1,400	410
	60–100 cm	2	2	100	370	700	700	1,000	480
	100–200 cm	4	4	100	600	1,400	1,500	2,500	800
	200–300 cm	5	5	100	1,000	3,300	3,200	5,100	1,600
	300–400 cm	3	3	100	3,400	3,700	4,100	5,200	970
	400–500 cm	3	3	100	3,100	4,200	4,900	7,600	2,400
	500–600 cm	0	0	--	--	--	--	--	--
Total PCBs (mg/kg)	15–60 cm	17	17	100	0.22	9.0	11	34	9.6
	60–100 cm	12	12	100	0.45	9.1	13	42	14
	100–200 cm	24	24	100	0.11	20	24	83	23
	200–300 cm	18	18	100	0.056	7.2	13	45	14
	300–400 cm	11	11	100	0.49	8.3	9.1	23	7.0
	400–500 cm	7	7	100	3.2	9.8	12	35	11
	500–600 cm	1	1	100	7.5	--	--	7.5	--
Total Dioxin/Furan TEQ 2005 (Mammal) (ng/kg)	15–60 cm	9	9	100	7.5	230	240	490	160
	60–100 cm	4	4	100	22	110	220	620	280
	100–200 cm	17	17	100	18	480	380	740	250
	200–300 cm	12	12	100	22	95	250	650	230
	300–400 cm	7	7	100	89	220	260	500	150
	400–500 cm	5	5	100	150	190	240	480	140
	500–600 cm	0	0	--	--	--	--	--	--
Copper (mg/kg)	15–60 cm	17	17	100	230	1,300	1,600	4,900	1,200
	60–100 cm	12	12	100	180	2,300	2,300	4,700	1,600
	100–200 cm	24	24	100	320	2,600	2,700	6,000	1,500
	200–300 cm	18	18	100	380	2,400	2,300	5,200	1,600
	300–400 cm	11	11	100	190	2,000	2,600	5,400	1,600
	400–500 cm	7	7	100	980	1,700	2,100	4,000	1,200
	500–600 cm	1	1	100	1,200	--	--	1,200	--
Lead (mg/kg)	15–60 cm	17	17	100	280	760	920	2,300	530
	60–100 cm	12	12	100	79	1,200	1,200	2,400	650
	100–200 cm	24	24	100	290	1,500	1,500	2,400	510
	200–300 cm	18	18	100	330	1,300	1,200	1,900	520
	300–400 cm	11	11	100	220	1,300	1,200	1,900	490
	400–500 cm	7	7	100	860	1,200	1,300	2,200	460
	500–600 cm	1	1	100	1,100	--	--	1,100	--

Notes:
Depth is depth below mudline. Totals reported using Kaplan-Meier, if applicable.
All statistics are calculated using detect and non-detect samples. Non-detect samples, if present, are set to the MDL.
Statistics show two significant figures, except where data were reported as one significant figure.
Table includes only subsurface sediment samples from cores that were sampled continuously.
--: indicates no information that is appropriate or available

Abbreviations:
cm: centimeter
MDL: method detection limit
mg/kg: milligrams per kilogram
ng/kg: nanograms per kilogram
PAH: polycyclic aromatic hydrocarbon
PCB: polychlorinated biphenyl
TEQ: toxic equivalence quotient

Groundwater Concentrations in East Branch – Summary Statistics

Chemical	Count	Count Detect	Percent Detect	Minimum	Median	Arithmetic Average	Maximum	Standard Deviation
Total PAH (34) (µg/L)	8	8	100	1.5	12	18	65	22
C19-C36 Aliphatics (mg/L)	8	3	38	0.00032	0.0015	0.004	0.015	0.0052
Total PCBs (ng/L)	8	8	100	5.5	18	120	710	240
Copper (µg/L)	8	2	25	0.26	2.0	3.8	19	6.3
Lead (µg/L)	8	3	38	0.12	2.0	3.2	14	4.4

Notes:

Dissolved phase concentrations for organic compounds estimated using partitioning theory with literature-based organic carbon partition coefficients and include the freely dissolved and DOC-bound phases (Method 2).

All statistics are calculated using detect and non-detect samples. Non-detect samples, if present, are set to the MDL.

Non-detects in summations, if present, set to the MDL.

Statistics show two significant figures, except where data were reported as one significant figure.

Abbreviations:

µg/L: micrograms per liter

DOC: dissolved organic carbon

MDL: method detection limit

mg/L: milligrams per liter

ng/L: nanograms per liter

PAH: polycyclic aromatic hydrocarbon

PCB: polychlorinated biphenyl

Particulate Phase Concentrations in Surface Water in East Branch – Summary Statistics

Chemical	Count	Count Detect	Percent Detect	Minimum	Median	Arithmetic Average	Maximum	Standard Deviation
Dry Weather								
Total PAH (34)	14	14	100	2.0	10	10	21	5.2
Total PCBs	2	2	100	0.17	0.23	0.23	0.29	0.087
Copper	9	8	89	19	81	140	490	150
Lead	3	2	67	8.3	67	170	440	240
Wet Weather								
Total PAH (34)	32	32	100	3.3	28	35	78	21
Total PCBs	32	32	100	0.087	0.62	0.71	1.9	0.45
Copper	23	22	96	55	410	400	780	210
Lead	19	17	89	4.5	180	210	770	190

Notes:

Units are milligrams per kilogram.

All statistics are calculated using detect and non-detect samples. Non-detect samples, if present, are set to the calculated or estimated detection limit, where applicable.

Statistics show two significant figures, except where data were reported as one significant figure.

Totals reported using estimated detection limit times 0.5, if applicable.

Samples with non-detected total suspended solids not included.

Results where dissolved fraction is greater than total fraction not included.

Abbreviations:

PAH: polycyclic aromatic hydrocarbon

PCB: polychlorinated biphenyl

Point Source Solids in East Branch – Summary Statistics

Chemical	Category	Outfall	Flow (MGY)			Sampled Particulate Concentration					
			Sampled	Non-Sampled	Total	Count	Minimum	Estimated Mean	Maximum	Lower Bound[a]	Upper Bound[a]
Total PAH (34) (mg/kg)	CSO	NCB083	490	3.2	490	3	37	52	72	37	72
	MS4[b]	NCQ632	57	31	88	5	73	92	110	78	110
	SW/DD	MCL001	2.7	59	62	3	9.0	23	34	9.0	34
C19-C36 Aliphatics (mg/kg)	CSO	NCB083	490	3.2	490	3	2100	2500	2600	2100	2600
	MS4[b]	NCQ632	57	31	88	5	1400	2600	3600	1700	3400
	SW/DD	MCL001	2.7	59	62	3	84	910	2300	84	2300
Total PCBs (mg/kg)	CSO	NCB083	490	3.2	490	3	0.099	0.11	0.12	0.099	0.12
	MS4[b]	NCQ632	57	31	88	5	0.50	0.88	1.4	0.59	1.2
	SW/DD	MCL001	2.7	59	62	3	0.018	0.026	0.034	0.018	0.034
Total Dioxin/Furan TEQ 2005 (Mammal) (ng/kg)	CSO	NCB083	490	3.2	490	3	61	85	110	61	110
	MS4[b]	NCQ632	57	31	88	5	62	93	120	67	120
	SW/DD	MCL001	2.7	59	62	3	1.9	4.3	8.5	1.9	8.5
Copper (mg/kg)	CSO	NCB083	490	3.2	490	3	56	200	330	56	330
	MS4[b]	NCQ632	57	31	88	5	77	300	380	190	380
	SW/DD	MCL001	2.7	59	62	3	53	69	85	53	85

Notes:

Depositing point source solids in the LTE calculation are based on data from the RI Phase 2 point sources sampling program, as documented in Section 5.1 and Appendix E of the RI Report (Anchor QEA 2023).

Statistics show two significant figures, except where data were reported as one significant figure.

a. Upper and lower bounds were calculated as +/- 2*SEM of the COC concentrations. In cases where the +/- 2*SEM was less than or greater than the minimum or maximum concentration, the bound was set to that minimum or maximum value to maintain values within the range of data.

b. Sampling location NCQ633 was sampled once before being removed from the Phase 2 point sources sampling program. For further details, see Section 5 of the RI Report (Anchor QEA 2023).

Abbreviations:

2*SEM: two times the standard error of the mean
COC: contaminant of concern
CSO: combined sewer overflow
LTE: long-term equilibrium
mg/kg: milligrams per kilogram
MGY: million gallons per year
MS4: municipal separate storm sewer system
ng/kg: nanograms per kilogram
PAH: polycyclic aromatic hydrocarbon
PCB: polychlorinated biphenyl
RI: Remedial Investigation
RI Report: *Remedial Investigation Report*
SW/DD: stormwater and direct drainage

Reference:

Anchor QEA (Anchor QEA, LLC), 2023. *Remedial Investigation Report.* Remedial Investigation/Feasibility Study, Newtown Creek. March 2023.

Figures

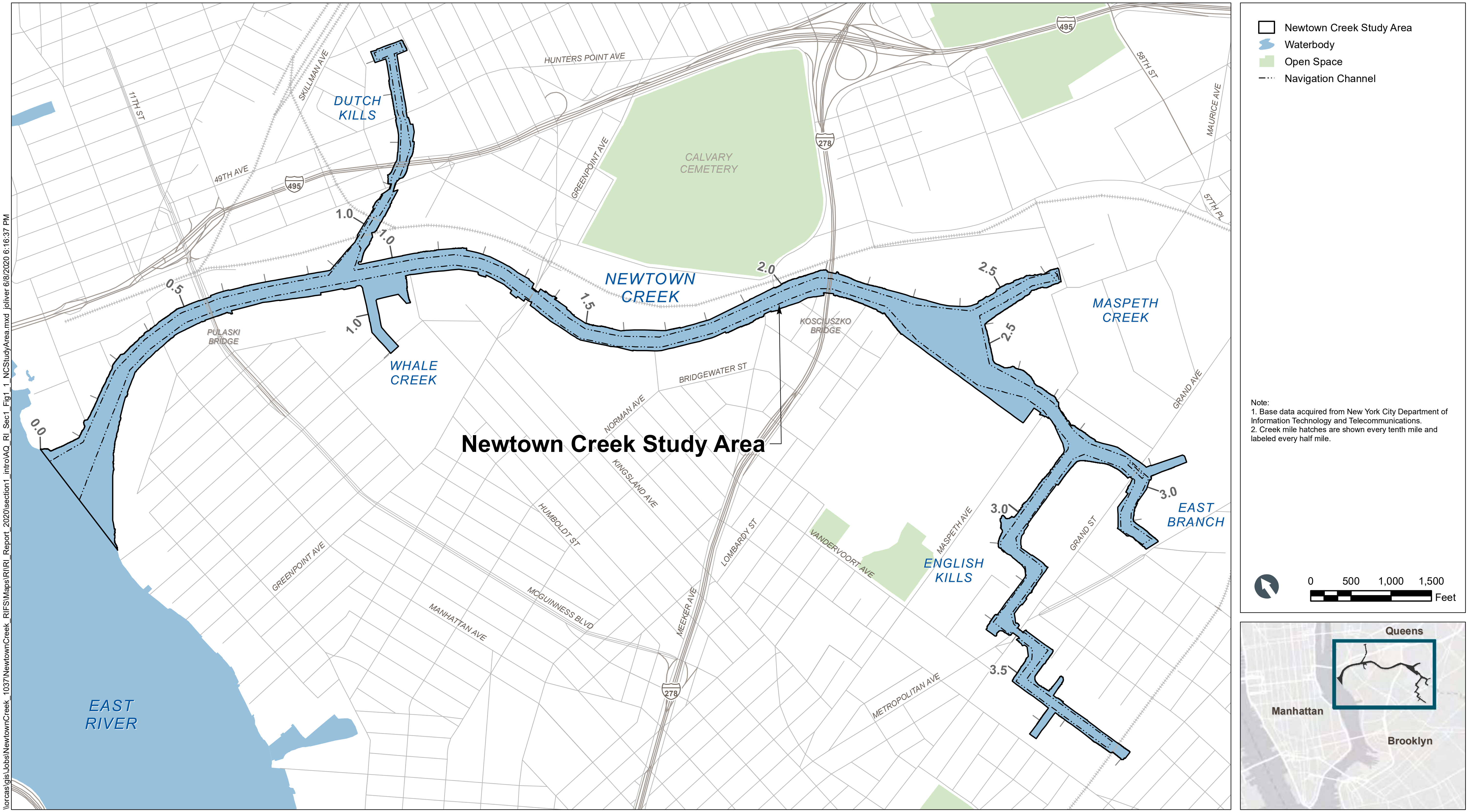

Figure 1-1
Newtown Creek Study Area
Remedial Investigation Report
Newtown Creek RI/FS

LEGEND:

- East Branch Tributary
- Newtown Creek
- Navigation Channel
- Creek Mile

NOTES:

1. Creek mile hatches are shown every hundredth mile and labeled every tenth mile. For the East Branch FFS, CM 0.0 begins at the mouth of East Branch.
2. Aerial imagery: New York State Department of Information Technology Services, 2022.

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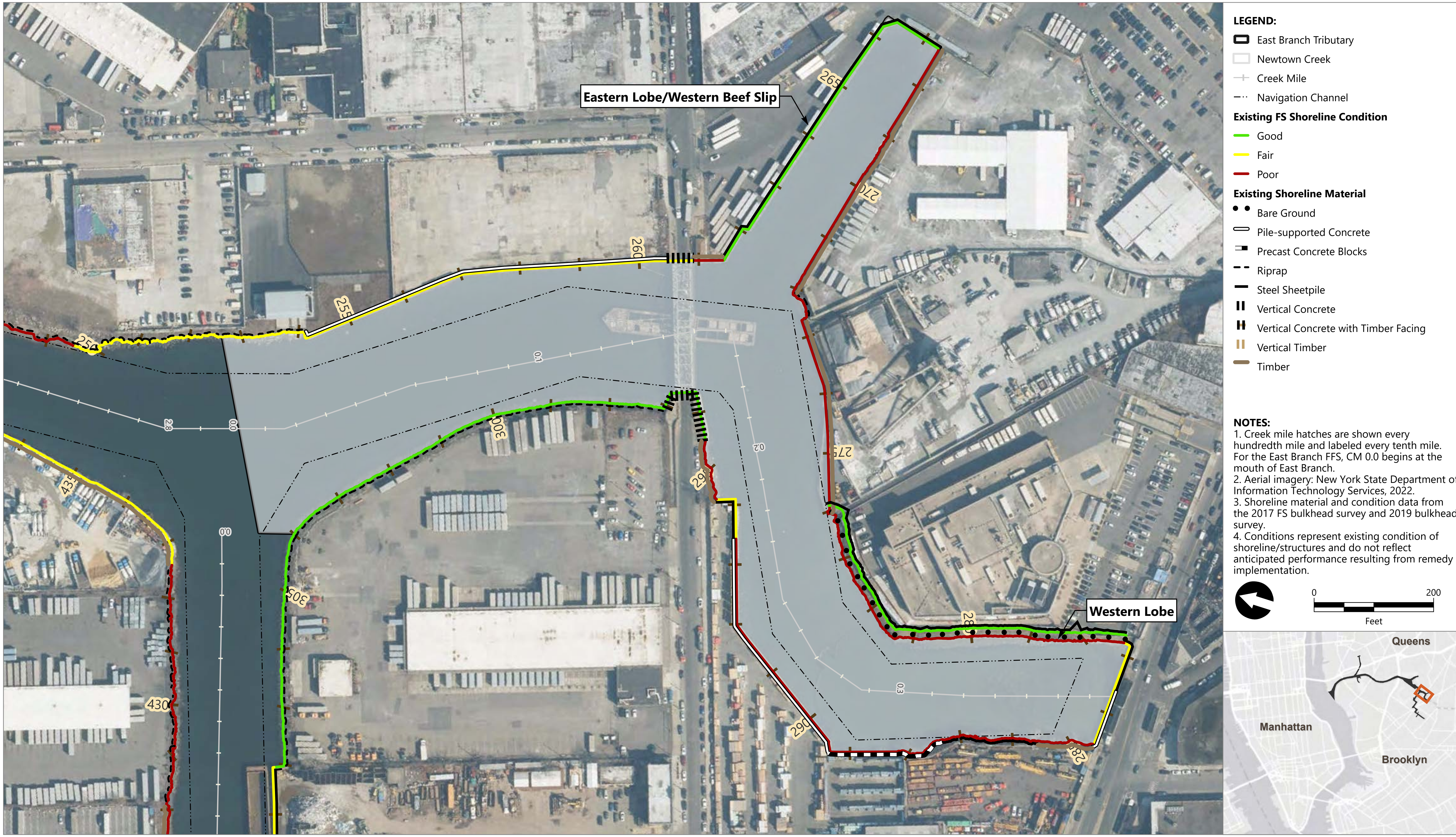
ANCHOR QEA

Figure 2
East Branch Tributary
Draft Materials for USEPA CSTAG East Branch Meetings
Newtown Creek RI/FS



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ANCHOR QEA

Figure 5
Existing Shoreline Conditions in East Branch
Draft Materials for USEPA CSTAG East Branch Meetings
Newtown Creek RI/FS

NOTES:
1. Creek mile hatches are shown every hundredth mile and labeled every tenth mile. For the East Branch FFS, CM 0.0 begins at the mouth of East Branch.
2. Aerial imagery: New York State Department of Information Technology Services, 2022.

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Figure 6
Utilities and Creek Crossings
Draft Materials for USEPA CSTAG East Branch Meetings
Newtown Creek RI/FS

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ANCHOR QEA

Figure 12
Point Source Discharge Locations to East Branch
Draft Materials for USEPA CSTAG East Branch Meetings
Newtown Creek RI/FS

NOTES:
1. Creek mile hatches are shown every hundredth mile and labeled every tenth mile. For the East Branch FFS, CM 0.0 begins at the mouth of East Branch.
2. Aerial imagery: New York State Department of Information Technology Services, 2022.
3. Bathymetry data from Ocean Surveys, Inc. (June 2022).
4. MLLW = mean lower low water
5. Break values for numerical classification bins are rounded up. Values between displayed ranges are placed in the higher bin.

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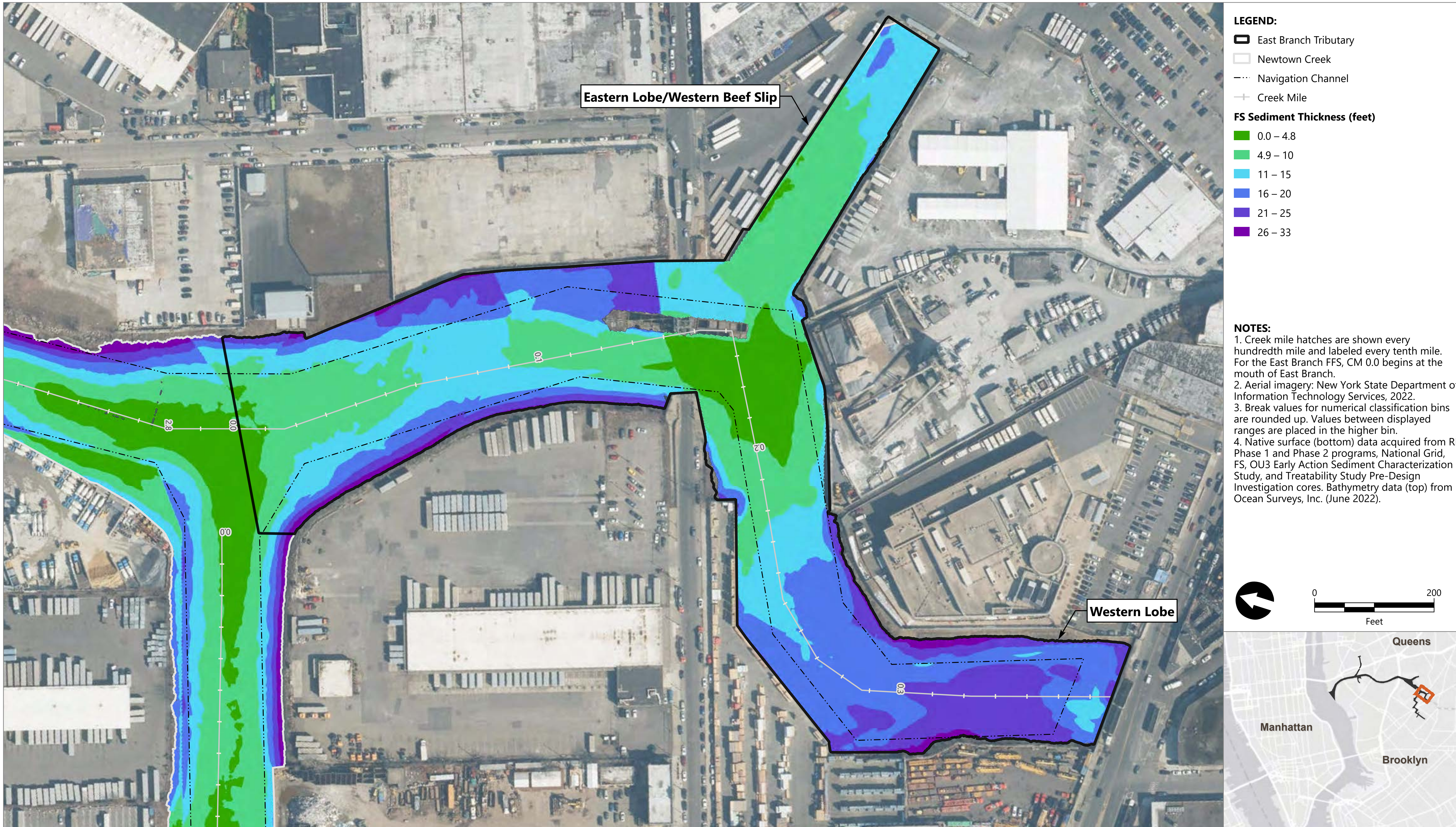
ANCHOR QEA

Figure 3
East Branch Bathymetry
Draft Materials for USEPA CSTAG East Branch Meetings
Newtown Creek RI/FS



NOTES:
1. Creek mile hatches are shown every hundredth mile and labeled every tenth mile. For the East Branch FFS, CM 0.0 begins at the mouth of East Branch.
2. Aerial imagery: New York State Department of Information Technology Services, 2022.
3. Break values for numerical classification bins are rounded up. Values between displayed ranges are placed in the higher bin.
4. Native surface (bottom) data acquired from RI Phase 1 and Phase 2 programs, National Grid, FS, OU3 Early Action Sediment Characterization Study, and Treatability Study Pre-Design Investigation cores. Bathymetry data (top) from Ocean Surveys, Inc. (June 2022).

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Figure 4
Sediment Thickness
Draft Materials for USEPA CSTAG East Branch Meetings
Newtown Creek RI/FS

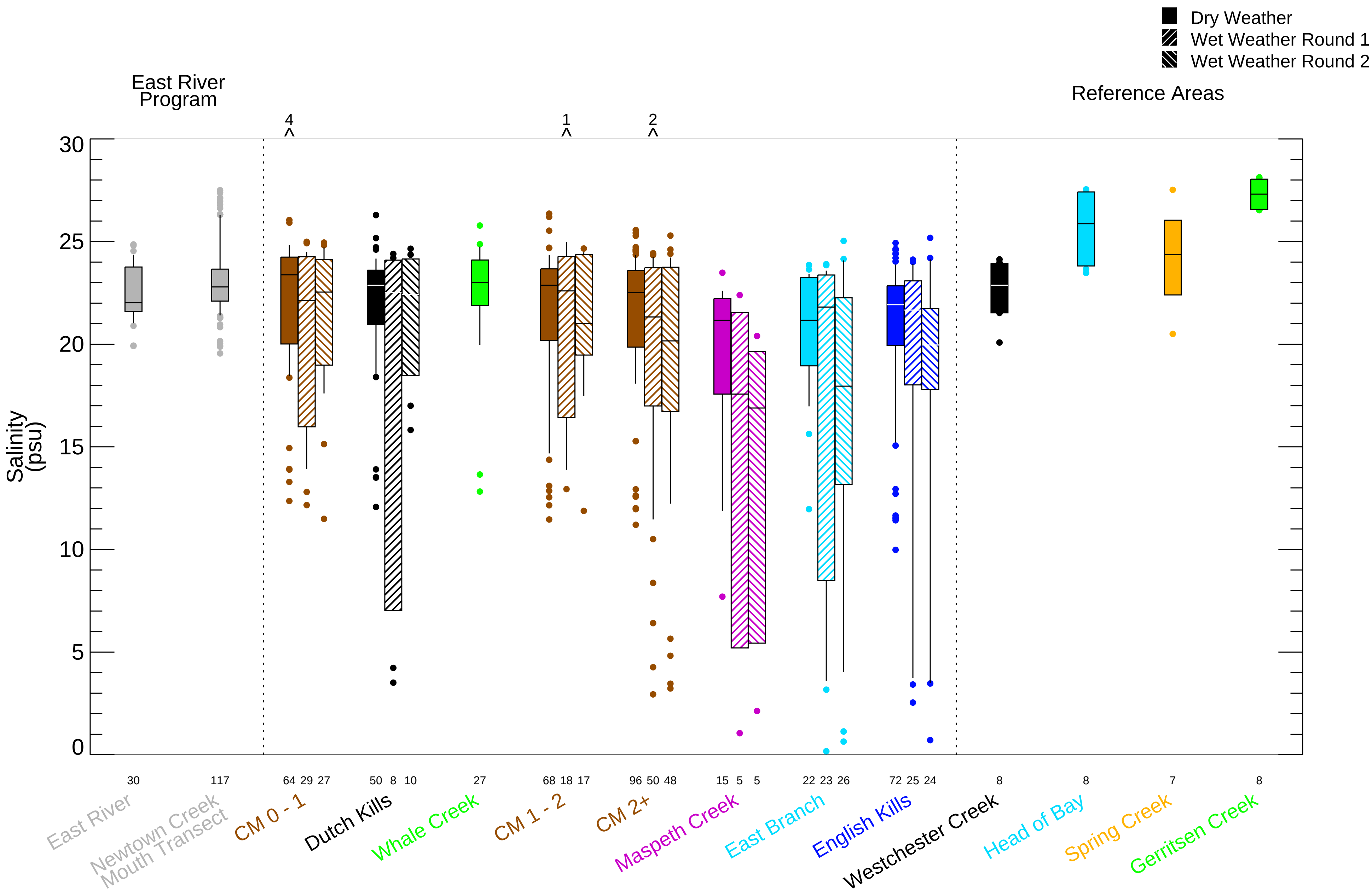

Figure 4-144

Salinity in Surface Water - Box Plot
Remedial Investigation Report
Newtown Creek RI/FS

ANCHOR QEA

Notes: Non-detects, if present, set to the MDL and plotted with open symbol.Sample size posted below x-axis.
Box: median, 25th, 75th percentiles; whiskers: 10th, 90th percentiles. Symbols: data outside whiskers; for n<=10, no whiskers; for n<=4, no box.
Caret symbols and numbers above or below panel, if present, indicate the number of values outside y-axis range.

MJR - B:\Projects\Newtown_Creek\Newtown_Creek_(120782-01.01)\Data_Review\Water\Surface_Water\IDL\RI_Figures\NTC_WC_boxplots_Salinity.pro Fri Sep 17 15:09:52 2021

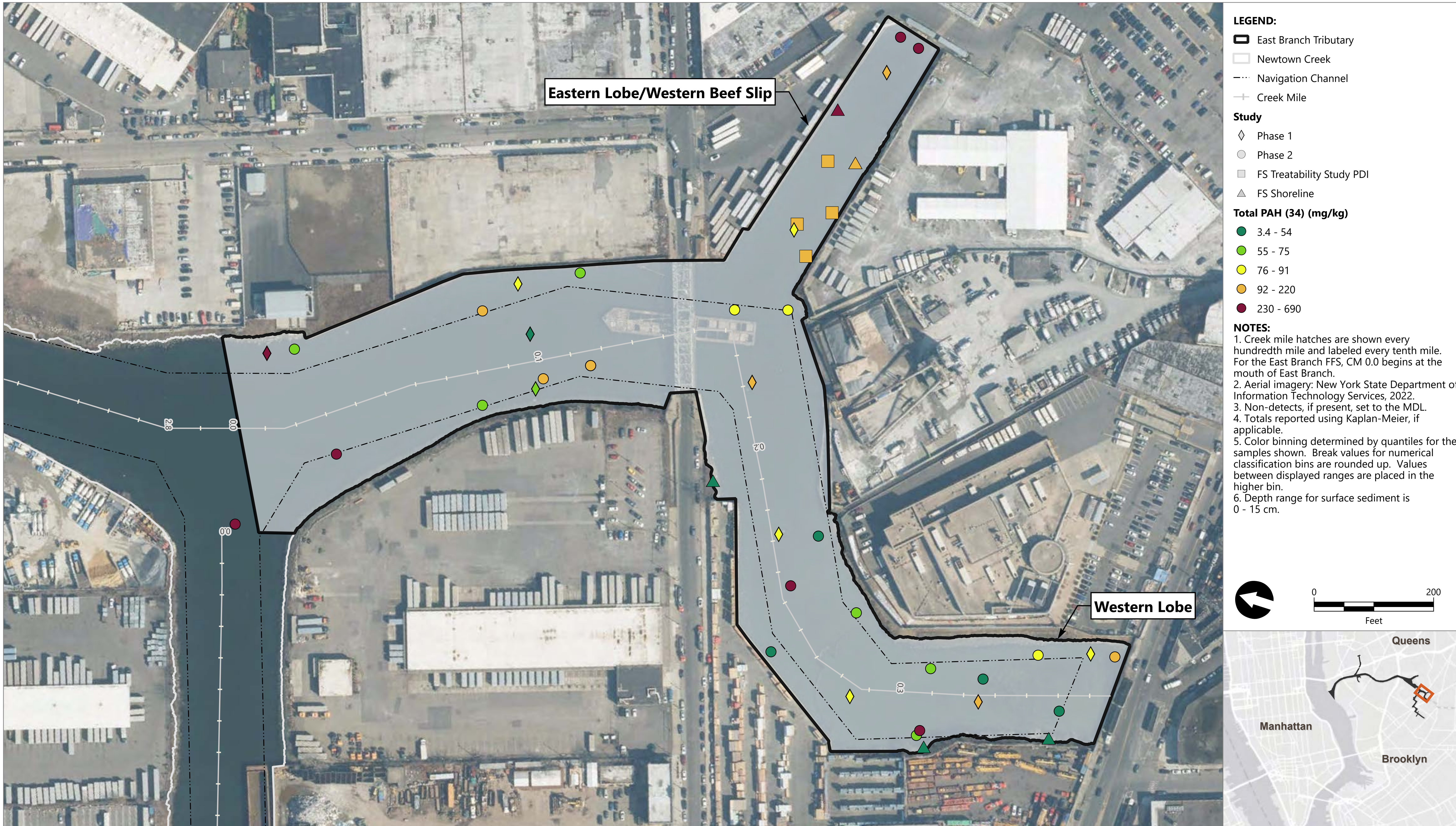

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Figure 7a
Total PAH (34) in Surface Sediment
Draft Materials for USEPA CSTAG East Branch Meetings
Newtown Creek RI/FS

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Figure 7b
C19-C36 Aliphatics in Surface Sediment
Draft Materials for USEPA CSTAG East Branch Meetings
Newtown Creek RI/FS

NOTES:
1. Creek mile hatches are shown every hundredth mile and labeled every tenth mile. For the East Branch FFS, CM 0.0 begins at the mouth of East Branch.
2. Aerial imagery: New York State Department of Information Technology Services, 2022.
3. Non-detects, if present, set to the MDL.
4. Totals reported using Kaplan-Meier, if applicable.
5. Color binning determined by quantiles for the samples shown. Break values for numerical classification bins are rounded up. Values between displayed ranges are placed in the higher bin.
6. Depth range for surface sediment is 0 - 15 cm.

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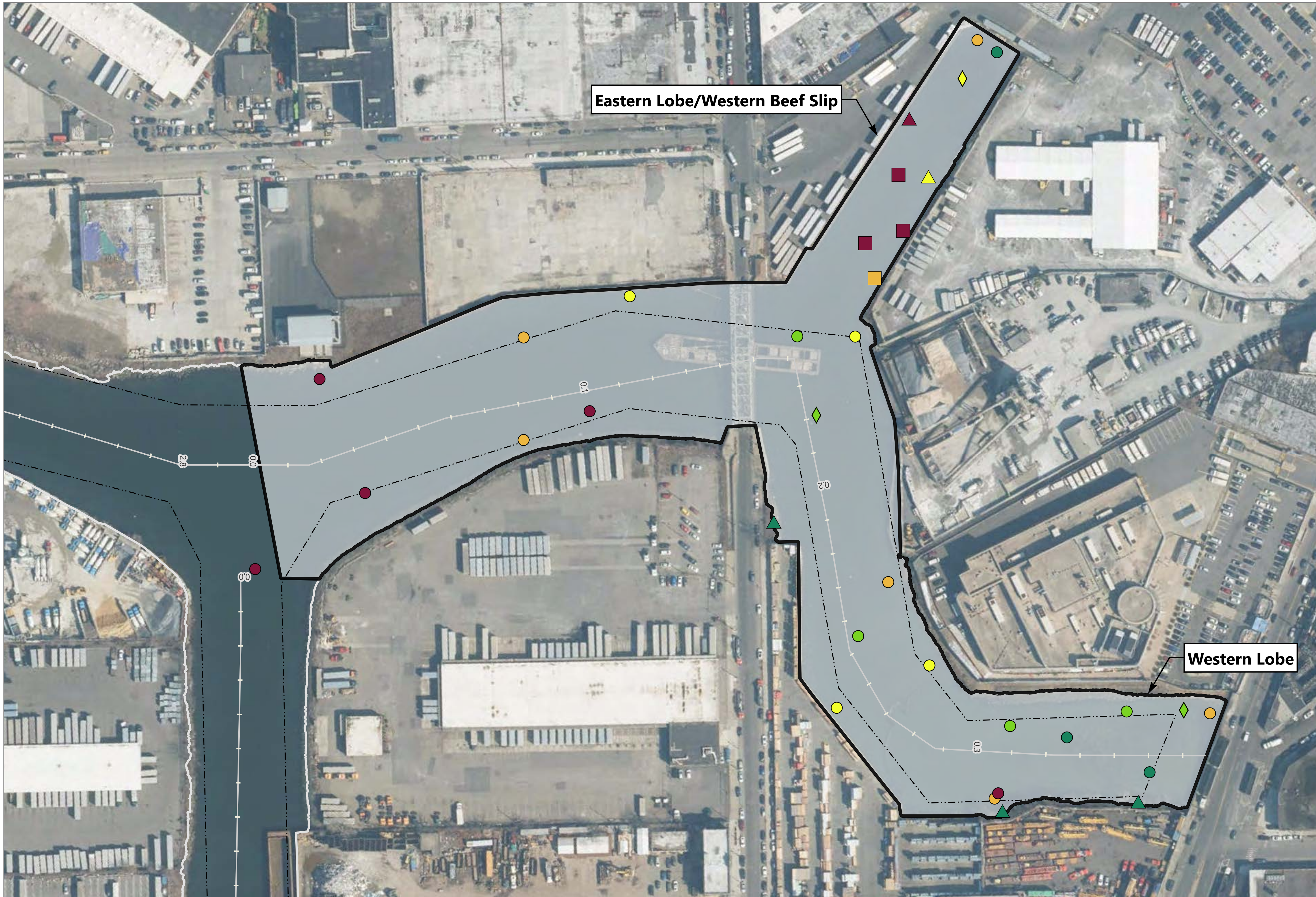
ANCHOR QEA

Figure 7c
Total PCBs in Surface Sediment
Draft Materials for USEPA CSTAG East Branch Meetings
Newtown Creek RI/FS



LEGEND:
- East Branch Tributary
- Newtown Creek
- Navigation Channel
- Creek Mile

Study
- Phase 1
- Phase 2
- FS Treatability Study PDI
- FS Shoreline

Total Dioxin/Furan TEQ 2005 (Mammal) (ng/kg)
- 4.1 - 43
- 44 - 70
- 71 - 86
- 87 - 120
- 130 - 290

NOTES:
1. Creek mile hatches are shown every hundredth mile and labeled every tenth mile. For the East Branch FFS, CM 0.0 begins at the mouth of East Branch.
2. Aerial imagery: New York State Department of Information Technology Services, 2022.
3. Non-detects, if present, set to the MDL.
4. Totals reported using Kaplan-Meier, if applicable.
5. Color binning determined by quantiles for the samples shown. Break values for numerical classification bins are rounded up. Values between displayed ranges are placed in the higher bin.
6. Depth range for surface sediment is 0 - 15 cm.

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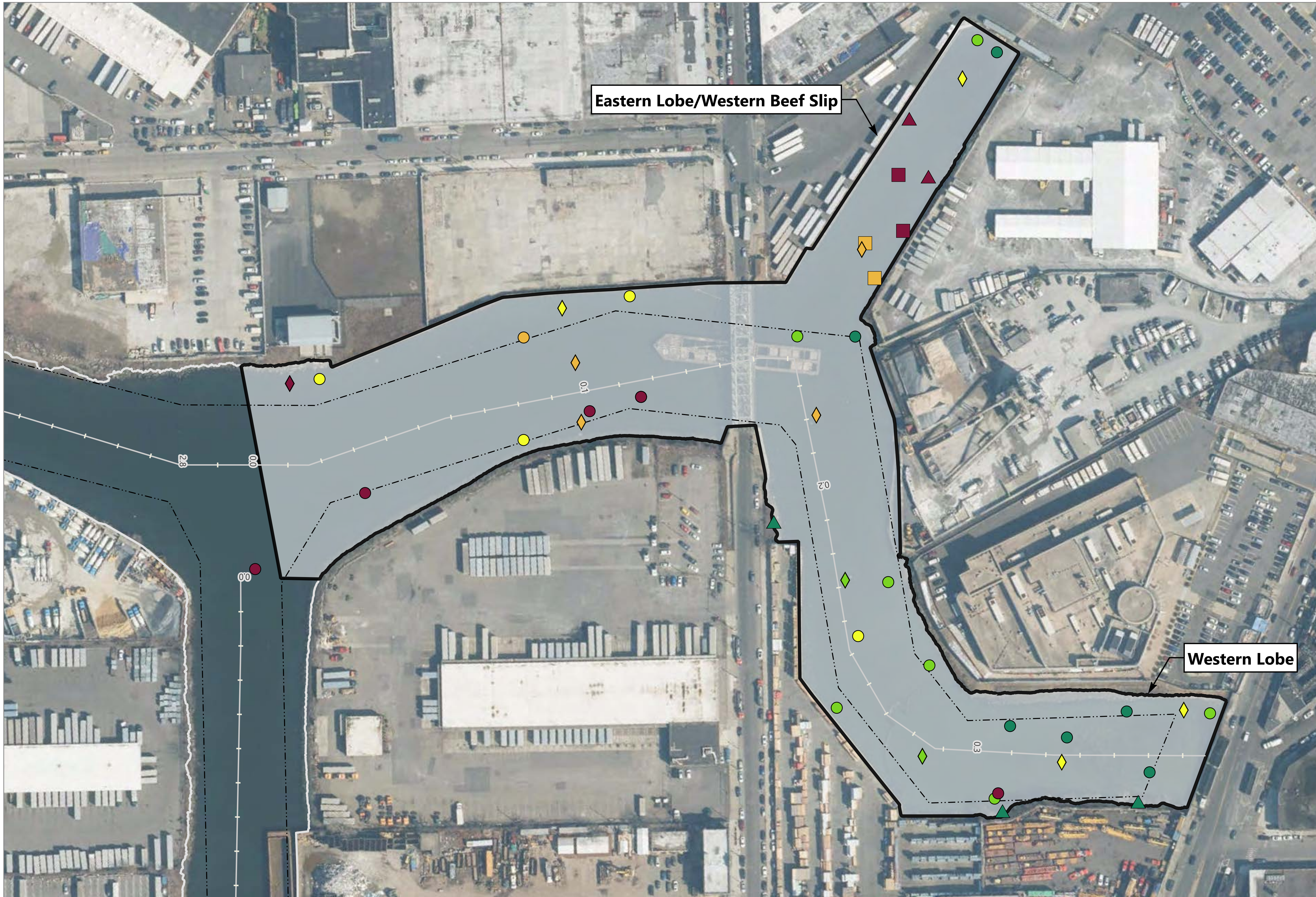
Figure 7d
Total Dioxin/Furan TEQ 2005 (Mammal) in Surface Sediment
Draft Materials for USEPA CSTAG East Branch Meetings
Newtown Creek RI/FS



LEGEND:

- East Branch Tributary
- Newtown Creek
- Navigation Channel
- Creek Mile

Study

- Phase 1
- Phase 2
- FS Treatability Study PDI
- FS Shoreline

Copper (mg/kg)

- 32 - 140
- 150 - 300
- 310 - 420
- 430 - 640
- 650 - 6,300

NOTES:
1. Creek mile hatches are shown every hundredth mile and labeled every tenth mile. For the East Branch FFS, CM 0.0 begins at the mouth of East Branch.
2. Aerial imagery: New York State Department of Information Technology Services, 2022.
3. Non-detects, if present, set to the MDL.
4. Totals reported using Kaplan-Meier, if applicable.
5. Color binning determined by quantiles for the samples shown. Break values for numerical classification bins are rounded up. Values between displayed ranges are placed in the higher bin.
6. Depth range for surface sediment is 0 - 15 cm.

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Figure 7e
Copper in Surface Sediment
Draft Materials for USEPA CSTAG East Branch Meetings
Newtown Creek RI/FS

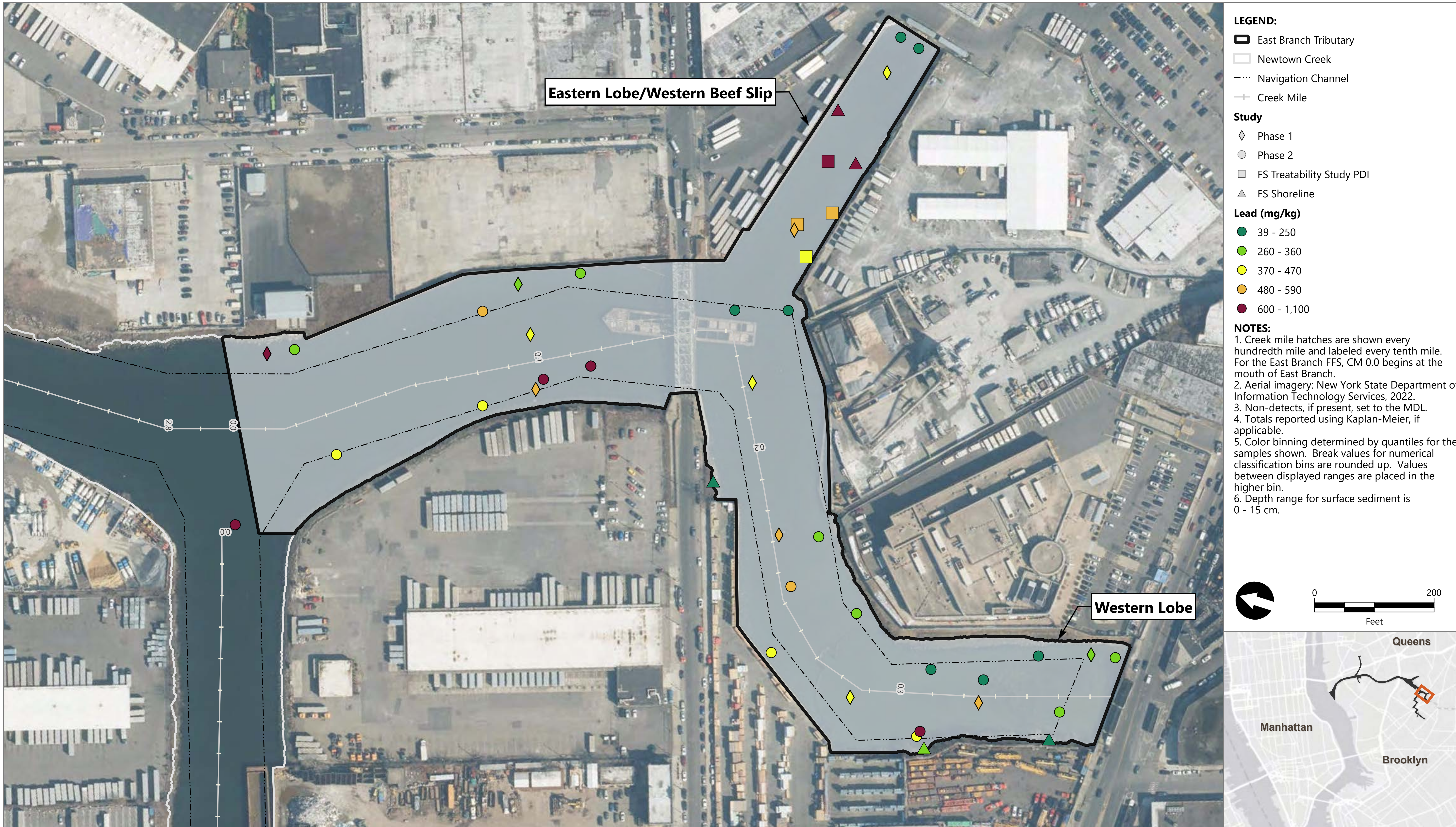

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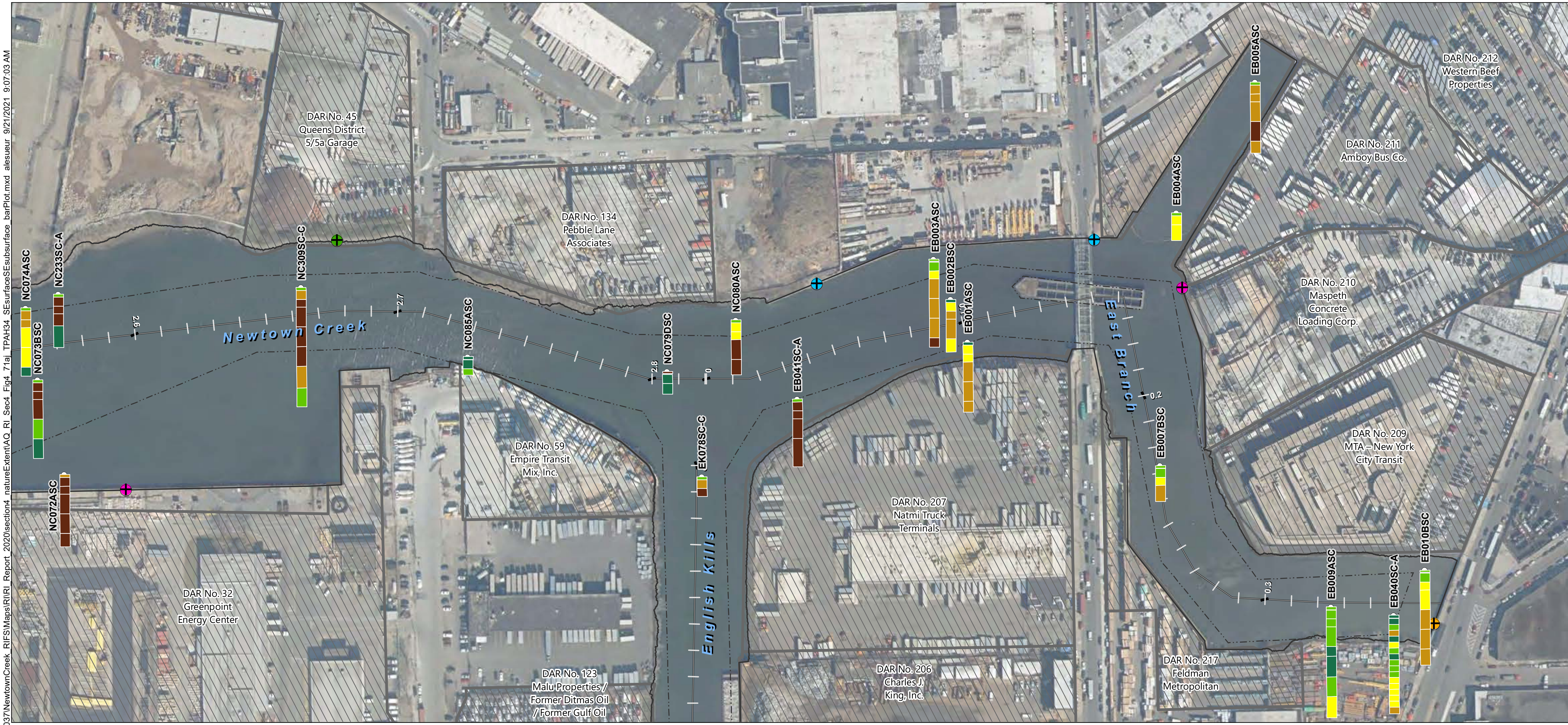
Figure 7f
Lead in Surface Sediment
Draft Materials for USEPA CSTAG East Branch Meetings
Newtown Creek RI/FS



Newtown Creek Study Area
Navigation Channel
Creek Miles
Shoreline DAR Sites

Category 1 – Individually Permitted Stormwater and Wastewater Discharges
Category 2A – Combined Sewer Overflows
Category 2B – WWTP Treated Effluent Overflow

Category 3A – MS4 and Major Stormwater Discharges
Category 3B – Highway Drains: Runoff from the Long Island Expressway (I-495)
Category 3C – Direct Discharges from Individual Sites
Newtown Creek Wastewater Treatment Plant

Total PAH (34) (mg/kg)
0.24 - 79
80 - 270
280 - 660
670 - 1,500
1,600 - 15,000

Depth in feet
0.0
2.5
5.0
10

Notes:
1. Map includes cores and their co-located surface sediment sample. For presentation purposes, surface sediment sample locations were translated to coincide with their associated core locations.
2. Map includes only cores with continuous samples throughout core (i.e., excludes high-resolution cores, groundwater cores).
3. Map includes surface and subsurface sediment and excludes native material.
4. Non-detects, if present, set to the MDL. Totals reported using Kaplan-Meier, if applicable.
5. Creek mile hatches are shown every tenth mile and labeled every half mile.
6. Color binning determined by quantiles for the samples shown. Break values for numerical classification bins are rounded up. Values between displayed ranges are placed in the higher bin.
7. Aerial photos acquired from New York State Department of Homeland Security and Emergency Services, 2016.

Feet
0 100 200 300 400

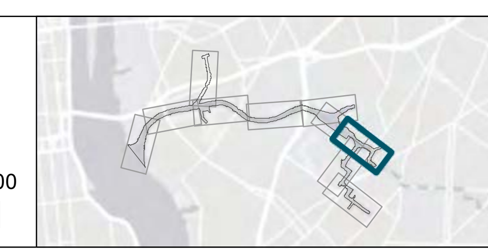


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Figure 4-71h
Total PAH (34) in Surface and Subsurface Sediment Bar Plots by Depth – Plan View of East Branch and Newtown Creek CM 2.6 to 2.8
Remedial Investigation Report
Newtown Creek RI/FS

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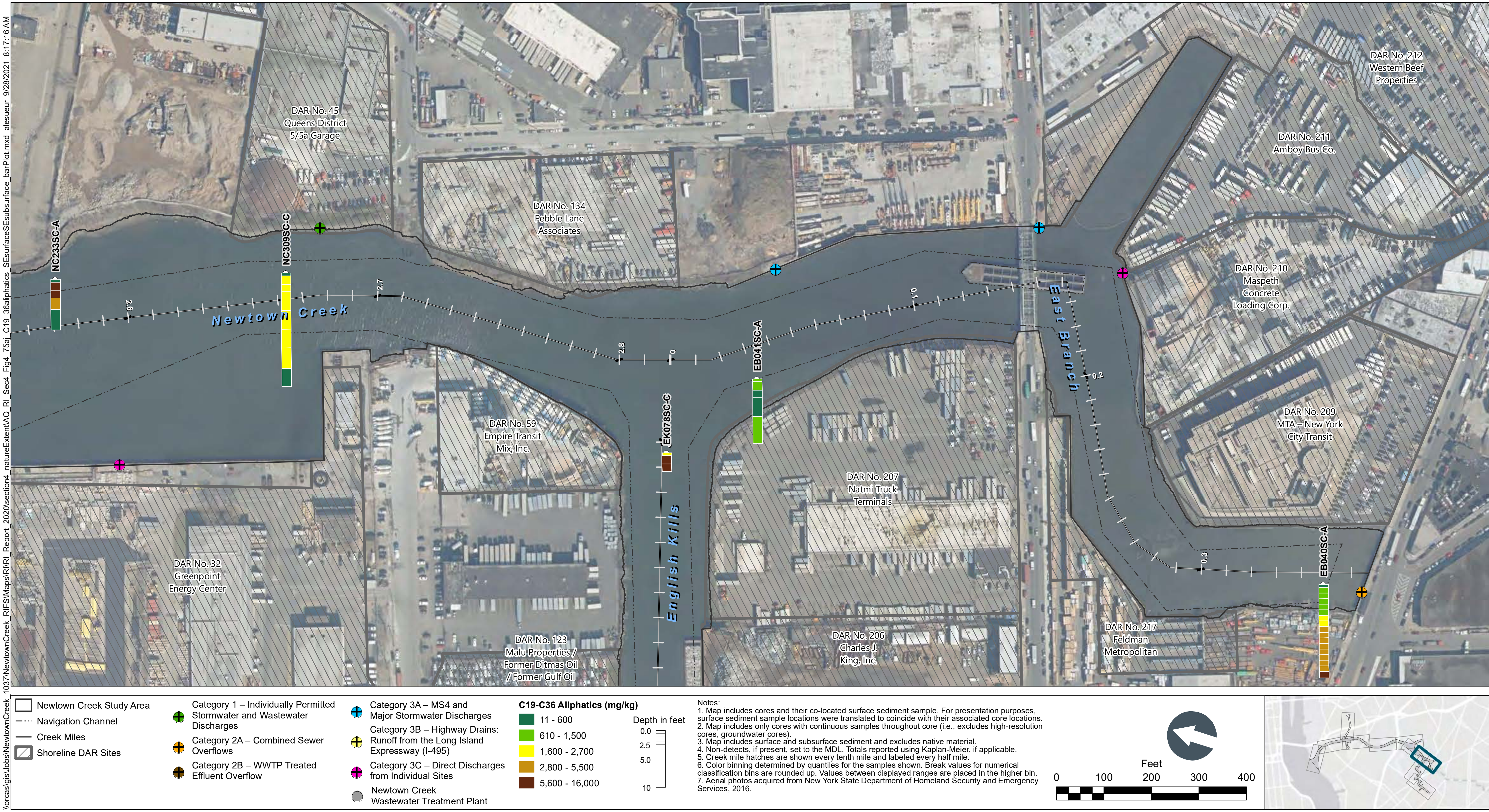
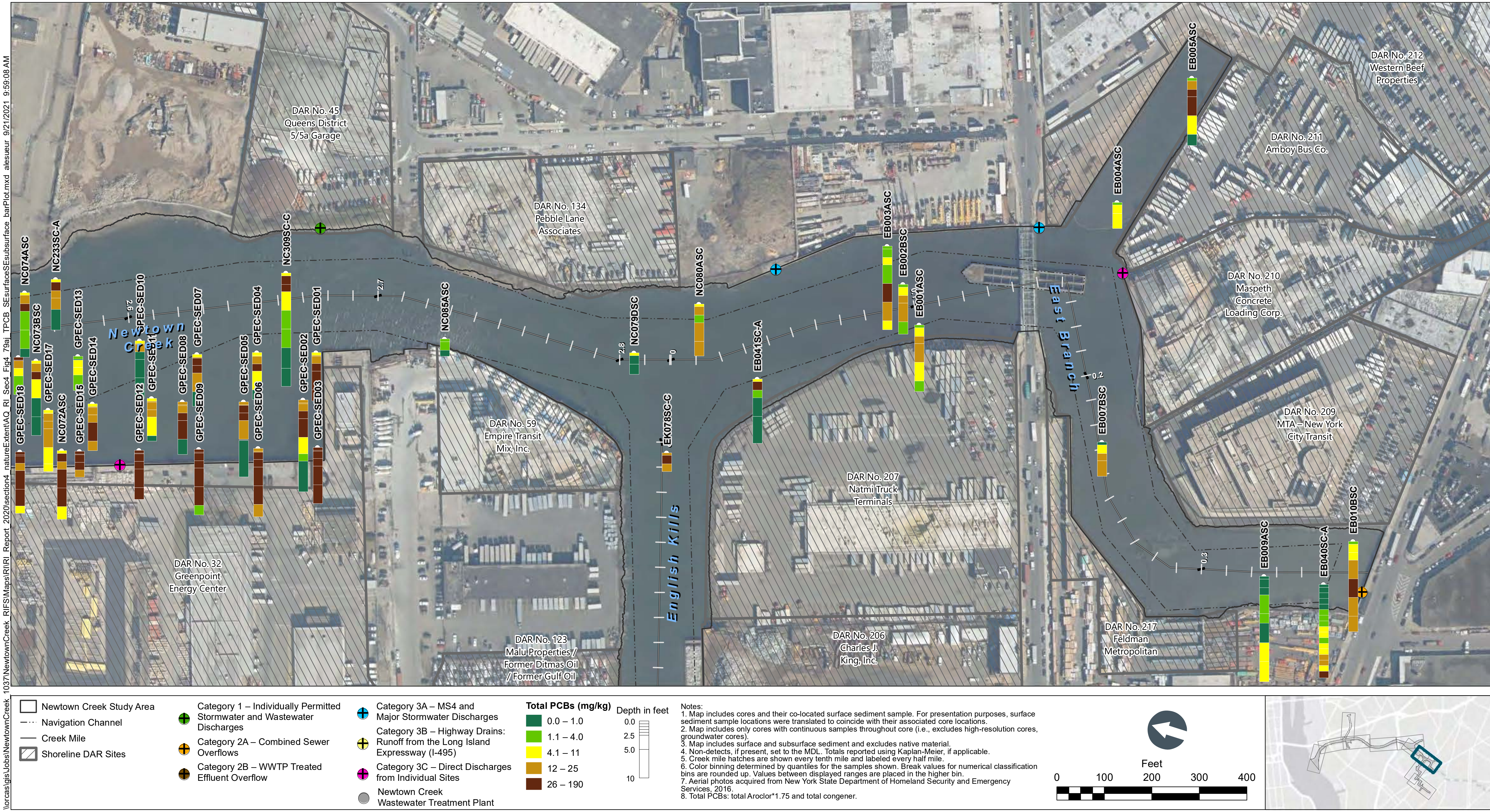


Notes:
1. Map includes cores and their co-located surface sediment sample. For presentation purposes, surface sediment sample locations were translated to coincide with their associated core locations.
2. Map includes only cores with continuous samples throughout core (i.e., excludes high-resolution cores, groundwater cores).
3. Map includes surface and subsurface sediment and excludes native material.
4. Non-detects, if present, set to the MDL. Totals reported using Kaplan-Meier, if applicable.
5. Creek mile hatches are shown every tenth mile and labeled every half mile.
6. Color binning determined by quantiles for the samples shown. Break values for numerical classification bins are rounded up. Values between displayed ranges are placed in the higher bin.
7. Aerial photos acquired from New York State Department of Homeland Security and Emergency Services, 2016.

ANCHOR QEA

Figure 4-75h
C19-C36 Aliphatics in Surface and Subsurface Sediment Bar Plots by Depth – Plan View of East Branch and Newtown Creek CM 2.6 to 2.8
Remedial Investigation Report
Newtown Creek RI/FS



Notes:
1. Map includes cores and their co-located surface sediment sample. For presentation purposes, surface sediment sample locations were translated to coincide with their associated core locations.
2. Map includes only cores with continuous samples throughout core (i.e., excludes high-resolution cores, groundwater cores).
3. Map includes surface and subsurface sediment and excludes native material.
4. Non-detects, if present, set to the MDL. Totals reported using Kaplan-Meier, if applicable.
5. Creek mile hatches are shown every tenth mile and labeled every half mile.
6. Color binning determined by quantiles for the samples shown. Break values for numerical classification bins are rounded up. Values between displayed ranges are placed in the higher bin.
7. Aerial photos acquired from New York State Department of Homeland Security and Emergency Services, 2016.
8. Total PCBs: total Aroclor*1.75 and total congener.

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Figure 4-79h
Total PCBs in Surface and Subsurface Sediment Bar Plots by Depth – Plan View of East Branch and Newtown Creek CM 2.6 to 2.8
Remedial Investigation Report
Newtown Creek RI/FS

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- Newtown Creek Study Area
- Navigation Channel
- Creek Miles
- Shoreline DAR Sites
- Category 1 – Individually Permitted Stormwater and Wastewater Discharges
- Category 2A – Combined Sewer Overflows
- Category 2B – WWTP Treated Effluent Overflow
- Category 3A – MS4 and Major Stormwater Discharges
- Category 3B – Highway Drains: Runoff from the Long Island Expressway (I-495)
- Category 3C – Direct Discharges from Individual Sites
- Newtown Creek Wastewater Treatment Plant

2,3,7,8-TCDD (ng/kg)
- 0.071 – 4.0
- 4.1 – 10
- 11 – 21
- 22 – 39
- 40 – 150
- No Data

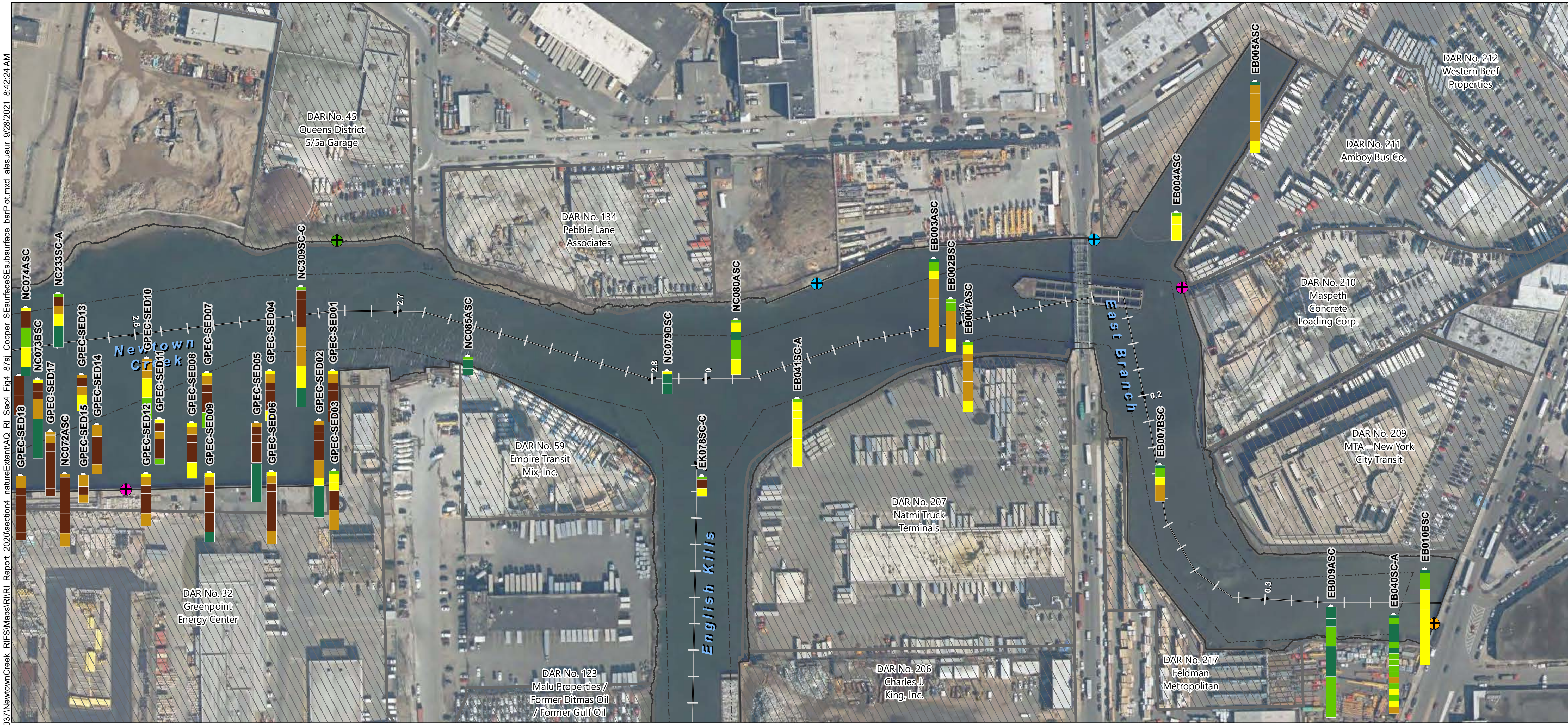
Depth in feet: 0.0, 2.5, 5.0, 10

Notes:
1. Map includes cores and their co-located surface sediment sample. For presentation purposes, surface sediment sample locations were translated to coincide with their associated core locations.
2. Map includes only cores with continuous samples throughout core (i.e., excludes high-resolution cores, groundwater cores).
3. Map includes surface and subsurface sediment and excludes native material.
4. Non-detects, if present, set to the MDL. Totals reported using Kaplan-Meier, if applicable.
5. Creek mile hatches are shown every tenth mile and labeled every half mile.
6. Color binning determined by quantiles for the samples shown. Break values for numerical classification bins are rounded up. Values between displayed ranges are placed in the higher bin.
7. Aerial photos acquired from New York State Department of Homeland Security and Emergency Services, 2016.

Feet: 0, 100, 200, 300, 400

ANCHOR QEA

Figure 4-83h
2,3,7,8-TCDD in Surface and Subsurface Sediment Bar Plots by Depth – Plan View of East Branch and Newtown Creek CM 2.6 to 2.8
Remedial Investigation Report
Newtown Creek RI/FS



Newtown Creek Study Area
Navigation Channel
Creek Mile
Shoreline DAR Sites

Category 1 – Individually Permitted Stormwater and Wastewater Discharges
Category 2A – Combined Sewer Overflows
Category 2B – WWTP Treated Effluent Overflow

Category 3A – MS4 and Major Stormwater Discharges
Category 3B – Highway Drains: Runoff from the Long Island Expressway (I-495)
Category 3C – Direct Discharges from Individual Sites
Newtown Creek Wastewater Treatment Plant

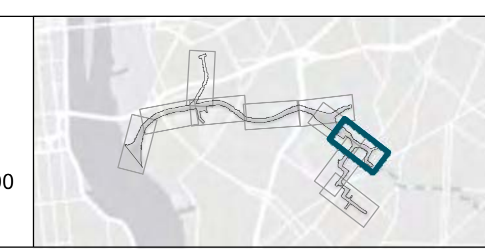
Copper (mg/kg)

- 9.0 – 440
- 450 – 1,300
- 1,400 – 3,000
- 3,100 – 6,100
- 6,200 – 170,000

Depth in feet: 0.0, 2.5, 5.0, 10

Notes:
1. Map includes cores and their co-located surface sediment sample. For presentation purposes, surface sediment sample locations were translated to coincide with their associated core locations.
2. Map includes only cores with continuous samples throughout core (i.e., excludes high-resolution cores, groundwater cores).
3. Map includes surface and subsurface sediment and excludes native material.
4. Non-detects, if present, set to the MDL. Totals reported using Kaplan-Meier, if applicable.
5. Creek mile hatches are shown every tenth mile and labeled every half mile.
6. Color binning determined by quantiles for the samples shown. Break values for numerical classification bins are rounded up. Values between displayed ranges are placed in the higher bin.
7. Aerial photos acquired from New York State Department of Homeland Security and Emergency Services, 2016.

Feet
0 100 200 300 400



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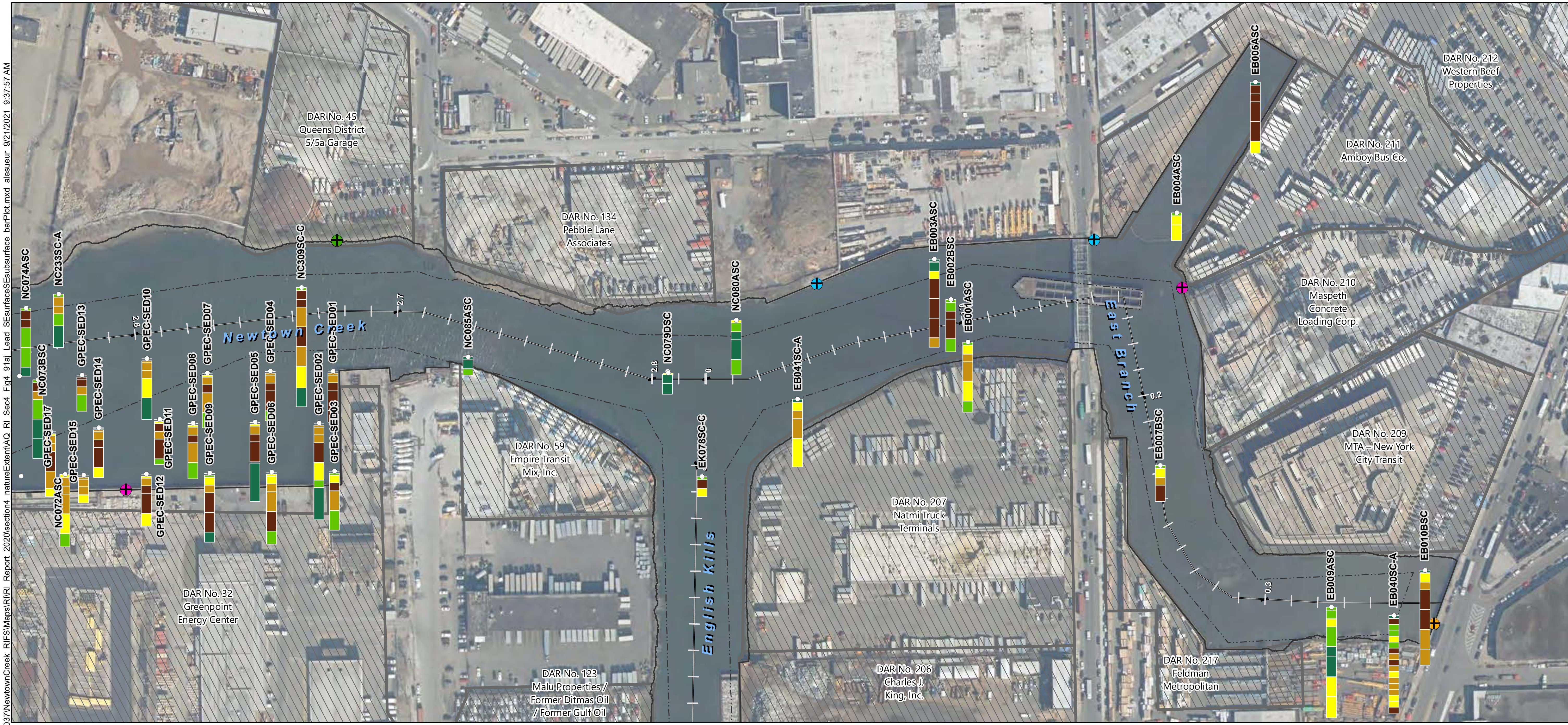
ANCHOR QEA

Figure 4-87h
Copper in Surface and Subsurface Sediment Bar Plots by Depth – Plan View of East Branch and Newtown Creek CM 2.6 to 2.8
Remedial Investigation Report
Newtown Creek RI/FS



- Newtown Creek Study Area
- Navigation Channel
- Creek Miles
- Shoreline DAR Sites
- Category 1 – Individually Permitted Stormwater and Wastewater Discharges
- Category 2A – Combined Sewer Overflows
- Category 2B – WWTP Treated Effluent Overflow
- Category 3A – MS4 and Major Stormwater Discharges
- Category 3B – Highway Drains: Runoff from the Long Island Expressway (I-495)
- Category 3C – Direct Discharges from Individual Sites
- Newtown Creek Wastewater Treatment Plant

Lead (mg/kg)

- 3.8 – 390
- 400 – 750
- 760 – 1,200
- 1,300 – 1,600
- 1,700 – 4,000

Depth in feet: 0.0, 2.5, 5.0, 10

Notes:
1. Map includes cores and their co-located surface sediment sample. For presentation purposes, surface sediment sample locations were translated to coincide with their associated core locations.
2. Map includes only cores with continuous samples throughout core (i.e., excludes high-resolution cores, groundwater cores).
3. Map includes surface and subsurface sediment and excludes native material.
4. Non-detects, if present, set to the MDL. Totals reported using Kaplan-Meier, if applicable.
5. Creek mile hatches are shown every tenth mile and labeled every half mile.
6. Color binning determined by quantiles for the samples shown. Break values for numerical classification bins are rounded up. Values between displayed ranges are placed in the higher bin.
7. Aerial photos acquired from New York State Department of Homeland Security and Emergency Services, 2016.

Feet: 0 100 200 300 400

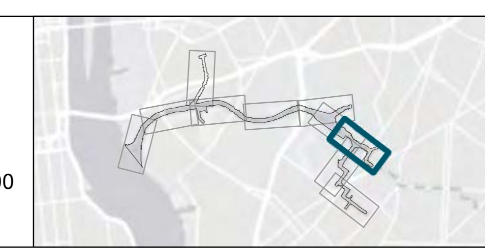
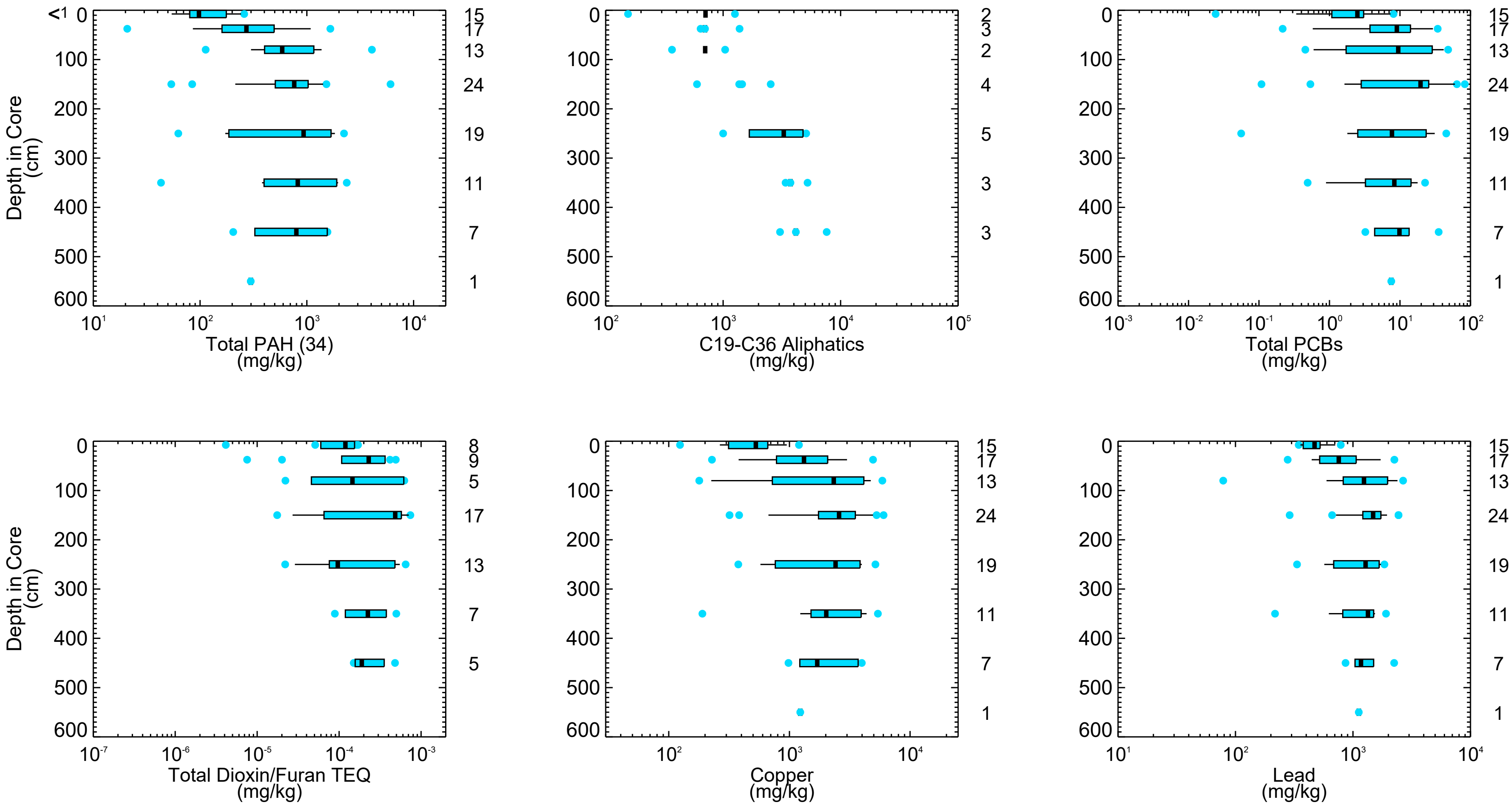


Figure 4-91h
Lead in Surface and Subsurface Sediment Bar Plots by Depth – Plan View of East Branch and Newtown Creek CM 2.6 to 2.8
Remedial Investigation Report
Newtown Creek RI/FS

ANCHOR QEA



Notes: Non-detects, if present, set to the MDL. Totals reported using Kaplan-Meier, if applicable.
Plot includes only cores with continuous samples throughout core, grouped by sample mid-depth.
Sample size posted at the right. Box: median, 25th, 75th percentiles; whiskers: 10th, 90th percentiles. Symbols: data outside whiskers; for n <= 10, no whiskers; for n <= 4, no box (but median is shown as vertical bar).
Caret symbols and numbers left or right of panel, if present, indicate the number of values outside x-axis range.
National Grid samples were not analyzed for Total PAH (34).
National Grid and Phase 1 samples were not analyzed for C19-C36 aliphatics.

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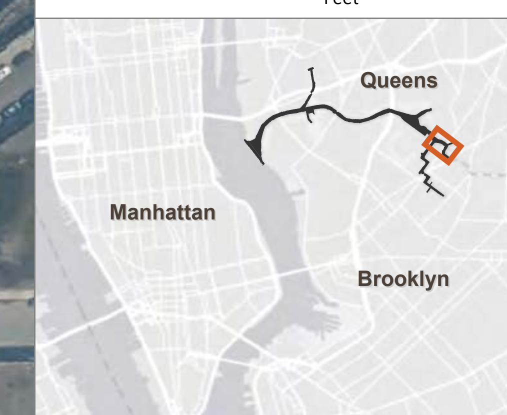
ANCHOR QEA

Figure 8

Surface Sediment and Subsurface Sediment Concentrations in the East Branch- Box Plots by Depth



LEGEND:

- East Branch Tributary
- Newtown Creek
- Navigation Channel
- Creek Mile
- RI Porewater: 0-15 cm
- RI Porewater: 15-30 cm
- RI Porewater: Mid-depth
- Treatability Study PDI Porewater

Total PAH (34) (µg/L)

- 0.0 - 0.60
- 0.61 - 1.9
- 2.0 - 6.1
- 6.2 - 23
- 24 - 620

NOTES:
1. Creek mile hatches are shown every hundredth mile and labeled every tenth mile. For the East Branch FFS, CM 0.0 begins at the mouth of East Branch.
2. Aerial imagery: New York State Department of Information Technology Services, 2022.
3. For RI Porewater locations, circle symbols are located at the actual sampling location, with data from 15-30 cm (triangles) program stacked vertically.
4. Non-detects, if present, set to the MDL.
5. Totals reported using Kaplan-Meier, if applicable.
6. Color binning determined by quantiles for the samples shown. Break values for numerical classification bins are rounded up. Values between displayed ranges are placed in the higher bin.

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ANCHOR QEA

Figure 11a
Total PAH (34) in Porewater
Draft Materials for USEPA CSTAG East Branch Meetings
Newtown Creek RI/FS

NOTES:
1. Creek mile hatches are shown every hundredth mile and labeled every tenth mile. For the East Branch FFS, CM 0.0 begins at the mouth of East Branch.
2. Aerial imagery: New York State Department of Information Technology Services, 2022.
3. For RI Porewater locations, circle symbols are located at the actual sampling location, with data from 15-30 cm (triangles) program stacked vertically.
4. Non-detects, if present, set to the MDL.
5. Totals reported using Kaplan-Meier, if applicable.
6. Color binning determined by quantiles for the samples shown. Break values for numerical classification bins are rounded up. Values between displayed ranges are placed in the higher bin.

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Figure 11b
Total PCBs in Porewater
Draft Materials for USEPA CSTAG East Branch Meetings
Newtown Creek RI/FS

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ANCHOR QEA

Figure 11c
Copper in Porewater
Draft Materials for USEPA CSTAG East Branch Meetings
Newtown Creek RI/FS

LEGEND:

- East Branch Tributary
- Newtown Creek
- Navigation Channel
- Creek Mile
- RI Porewater: 0-15 cm
- RI Porewater: 15-30 cm
- RI Porewater: Mid-depth
- Treatability Study PDI Porewater

Lead (µg/L)

- 0.17
- 0.18 - 0.34
- 0.35 - 3.4
- 3.5 - 4.0
- 4.1 - 8.6

NOTES:

1. Creek mile hatches are shown every hundredth mile and labeled every tenth mile. For the East Branch FFS, CM 0.0 begins at the mouth of East Branch.
2. Aerial imagery: New York State Department of Information Technology Services, 2022.
3. For RI Porewater locations, circle symbols are located at the actual sampling location, with data from 15-30 cm (triangles) program stacked vertically.
4. Non-detects, if present, set to the MDL.
5. Totals reported using Kaplan-Meier, if applicable.
6. Triad metals plotted from peeper analysis.
7. Due to the low number of unique values in the data presented in this map, color binning was determined by quartiles instead of quintiles. Break values for numerical classification bins are rounded up. Values between displayed ranges are placed in the higher bin.

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ANCHOR QEA

Figure 11d
Lead in Porewater
Draft Materials for USEPA CSTAG East Branch Meetings
Newtown Creek RI/FS

LEGEND:

- East Branch Tributary
- Newtown Creek
- Navigation Channel
- Creek Mile

Estimated Dissolved Phase Total PAH (34) (µg/L)

- 1.5 - 1.9
- 2.0 - 9.1
- 9.2 - 16
- 17 - 35
- 36 - 65

NOTES:

1. Creek mile hatches are shown every hundredth mile and labeled every tenth mile. For the East Branch FFS, CM 0.0 begins at the mouth of East Branch.
2. Aerial imagery: New York State Department of Information Technology Services, 2022.
3. Dissolved phase concentrations are estimated using partitioning theory with literature-based organic carbon partition coefficients and include the freely-dissolved and DOC-bound phases.
4. Total PAH (34) concentrations are calculated by summing individual compounds. Non-detects in summations, if present, are set to the MDL.
5. Color binning determined by quantiles for the samples shown. Break values for numerical classification bins are rounded up. Values between displayed ranges are placed in the higher bin.

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ANCHOR QEA

Figure 11a
Estimated Dissolved Phase (Method 2) Total PAH (34) in Groundwater
Draft Materials for USEPA CSTAG East Branch Meetings
Newtown Creek RI/FS

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ANCHOR QEA

Figure 11b
Estimated Dissolved Phase (Method 2) C19-C36 Aliphatics in Groundwater
Draft Materials for USEPA CSTAG East Branch Meetings
Newtown Creek RI/FS

LEGEND:

- East Branch Tributary
- Newtown Creek
- Navigation Channel
- Creek Mile

Estimated Dissolved Phase Total PCBs (ng/L)

- 5.5 - 6.8
- 6.9 - 12
- 13 - 92
- 93 - 100
- 110 - 710

NOTES:

1. Creek mile hatches are shown every hundredth mile and labeled every tenth mile. For the East Branch FFS, CM 0.0 begins at the mouth of East Branch.
2. Aerial imagery: New York State Department of Information Technology Services, 2022.
3. Dissolved phase concentrations are estimated using partitioning theory with literature-based organic carbon partition coefficients and and include the freely-dissolved and DOC-bound phases.
4. Total PCBs concentrations are calculated by summing individual compounds. Non-detects in summations, if present, are set to the MDL.
5. Color binning determined by quantiles for the samples shown. Break values for numerical classification bins are rounded up. Values between displayed ranges are placed in the higher bin.

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ANCHOR QEA

Figure 11c
Estimated Dissolved Phase (Method 2) Total PCBs in Groundwater
Draft Materials for USEPA CSTAG East Branch Meetings
Newtown Creek RI/FS

NOTES:
1. Creek mile hatches are shown every hundredth mile and labeled every tenth mile. For the East Branch FFS, CM 0.0 begins at the mouth of East Branch.
2. Aerial imagery: New York State Department of Information Technology Services, 2022.
3. Non-detects, if present, set to the MDL.
4. Totals reported using Kaplan-Meier, if applicable.
5. Color binning determined by quantiles for the samples shown. Break values for numerical classification bins are rounded up. Values between displayed ranges are placed in the higher bin.

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ANCHOR QEA

Figure 11d
Dissolved Copper in Groundwater
Draft Materials for USEPA CSTAG East Branch Meetings
Newtown Creek RI/FS

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ANCHOR QEA

Figure 11e
Dissolved Lead in Groundwater
Draft Materials for USEPA CSTAG East Branch Meetings
Newtown Creek RI/FS

NOTES:
1. Creek mile hatches are shown every hundredth mile and labeled every tenth mile. For the East Branch FFS, CM 0.0 begins at the mouth of East Branch.
2. Aerial imagery: New York State Department of Information Technology Services, 2022.
3. The most notable observation is the visual observation and shake test with the greatest relative degree of sheen or NAPL. By depicting the most notable visual observation and shake test result, the map conservatively presents the observations of sheen and NAPL.

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ANCHOR QEA

Figure 9a
Most Notable NAPL Observations in Surface Sediment
Draft Materials for USEPA CSTAG East Branch Meetings
Newtown Creek RI/FS

NOTES:
1. Creek mile hatches are shown every hundredth mile and labeled every tenth mile. For the East Branch FFS, CM 0.0 begins at the mouth of East Branch.
2. Aerial imagery: New York State Department of Information Technology Services, 2022.
3. The most notable observation is the visual observation and shake test with the greatest relative degree of sheen or NAPL. By depicting the most notable visual observation and shake test result, the map conservatively presents the observations of sheen and NAPL.

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ANCHOR QEA

Figure 9b
Most Notable NAPL Observations in Subsurface Sediment
Draft Materials for USEPA CSTAG East Branch Meetings
Newtown Creek RI/FS

NOTES:
1. Creek mile hatches are shown every hundredth mile and labeled every tenth mile. For the East Branch FFS, CM 0.0 begins at the mouth of East Branch.
2. Aerial imagery: New York State Department of Information Technology Services, 2022.
3. The most notable observation is the visual observation and shake test with the greatest relative degree of sheen or NAPL. By depicting the most notable visual observation and shake test result, the map conservatively presents the observations of sheen and NAPL.

Publish Date: 2023/05/03, 4:43 PM | User: alesueur
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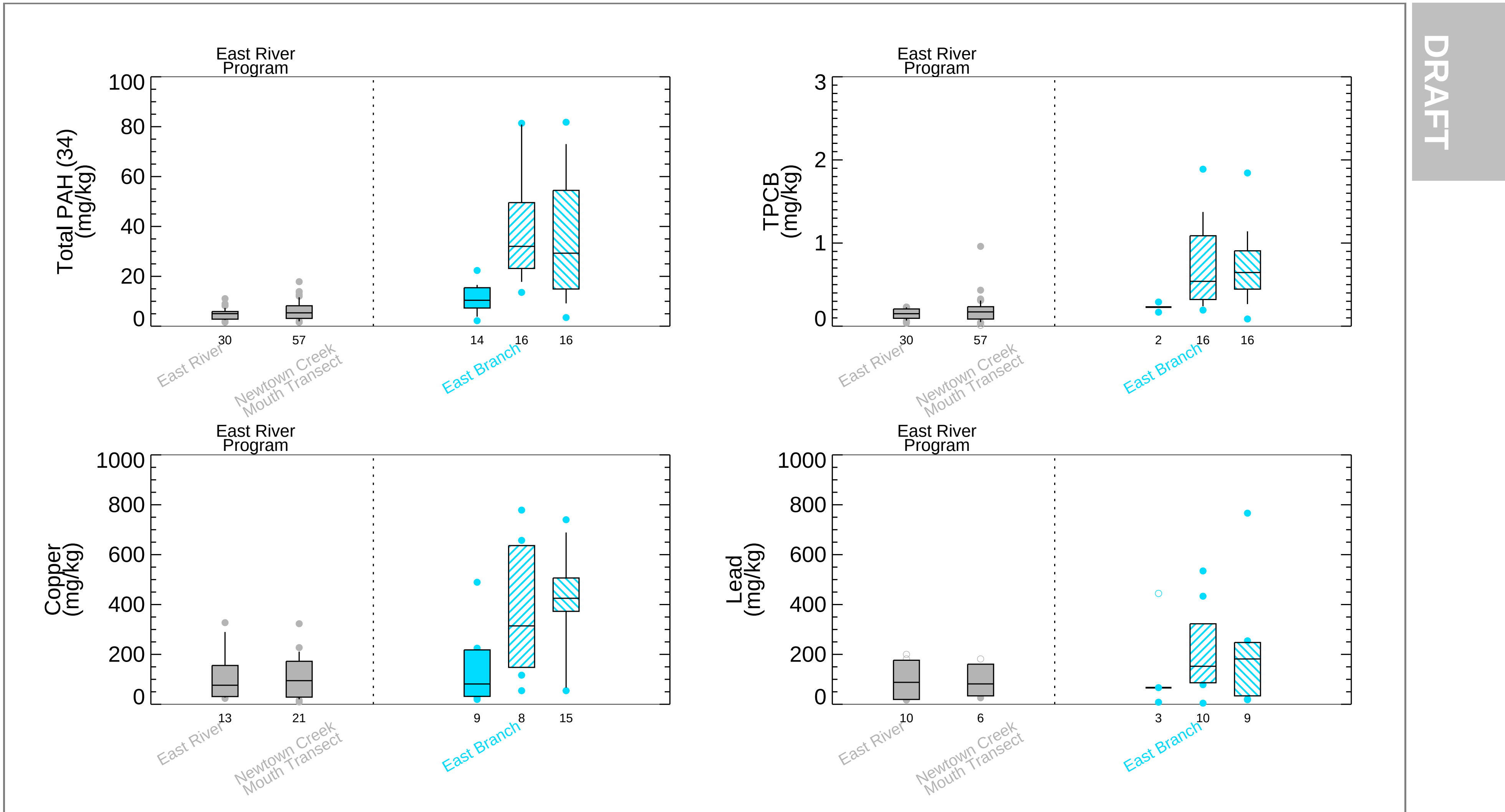
ANCHOR QEA

Figure 9c
Most Notable NAPL Observations in Native Material
Draft Materials for USEPA CSTAG East Branch Meetings
Newtown Creek RI/FS



Notes: Non-detects, if present, set to the estimated MDL and plotted with open symbol. Sample size posted below x-axis. Totals reported using estimated detection limit times 0.5, if applicable.
Box: median, 25th, 75th percentiles; whiskers: 10th, 90th percentiles. Symbols: data outside whiskers; for n<=10, no whiskers; for n<=4, no box (but median is shown as horizontal line).
Caret symbols and numbers above or below panel, if present, indicate the number of values outside y-axis range.
Samples with non-detected TSS not included. Samples where dissolved fraction greater than total fraction not included.
Surface water samples were not analyzed for C19-C36 aliphatics.
Particulate phase calculations for Total Dioxin/Furan TEQ were not performed because site-specific partitioning coefficients were not possible, given that Total Dioxin/Furan TEQ was not analyzed in porewater samples.
"Wet Weather" is round 1 of the wet weather sampling program. "Transition" is round 2 of the wet weather sampling program.

Dry Weather
Wet Weather
Transition

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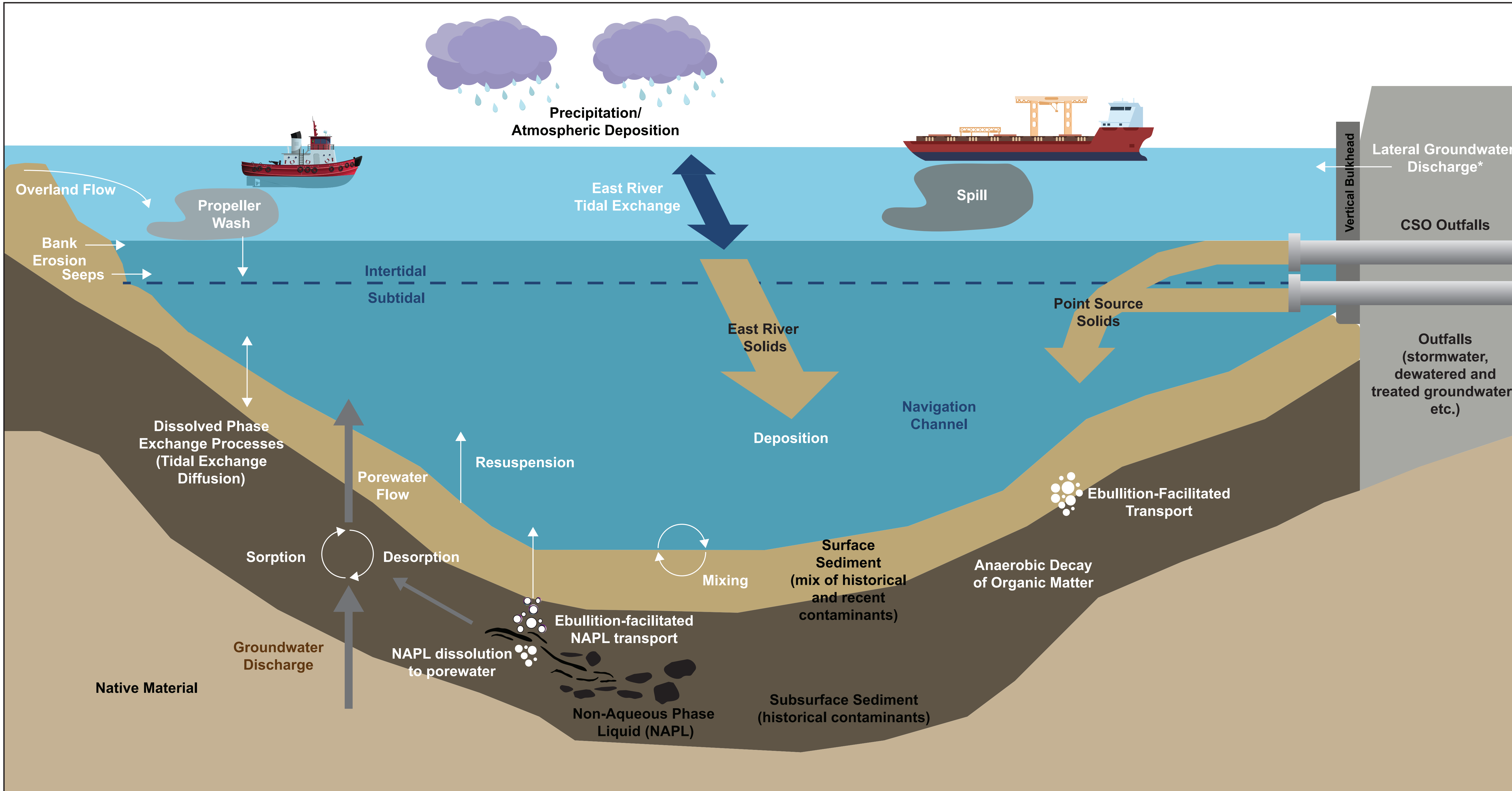
ANCHOR QEA

Figure 10

Particulate Phase Concentrations in Surface Water During Dry and Wet Weather Sampling Events - Box Plot by Location

Draft Materials for USEPA CSTAG East Branch Meetings
Newtown Creek RI/FS

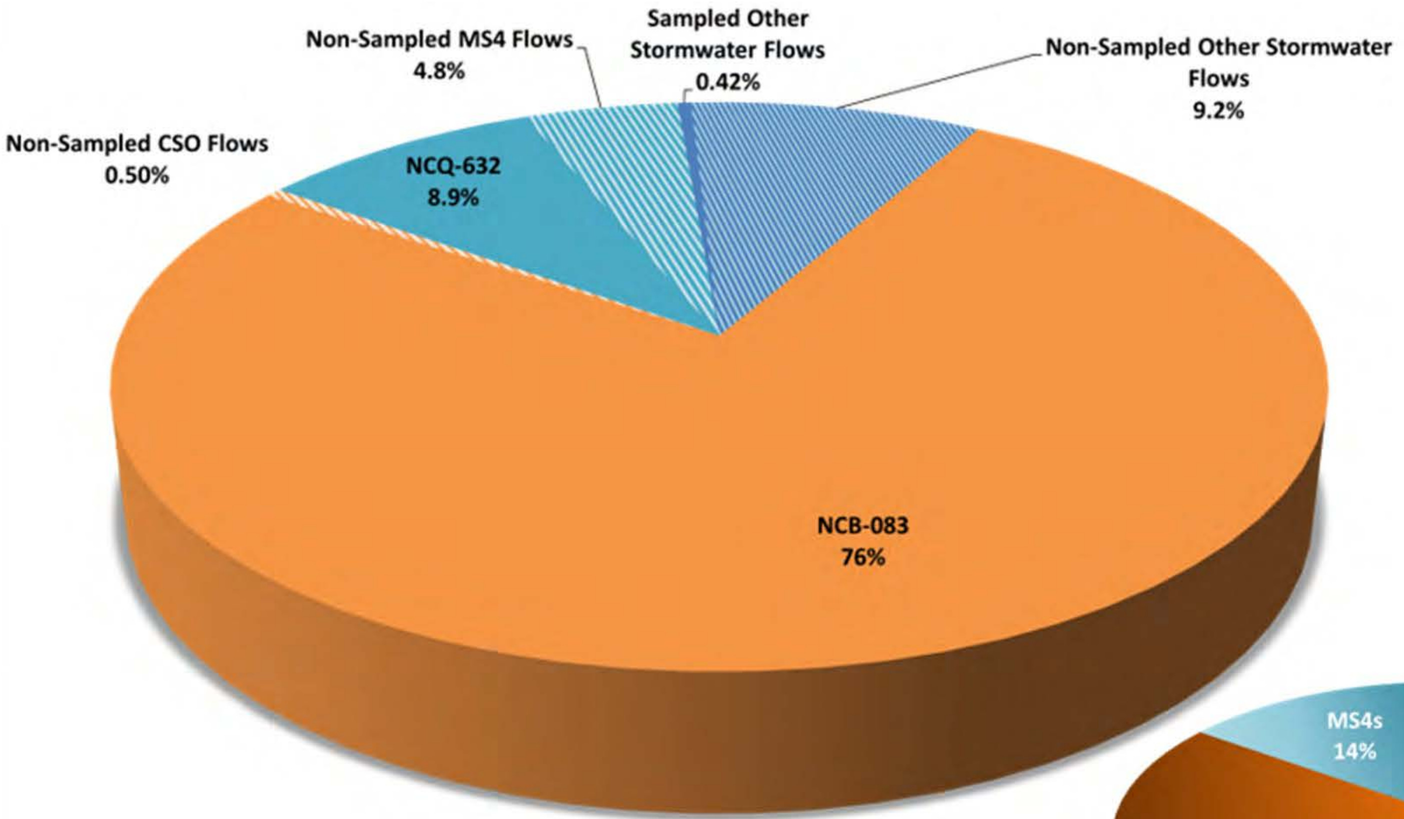


Note:
This figure is intended to illustrate ongoing external inputs of solids and contaminants to the East Branch and in-creek processes that affect the redistribution of solids and contaminants in the East Branch.
*Lateral groundwater discharges occur in vertical permeable shoreline areas that include vertical wood, wood, precast concrete, and pile-supported concrete bulkheads.

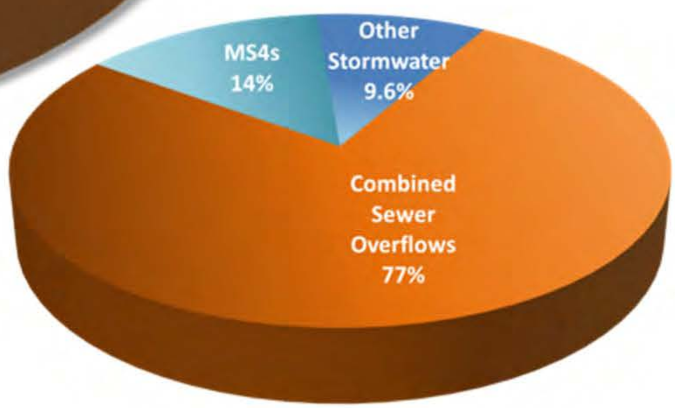
Figure is adapted from Figure 8-1 in the Remedial Investigation Report, RI/FS, Newtown Creek, March 2023 prepared by Anchor QEA.

East Branch Conceptual Site Model

DRAFT



Detailed Relative Contribution of Annual Discharge Volumes



Relative Contribution of Annual Discharge Volumes

Notes:
Hatching indicates volume from discharges that were not sampled during the RI.
Flows estimated using NYCDEP Infoworks model and SPDES documentation (e.g., Discharge Monitoring Reports).

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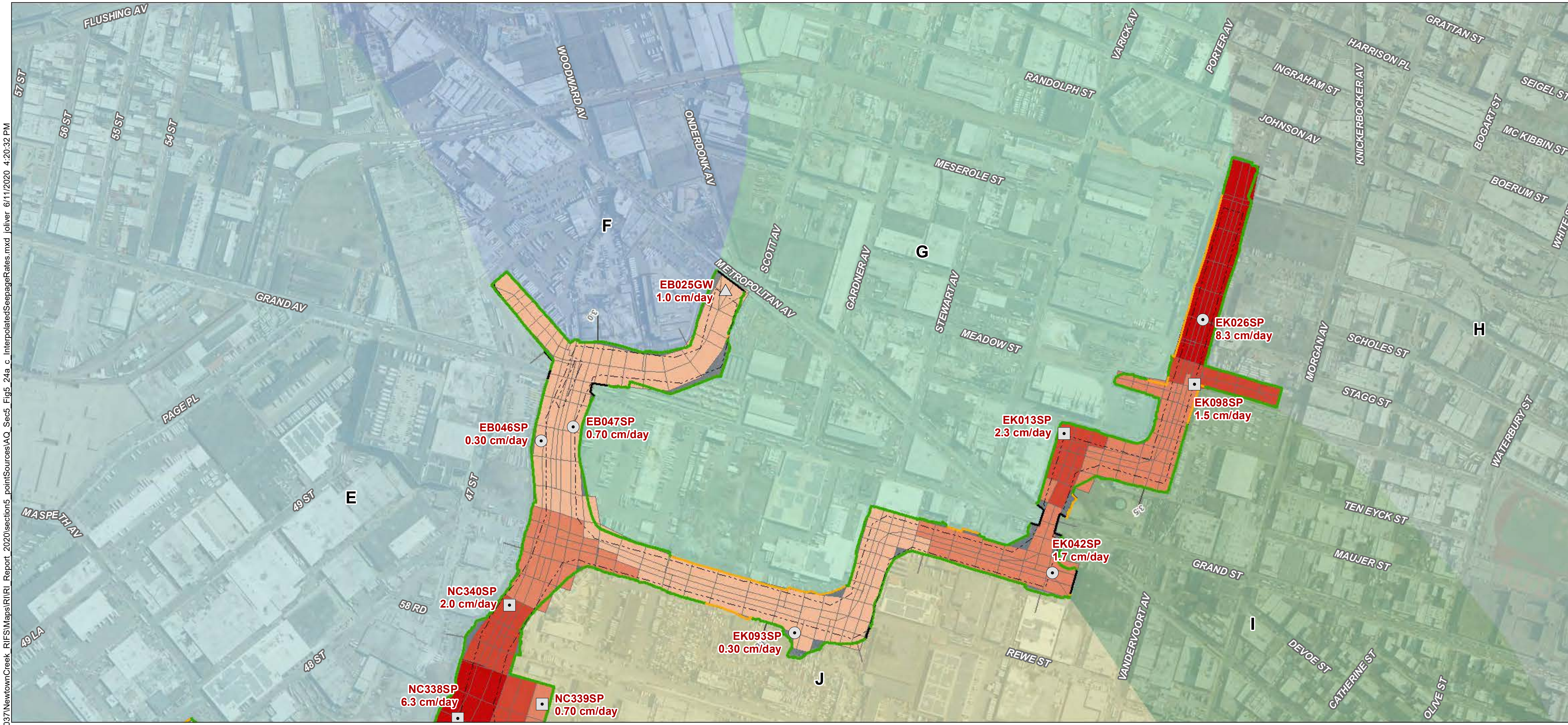
ANCHOR QEA

Figure 13
Relative Magnitude of Annual Point Source Discharge in East Branch
Draft Materials for USEPA CSTAG East Branch Meetings
Newtown Creek RI/FS



- - Navigation Channel
⊙ Phase 2 Seepage Meter Measurement Location
▣ FS Part 1 Seepage Meter Measurement Location
△ Phase 2 In-Creek Long-Term Monitoring Station
Model Grid

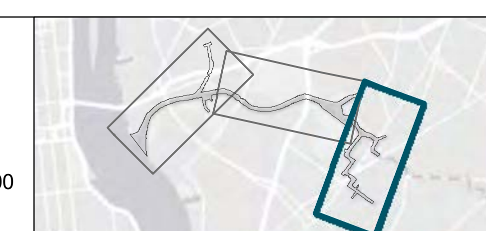
Shoreline Category
Deep Barrier
Shallow Barrier
Permeable

Segment Group
E H
F I
G J

Interpolated Groundwater Discharge (centimeters per day)
-0.090 – 0.0
0.11 – 1.0
1.1 – 2.0
2.1 – 4.0
4.1 – 6.0
6.1 – 8.4

Notes:
1. The arithmetic average seepage rate was interpolated using a triangular irregular network (TIN) method.
2. The seepage meter measurement and in-creek long-term monitoring locations were labeled with station ID and arithmetic average seepage rate in centimeters per day.
3. Positive seepage values (shown in red) indicate that the net flow of groundwater is into the creek ("gaining stream").
4. Negative seepage values (shown in blue) indicate that the net flow of groundwater is away from the creek ("losing stream").
5. Creek mile hatches are shown every tenth mile and labeled every half mile.
6. Aerial photos acquired from New York State Department of Homeland Security and Emergency Services, 2016.
7. Break values for numerical classification bins are rounded up. Values between displayed ranges are placed in the higher bin.

Feet
0 250 500 750 1,000



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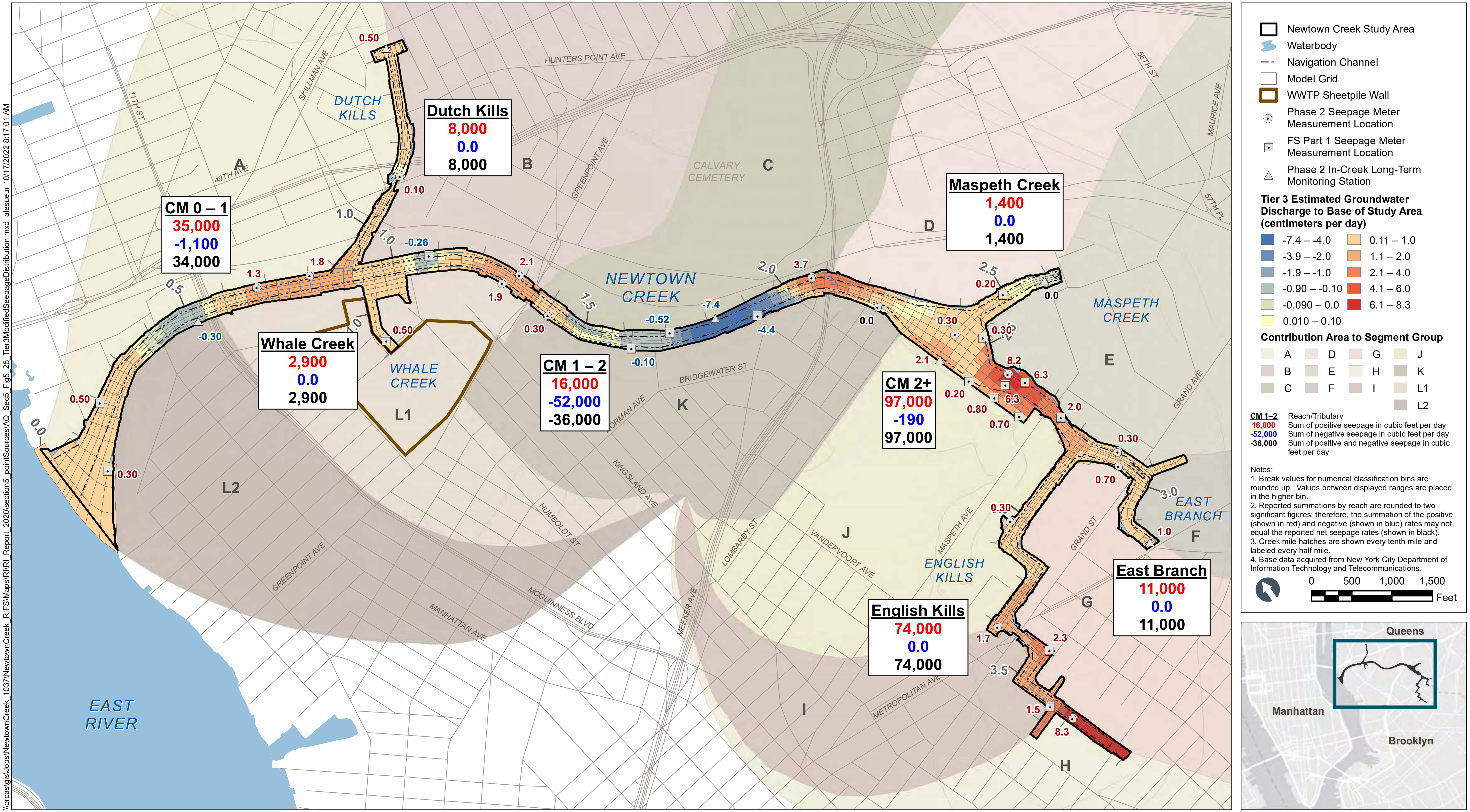
ANCHOR QEA

Figure 5-24c
Interpolated Seepage Rates – CM 2.6+, East Branch, and English Kills
Remedial Investigation Report
Newtown Creek RI/FS



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ANCHOR QEA

Figure 5-25
Tier 3 Modified Seepage Distribution
Remedial Investigation Report
Newtown Creek RI/FS

Figure 20a Placeholder

A figure presenting the TPAH(34) loads to subsurface sediment from groundwater (base case - lower bound [Method 1]) for the East Branch area will be provided prior to the meeting. This will be similar to Figure 20c, except will present estimated loads for TPAH(34).

Figure 20b Placeholder

A figure presenting the TPAH(34) loads to subsurface sediment from groundwater (base case - upper bound [Method 2]) for the East Branch area will be provided prior to the meeting. This will be similar to Figure 20c, except will present estimated loads for TPAH(34).

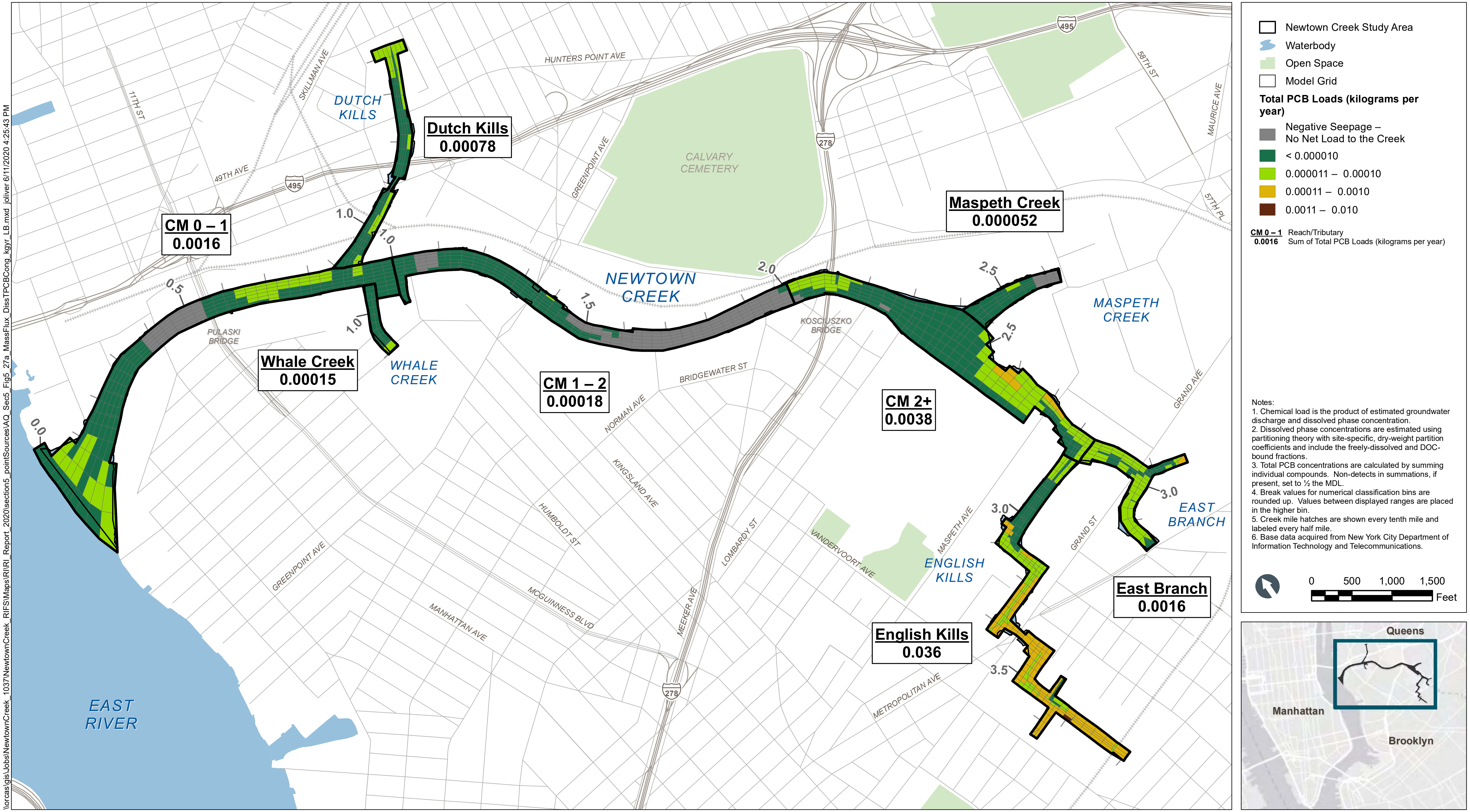

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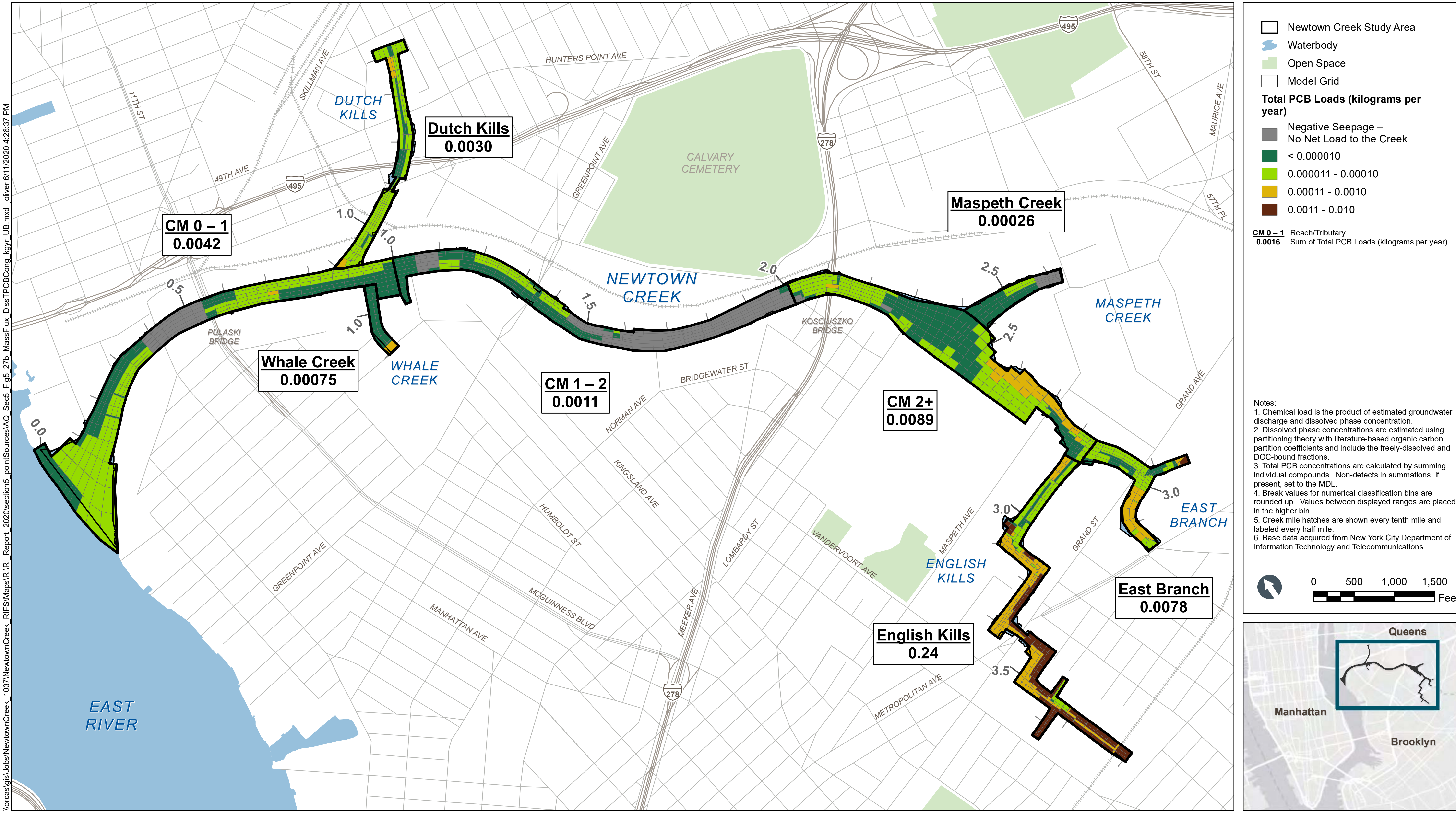
Figure 5-27a
Total PCB Loads to Subsurface Sediment from Groundwater – Base Case – Lower Bound (Method 1)
Remedial Investigation Report
Newtown Creek RI/FS



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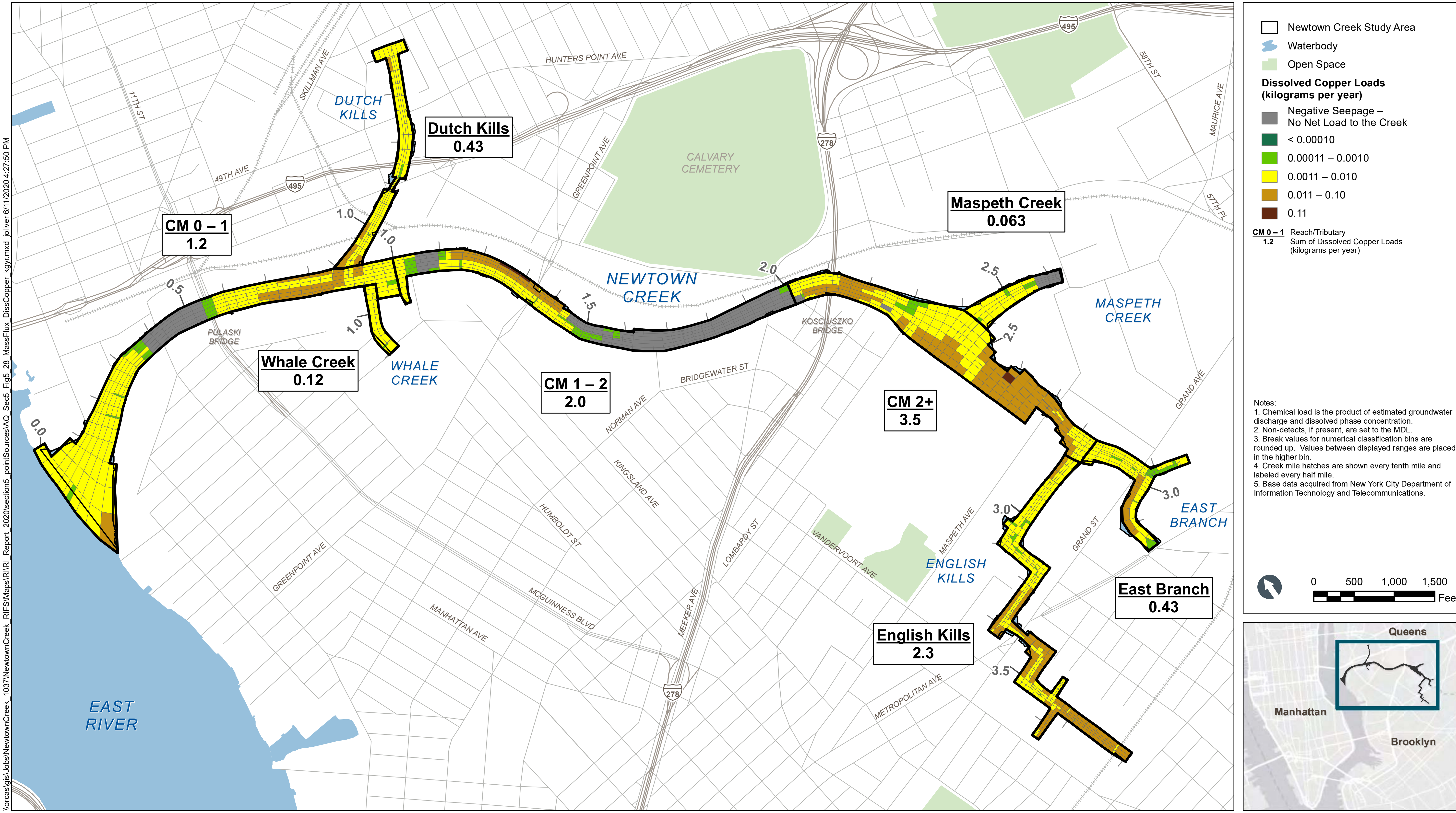
ANCHOR QEA

Figure 5-27b
Total PCB Loads to Subsurface Sediment from Groundwater – Base Case – Upper Bound (Method 2)
Remedial Investigation Report
Newtown Creek RI/FS



ANCHOR QEA

Figure 5-28
Dissolved Copper Loads to Subsurface Sediment from Groundwater
Remedial Investigation Report
Newtown Creek RI/FS

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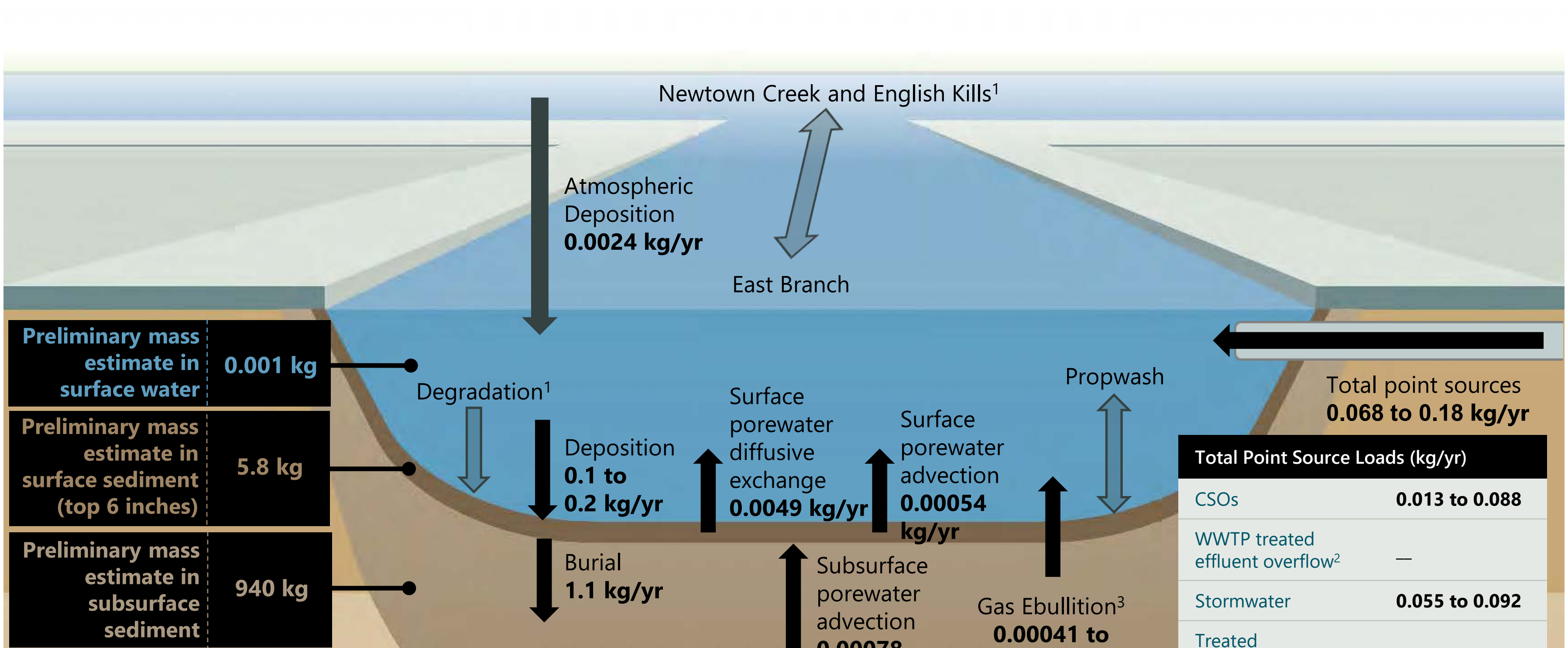
Figure 14
Spatial Extent of Gas Ebullition Associated Dynamic Sheens
Draft Materials for USEPA CSTAG East Branch Meetings
Newtown Creek RI/FS

Figure 22 Placeholder

A figure presenting the estimated TPAH(34) annual loads to the East Branch area will be provided prior to the meeting. This figure will be similar to Figures 23 and 24, except will present estimated loads for TPAH(34).



Total Point Source Loads (kg/yr)	
CSOs	0.013 to 0.088
WWTP treated effluent overflow[2]	—
Stormwater	0.055 to 0.092
Treated groundwater[2]	—
Total	0.068 to 0.18

Notes:
With the exception of gas ebullition, information regarding annual load estimates and ranges is provided in Section 6.5 of the *Remedial Investigation Report* (Anchor QEA 2023).
Incomplete information for other COCs evaluated as part of the East Branch CSM precludes these calculations because they were not measured as extensively as the three focus COCs of the RI (i.e., Total PAH [17], Total PCBs, and copper).
1. Exchanges with English Kills and Newtown Creek, propwash, and degradation within East Branch are not quantified. These will be evaluated further, as appropriate, as part of the chemical fate and transport modeling and Feasibility Study.
2. WWTP treated effluent overflow and treated groundwater effluent do not discharge to East Branch.
3. Gas ebullition loads from Table 5-5 of the *Feasibility Study Gas Ebullition Data Evaluation Report* (Anchor QEA 2022b).
4. USEPA is still evaluating lateral groundwater contaminant loads.

--: indicates no information that is appropriate or available
kg/yr: kilograms per year

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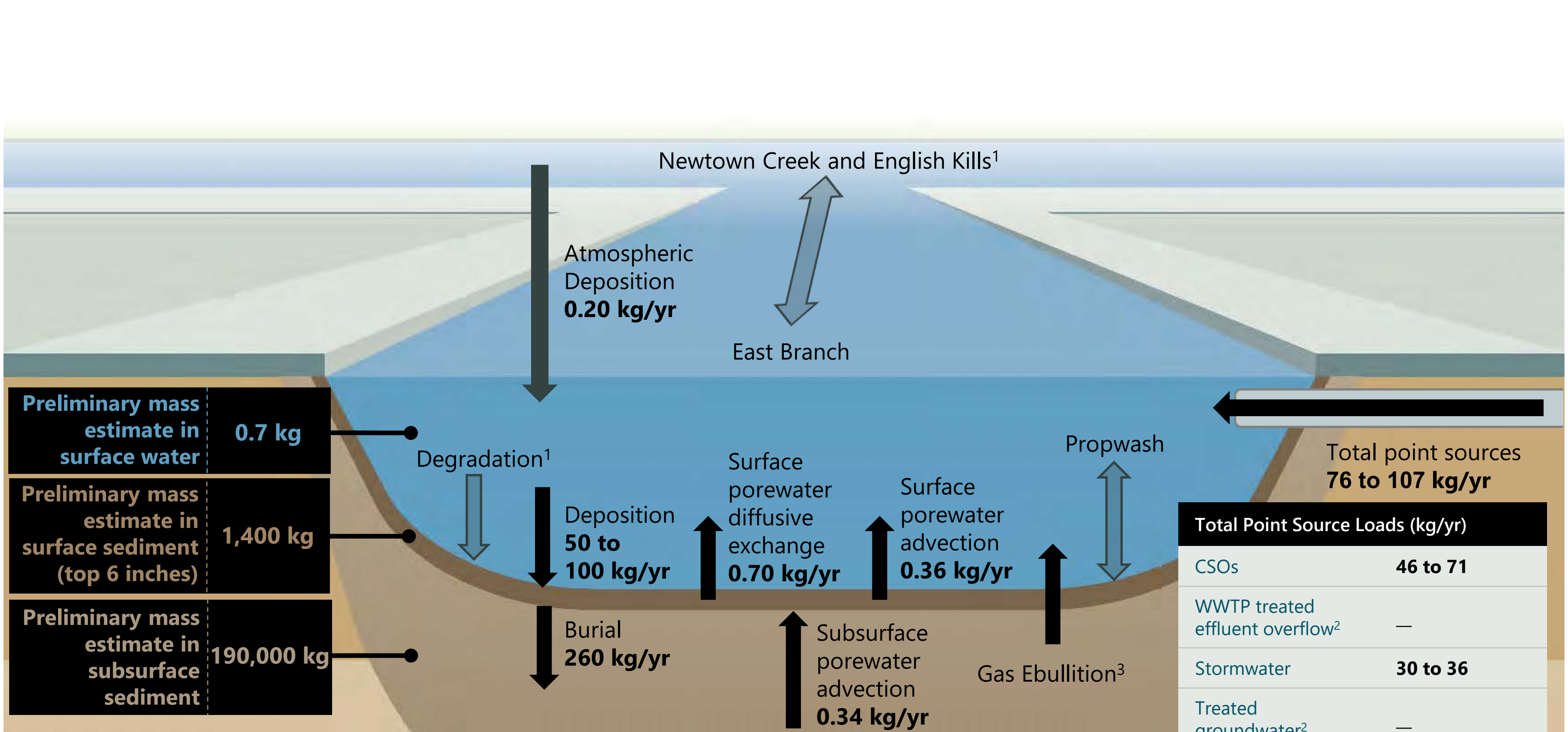
Figure 16
Estimated Total PCB Annual Loads
Draft Materials for USEPA CSTAG East Branch Meetings
Newtown Creek RI/FS

DRAFT



Total Point Source Loads (kg/yr)	
CSOs	46 to 71
WWTP treated effluent overflow[2]	—
Stormwater	30 to 36
Treated groundwater[2]	—
Total	76 to 107

Notes:
With the exception of gas ebullition, information regarding annual load estimates and ranges is provided in Section 6.5 of the *Remedial Investigation Report* (Anchor QEA 2023).
Incomplete information for other COCs evaluated as part of the East Branch CSM precludes these calculations because they were not measured as extensively as the three focus COCs of the RI (i.e., Total PAH [17], Total PCBs, and copper).
1. Exchanges with English Kills and Newtown Creek, propwash, and degradation within East Branch are not quantified. These will be evaluated further, as appropriate, as part of the chemical fate and transport modeling and Feasibility Study.
2. WWTP treated effluent overflow and treated groundwater effluent do not discharge to East Branch.
3. Gas ebullition annual load was not evaluated for copper.
4. USEPA is still evaluating lateral groundwater contaminant loads.

--: indicates no information that is appropriate or available
kg/yr: kilograms per year

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Figure 17
Estimated Copper Annual Loads
Draft Materials for USEPA CSTAG East Branch Meetings
Newtown Creek RI/FS