Gowanus Canal
Public Meeting

U.S. Environmental Protection Agency

Region 2

January 23, 2013 at Carroll Gardens

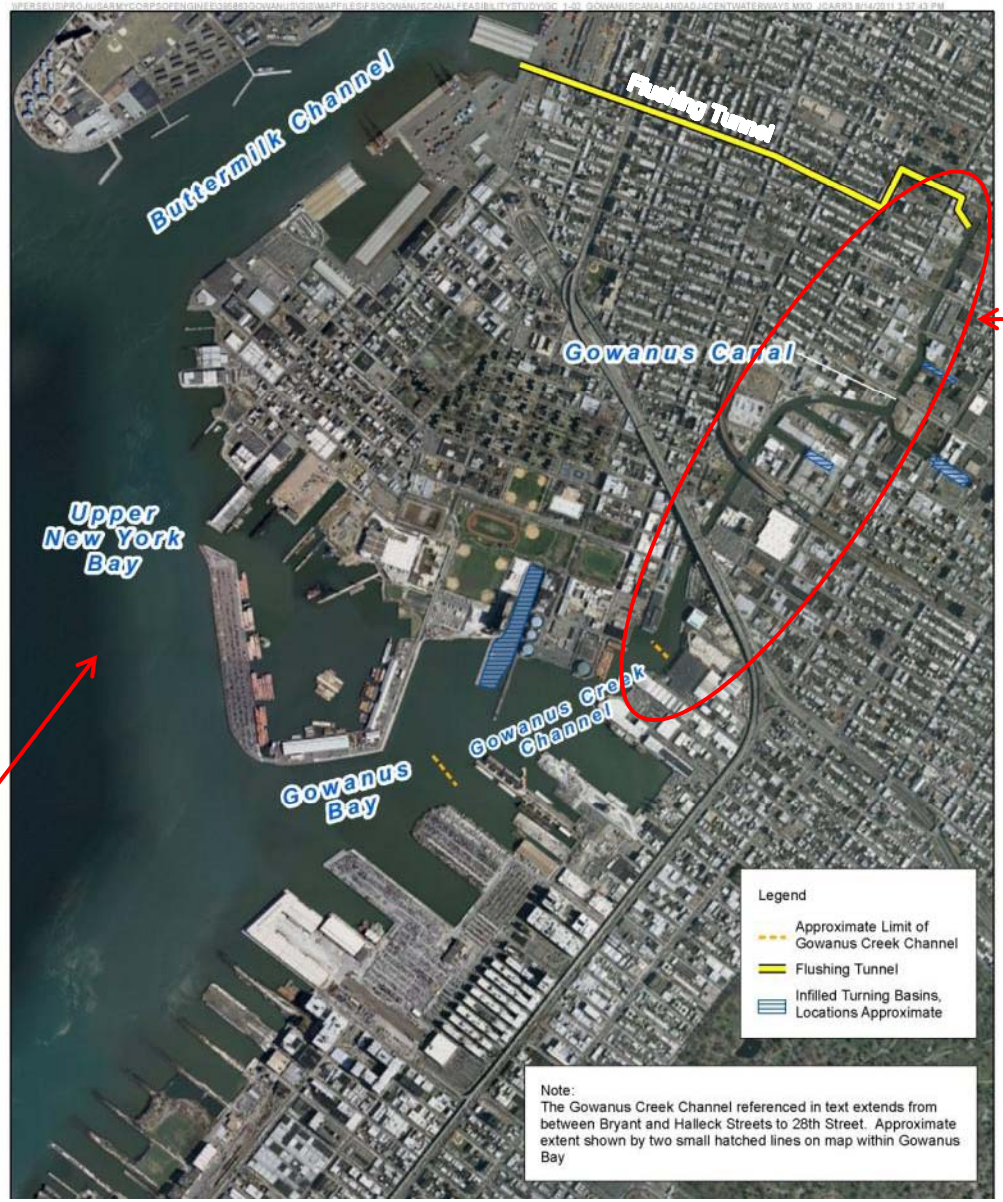
January 24, 2013 at Red Hook

Presentation Overview

- Background
- Sources of Contamination
- Nature and Extent of Contamination
- Summary of Site Risks
- Feasibility Study
- Preferred Remedy
- Schedule

Background

Site Location



Gowanus Canal Project Area

Reference Area

Project History

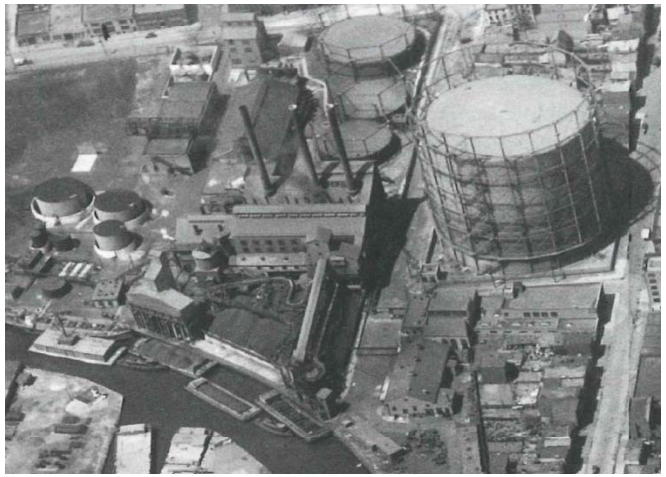
- ✓ Gowanus Canal placed on the National Priorities List – March 2010
- ✓ Remedial Investigation Report – January 2011
- ✓ Feasibility Study – December 2011
- ✓ Proposed Plan – December 2012

Sources of Contamination

Sources of Contamination

- **Inactive**
  - **Historical industrial activities**

- **Active**
  - **Three former manufactured gas plants (MGPs)**
  - **Combined sewer overflow (CSO) discharges**
  - **Upland sites with contaminated groundwater**
  - **Unpermitted pipe outfalls**



Former MGPs

Rising tar globs and sheen

Tar in sediment

Combined Sewer Overflows

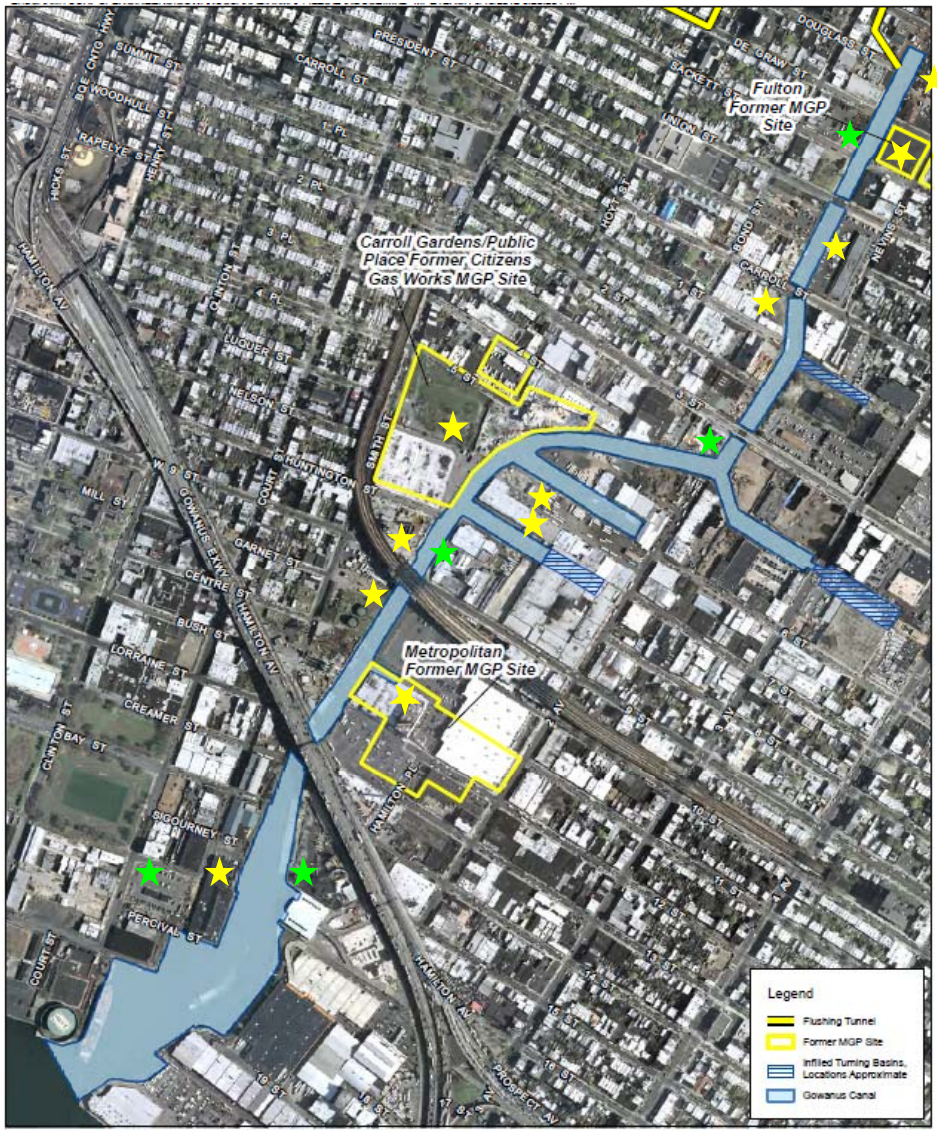
Sediment Mounds

http://www.youtube.com/watch?v=HzWOOqPAEgs

Unpermitted Pipe Outfalls

- **Discharges are minor compared to other sources**

Contaminated Groundwater Discharge



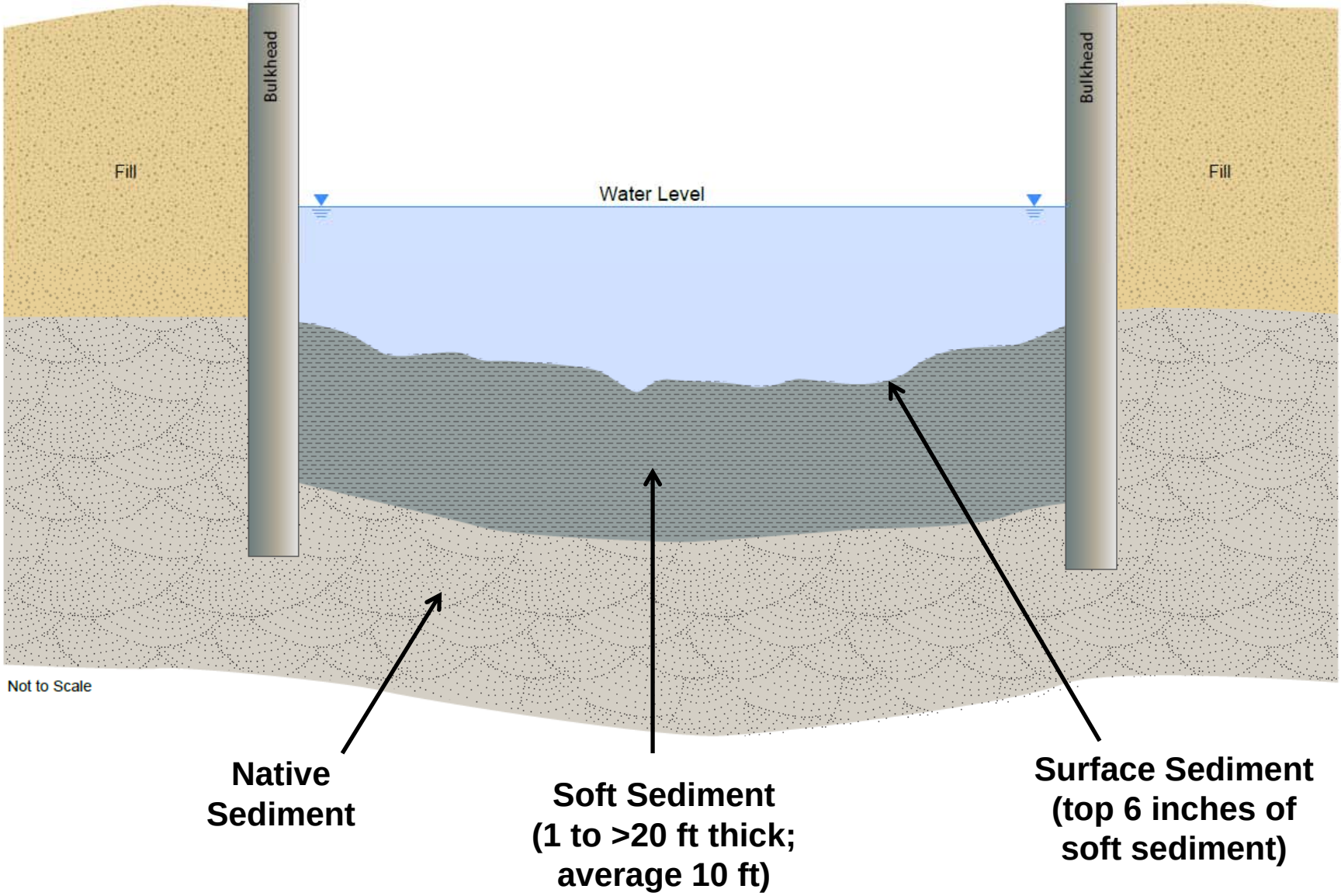
- **16 properties with contaminated groundwater have been identified and prioritized for further evaluation**

★ Sites included in NYSDEC program

★ New sites referred to NYSDEC

Nature and Extent of Contamination

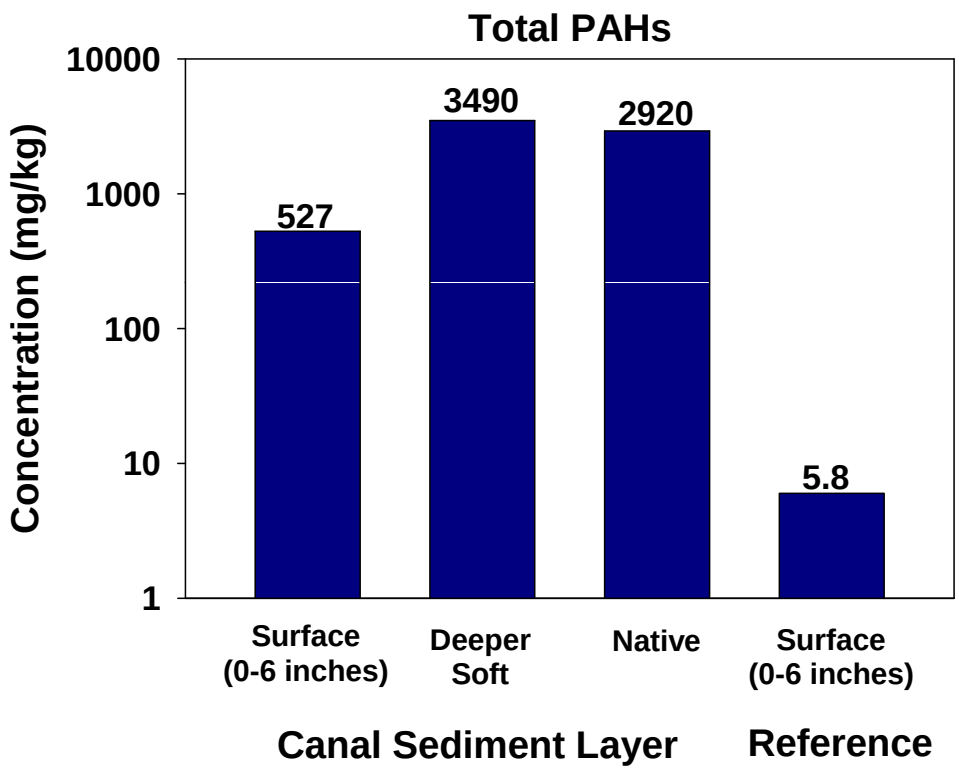
Gowanus Canal Sediment Layers

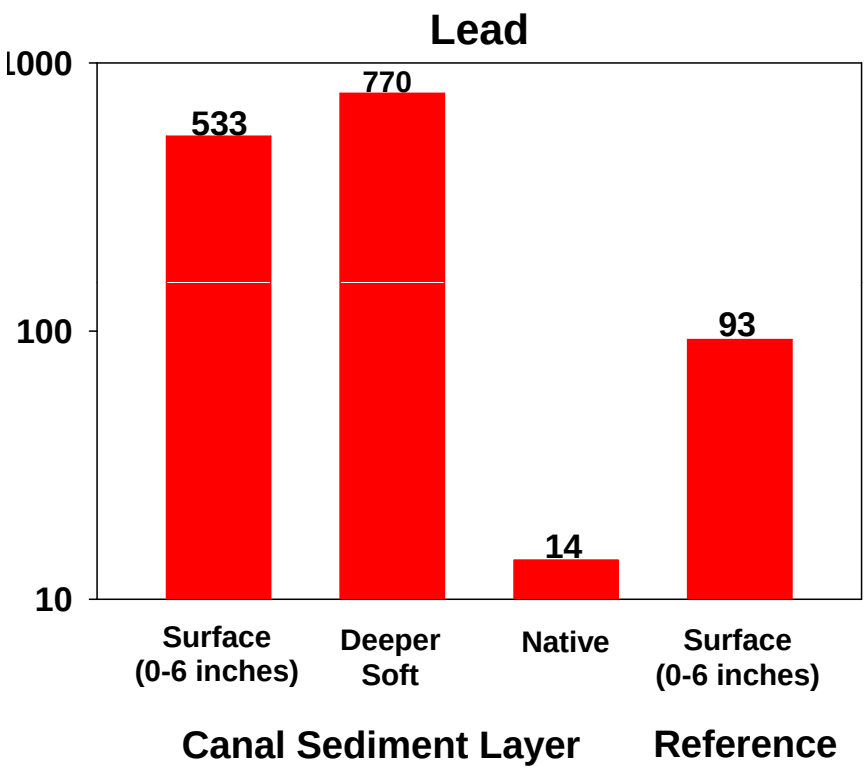


Contaminants of Concern

- **Soft Sediment**
  - **Polycyclic aromatic hydrocarbons (PAHs)**
  - **Polychlorinated biphenyls (PCBs)**
  - **Metals (barium, cadmium, copper, lead, mercury, nickel, silver)**
  - **Non-aqueous phase liquid (NAPL)**
- **Native Sediment**
  - **PAHs**
  - **NAPL**

Comparison of Sediment Layers





Other contaminants show similar patterns

Summary of Risks

Human Health Risk Summary

Pathways Evaluated	Cancer Risk	Non-Cancer Hazard	Unacceptable Contaminants and Media
Direct contact with surface sediment and surface water and breathing air during recreational use	√		Carcinogenic PAHs in sediment and surface water
Direct contact with surface sediment and surface water and breathing air during canal overflow	√		Carcinogenic PAHs in sediment
Ingestion of fish and crabs	√*	√*	PCBs in tissue

*Reference area risk & hazard also unacceptable

Ecological Risk Summary

- **Risk to bottom-dwelling (benthic) organisms**
  - **PAHs pose greatest risk**
  - **PCBs and metals also contribute**
- **Risks to wildlife from consuming contaminated prey and sediment**
  - **Plant-eating birds (e.g., black duck) – PAHs**
  - **Omnivorous birds (e.g., heron) – mercury**

Feasibility Study

Feasibility Study Process

Six Main Steps

1. Develop Remedial Action Objectives
2. Develop Preliminary Remediation Goals
3. Define Remediation Target Areas
4. Identify and Screen Remedial Technologies
5. Develop and Screen Remedial Alternatives
6. Evaluate Remedial Alternatives in Detail

Remedial Action Objectives

- **Human Health**
  - **Reduce the cancer risk to human health from the incidental ingestion of and dermal contact with PAHs in sediment during recreational use of canal or from exposure to canal overflow to levels that are within or below EPA's excess lifetime cancer risk range of 10^{-6} to 10^{-4}**
  - **Reduce the contribution of PCBs from the Gowanus Canal to fish and shellfish by reducing the concentrations of PCBs in Gowanus Canal sediment to levels that are within the range of Gowanus Bay and Upper New York Bay reference concentrations**

Remedial Action Objectives

- **Ecological**
  - **Reduce the risks to benthic organisms in the canal from direct contact with PAHs, PCBs and metals in sediments by reducing sediment toxicity to levels that are comparable to reference conditions in Gowanus Bay and Upper New York Bay**
  - **Reduce the risk to herbivorous birds from dietary exposure to PAHs.**

Remedial Action Objectives

- **NAPL Mitigation**
  - **Eliminate the migration of NAPL into the canal**
  - **Prevent or minimize NAPL from serving as source of contaminants to the canal**

Preliminary Remediation Goals (PRGs)

- No regulatory standards or criteria for contaminated sediments have been established for New York
- Site-specific PRGs were developed for the Gowanus Canal to identify the target area for cleanup
- “Clean” canal bottom surface will be established at the end of the cleanup; PRGs are also performance targets for the “clean” surface

PRGs for Human Health Protection

Contaminant	Concentration (mg/kg)		
	Recreational Use		Fish/Crab Ingestion
	Upper Bound (1×10^{-4})	Lower Bound (1×10^{-6})	
BAA	24	0.40	--
BAP	2.4	0.040	--
BBF	24	0.40	--
BKF	240	4.0	--
DA	2.4	0.040	--
ID	24	0.40	--
Total PCBs	--	--	0.48

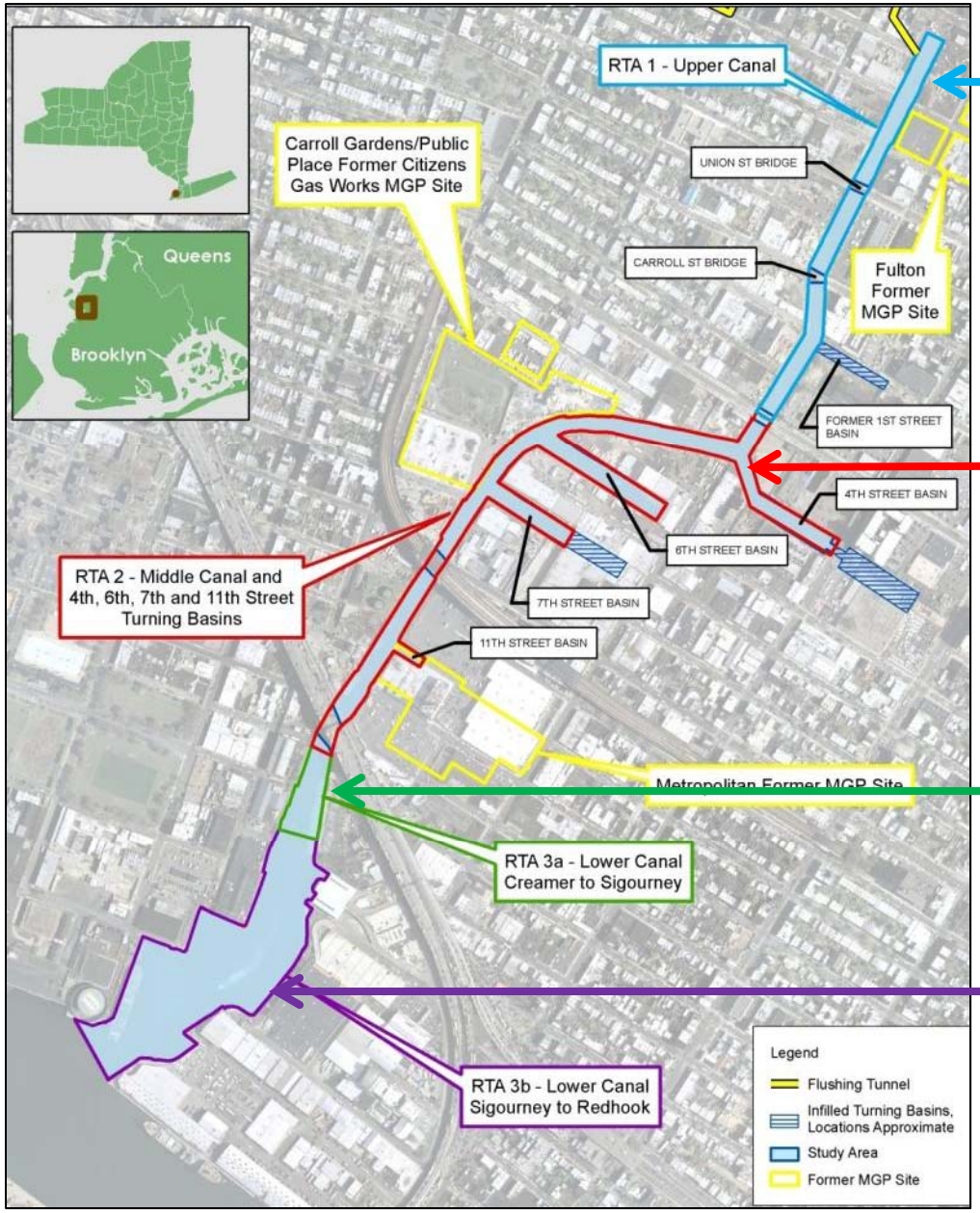
BAA – benzo(a)anthracene, BAP – benzo(a)pyrene, BBF – benzo(b)fluoranthene, BKF – benzo(k)fluoranthene, DA – dibenz(a,h)anthracene, ID – indeno(1,2,3-c,d)pyrene

PRGs for Ecological Protection

Contaminant	Concentration (mg/kg)	
	Benthic Community	Herbivorous Birds
Total PAH	20*	230
Copper	80	--
Lead	94	--

*At 6% total organic carbon content

Remediation Target Areas (RTAs)



RTA 1
Upper Canal
Intermediate level of contamination

RTA 2
Middle Canal
Highest level of contamination

RTA 3a
Lower Canal
Lowest level of contamination, shallower

RTA 3b
Lower Canal
Lowest level of contamination, deeper

Remedial Alternatives
Sediment Dredging and Capping

1 No Action

2 Dredge soft sediment to specified elevation
Two-layer cap (isolation and armor layers)

3 Dredge soft sediment to specified elevation
Three-layer cap (treatment, isolation, and armor layers)

4 Dredge all soft sediment
Two-layer cap (isolation and armor layers)

5 Dredge all soft sediment
Three-layer cap (treatment, isolation, and armor layers)

6 Dredge all soft sediment
Stabilize top of native sediment
Two-layer cap (isolation and armor layers)

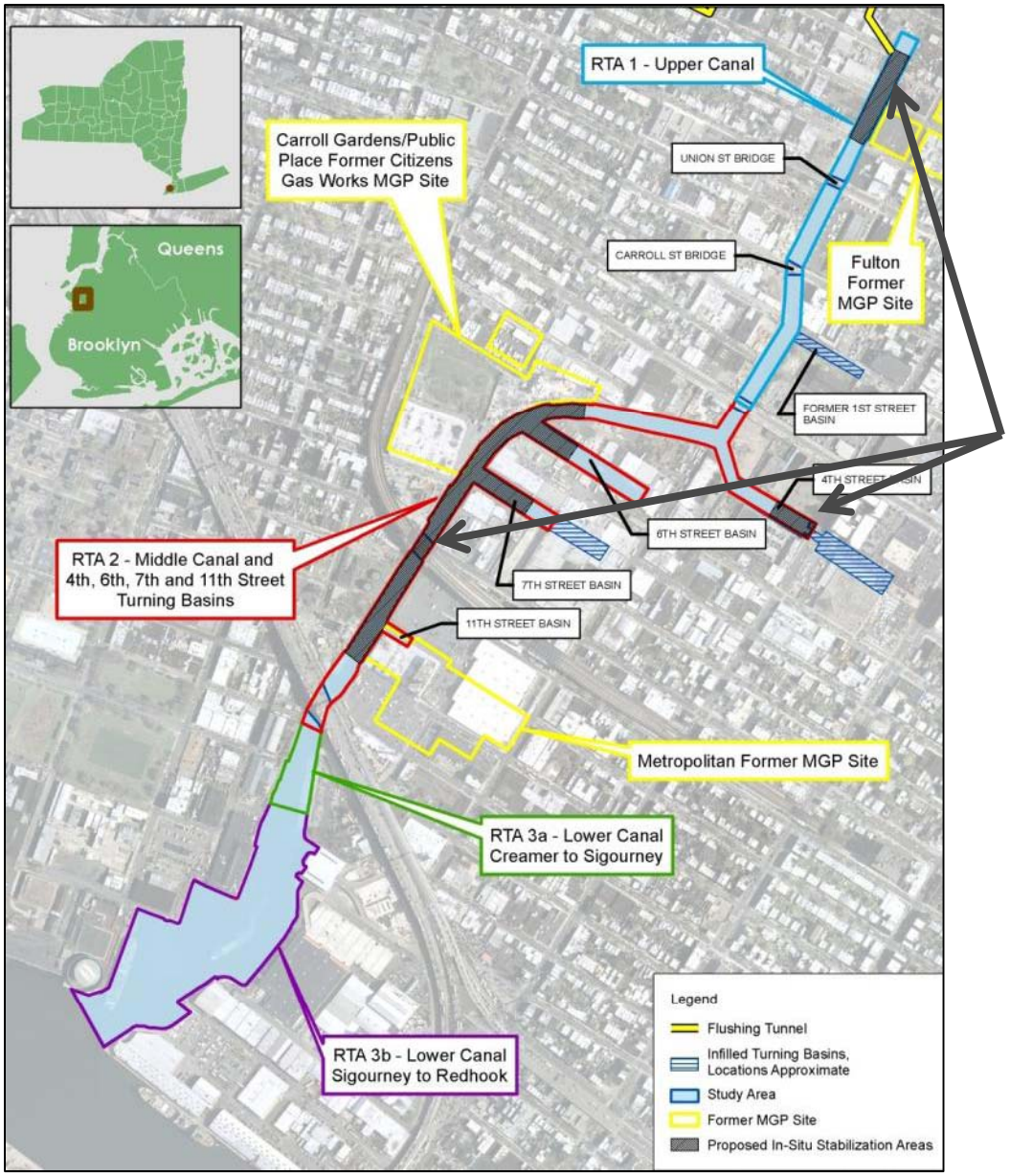
7 Dredge all soft sediment
Stabilize top of native sediment
Three-layer cap (treatment, isolation, and armor layers)

Capping

- **Capping included in all alternatives except No Action**
  - **NAPL-contaminated sediments beyond practical depth of removal**

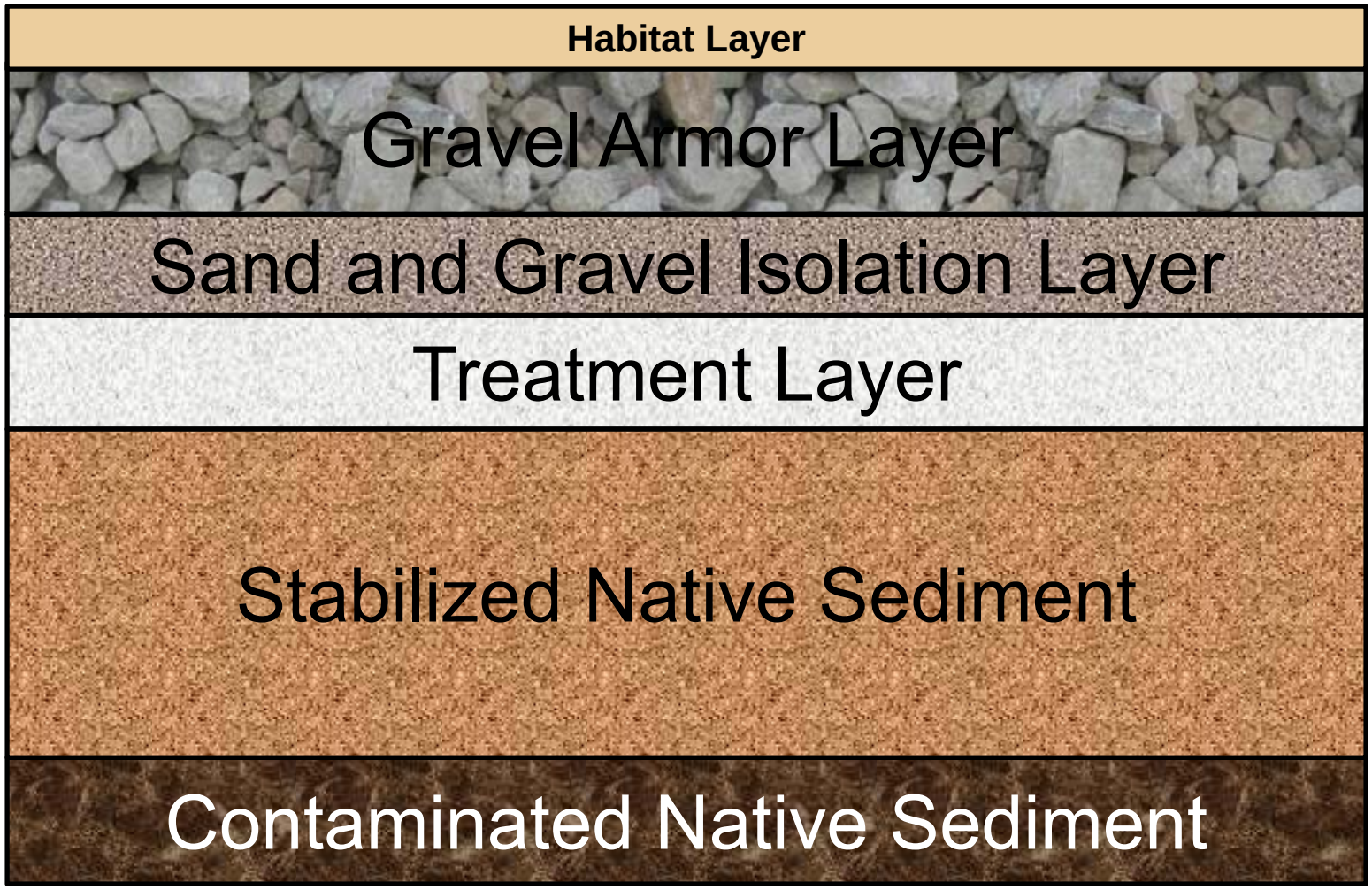
- **Capping-only alternative not considered because:**
  - **Cap in RTA 1 would restrict water depth and expose large area of sediment at low tide**
  - **Cap in RTA 2 would compress soft sediment and mobilize NAPL**
  - **Capping only remedy is not compatible with continued commercial navigation**

In Situ Stabilization (ISS)



- **ISS in areas where NAPL may migrate upward from native sediment**
- **Pre-design investigation planned to refine ISS approach and target areas**
- **ISS also should reduce contaminant transport to the canal via groundwater discharge**

Conceptual Layout of Capping and *In Situ* Stabilization

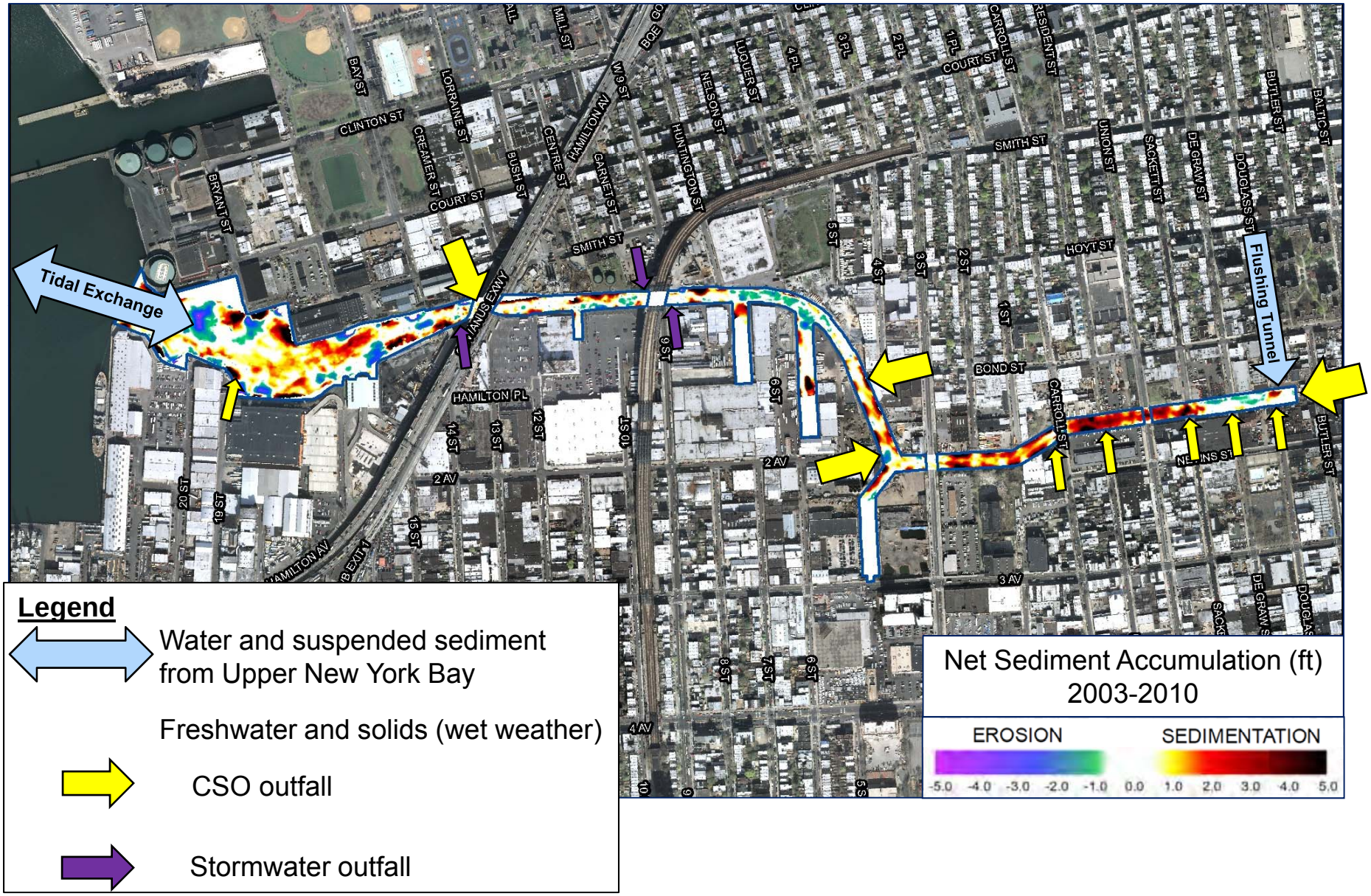


Source Control

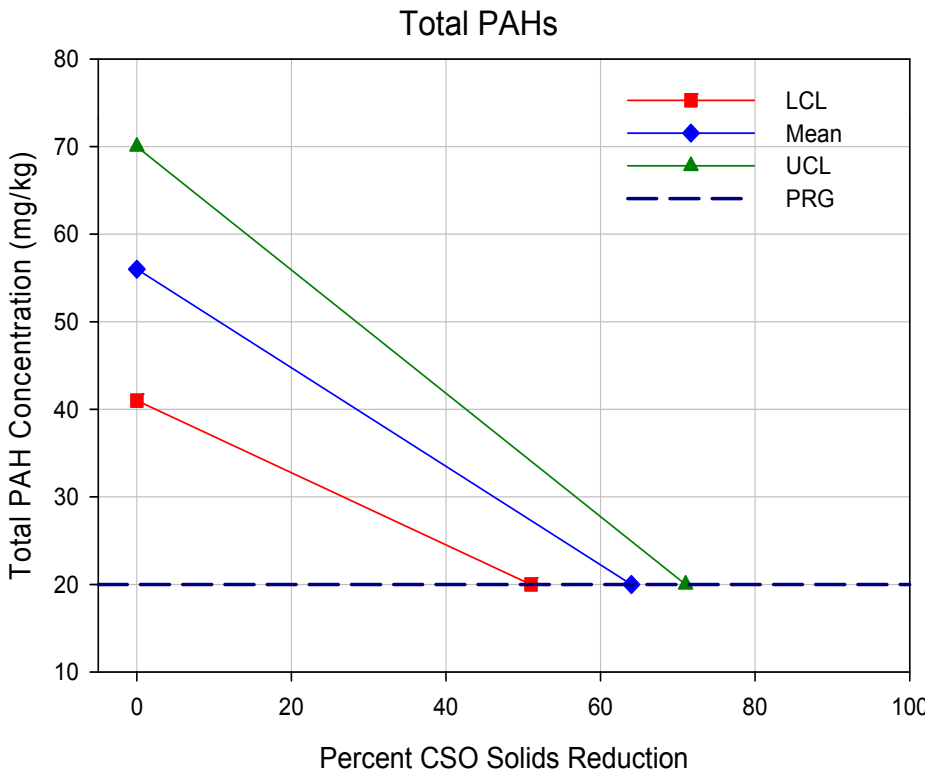
- Source control required for any alternative to be effective
- Included as a component of all action alternatives
- Source control measures for:
  - Discharges from former MGPs and other upland sites
  - CSO discharges
  - Contaminated groundwater discharge
  - Discharges from unpermitted pipes

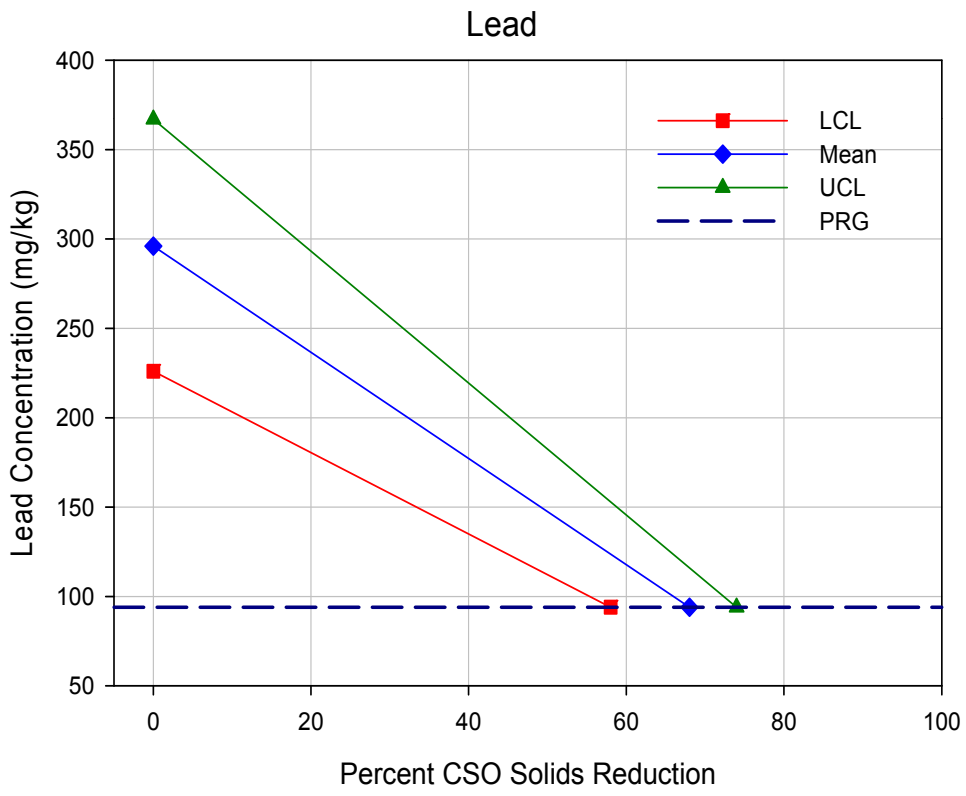
Source Control – Locations of Former MGPs

Source Control – CSO Discharges

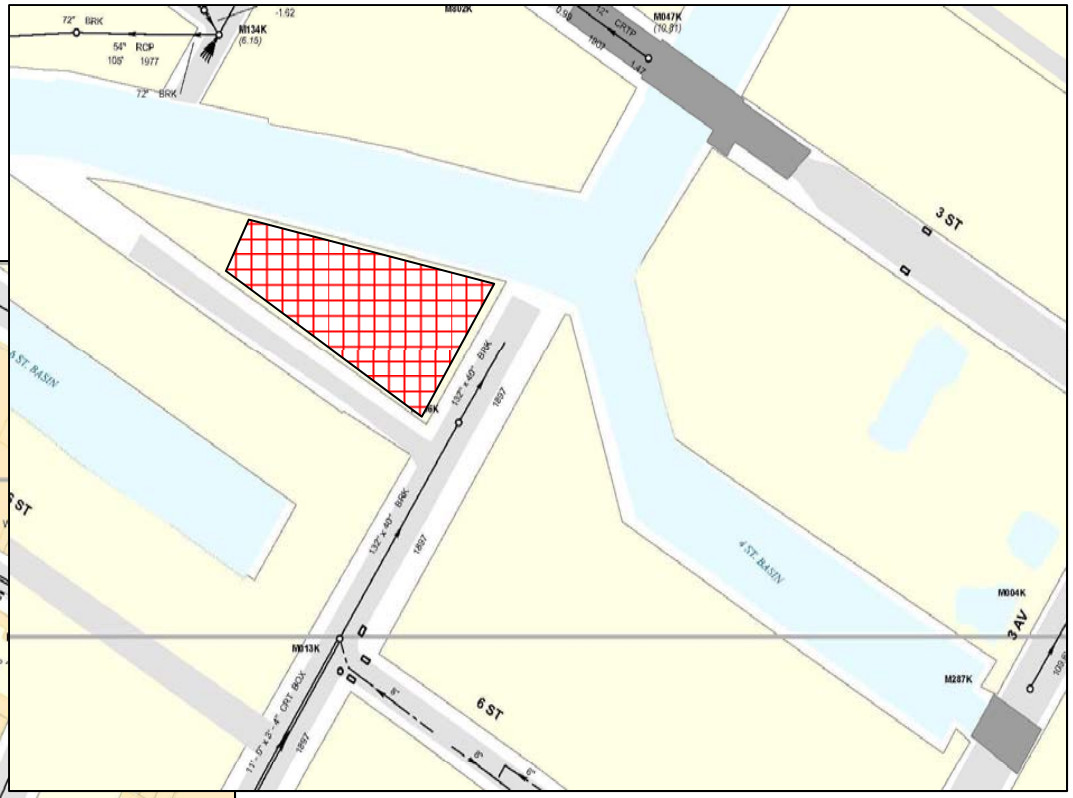


Source Control – Preliminary Estimate of Solids Reductions to Achieve Remediation Goals

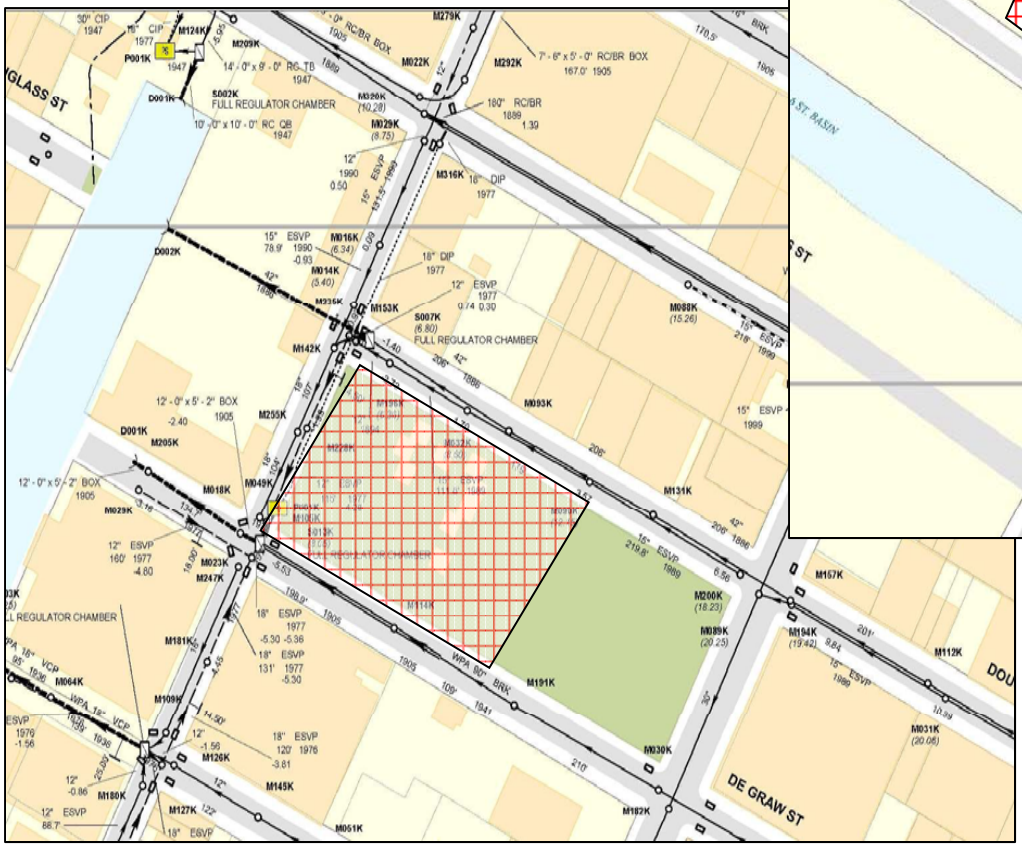




Source Control – Potential CSO Storage Tank Locations



CSO OH-007



CSO RH-034

1st Street Basin Excavation

- Component of all alternatives

Remedial Alternatives
Treatment and Disposal Options

		RTA1	RTA 2	RTA 3
A	Off-site thermal desorption, beneficial use	Y	Y	Y
B	Off-site disposal (landfill)	Y	Y	Y
C	Off-site cogeneration, beneficial use	Y	Y	Y
D	Off-site stabilization, beneficial use	Y	N	Y
E	On-site stabilization, beneficial use	Y	N	Y
F	Off-site stabilization/disposal in on-site Confined Disposal Facility (CDF)	N	N	Y
G	On-site stabilization/disposal in on-site CDF	N	N	Y

Y – yes (retained)
N – no (screened out)

Conceptual Diagram of Potential CDF

ES080211052107KNV

CH2MHILL.

Detailed Evaluation of Alternatives

- **Detailed evaluation performed using NCP criteria**
  - **Threshold Criteria**
    - ***Overall Protection of Human Health and the Environment***
    - ***Compliance with "applicable or relevant and appropriate requirements" (ARARs)***
  - **Balancing Criteria**
    - ***Long-term Effectiveness and Permanence***
    - ***Reduction of Toxicity, Mobility or Volume through Treatment***
    - ***Short-term Effectiveness***
    - ***Implementability***
    - ***Cost***
  - **Modifying Criteria**
    - ***State Acceptance indicates if, based on its review of the Proposed Plan, State concurs with proposed remedy***
    - ***Community Acceptance refers to public's general response to proposed remedy***

Preferred Remedy

Preferred Remedy
Dredging and Capping

- **RTA 1 and 2**
  - **Alternative 7**
    - ***Dredge all soft sediment***
    - ***In-situ stabilization of target areas of native sediment***
    - ***Cap with 3-layer cap***
- **RTA 3**
  - **Alternative 5**
    - ***Dredge all soft sediment***
    - ***Cap with 3-layer cap***
- **Remedy also includes**
  - **Excavation of 1st Street Basin**
  - **Source Controls**
  - **Institutional Controls**

Preferred Remedy
Source Controls

- **Former MGPs and other upland sites**
  - **Being addressed/evaluated by NYSDEC**
  - **Remedy for former MGP site Public Place includes:**
    - ***Cut-off wall between site and canal***
    - ***Removal of major mobile coal tar sources***
    - ***Recovery wells on approach to cut-off wall***
  - **Remedies for MGPs Fulton and Metropolitan may be similar**
  - **Schedules will be coordinated with the canal remedy**

Preferred Remedy
Source Controls (contd.)

- **CSO discharges**
  - **Solids reduction at two major outfalls**
  - **In-line retention tanks at RH-034 and OH-007 presumed, for cost estimating, to be 8-million and 4-million gallons, respectively**
  - **Estimated cost: $78 M**

- **Unpermitted pipe discharges**
  - **Coordinate with NYCDEP and NYSDEC to permit or seal**
  - **Minimal costs anticipated**

Preferred Remedy
Treatment and Disposal

- **RTA 1 – Upper Canal**
  - **Option A – Off-site thermal desorption**
    - ***NAPL impacted areas***
  - **Option D – Off-site stabilization, beneficial use**
    - ***Non-NAPL impacted areas***

- **RTA 2 – Middle Canal**
  - **Option A- Off-site thermal desorption**

- **RTA 3 – Lower Canal**
  - **Option D – Off-site stabilization, beneficial use**
  - **Option G – On-site stabilization, placement in onsite CDF; CDF contingent upon state and public acceptance**

Preferred Remedy
Cost

- **Present worth cost: $467-504 million**
  - **Capital: $286M**
  - **Annual O&M: $2M**
  - **Treatment and Disposal: $179-216 million**

Costs include 1st Street basin excavation and storage tank source controls at two CSOs

Basis: 7% discount rate and 30-year time interval

Costs are order of magnitude estimates, +50% to -30%

Costs assume RTA 3 sediment undergoes on-site stabilization and disposal in on-site CDF.

If off-site stabilization and beneficial use selected, costs increase by $37 million.

Basis for Remedy Preference

- **Removal of all soft sediment will**
  - **Permanently remove grossly-contaminated material from the environment**
  - **Limit potential for recontamination by multiple contaminants in the event of future cap failure**

Basis for Remedy Preference (contd.)

- **Removal of all soft sediment (contd.)**
  - **Greater water depth would support navigation and better protect the cap from damage**
  - **Necessary for remedy implementation and future maintenance of remedy and bulkheads**
- **Treatment and disposal options allow beneficial use of dredged sediments**

Schedule

- **Public comments due – March 28, 2013**
- **Selection of Remedy – Summer of 2013**
- **Completion of Remedial Design – by 2016**
- **Completion of Remedial Action – by 2022**

Questions?

Photo credit: Katia Kelly