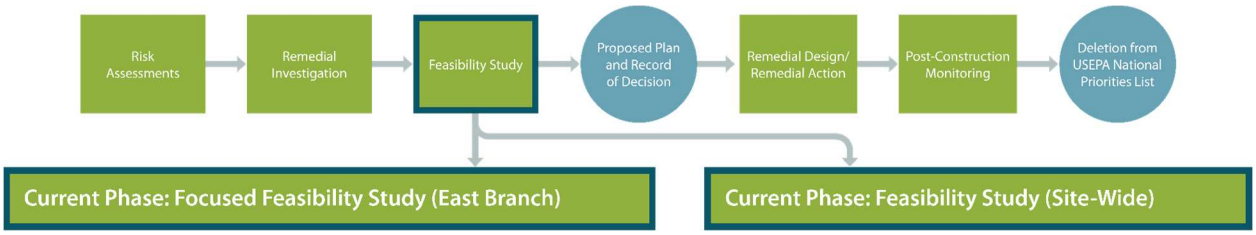
NEWTOWN CREEK GROUP

A Guide to Contaminants of Concern and Non-Aqueous Phase Liquid (NAPL) in Newtown Creek and the East River

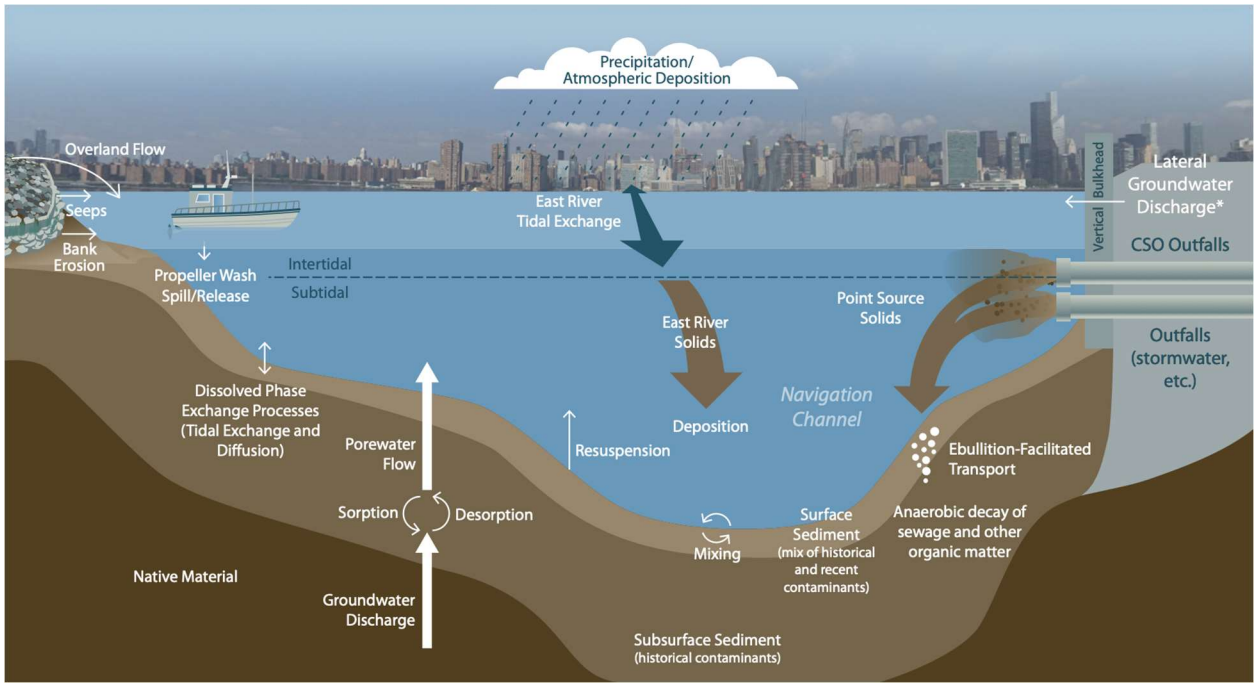
Background Information

Superfund is a US Environmental Protection Agency (EPA) program that evaluates potential risks from waste sites, contaminated waterways, and other sites. The Superfund program also develops remedies at these sites to reduce risks to human health and the environment. The EPA oversees, reviews, and approves all work conducted under the Superfund program.

The Remedial Investigation (RI) phase of the Superfund process in Newtown Creek was completed on April 7, 2023. A public copy is available on the NCG Website. The Feasibility Study (FS) phase is in progress. The FS uses data collected and scientific models built during the RI to evaluate remedial alternatives for the creek using nine criteria. Additional data collection is often needed to support development and evaluation of remedial alternatives. A Focused Feasibility Study (FFS) is currently being conducted on the East Branch segment of Newtown Creek. It will evaluate potential cleanup alternatives for this area of the creek and will be implemented on an expedited timeline, which will begin cleanup activities sooner and inform cleanup options for the rest of the creek. The FS process for the rest of the creek is simultaneously being conducted, in parallel with the FFS process for East Branch.



A **conceptual site model** (CSM) is a way to compile all the RI information and link it together in a way that provides a comprehensive understanding of the Superfund Site and assists in the development of appropriate remedial options for the Site. Below is a figure illustrating the CSM for Newtown Creek.



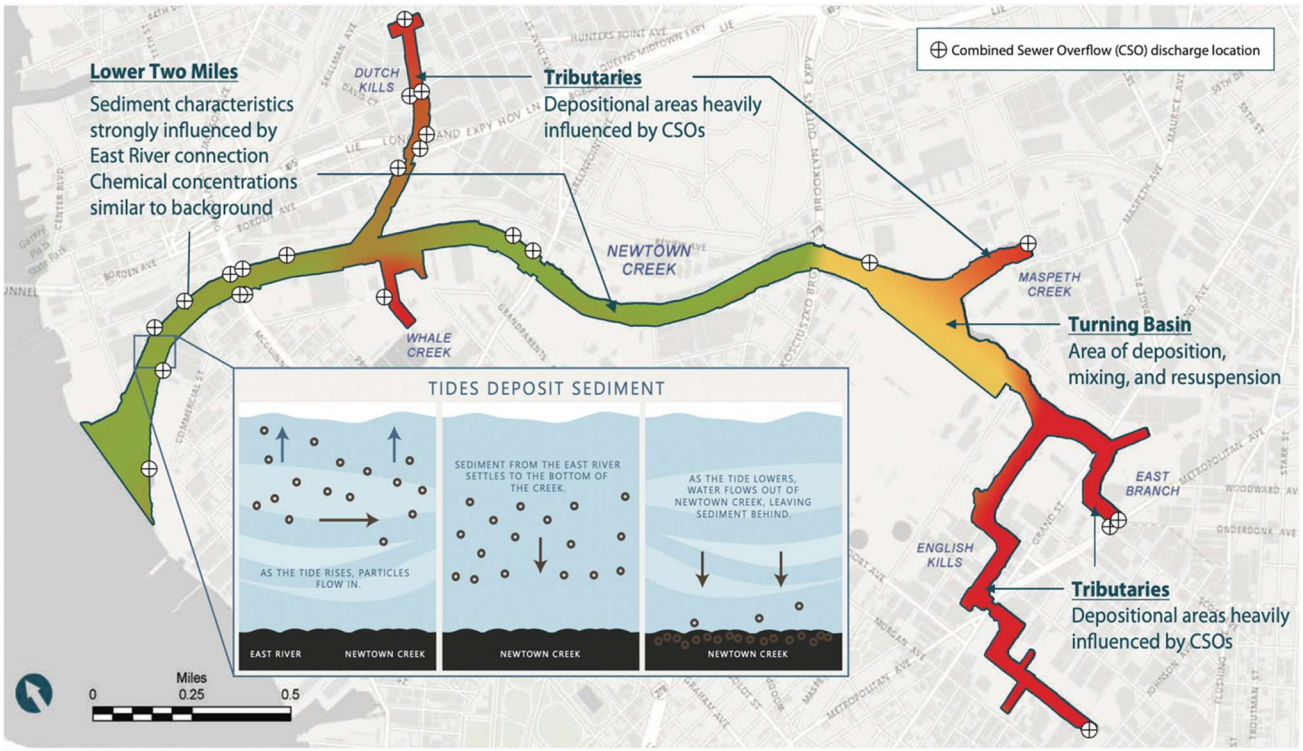
The CSM figure shows the primary sources of water and contaminants going into the creek, and how these sources interact with the existing contaminants found in the sediment at the bottom of the creek. The primary sources of water and contaminants going into Newtown Creek are the East River, New York City sewers and street storm drains, and stormwater runoff from properties surrounding the creek.

The **contaminants of concern (COCs)** are the chief contaminants, identified by the EPA through the human health and ecological risk assessment process, that pose unacceptable levels of risk to human health and the environment that the remedy will have to resolve. COCs are found within the sediments at the bottom of the creek and are introduced into the creek through the various sources shown on the CSM figure above. The risk assessments have identified the following as the most prevalent COCs in Newtown Creek: polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), petroleum hydrocarbons (C19 to C36), metals, and dioxins/furans.

COC Observations in Newtown Creek's East Branch

The figure below shows the predicted contribution from local sources to the total solids deposited onto Newtown Creek's sediment bed. The surface sediment in the tributaries of the creek is expected to have the highest total deposition due to shallower depths and lower circulation than in the main stem of the creek. One of these tributaries, the East Branch, is

an ideal site for an early action to test remedy efficacy against the various sources of contamination. In addition to the influence of sewers and street drains which empty into the East Branch, the East Branch provides a good test case because it includes high concentrations of COCs, including NAPL.



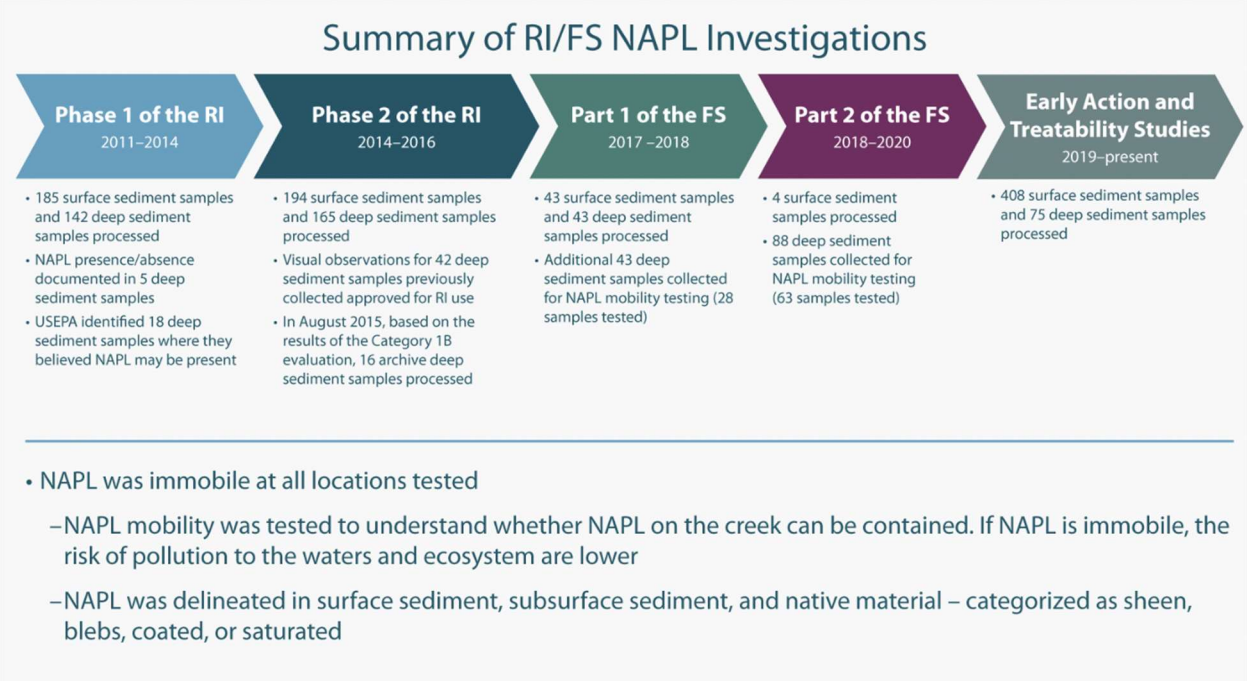
Introduction to NAPL

Another contaminant found in the surface and subsurface sediments of the creek bed is **non-aqueous phase liquid (NAPL)**. NAPLs are organic liquid compounds that do not dissolve in or easily mix with water such as oil, gasoline, and petroleum products. NAPL frequently contains varying concentrations of COCs, primarily PAHs and other hydrocarbon compounds, and sometimes PCBs. NAPL can enter the Creek in various ways. For example, NAPL can enter via seeps, which are fluids that emerge from shorelines, bulkheads, or sediments and reach water level. NAPL can also appear during rain events when oil on the streets is washed down street drains which empty into the Creek, untreated. When NAPL reaches the water, it disperses and, depending on the physical properties of the NAPL and the quantity present, the NAPL breaks into small droplets which can transition to a thin sheen on the water surface or break down. NAPL can be broken down by sunlight,

biodegradation, evaporation, and dissolution into the water. NAPL dispersed in or on the surface water as discrete droplets or residual sheen may attach to solids particles suspended in or on the surface water causing them to sink within the water column and deposit on the sediment bed, where COCs dissolved in the NAPL can add to the surface sediment COC concentration.

Water particles that attach to the oil droplets and become dense enough for larger droplets are called blebs. These blebs can sink, deposit on the creek's floor and become part of the sediment bed. Where these deposits go is influenced by water and wind currents, boat traffic, and the presence of bulkheads.

Summary of RI/FS NAPL Investigations



During the RI and the FS, sampling was done to search for NAPL both in surface sediments at the most shallow layer of the creek bed and from deep, subsurface sediments. They were analyzed with the purpose of understanding how much NAPL is present in the creek, and whether or not the NAPL is moving from the creek's deep subsurface layers to the creek bed's surface layer. Researchers focused on these questions in order to understand the degree to which NAPL from the sediment is contaminating the creek. NAPL mobility testing indicates whether or not NAPL can be contained in the sediment. This is especially

important because if the NAPL in the sediment is immobile, then the risk of it polluting the waters and ecosystem of Newtown Creek is lower.

Overall, more than 600 surface sediment samples and 300 deep sediment samples were processed for visual observation of NAPL. More than 120 deep sediment samples were collected for NAPL mobility testing. This sampling process began in 2019 and continues today.

The table below shows where sheens and various forms of NAPL were observed in samples taken at various depths of the creek bed, where the deepest layer is referred to as native material and the most superficial layer is referred to as surface sediment. These data aid researchers in understanding if NAPL exists in the various layers of Newtown Creek sediment.

Summary of Visual Observations (Counts and %)

	Most Notable Visual Observations									
Deposit Type	None	% of Reach	Sheen	% of Reach	Blebs	% of Reach	Coated	% of Reach	Saturated	% of Reach
Surface sediment (78)	27	35%	51	65%	0	0%	0	0%	0	0%
Subsurface sediment (53)	10	19%	41	77%	2	4%	0	0%	0	0%
Native material (32)	31	97%	1	3%	0	0%	0	0%	0	0%

Researchers observed blebs in 3% of native material samples, 77% of subsurface sediment samples, and 65% of surface sediment samples. Some of these samples that showed the most NAPL were spun at extremely high speeds through a process called centrifugation to determine if these blebs were capable of moving through the sediment. It was observed that they could not, therefore it can be confidently concluded that the NAPL is immobile in the areas that were tested in East Branch.

These data are crucial for our understanding of the degree to which NAPL in sediment, and the COCs found in NAPL, is or is not contaminating the East Branch ecosystem. NAPL's presence alone is not necessarily an indicator of previous ecosystem pollution, because Newtown Creek is an actively used industrial waterway today that interfaces with the East River and a location where many sewers and street drains empty into. This dataset demonstrates that NAPL in the East Branch of Newtown Creek's sediment is not substantially mobile, and therefore NAPL is not chiefly responsible for the environmental degradation of the East Branch. These data will be included in the detailed evaluation of remedial alternatives in the East Branch Focused Feasibility Study.