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

Reference Area

Gowanus Canal Project Area

Legend
- Approximate Limit of Gowanus Creek Channel
- Flashing Tunnel
- Shaded Turning Basins, Locations Approximate

Note:
The Gowanus Creek Channel referenced in text extends from between Bryant and Hallock Streets to 35th Street. Approximate extent shown by two small hatched lines on map within Gowanus Bay.
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

Tar in sediment

Rising tar globs and sheen
Combined Sewer Overflows

9/16/2010: Storm flooding Gowanus Canal with Raw Sewage
by keanhokeanho

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

Sediment Mounds
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

- **Native Sediment**: Surface Sediment (top 6 inches of soft sediment)
- **Soft Sediment**: (1 to >20 ft thick; average 10 ft)
- **Surface Sediment**: (top 6 inches of soft sediment)
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

<table>
<thead>
<tr>
<th>Pathways Evaluated</th>
<th>Cancer Risk</th>
<th>Non-Cancer Hazard</th>
<th>Unacceptable Contaminants and Media</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct contact with surface sediment and surface water and breathing air during recreational use</td>
<td>✔</td>
<td></td>
<td>Carcinogenic PAHs in sediment and surface water</td>
</tr>
<tr>
<td>Direct contact with surface sediment and surface water and breathing air during canal overflow</td>
<td>✔</td>
<td></td>
<td>Carcinogenic PAHs in sediment</td>
</tr>
<tr>
<td>Ingestion of fish and crabs</td>
<td>✔*</td>
<td>✔*</td>
<td>PCBs in tissue</td>
</tr>
</tbody>
</table>

*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

<table>
<thead>
<tr>
<th>Contaminant</th>
<th>Concentration (mg/kg)</th>
<th>Recreational Use</th>
<th>Fish/Crab Ingestion</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Upper Bound (1 x 10^-4)</td>
<td>Lower Bound (1 x 10^-6)</td>
</tr>
<tr>
<td>BAA</td>
<td>24</td>
<td>0.40</td>
<td>--</td>
</tr>
<tr>
<td>BAP</td>
<td>2.4</td>
<td>0.040</td>
<td>--</td>
</tr>
<tr>
<td>BBF</td>
<td>24</td>
<td>0.40</td>
<td>--</td>
</tr>
<tr>
<td>BKF</td>
<td>240</td>
<td>4.0</td>
<td>--</td>
</tr>
<tr>
<td>DA</td>
<td>2.4</td>
<td>0.040</td>
<td>--</td>
</tr>
<tr>
<td>ID</td>
<td>24</td>
<td>0.40</td>
<td>--</td>
</tr>
<tr>
<td>Total PCBs</td>
<td>--</td>
<td>--</td>
<td>0.48</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Contaminant</th>
<th>Concentration (mg/kg)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Benthic Community</td>
<td>Herbivorous Birds</td>
</tr>
<tr>
<td>Total PAH</td>
<td>20*</td>
<td>230</td>
</tr>
<tr>
<td>Copper</td>
<td>80</td>
<td>--</td>
</tr>
<tr>
<td>Lead</td>
<td>94</td>
<td>--</td>
</tr>
</tbody>
</table>

*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

<table>
<thead>
<tr>
<th>Habitat Layer</th>
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</thead>
<tbody>
<tr>
<td>Gravel Armor Layer</td>
</tr>
<tr>
<td>Sand and Gravel Isolation Layer</td>
</tr>
<tr>
<td>Treatment Layer</td>
</tr>
<tr>
<td>Stabilized Native Sediment</td>
</tr>
<tr>
<td>Contaminated Native Sediment</td>
</tr>
</tbody>
</table>
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 – Preliminary Estimate of Solids Reductions to Achieve Remediation Goals

Total PAHs

- LCL
- Mean
- UCL
- PRG

Lead

- LCL
- Mean
- UCL
- PRG
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

| 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
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