GOWANUS CANAL SUPERFUND SITE
RECORD OF DECISION

APPENDIX V

RESPONSIVENESS SUMMARY

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RESPONSIVENESS SUMMARY
FOR THE
RECORD OF DECISION
GOWANUS CANAL SUPERFUND SITE
BROOKLYN, KINGS COUNTY, NEW YORK

INTRODUCTION

This Responsiveness Summary provides a summary of citizens' comments and concerns received during the public comment period related to the Gowanus Canal Superfund site (Site) Proposed Plan and provides the U.S. Environmental Protection Agency's (EPA's) responses to those comments and concerns. All comments summarized in this document have been considered in the EPA's final decision in the selection of a remedy to address the contamination at the Site.

SUMMARY OF COMMUNITY RELATIONS ACTIVITIES

Due to the technically complex issues at the Site and the significant public interest, the EPA greatly augmented its interaction with the community beyond what is typical for the Superfund remedy selection process. Specifically, while the EPA typically releases RI/FS reports simultaneously with the Proposed Plan and conducts a public meeting to discuss the results of the investigation and the basis for the preferred remedy, for this Site, the RI and FS reports were released separately at the time of their respective completion in order to facilitate their review and understanding by the public. The RI report was made available on the EPA's website in January 2011 and the FS report was made available on the EPA's website in December 2011. Following the release of each of these documents, the EPA held separate public meetings in the Carroll Gardens and Red Hook neighborhoods to present the findings. These meetings were announced in the local press. Several follow up meetings to further discuss the technical issues and the community's concerns were held at the invitation of the Gowanus Canal Community Advisory (CAG) (which is composed primarily of local community group representatives whose role in part is to disseminate information to their groups), the local Community Boards and other local organizations.

On December 27, 2012, a press release was issued (which generated a number of on-line articles) and a number of e-mails were sent to the Site's mailing list re-announcing the availability of the RI and FS reports and announcing the availability of an FS addendum report and Proposed Plan[1] on the EPA's website. On December 28, 2012, the RI report, FS report, FS addendum report and Proposed Plan were made available to the public at information repositories maintained at the Community Free Library, located at the Carroll Gardens Library, the Joseph Miccio Community Center and the

[1] A Proposed Plan describes the remedial alternatives considered for a site and identifies the preferred remedy with the rationale for this preference.

EPA Region II Office. A notice of availability for the above-referenced documents was published in the *Courier Life*, *Red Hook Star-Revue* and *The Brooklyn Paper* on January 4, 2013. Notices were published in these papers again on January 18, 2013 to announce a revised starting time for the January 23, 2013 public meeting. On January 23, 2013 and January 24, 2013, the EPA conducted public meetings at Public School 58 (the Carroll School) and the Joseph Miccio Community Center, respectively, to present the Proposed Plan for the Site, including the preferred remedy, and to respond to questions and comments from the approximately 200 attendees at the January 23, 2012 meeting and 100 attendees at the January 24, 2012 meeting. At both of the meetings, there was nearly unanimous, strong support for the proposed remedy. At the January 24, 2013 meeting, concerns were expressed by the public about an option proposed by EPA for the disposal in an on-Site confined disposal facility (CDF)[2] for the stabilized, lesser contaminated sediments.

Prior to the release of the Proposed Plan and the commencement of the public comment period, a member of the CAG expressed concern that a 30-day comment period would be too short to provide the CAG members and other stakeholders sufficient time to provide technically well-informed comments. Accordingly, a 90-day public comment period was announced at the time of the release of the Proposed Plan.

In response to a January 28, 2013 request from a representative of New York City (NYC) that the public comment period be extended 30 days, the comment period was extended to April 27, 2013.

A notice announcing the extension of the public comment period to April 27, 2013 was published in the *Courier Life*, *Red Hook Star-Revue* and *The Brooklyn Paper* on March 22, 2013.

During the comment period, the EPA held informational meetings with the CAG in Carroll Gardens on February 11, 2013, the Red Hook community on February 13, 2013, the residents of public housing located immediately north of the canal on March 27, 2013, the Red Hook community on April 16, 2013, the CAG on April 23, 2013 and the residents of public housing in Red Hook on April 25, 2013 to discuss, in more detail, the specifics of the Proposed Plan and to answer additional questions from the community. With the exception of the April 25, 2013 meeting which was attended by 25 people, all of the other follow up meetings were well attended.

SUMMARY OF COMMENTS AND RESPONSES

Comments were received at the two public meetings and in writing (letters, postcards and e-mail).

[2] A secure structure designed to contain dredged sediments (in this case, after stabilization) within a waterway.

The public generally supports the dredging, capping and combined sewer overflow (CSO)[3] contaminated solids abatement components of the remedy. The CAG, which is comprised of approximately 50 members representing over 30 organizations and 20 non-organizational members, passed resolutions in support of the overall remedy, including 100% CSO control. Community Board Six, a municipal entity which represents the neighborhoods surrounding the canal, submitted comments supporting the overall remedy.

While 15 businesses and approximately 700 Red Hook residents located in close proximity to the proposed location of the CDF expressed support for its construction, approximately 900 parties located in other sections of Red Hook, elsewhere in New York State and in other states expressed strong opposition to the CDF option. In addition, No Toxic Red Hook submitted two similar petitions to the EPA containing approximately 2,500 original names and signatures from business owners, residents, users of the recreation area and concerned citizens. The petitions express opposition to the processing of contaminated sediments in Red Hook and their placement in a local CDF. The petitions can be found in Appendix V-f.

Although various development interests filed formal comments in opposition to nomination of the Site for the National Priorities List (NPL) in 2009, no comments were filed in opposition to the Proposed Plan by the developers who have acquired property along the canal for residential, commercial and other redevelopment purposes since the Site was placed on the NPL.

Friends of Douglass Greene Park presented the EPA with a petition with 765 parties expressing opposition to the placement of an in-line sewage/stormwater retention tank beneath the Douglass and Degraw community pool. The petition also sought an assurance from the EPA that should any disruption or displacement to the pool be necessary as a result of the remediation, the park's facilities and services would be provided at a nearby location.

The NYC Department of Environmental Protection (NYCDEP), a potentially responsible party (PRP), submitted 124 pages of comments, with approximately 300 pages of attachments. When read in their entity, NYCDEP's comments state that the CSOs do not contribute to unacceptable impacts to the canal, lengthy additional studies are needed prior to remedy selection, further nonaqueous phase liquid (NAPL)[4] controls are needed and various project complexities effectively prevent addressing the contamination in the canal. National Grid, another PRP, submitted 43 pages of comments and 600 pages of attachments. National Grid, in sum, agreed that a cleanup of the canal can be done, despite significant technical challenges, asserted that even greater CSO controls were warranted and advocated for less dredging than

[3] Combined sewers receive both sewage and stormwater flows and discharge to the canal when the sewer system's capacity is exceeded.

[4] Concentrated liquid contamination, typically oil-like, that forms a separate phase and does not dissolve in water.

indicated in the proposed plan. Comments questioning various aspects of the remedy were also submitted by various other PRPs and industry-related parties. Notably, NYCDEP was alone in stating that no further CSOs controls are warranted. Industry and other PRP commenters suggested that additional CSO controls beyond those set forth in the Proposed Plan are needed for an effective cleanup.

The transcripts from the two public meetings can be found in Appendix V-d.

The written comments (letters, postcards and e-mails) submitted during the public comment period can be found in Appendix V-e. A summary of the comments provided at the public meetings and in writing, as well as the EPA's responses to them, are provided below.

Historical Discharges

Comment #1: A commenter stated that, in the future, it would be better for the EPA to be proactive in preventing the need for hazardous waste site cleanups.

Response #1: Following the canal's construction in the mid-1800s, sewage and industrial wastes were discharged directly into the canal, consistent with the poor environmental practices typical of the era. As a result of these discharges, the canal quickly became and has remained as one of New York's most polluted waterways.

Following the creation of the EPA in 1970, Congress passed a number of laws with the intention of improving the environment. The Clean Water Act (CWA), passed in 1972, was established with the goal of eliminating releases of high amounts of toxic substances into surface water. The Resource Conservation and Recovery Act (RCRA) was passed in 1976 to address the nation's increasing problems from municipal and industrial waste. The purpose of RCRA is to ensure proper management of hazardous wastes from the point of generation until final disposal. The CWA and RCRA have resulted in significant improvements in the handling of hazardous substances, greatly reducing the creation of new hazardous waste sites.

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), more commonly known as "Superfund," was created in 1980, primarily to address the releases that occurred in the past. With the selected remedy for the Site, the EPA intends to comprehensively address the various ongoing sources which continue to contribute contamination to the canal, including three former manufactured gas plants (MGPs) and ongoing discharges of contaminated CSO solids.

Potentially Responsible Parties

Comment #2: A commenter stated that many businesses that made large profits over the years polluted the canal and the upland areas. The commenter, as well as several other commenters, opined that those that are responsible for the contamination should be held accountable for it.

Response #2: Under state and federal Superfund laws, the parties that are responsible for creating hazardous waste sites are responsible for addressing the contamination, either by performing the necessary investigatory and remediation work themselves or by providing funds so that the State or the EPA can perform the work.

The former MGP facilities are being addressed under the State Superfund and Brownfield Cleanup programs by National Grid, a PRP for these facilities (as well as the Site).

The EPA has identified a number of PRPs related to the canal, with the primary ones being NYC and National Grid. In April 2010, the EPA entered into administrative consent orders (AOCs)[5] with NYC and National Grid to perform work in support of the EPA's remedial investigation/feasibility study (RI/FS) for the canal. Following the selection of a remedy for the Site, it is the EPA's intention to use its enforcement authorities to compel the PRPs to undertake the performance of the design and construction of the remedy at their own expense.

Sediment Transport and Deposition – Current Conditions in Canal

Comment #3: The PRP Group[6] provided comments related to sediment transport and deposition in the canal under current conditions. The general topics covered by these comments are summarized below.

- The Proposed Plan does not discuss how the pattern/deposition rate of sediment may have changed since 1850 and the factors responsible; understanding these factors is crucial to the selection of the remedy and source control design/methodologies.
- The Proposed Plan does not explain why the upper canal is the reach most affected by deposition of CSO solids, or why the lower reach is not similarly impacted, and appears to contain internal inconsistencies related to the description of sediment transport and deposition processes.

Response #3: Sediment deposition rates and patterns in the canal have varied since 1850 due to the use of the canal as an open sewer, construction and operation of the Flushing Tunnel, watershed development, episodic dredging events, vessel

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[5] AOCs are legal documents that formalize an agreement between the EPA and PRPs covering the PRPs' responsibilities to perform investigatory work at a Superfund site.

[6] The PRP Group consists of Beam, Inc.; The Dun and Bradstreet Corporation; ExxonMobil Oil Corporation; Hauck Manufacturing Company; Hess Corporation; Honeywell International, Inc.; MRC Holdings, Inc., for itself and on behalf of Citigroup, Inc.; Patterson Fuel Oil Company, Inc.; Ream Beverage Can Company; SPX Corporation as successor to O-Z/Gedney Co., Inc.; Union Oil Company of California and Verizon New York Inc.

movements, changes in the sewer system configuration and other factors. Given the complexity of the canal's history, any attempt to characterize historic patterns and rates of sediment deposition would be largely speculative. This historic information is not needed to select and design the remedy for the canal. The remedy's design must be based on expected future conditions. Therefore, the EPA does not plan to further investigate historic sediment deposition rates and patterns.

The lack of tidal flow to the upper reach of the canal was anticipated even before the canal was constructed. The general history of the flow problems created by the canal's configuration and sewage inputs, including the accumulation of CSO sediment in the upper reach, has been documented in multiple reports by NYCDEP (1983 201 Facilities Plan, 1993 Inner Harbor CSO Facility Planning Project, 2001 Gowanus Facilities Upgrade Plan, 2007 Receiving Water Quality Modeling Report, 2008 *Gowanus Canal Waterbody/Watershed Facility Plan Report (*WWFP)). NYC is also currently under order from the State to dredge the accumulated CSO sediment mound in the upper reach--work that was first proposed and approved in 1983.

The "CSO Impacts" section of the FS report addendum explains why the upper reach of the canal is most affected by the deposition of CSO solids: (1) the outfall at the head of canal (RH-034) has the single largest contribution to annual CSO discharge; (2) the shallow sediments (0-2 feet depth interval) in the upper reach are less influenced by impacts from the former MGP facilities or historical industrial discharges and (3) the sediments in the upper reach are less susceptible to resuspension by propeller wash from vessel traffic or from tidal forces. While the middle and lower reaches of the canal are impacted by CSO solids**,** the middle reach is also heavily impacted by the two former MGP facilities located there and the lower reach is influenced by incoming sediment from Gowanus Bay and Upper New York Bay. When sediments are resuspended in the middle reach of the canal by vessel activity, the coarser-grained fraction redeposits first and the finer-grained fraction remains in suspension for a longer period of time. The portion of the finer-grained fraction that is transported to the lower reach by tidal advection-dispersion mixes with relatively clean incoming suspended sediments from Gowanus Bay and Upper New York Bay, resulting in an overall decrease in contaminant concentrations.

Finally, the approach utilized in the selected remedy also reduces the relevance of historic sediment deposition rate and patterns. Full removal of the accumulated sediment eliminates this as a post-construction source of sediment transport. CSO solids control measures, combined with the work currently being implemented by the NYCDEP will significantly reduce CSO solids inputs.

Reference Areas

Comment #4: National Grid and NYCDEP commented regarding the selection of the reference area for the canal RI/FS and the use of Gowanus Bay and Upper New York Bay reference area data to predict post-remedy conditions within the canal as follows:

- National Grid noted that if NYCDEP cannot reach full CSO control because it is technically infeasible or prohibitively costly (or both), then any ongoing contribution should be considered background for the canal.
- National Grid noted that the Proposed Plan does not fully acknowledge that the post-remedy environment of the canal will continue to receive stormwater and CSO discharges from heavily urbanized and industrialized properties; there is no basis for concluding that polycyclic aromatic hydrocarbon (PAH) concentrations in post-remedy surface sediments would be near the upper end of the Gowanus Bay and Upper New York Bay reference range (14 milligrams per kilogram [mg/kg]).
- NYCDEP noted that the Gowanus Bay and Upper New York Bay reference locations are open water areas that are not as protected as the canal, and sediments that accumulate in the reference area are likely to be different from those that accumulate in the canal.
- NYCDEP noted that the EPA should consider the reference area data collected for the Newtown Creek RI/FS. These reference area data were collected from 14 water bodies that were categorized as industrial with CSO input, industrial with minimal or no CSO input, non-industrial with CSO input and non-industrial with minimal or no CSO input.

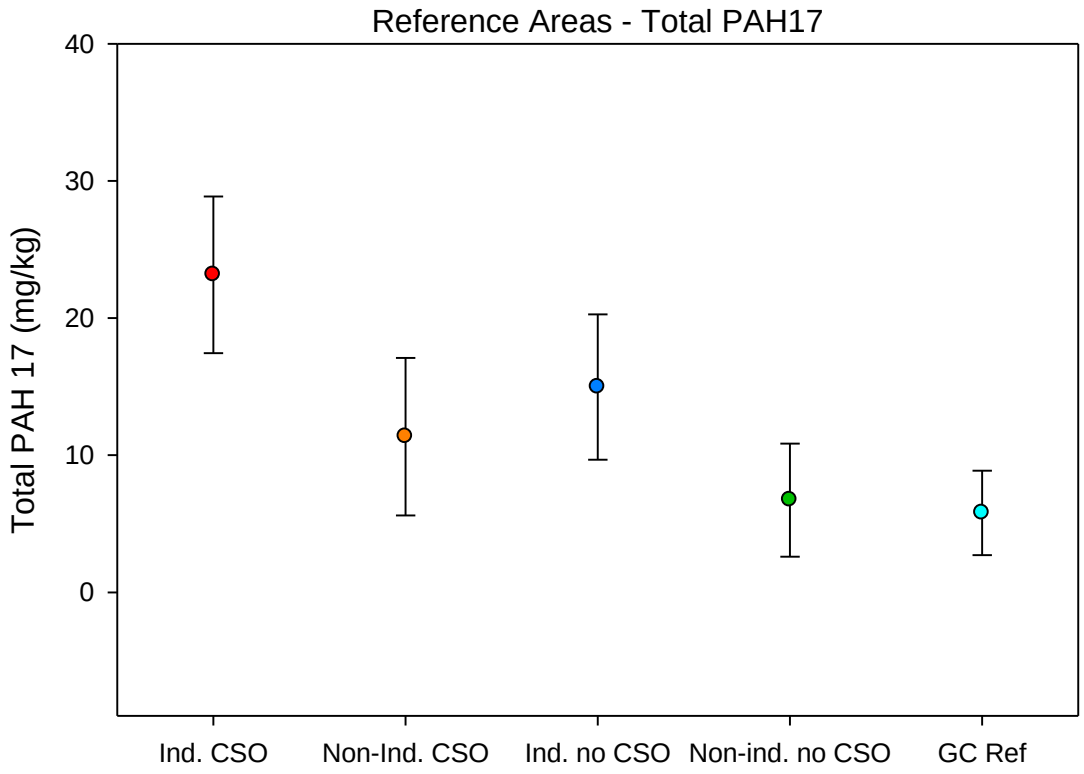
Response #4: The sediment remedy will result in a clean cap surface on the bottom of the canal. If the PAH contributions from the former MGP facilities and CSOs were completely eliminated, then the solids-associated PAHs deposited on this clean surface would be derived primarily from solids delivered to the canal from Upper New York Bay through tidal action and the Flushing Tunnel, storm sewers and direct overland flow. The suspended sediments from Gowanus Bay and Upper New York Bay would be expected to have a substantial post-source control influence on sediment quality because less than 10 percent of the canal watershed is drained into the canal by storm sewers and direct runoff (assuming that no high-level sewer separation would occur) However, since CSOs to the canal will not be entirely eliminated as part of the sediment remedy, the newly-established background level of PAHs in surface sediment will depend on the level of CSO reductions achieved. The goal is to reduce the contribution of CSO solids so that the average total PAH concentration in canal's surface sediments after remediation does not exceed the preliminary remediation goal (PRG)[7] of 20 mg/kg.

[7] Because there are no promulgated standards or criteria that apply to the cleanup of contaminated sediments in New York, Site-specific, PRGs for sediments in the Gowanus Canal were developed. PRGs are used to define the extent of cleanup needed to achieve the RAOs. A "clean" surface will be established at the bottom of the Gowanus Canal at the end of remedy construction. The PRGs will be used as performance targets for this "clean" surface.

In other words, the remedy will be designed to achieve a total PAH background concentration of less than 20 mg/kg total PAH.

Data recently collected from candidate reference areas for the Newtown Creek Superfund site RI indicate that the range of PAH concentrations in enclosed and semi-enclosed industrial embayments without CSOs is comparable to the reference area concentrations measured in the Gowanus Canal RI. Specifically, surface sediment samples were collected from 14 enclosed or semi-enclosed water bodies generally located throughout Jamaica Bay and the Upper East River. The 14 areas were selected to represent four general categories of reference areas: (1) industrial with CSOs; (2) industrial with no or minimal CSO input; (3) non-industrial with CSOs and (4) non-industrial with no or minimal CSO input (Anchor QEA, 2012). Although with respect to the Newtown Creek Superfund site RI, the data are still under evaluation and specific locations for background and reference have not been determined, the data from the candidate reference areas collectively provide an indication of the PAH concentrations that can reasonably be expected in various types of water bodies. The Gowanus Canal watershed includes a mix of residential, commercial and light industrial land uses, and may fall between the industrial and non-industrial categories. Figure 1below, shows the mean total PAH concentration in each type of reference area, along with the 95 percent confidence interval for the mean (the Gowanus Bay and Upper New York Bay reference area (denominated as "GC Ref" in Figure 1) is also shown for comparison). For all categories except "industrial with CSOs," the mean and 95 percent confidence interval for the mean total PAH background concentrations are near or below 20 mg/kg.[8]

[8] PAH data for the Newtown Creek reference areas were not evaluated on a carbon-normalized basis because the PRG for the canal should be compared to the PAH concentrations in sediment at the point of exposure (in the canal), and reference area PAH concentrations are only moderately correlated with Total Organic Carbon (TOC) content (R = 0.57).



Notes: Mean and 95% confidence intervals; one result from Ind. CSO group excluded (304 mg/kg).

Figure 1: Comparison of Total PAH Concentrations in Surface Sediment from the Newtown Creek and Gowanus Canal Reference Areas

Although Gowanus Bay and Upper New York Bay are more open than the canal, the sediments in this area provide the best available representation of regional background conditions excluding point source releases and surface runoff to the canal. As reported in the CSO Impacts section of the FS report addendum, the estimated total PAH concentrations on suspended sediments in the surface water samples from the Gowanus Bay and Upper New York Bay reference area are similar to the reference area surface sediment concentrations. Figure 1 indicates that the mean PAH concentration in the Gowanus Bay and Upper New York Bay reference area is similar to the "non-industrial with no or minimal CSO input" category for the Newtown Creek reference area.

The newly-established background condition in the canal after the remedy implementation is expected to have an average total PAH concentration of 20 mg/kg. That is higher than the Gowanus Bay and Upper New York Bay reference, but within the range of background concentrations for a New York Harbor setting with characteristics similar to the Gowanus Canal.

PCB Concentrations in Surface Sediment from Canal and Reference Area

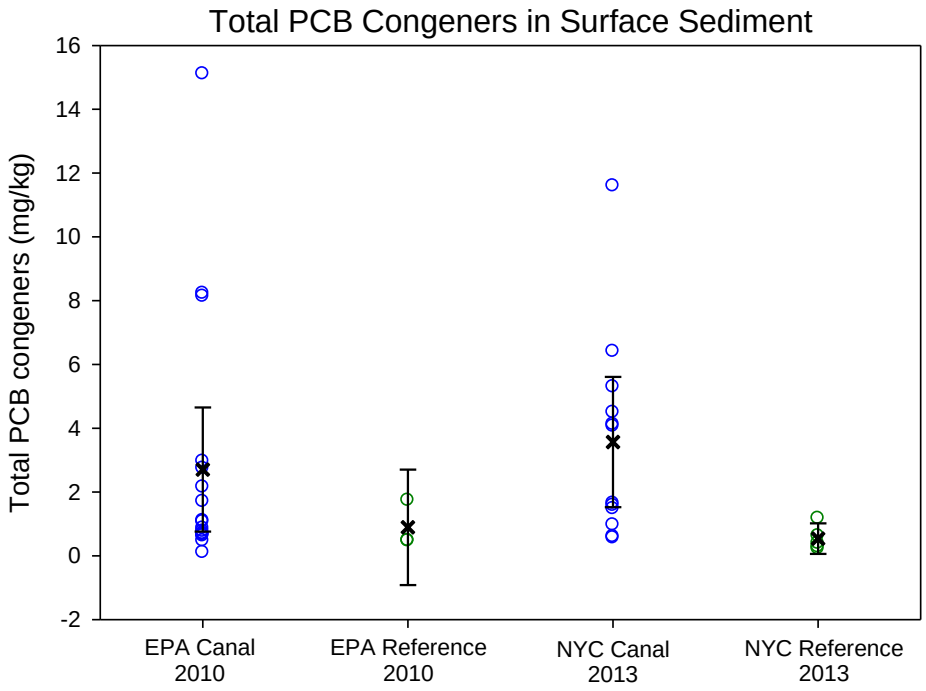
Comment #5: Consolidated Edison (ConEd), a PRP, stated that there is no statistically significant difference between total PCB congener concentrations in surface sediment samples from the canal and samples from the Gowanus Bay and Upper New York Bay reference area.

Response #5: The EPA did not perform statistical comparisons of total PCB congener concentrations because fewer than ten sampling results were available for the reference area samples. Specifically, only three reference area samples were analyzed for PCB congeners, which is an insufficient number for a robust statistical comparison. The statistical comparison of total PCB Aroclor results (27 canal and 10 reference area samples) indicated that the median concentration in the canal samples is significantly higher than in the reference samples. However, as noted in the Proposed Plan, PCB congener data are more reliable for the quantification of PCBs in sediments.

The plot in Figure 2, below, shows the distribution of total PCB congener concentrations in surface sediment samples collected by the EPA in 2010 for the RI. Also shown are the total PCB congener concentrations in samples collected by NYCDEP at a subset of the RI locations in 2013 (including five of the reference area locations). The EPA and NYCDEP results are consistent, and both show that the mean total PCB congener concentration in canal sediments is above the 95 percent confidence interval of the mean reference area concentration. Total PCB congener concentrations of greater than 4 mg/kg were detected in some of the canal surface sediments. Additionally, PCB Aroclor data for deeper soft sediment[9] show concentrations as high as 51 mg/kg (EPA, 2010 RI samples) and 66 mg/kg (National Grid, 2012 CSO mound samples[10]). These results clearly show that some of the surface and deeper soft sediments in the canal are contaminated with PCBs at levels that are substantially higher than reference area concentrations. PCBs in deeper soft sediments may be transported by various events, including vessel scour and storm events.

[9] "Soft sediment" is defined as the hazardous substance-contaminated sediments which have accumulated above the native sediments.

[10] These results were provided in National Grid's comments on the Proposed Plan .



Notes: NYC results are based on unvalidated data. Field duplicates are averaged.
The mean and 95 percent confidence interval is shown for each sample group.

Figure 2: Distribution of Total PCB Congener Concentrations in Surface Sediment Samples

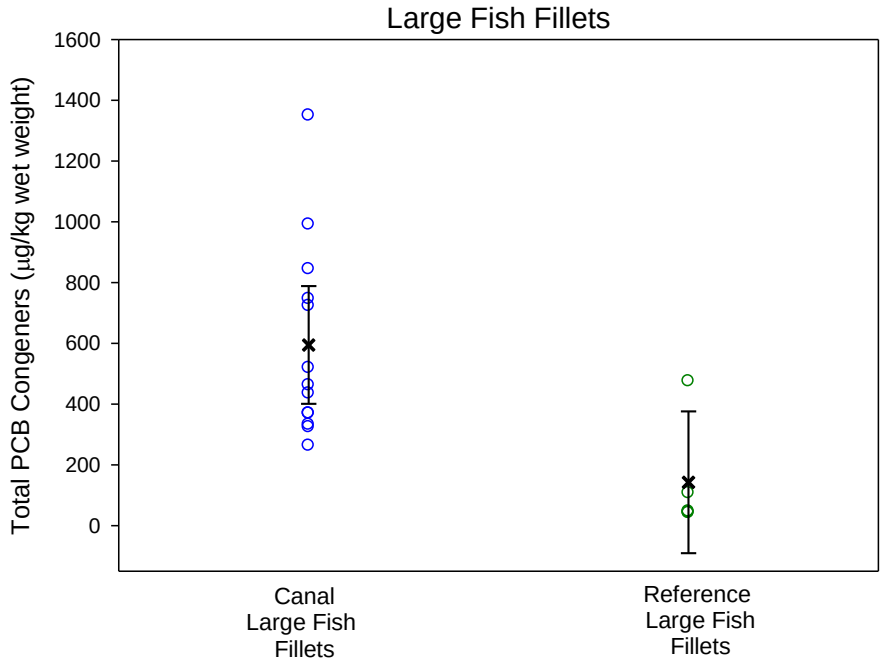
PCB Concentrations in Fish and Crab Tissue Samples from Canal and Reference Area

Comment #6: ConEd asserts that the EPA has not supported the assertion that PCB levels in fish taken from the Gowanus Canal are about two times higher than PCB levels in fish taken from the reference area.

Response #6: The Proposed Plan states that the "average concentrations of PCBs in the canal fish and crab samples were about two times higher than the average PCB concentrations in the reference area samples collected from Gowanus Bay and Upper New York Bay." This statement is based on the comparison of total PCB congener concentrations in American eel fillet and whole body blue crab tissue samples because these were the only species evaluated in the human health risk assessment (HHRA) that were caught in both the canal and reference area. Although striped bass and white perch were caught in the canal, none were caught in the reference area, so direct comparisons were not possible. The average concentration of total PCB congeners in the eel fillet samples from the canal (six samples) was 862 micrograms per kilogram (µg/kg) wet weight, which is 1.8 times higher than the concentration in the single American eel fillet sample from the reference area (475 µg/kg wet weight). The average total PCB congener concentration in whole body blue crab from the canal (12 samples) was 157 µg/kg, which is 1.7 times higher than the average concentration in the reference area samples (91 µg/kg; eight samples).

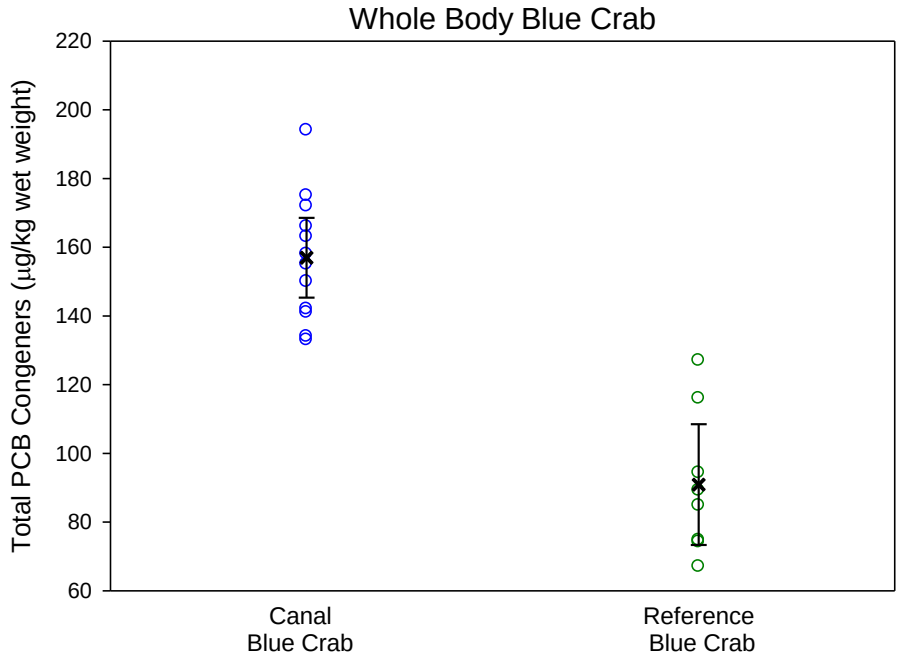
The concerted fish and shellfish collection effort undertaken for the RI did not yield sufficient numbers of samples of the same large fish species from both the canal and reference area to perform robust statistical comparisons. The plots in Figures 3 and 4, below, show the total PCB congener concentrations in all large fish fillets and whole body blue crab samples for the canal and reference area. Although the results for the large fish fillets reflect a different mix of species in the canal and reference area, the data collected to date indicate that PCB concentrations in large fish and crab tissue are higher in the canal than in the Gowanus Bay and Upper New York Bay reference area.

It should be noted that pre-existing New York State fishing advisories apply to both the canal and the harbor. Despite these advisories, there is evidence of fish consumption within the canal and near the mouth of the canal, particularly for subsistence fishing within communities with environmental justice (EJ) concerns. PCBs in both the canal and the harbor are a source to fish and crab tissue. The PCBs in the canal are co-located with other COCs in the accumulated sediment. As a result, all of the PCB mass in the canal will be removed as part of the selected remedy. This removal is expected to lead to the elimination of PCBs available for fish and crab uptake within the canal. Given that the unacceptable human health exposure pathway for fish ingestion is caused solely by PCBs, addressing this exposure risk through removal of the accumulated sediments is warranted. Such removal will also reduce PCB transport to the harbor and is expected to improve the background risk from ingestion of PCB-contaminated fish.



Notes:
Gowanus Canal - 6 American eel, 5 smallmouth bass, 2 white perch
Reference Area - 1 American eel, 3 scup, 1 weakfish
The mean and 95 percent confidence intervals are shown for each sample group.

Figure 3: Total PCB Congener Concentrations in All Large Fish Fillets Samples for Canal and Reference Area



Notes:
The mean and 95 percent confidence intervals are shown for each sample group.

Figure 4: Total PCB Congener Concentrations in Whole Body Blue Crab Samples for Canal and Reference Area

PCB Sources

Comment #7: NYCDEP asserts that there are sources of PCBs to the Gowanus Canal other than CSOs that have not been identified.

Response #7: The RI/FS did not identify specific sources of PCBs to canal sediments other than CSOs and historic discharges. The CSO samples collected for the RI were analyzed for PCB Aroclors only, which were detected in one wet weather CSO water sample. CSO samples collected by NYCDEP in 2013 were analyzed for PCB congeners; total PCB congener concentrations on CSO solids ranged from 0. 24 to 0. 94 mg/kg. These levels may be indicative of the low levels of PCBs typically found in urban runoff. These concentrations are substantially lower than total PCB congener concentrations in some of the surface sediment samples collected from the canal, particularly samples collected from the middle reach where total PCB congener concentrations are as high as 15 mg/kg. As noted previously, removal of all of the accumulated sediment as part of the selected remedy will address any PCB contributions from within the canal. The area with the highest detected PCB concentration was in sediments in the middle reach of the canal. Additional sampling will be conducted during the remedial design to determine if there is an upland source at this location which requires control. Upland sources referred to NYSDEC will also be investigated, as appropriate. The use of PCBs was phased out in the 1970's. ConEd's 3rd Avenue Service Center, which has operated since 1925, is located in the middle section of the canal, has been connected to the sewer system, handled PCBs for many

years, and has been the subject of numerous violations and spill events involving PCBs and other materials. See ConEd's November 16, 2009 Response to the EPA Information Request. The facility has been subject to corrective actions. It is also possible that some PCBs may continue to be transported from residual source areas (such as underground electric utility vaults) to the canal through CSO discharges. Based on the EPA's investigation of PRPs, the number of facilities believed to have handled PCBs in the vicinity of the canal is limited. As a result of these factors, the EPA believes that the PCB loading in the canal is primarily from historic disposal.

Source Characterization and Control

Comment #8: A commenter opined that the Proposed Plan is missing an integrated mapping of overall polluted upland areas and their impacts on the water and that the RI has sidestepped the issue of an integrated flood plain-wide pollution assessment. NYCDEP, National Grid, the PRP Group, the Sediment Management Workgroup[11] and Community Board Six note the importance of identifying, characterizing and effectively controlling all upland sources along the canal and coordinating these actions with the implementation of the canal remedy to prevent recontamination of the canal and to ensure the sustainability of the implemented remedy. The upland contaminant sources of concern identified by these commenters included:

- CSOs
- Former MGP facilities
- Other upland sites
- Surface runoff
- Unpermitted outfalls
- Direct loading of solids from eroding fill material along the shoreline through broken bulkheads

The general concerns that were expressed by the commenters include:

- NYCDEP, National Grid, the Sediment Management Workgroup, Community Board Six note that the Proposed Plan fails to adequately address the EPA's long-standing priority to control sources early, thereby posing a significant risk of recontamination. The priority should be controlling all contamination sources along the canal.
- The Sediment Management Workgroup and National Grid note that the Proposed Plan focuses on the sediments, rather than on potential sources of recontamination, such as CSOs, stormwater, groundwater and sediment resuspension due to commercial navigation and the Flushing Tunnel.
- NYCDEP and National Grid note that the Proposed Plan does not identify all potential continuing sources of contamination to the canal. The EPA should identify

[11]The Sediment Management WorkGroup is an *ad hoc* group open to membership from industry and government parties with responsibility for management of contaminated sediments. The work group's objective is to advance scientifically-sound approaches to improve sediment risk assessment, collect and share information to enhance and evaluate remedial technologies and alternatives and promote risk-based and cost-effective sediment management decisions.

and characterize these sources. The EPA should quantify the major sources of PAHs to the canal and evaluate their impacts under future conditions with respect to the proposed remedy.

- NYCDEP and National Grid note that the Proposed Plan does not present details on the remedial measures for controlling all sources of contamination to the canal, other than the former MGPs.
- National Grid notes that a background level after all sources of contamination to the canal are controlled should be established. After that, a control plan with specific steps and schedules can be established. The plan should control sources to the maximum achievable level, while it should simultaneously maintain flexibility and employ an adaptive management approach to design the rest of the remedy.
- NYCDEP, National Grid and the PRP Group note that upland sources are not well understood and the interception/remediation of these sources are not defined in the Proposed Plan. Historical operations along the canal include approximately 80 parcels directly adjacent to the canal that may be responsible for groundwater impacts.
- NYCDEP notes that the Proposed Plan does not recognize the critical importance of groundwater on the long-term effectiveness of the sediment remedy and the need to integrate groundwater management with in-canal remedies.
- NYCDEP notes that the Proposed Plan does not address the direct loading of solids from eroding fill material along the shoreline through broken bulkheads. Fill is known to contain ash and other wastes that are high in PAHs, metals and other contaminants.
- National Grid notes that hazardous wastes from accidental spills are conveyed to the canal through CSOs, storm water and unpermitted outfalls. These spills and transport routes must be recognized and addressed prior to any remedy selection.
- The Sediment Management Workgroup and National Grid note that the Proposed Plan does not adequately address the timing and sequencing of the sediment remedy and source control efforts.
- NYCDEP and National Grid note that the Proposed Plan does not offer tangible evidence of the EPA's coordination with others related to the anticipated implementation schedules for non-former MGP upland sites and CSO controls, relative to the sediment remedy. Such cleanups must be conducted prior to addressing canal sediments, as they present potential for recontamination.
- National Grid notes that the effectiveness of upland source control measures must be demonstrated prior to any remedy implementation.
- NYCDEP notes that the Proposed Plan should have described how the effectiveness of the reductions achieved as a result of source control will be monitored during the post-remedial five-year reviews.

The overall response addresses the following comment topics because of their interconnection:

- Consistency of the EPA's actions at the Gowanus Canal with the EPA's priority for source control
- Identification, characterization and remedial measures for all sources
- Timing and sequencing of sediment remedy in canal with source control efforts
- Coordination with other parties to implement the necessary source controls
- Monitoring and demonstrated effectiveness of source control measures

Response #8: The EPA recognizes the critical importance of identifying, characterizing and abating all continuing sources of contaminant releases to the canal and integrating these actions with the schedule for the sediment remedy in the canal. The EPA recognizes that controlling these releases is critical to ensuring the protectiveness and sustainability of the sediment remedy. To that end, the EPA included source control as a baseline component of all remedial alternatives evaluated in the FS and, by extension, in the selected remedy.

In the RI/FS reports and Proposed Plan, the EPA identified multiple sources and transport pathways for the release of contaminants to the canal. While all identified sources along the canal will be addressed, the EPA considers the primary ongoing sources of contamination to be the CSOs in the upper reach of the canal (outfalls RH-034 and OH-007) and the three former MGP facilities. The EPA is coordinating and will continue to coordinate with NYSDEC, which is directing the investigation and remediation of contaminated upland areas adjacent to the canal with the goal of developing and implementing remedies that will prevent recontamination of the canal. The EPA has identified and has referred to NYSDEC a number of properties along the canal, for NYSDEC investigation and, if necessary, remediation.

The EPA recognizes the importance of the timing of the implementation of the source controls relative to the implementation of the sediment remedy. To that end, the EPA developed a schedule for the implementation of the canal remedy that integrates the timing of the source controls at the former MGP facilities, CSOs and other sources identified along the canal. The EPA and NYSDEC have discussed this schedule and its elements and the responsibilities of each party in relation to ensuring that the overall schedule for the canal is achieved. This schedule is available at for review at http://www.epa.gov/region2/superfund/npl/gowanus/pdf/EPADECDEPGowanusTimeline11-2011.pdf.

Evidence of the cooperation and coordination between the EPA and NYSDEC is the rapid progress made at establishing the general scope and schedules for the source control remedies at the three former MGP facilities, which likely present the most complex challenges from all the upland properties identified for investigation of contaminant release potential. The source control remedies for the former MGP facilities need to be consistent with the remedial objectives and schedule for the sediment remedy in the canal.

After remedy implementation, as required under CERCLA, the EPA will be responsible for monitoring to assess the effectiveness of the source control measures and thus, the effectiveness of the remedy.

Combined Sewer Overflows

The majority of the commenters agreed with the need to control CSO discharges and suggested that higher levels of controls or capture of these discharges were needed than estimated in the Proposed Plan. NYCDEP, however, commented that the CSOs are not contributing to the contamination present in the canal. Therefore, NYCDEP asserted that CSO controls are not needed for CERCLA remedial purposes.

In a letter dated June 28, 2012, NYSDEC identified eight possible options that might be effective in addressing solids from CSOs and suggested that NYCDEP evaluate the feasibility of these options. NYCDEP completed its response (Evaluation of Possible Measures for CSO Solids Control, Gowanus Canal Superfund Site, Brooklyn, New York, October 3, 2012) for the following eight options:

- Optimizing existing sedimentation trap at outfall OH-007
- Improved maintenance program at the outfall OH-007 sediment trap
- Installation of silt curtains and/or netting facilities at all CSO outfalls discharging to the Gowanus Canal
- Yearly monitoring of CSO solids deposition in the canal
- Development of metrics for maintenance dredging of CSO solids in the canal
- Additional regular sewer cleaning in the drainage area
- Engineering evaluation of an interim or permanent sedimentation trap at outfall RH-034.
- Advance NYCDEP's dredging of CSO mounds at the head end of the canal to comply with the CSO Order on Consent, while seeking synergetic opportunities to advance the demonstration and development of remedial design protocols for dredging, dewatering, disposal, stabilization and capping pursuant to the Superfund program.

In parallel, the EPA evaluated possible options identified by NYSDEC and added to these options, the installation of CSO retention tanks.

The FS report addendum presented the degree of contaminated CSO solids reductions estimated to be required by the EPA to meet the established remedial action objectives for the canal, the results of the CSO solids control measure screening performed by the EPA and costs for the different CSO solids control options. The EPA selected the retention tank option because tanks are the only technology able to achieve the projected needed contaminated CSO solids reductions.

Former Manufactured Gas Facilities

The former MGP facilities are being characterized and addressed under the State Superfund and Brownfield Cleanup programs by National Grid, a PRP for these sites as well as for the canal.[12] The EPA and NYSDEC have agreed to a coordinated schedule

[12] NYC, which is an owner of major source area parcels at the Public Place Brownfields site and the former Fulton MGP State Superfund site, is also a PRP for these former MGP facilities.

for the former MGPs and canal sediment cleanup efforts based on the anticipated timing of the dredging in the canal (which would commence at the head of the canal).

In January 2012, NYSDEC directed National Grid to begin the expedited remedial design of a cutoff wall as an interim remedial measure for the Fulton former MGP, near the head of the canal. The purpose of this wall is to prevent subsurface migration of NAPL from the Fulton former MGP facility into the sediments at the bottom of the canal. For the Carroll Gardens/Public Place (formerly known as "Citizens Gas Works") (hereinafter, "Public Place") former MGP facility, the remedy includes a combination of excavation and a subsurface barrier wall and tar extraction wells. An investigation and partial source control cleanup was implemented at the Metropolitan site, the third and most southerly former MGP facility, in 2003 under the State's Voluntary Cleanup program. Since there are potential source areas at this former MGP facility that were not addressed by the actions taken in 2003, an RI is currently underway. Based upon the remedy selected for the Carroll Gardens/Public Place former MGP facility and the interim remedial measure for the Fulton former MGP, it is presumed that the remedy for the Metropolitan former MGP will include the construction of a cutoff wall between the former MGP facility and the canal, removal of remaining major mobile coal tar sources, and recovery of coal tar product collected in the approach to the cut-off wall.

The control measures described above are expected to address releases from the three former MGPs and provide the needed source control.

Other Upland Properties

The Gowanus Canal RI included an evaluation of the potential for contaminated groundwater to recontaminate canal sediments following implementation of the selected remedy. The EPA identified 16 locations that may represent potential ongoing sources of contamination to the canal via groundwater discharge. These sites were referred to NYSDEC for investigation and, if necessary, remediation under the State Superfund program.

Some of the identified locations appear to be areas where MGP tar has been transported outside the original source areas, deposited on the canal bottom and subsequently infiltrated into the banks of the canal at certain locations. Depending on the degree of contamination and the elevation of the contaminated soils, tar could move back toward the canal as dredging proceeds, presenting the potential for recontamination of sediments. Subsurface barrier walls along the bank of the canal may be required in these areas in order to protect the integrity of the canal remedy.

Relative to the former MGP facilities, these areas are significantly smaller potential sources of contamination to the canal and are, thus, expected to require only a fraction of the time and cost to address. The costs of these smaller upland parcels have not been included in EPA's decision document. The costs and remedy selection, to the extent required for these other parcels, will be determined in separate cleanup decisions following their respective investigations. Based on the EPA's ongoing interactions with NYSDEC, landowners, developers and PRPs, the EPA anticipates that the cleanups will be funded and performed by a variety of parties. These include developers of projects

along the canal (such as the Whole Foods and Lightstone Group), as well as current and former owners responsible for disposal.[13] The EPA will coordinate with NYSDEC the remediation schedules for these sites relative to the schedule for the canal remedy to ensure that they too do not compromise the effectiveness of the remedy.

The EPA proposes to address several of the identified locations as part of the remedy for the canal--the filled-in former 1st Street Basin; 400 Carroll Street (part of the Lightstone Group project) and a portion of the 5th Street Basin beneath the 3rd Avenue bridge.

Because the upland contamination source areas which may impact groundwater have been referred to NYSDEC for investigation and remediation, if necessary, the EPA believes that no additional components of a separate groundwater remedy are required as part of the overall remedy for the Gowanus Canal.

Within the canal boundaries, the proposed cleanup approach for the Gowanus Canal is consistent with OSWER Directive 9283. 1-33, June 2009, *Summary of Key Existing EPA CERCLA Policies for Groundwater Restoration,* because it does not rely on dilution or dispersion of contaminated groundwater discharging into the canal. The criteria in the OSWER Directive that "groundwater should not be allowed to migrate and further contaminate the aquifer or other media" has been met by identifying the groundwater discharges that should be addressed under the State Superfund program. Additionally, in-situ stabilization (ISS) and the active layer in the sediment cap will be designed to adsorb contaminants in upwelling groundwater prior to discharge to the canal.

The Region has completed additional studies to determine and manage, through stabilization and capping, the effects of contaminant leaching from native sediments to upwelling groundwater that discharges to the canal. These studies have used the recently developed Leaching Environmental Assessment Framework (LEAF) that has identified four new analytical methods to assess the leaching from native and stabilized media. A report on these studies has been recently issued and is part of the Administrative Record for the site.

Surface Water

While surface water runoff was identified as a contaminant transport pathway in the conceptual site model (CSM) for the canal, it was identified as a relatively minor source compared to other sources, because direct runoff drains only six percent of the watershed surrounding the canal. The EPA's assessment of this issue is consistent with studies performed by NYCDEP:

[13] Several of the sites referred by the EPA to NYSDEC appear to be potentially related to the former MGP facilities. NYSDEC is aware of the existence of parcels to which coal tar contamination may have migrated from the original former MGP facility parcels, particularly near Public Place. Parcels which further investigation shows are associated with the former MGP facility contamination will be addressed by National Grid, most likely as part of a second cleanup phase after the primary former MGP source areas have been addressed.

> Direct overland runoff from undeveloped areas immediately adjacent to the waterbody still occurs, but is insignificant in terms of magnitude and impact when compared to combined sewer and stormwater discharges. Therefore nonpoint source loads are not considered in the receiving water model. (NYCDEP Receiving Water Quality Modeling Report – Volume 4 – Gowanus Canal. City-Wide Long Term CSO Control Planning Project – September 2007, page 3-3).

NYC has a green infrastructure implementation plan for the coming years that it expects will lead to an incremental reduction in runoff entering the combined sewers and reduce CSOs to the canal. An added objective for this green infrastructure plan should be aiming to reduce the surface runoff that can discharge directly to the canal.

Unpermitted Pipe Outfalls

Nearly 250 outfalls were identified and evaluated in the RI. Based on the RI data and measurements, the loadings from the unpermitted outfalls are insignificant by comparison to other sources, such as the CSOs. The EPA's assessment in this regard is consistent with NYCDEP's 2008 WWFP:

> The NYCDEP Shoreline Survey Program has identified numerous point source discharges to Gowanus Canal. Approximately 144 outfalls were identified by the Shoreline Survey, of which about 126 were not already addressed elsewhere in this report as combined-sewer or storm sewer outfalls. . . .Overall, the total contribution of flow from these additional point sources was determined to be insignificant relative to CSO and stormwater inputs. The 154 MGD average induced flow resulting from the Flushing Tunnel, as described elsewhere in this report, further diminishes the significance of these inputs. (NYCDEP WWFP, 2008, pages 4-35 and 4-39).

Nevertheless, the selected remedy includes measures to control discharges through the unpermitted outfalls to the canal. Unpermitted discharges will be terminated by either sealing the pipes or requiring the property owner to obtain the necessary permit to continue the discharge.

Direct Loading of Solids from Eroding Fill Material along Shoreline through Broken Bulkheads

Solids contributed by erosion (including through bulkheads in disrepair) are of potential concern to the remedy if the solids contribute hazardous substances. Cleanup of the upland parcels should reduce or eliminate such hazardous substance loadings via erosion. In addition, the EPA anticipates that the majority of the bulkheads along the canal will be upgraded prior to or during the course of the remedial action, limiting the contribution of fill material via erosion through bulkheads. Where replacement is not needed for purposes of the remedy, the EPA will facilitate a streamlined permitting approach to reduce transaction costs and expedite approval.

In cases where bulkheads are so deteriorated that they may fail when the temporary sheet-piling is removed after dredging, the EPA intends to cooperate with NYC on inspection and enforcement of existing NYC bulkhead maintenance requirements.

Other Pipe Outfalls

Comment #9: National Grid provided comments related to the existence of unpermitted pipe outfalls along the length of the canal. The comments focused on characterization of the potential discharges from the pipes and the significance of the discharges to the evaluation and design of a remedy. The specific comments included the following:

- The RI did not evaluate wet weather discharges from any of these pipes. As a result, the chemical loading from these unpermitted discharges is unknown.
- Loading from the over 200 unpermitted pipes could be a significant factor in the evaluation of a Site remedy
- The EPA's investigations of unpermitted pipes is more of a "snapshot" and does not provide the entire story because they were not conducted concurrently with releases of contaminants from upland sources.
- There is no reference in the Proposed Plan as to where the data from the additional work of "tracing outfall features to their origin" can be found.

Response #9: The selected remedy requires that the unpermitted discharges be terminated by either sealing the pipes or requiring the property owner to obtain the necessary permit from New York State in order to continue the discharge. These measures will ensure that unpermitted discharges will not compromise the remedy's effectiveness and sustainability. The EPA will work with NYSDEC and NYCDEP to identify the property owners associated with unpermitted pipe outfalls and develop a plan to address the discharges.

Based on independent evaluations, both the EPA and NYCDEP concluded that the overall loading from the unpermitted pipes is minor compared to CSO and stormwater inputs. As noted above, the WWFP states that "Overall, the total contribution of flow from these additional point sources was determined to be insignificant relative to CSO and storm water inputs. The 154 [million gallons per day] average induced flow resulting from the Flushing Tunnel... further diminishes the significance of these inputs" (NYCDEP, 2008). Additional work to fully characterize and quantify the loadings from these pipes is unwarranted, given that they will be sealed or permitted as part of the remedy. Additional details of the pipe outfall evaluation, including the work that was performed to trace outfall features to their origin, are provided in the RI report, Appendix G: Survey of Outfall Features to the Canal.

Former Manufactured Gas Plant Facility Cleanups

Comment #10: A commenter asked whether there is a settlement agreement between National Grid and the State of New York to carry out the design and construction of remedial work at the three former MGPs facilities located along the canal.

Response #10: National Grid is the primary PRP for the former MGP facilities. The investigation and cleanup of the former Fulton Municipal Works and Metropolitan MGP facilities are being addressed by National Grid under an agreement with the State of New York. That agreement also covers a number of other additional facilities formerly

operated by Brooklyn Union Gas. Public Place is being addressed in a similar manner by National Grid under the State's Brownfield Cleanup programs. The design of the remedy that was selected for Public Place in 2007 is approximately 50% complete.

Comment #11: Because of the inability to remove all of the contaminants from the former MGP facilities and a concern that unforeseen events, such as a hurricane, might cause a release of contaminants, a commenter suggested that it be mandated that the former MGP properties be restricted to open space, parkland or restored wetlands rather than residential development.

Response #11: The intent of remediating the former MGP facilities is to prevent the migration of contaminants into the canal, prevent exposure of the public and ecological receptors to contamination and remove or immobilize as much of the contaminant source material as practicable. This may be accomplished through a variety of measures, such as containment, treatment, removal and institutional controls. The extent of the remediation of the former MGP facilities will be a function of the intended future use of each property and the potential for the contamination to affect off-Site properties, including the canal itself. If the intended future use of the former MGP facilities is residential, the remedies will need to be consistent with restricted residential cleanup objectives.

Comment #12: A commenter noted that the NYC parks department needs to work with the EPA, National Grid and NYSDEC to properly excavate the coal tar-contaminated soils under the pool at the Thomas Greene Park (the park overlies the former Fulton MGP State Superfund site). Another commenter requested that the EPA demand the highest level of remediation possible for the former Fulton MGP State Superfund site from National Grid. Several commenters suggested that the EPA use its Superfund authority to enforce the entire upland area cleanup in a coordinated fashion that will not cause multiple disruptions to the community and its resources. Other commenters suggested that the former Fulton MGP State Superfund site be incorporated into the Superfund cleanup to ensure the protectiveness of the remedy.

Response #12: National Grid is undertaking the investigation and cleanup of the three former MGP facilities under New York State supervision. While NYSDEC has not yet completed the remedy selection process for the former Fulton MGP State Superfund site (it is anticipated that National Grid will complete an FS report this year), New York State regulations governing the State Superfund program require source removal or control for all remedies, including former MGP facilities. NYSDEC will ensure that each remedy will adequately address the source of the contamination so as to prevent the migration of contamination into the canal. The EPA and NYSDEC have agreed to a coordinated cleanup schedule through which the agencies will seek to maximum efficiencies while minimizing construction impacts to the extent possible.

Comment #13: Bluestone Gowanus Green Partners indicated that its proposal for Public Place will provide much needed affordable housing and public open space. The commenter expressed concern about the timeliness of the completion of the remedy for

Public Place former MGP facility. Bluestone Gowanus Green Partners also expressed a desire to discuss with the EPA and NYSDEC the design for this facility. Specifically, they would like to discuss excavation depths, barrier wall materials, the barrier wall and its final location and the location of tie backs for the barrier wall, location of collection wells and any other facility or access connected to the remediation which might ultimately be located on the former MGP facility.

Response #13: The cleanup of Public Place will be completed in accordance with a schedule agreed upon between the EPA and NYSDEC to insure that releases from this facility are controlled in a timely manner so as not to affect the integrity of the canal remedy as the canal remedy is implemented. That schedule is intended to provide a timeframe by which upland source control work must be done. The design of the remedy is roughly 50 percent complete at this time. A large-scale pilot test is scheduled to begin in early fall 2013.

NYC owns more than half of the property subject to the Public Place cleanup and also owns the Bond-Lorraine sewer beneath the property, which will need to be replaced as part of the cleanup. The sewer replacement will remove sewer flow obstructions which have been present at this location for decades. In so doing, the project will help reduce the frequency and volume of CSO events in this area of the canal. The locations for barrier wall tiebacks are dictated largely by the need to protect the reconstructed sewer line.

It is well known that significant redevelopment is anticipated around the canal, including high density residential redevelopment along the banks of the canal that has already been approved. NYC fully supports the cleanup and redevelopment of this parcel and has made it available to Bluestone Gowanus Green Partners. If redevelopment plans necessitate the refinement of the remedial design, NYSDEC has indicated that it is willing to discuss such modifications with NYC and the developer.

It should be noted that the EPA does not have a formal role with respect to land use zoning and related issued regarding upland properties along the canal. NYSDEC, which is overseeing National Grid's work, and NYC, as owner of the property and through its zoning and building construction regulatory process, have the primary roles regarding cleanup schedules and design considerations.

Comment #14: A commenter expressed concern that failure to install the proposed cutoff wall as an interim remedial measure at the former Fulton MGP State Superfund site to prevent further migration of NAPL into the canal in a timely manner would significantly delay the commencement of the cleanup of the canal. The commenter also stated that since the design and proposed location of the cutoff wall have yet to be presented to the public, not only is the coordination of the implementation of this remedy with the overall cleanup of the canal in question, but understanding the impacts of where the NAPL could possibly migrate to if it is prevented from entering the canal create additional concerns about the health and safety of nearby residents, businesses and park and pool users. In addition, states the commenter, National Grid insists that

coal tar waste only migrates downward, whereas the EPA has stated that NAPL can migrate downward and upward and can be transported via groundwater.

Response #14: In January 2012, NYSDEC directed National Grid to begin an expedited remedial design of a cutoff wall as an interim remedial measure for the former Fulton MGP State Superfund site. The purpose of this wall is to prevent subsurface migration of NAPL from this former MGP facility into the sediments at the bottom of the canal. NAPL generally migrates laterally or laterally and downwards through soil, depending on its specific gravity. Once in the canal, however, other processes, such as ebullition from gas bubbles, may cause small amounts of NAPL to rise. Regardless of the direction NAPL migrates, it is anticipated that hydraulic controls will be necessary to prevent the migration of NAPL and contaminated groundwater around the cutoff wall. Accordingly, the design will include a NAPL collection system similar to the system included in the Public Place design to prevent the redirection of NAPL flow to surrounding areas.

Comment #15: A commenter expressed concern about how the future elimination of the migration of NAPL will be achieved, since remedies have not been selected for two of the three former MGP facilities.

Response #15: While remedies have not been selected for the Fulton and Metropolitan former MGP facilities, based upon the remedy that has been selected for the Public Place former MGP facility, it is assumed that the remedies will include the removal of mobile sources, construction of cutoff walls along the canal and active recovery of NAPL near the cutoff walls for each of the former MGP facilities. These remedies, which are consistent with techniques used at other former MGP facilities in New York State, will prevent the migration of contamination from the former MGP facilities into the canal. The cleanup of the former MGP facilities will be completed in accordance with schedules agreed upon between the EPA and NYSDEC to insure that releases from the former MGP facilities are controlled in a timely enough manner so as not to affect the integrity of the canal remedy.

Comment #16: A commenter asked how much the remediation of the three former MGP facilities being undertaken by National Grid will cost.

Response #16: While NYSDEC has not yet completed the remedy selection process for the Fulton and Metropolitan former MGP facilities, NYSDEC has selected a remedy for the Public Place former MGP facility. Based on National Grid's remedial design work performed for the Public Place former MGP facility to date, the cost to address this facility is estimated to be $175-200 million. It is assumed that the costs for the two other former MGP facilities would each be in the same range or less.

Remediation Plan

Comment #17: A commenter requested that the EPA stick with the remedy described in the Proposed Plan and not let any of the components be negotiated away. Another

commenter stated that the RI report had some data gaps with regard to the nature of landfilling around the Gowanus Canal. The commenter provided some background material suggesting that the 4th Street turning basin, which the Proposed Plan did not address, be included in the remediation proposal. Several other commenters also suggested that the 4th Street turning basin be addressed.

Response #17: While the essential components of the selected remedy (dredging, capping and CSO abatement) are the same as the remedy proposed in the Proposed Plan, several modifications were made to portions of the selected remedy.

The Proposed Plan presented two disposal options for the lesser contaminated sediments dredged from the lower portion of the canal--off-Site stabilization and reuse or on-Site stabilization followed by their placement in a CDF located on privately-owned property at the Gowanus Bay Terminal (GBX) on Columbia Street in Red Hook---that would be evaluated based upon community input and acceptance. The EPA's intent was to introduce the on-Site stabilization and CDF creation option and discuss its merits with the community. If the community objected to it following the public presentations, the option would not be selected.

During the public comment period, significant concerns were expressed about the option of using on-Site stabilization of the lesser contaminated sediments dredged from the lower portion of the canal and their placement in a CDF. As a result of the community's concerns, this disposal option was eliminated from consideration. These sediments will be stabilized off-Site and beneficially reused to the extent possible.

It should be noted that some confusion exists as to the names of the various turning basins. The 4th Street turning basin connects with the filled in 5th Street turning basin at the location of the 3rd Avenue Bridge. The selected dredging and capping remedy includes the remediation of the 4th Street turning basin. Based upon suggestions made during the public comment period, the remedy also includes the dredging, capping and restoration of the portion of the 4th Street turning basin underneath the 3rd Avenue bridge, as well as the portion of the 5th Street turning basin beginning underneath the 3rd Avenue bridge and extending approximately 25 feet to the east, and the installation of a barrier or interception system, as determined during remedial design, on the 5th Street turning basin side of the bridge. This parcel was previously referred by the EPA to NYSDEC for investigation as an additional upland source area.

Dredging Complete Soft Sediment Column Negatively Impacts Dissolved Oxygen Content in Canal

Comment #18: NYCDEP and National Grid point out that the decreased velocity of surface water through the canal resulting from a deeper channel depth as a result of dredging may result in a net decrease in the dissolved oxygen content of the canal. NYCDEP points out that it has invested $150 million retrofitting the Flushing Tunnel to deliver higher flow rates to help maintain dissolved oxygen levels at standards set by the State of New York and these efforts may be insufficient to meet the standards with

the deeper channel. NYCDEP also states that the organic pollutants in the canal would undergo oxidation for a longer period of time, stressing dissolved oxygen concentrations.

Response #18: While a deeper channel will slow the water flow rate in the canal compared to a shallower channel and may decrease the dissolved oxygen concentrations in portions of the canal, potential decreases in dissolved oxygen from a deeper channel would likely be offset by the reduced load of organic matter in the canal as a result of CSO controls and the removal of the large organic load already present in the existing soft sediment. The present conditions at the canal bottom generate a high demand for oxygen which is consumed during reactions with the chemical and biological contaminants. A clean canal bottom will result in a higher concentration of available oxygen in the water.

Studies performed by National Grid demonstrate that the CSOs are a source of the dissolved oxygen depletion in the canal. The remedy controls for CSOs will reduce the discharge of organic matter in the canal and, therefore, will reduce oxygen consumption. Furthermore, modeling performed by National Grid and NYCDEP using independent models suggests that, under the scenario where CSO discharges have not been reduced and the Flushing Tunnel is operating, dissolved oxygen concentrations would be near the dissolved oxygen standard. As a result, under the selected remedy with reduced CSO discharges and removal of the chemical contaminants from the canal bottom, improvements to dissolved oxygen levels, while not evaluated, may be significant. This position is consistent with the findings of each of the major NYCDEP reports on the canal since 1983. The reports have consistently indicated that both the CSO discharges and the CSO-impacted sediment are major factors in reduced dissolved oxygen levels:

> CSO outfall solids produce a solids mound at the head of the Canal that causes high sediment oxygen demand (SOD). SOD in other areas of the Canal result from settled solids but to a lesser degree." (NYCDEP, Inner Harbor CSO Facility Planning Project, Modeling Report, December 1993, page C-1).
>
> Organic material deposited through the settling of combined sewer overflow over many years is present in the Canal. Removal of this material may reduce sediment oxygen demand (SOD) which contributes substantially to low dissolved oxygen levels. Another benefit of dredging is the improved aesthetics of the waterbody by removing sediment mounds which are visible during low tide. Dredging of the Canal was recommended under the Gowanus Canal 201 Facilities 'Plan. (NYCDEP, Inner Harbor CSO Facility Planning Project – Final Draft Facilities Planning Report, July 1993, page 7-31).
>
> At the head of Gowanus Canal where the largest dissolved oxygen deficits were calculated, CSOs contribute up to about 70 percent of the total deficit, with CSO discharges from the Gowanus Pump Station alone accounting for up to 67 percent of the total deficit. Stormwater discharges, background (Upper New York Bay) dissolved-oxygen deficits, and residual sediment oxygen demand account for the remaining 30 percent of the deficit. Point source pollutants have been identified as being the major contributor to the water quality impairments found in

> Gowanus Canal (NYSDEC, 2002)…. In the Gowanus Canal watershed, point source loadings originate from the combined sewer system, and/or from storm sewer discharges. These discharges are the source of high organic-content solids and coliform, which ultimately promote low dissolved oxygen conditions, high coliform concentrations, and formation of sediment mounds with high sediment oxygen demand (SOD)." (NYCDEP, Receiving Water Quality Modeling Report, 2007, page 2-6 and 3-13).

As discussed elsewhere, the EPA believes that a range of remedial benefits support the complete removal of the soft sediment. Similarly, a range of benefits support a restoration of increased upper canal depths, including non-commercial navigation needs and protection of the cap. These remedial benefits do not appear to be offset by the limited risk that dissolved oxygen will be negatively impacted by increased depths. In the unlikely event that such increased water depths are shown in the future to have severe negative impacts on dissolved oxygen, the canal depth could be readily decreased through the addition of clean fill material as needed to mitigate those impacts.

Dredging Challenges

Comment #19: NYCDEP and National Grid assert that the Proposed Plan does not consider how dredging operations should be conducted in view of the challenges presented by the canal conditions. Site specific restrictions and future use need to be considered. Items that need to be considered include:

- Bathymetry
- Canal width
- Infrastructure
- Debris
- Waterbody access
- Currents
- Coordination of removal, treatment, and disposal
- Geotechnical conditions

Response #19: The EPA agrees that the canal presents challenging conditions (limited space, water depths, bathymetry, CSOs, potential impacts to the public, etc.). Many of the technical challenges listed in the comments were considered at the conceptual level in the FS report (for example, potential for sediment resuspension during dredging is addressed through the use of sheet pile cells). Operational challenges, such as narrow width and limited land access, will be further explored and addressed during the design. A detailed layout of the entire dredging, stabilizing and disposal process will be prepared as part of the design, integrating the identified challenges.

NYCDEP is currently required by its order with the State to conduct a more limited dredging at the head of the canal. If implemented, this dredging would require, to a lesser extent, addressing many of the same constraints, including bulkhead stability, resuspension, capping and site limitations. Based on the EPA's experience with other sediment sites, the selected remedy is implementable.

Dredging Design Criteria

Comment #20: NYCDEP and National Grid note that the Proposed Plan did not consider dredging design criteria. They asserted that factors that need to be considered include:

- Tolerances
- Slopes
- Volumes
- Treatment
- Disposal
- Schedule and length of activities

Response #20: The selected remedy considered these criteria in a conceptual manner. The criteria will be addressed in detail during the remedial design.

Potential Impacts to Public

Comment #21: The PRP Group notes that dredging could have negative impacts on the public. It will bring NAPL to the surface of the water, and it is expected that odorous volatile constituents will be released to the atmosphere from the water surface.

Response #21: The short-term and long-term impacts of the dredging and capping alternatives were evaluated as part of the FS. Releases of NAPL during dredging were identified as a significant concern and an approach to address it was included in the remedial alternatives. Releases of NAPL will also be addressed by using best management practices during dredging to minimize release of suspended sediments and NAPL. Air monitoring will be conducted and mitigation measures will be implemented during the remedial activities to control release of hazardous volatile organic compounds.

Sediment Resuspension and Residual Contamination

Comment #22: National Grid opines that resuspension evaluations with appropriate modeling are needed to predict suspended solids concentrations as a function of distance and time, resuspension rates, related potential for contaminant release to water and air and residual sediments. No such evaluations were conducted or even considered in developing the Proposed Plan.

Response #22: Modeling of sediment resuspension and estimation of resuspension rates will be performed as part of the remedial design. These will be compared to performance standards to evaluate the appropriate operational and engineering controls.

Since the placement of the cap is envisioned as taking place after the generated residuals have settled, it is not clear why the presence of “residual sediments” would be a concern, especially when the entire footprint of the canal is to be dredged and the entire dredging footprint will be capped.

Sheet Pile Enclosed Cells and Treatment of Water Within Cells

Comment #23: National Grid states that mechanical dredging may be the most suitable technology for dredging in the canal. National Grid notes that the Proposed Plan assumes that all dredging and capping will be conducted within the enclosures, the enclosures will capture all resuspended sediment and overlying water from the enclosures will be treated prior to opening the enclosures. Specific issues with this approach include:

- No technical evaluations and consideration of the potential negative impacts of implementing such controls.
- The effect of channel narrowing from these enclosures was not considered.
- The proposed treatment of the impacted cell water would be inadequate. Concentration of the impacted water would create odors

National Grid suggests that the ROD allow flexibility in the type of controls needed.

Response #23: The ROD allows flexibility in how the dredging will be performed. Sheet pile enclosures were selected as the representative sediment resuspension control due to the presence of NAPL in the sediments. The approach for controlling resuspension and the use of sheet pile enclosures to achieve this will be finalized during the design. Alternative approaches, including the use of reinforced silt curtains, may be appropriate for some sections of the canal and will be considered during the design.

Sediment resuspension controls will concentrate resuspension within a smaller area. As National Grid acknowledges, mechanical dredging may be the most suitable technology for dredging in the canal, so that the best way to limit releases to air will be to follow dredging best management practices to minimize the disturbance of sediments during the dredging process. The need for additional controls to limit releases to air will be evaluated during the design.

For sheet pile enclosures, the number of volumes of water to be treated, the size of the water treatment system, and the location of the discharge of the treated water will be determined during the design. Regardless, a sudden release of water with elevated contaminant concentrations will not be allowed.

Treatment and Disposal of Dredged Sediments

Comment #24: National Grid notes that the EPA indicates that all treatment/disposal options will include barging dredged sediment to a “local on-site dewatering and transfer facility.” The remedy does not account for inevitable delays due to things like:

- Public concern and releases, not to mention the very real challenges to re-handling and transport posed by the limited access to the canal.
- Acceptable offloading and treatment sites.
- Considerations for the special needs for stabilization and thermal treatment.

Response #24: As stated previously, a detailed layout of the entire dredging, stabilizing, and disposal process will be prepared as part of the remedial design, integrating the identified challenges.

Identification of a beneficial use for the stabilized material is an iterative process that begins with the identification of a proposed beneficial use, development of the associated performance criteria for the stabilized material for that particular use (*e.g.,* material strength, leaching capacity, porosity/hydraulic conductivity, resistance to weathering or corrosion, etc.), and then treatability testing to determine the stabilization requirements (*e.g.,* reagents, mix ratios, curing times) that will result in meeting the established performance criteria. Preliminary beneficial uses currently identified are based on contacts with landfill operators and other vendors. These options will be refined during the remedial design.

Should landfill disposal be determined to be required, treatability testing will be performed during the design phase to determine the minimum amount of stabilization/dewatering needed so the sediments can reliably meet the requirements of the selected landfill. Also, discussions will be held with multiple landfills before a selection is made to ensure that the selected landfill can accept the stabilized sediments.

Dredging Specifics

Comment #25: Two commenters asked where the staging areas for the implementation of the remedy will be sited and generalized logistics related to dredging.

Response #25: Staging areas may be needed for one or more operations, including de-watering, water treatment, construction material storage and stabilized sediment transfer. The location of staging areas will be determined during the design based on engineering considerations, such as the size of the operation and suitable available land. The EPA will update the community on our staging area selection during the design. Any equipment for operations such as water treatment will be utilized only for the project duration, and will be de-contaminated and removed following their use. Dewatering and treatment of decanted water may also potentially occur on barges. Appropriate control measures will be used to monitor and minimize project impacts, such as noise and odor. The EPA currently anticipates that the logistics of dredging within the largely narrow canal will generally result in only limited volumes of sediment being handled at any one time. The EPA will continue the ongoing outreach with the community regarding the project design and implementation, including monitoring and control measures.

Comment #26: A commenter inquired as to the volume of contaminated sediment present in the canal, the volume of contaminated sediment that will be dredged, the sediment cleanup level and the area that will be capped.

Response #26: Deep borings installed in the canal adjacent to Public Place by National Grid in 2010 indicated that contamination extends to a depth in excess of 50 feet below

the sediment surface. Since it would not be practical to dredge the contaminated sediments to such a depth, the entire column of hazardous substance-contaminated soft sediment will be dredged. Soft sediments are the sediments which have accumulated above the native sediments. The soft sediment layer ranges in thickness from approximately 1 foot to greater than 20 feet, with an average thickness of about 10 feet. The estimated volume of sediments that would be dredged is 588,000 cubic yards. Since highly contaminated native sediment that cannot be dredged will remain after all of the soft sediment is removed, sediment contaminant cleanup levels have not been defined. Instead, a multilayer cap will be installed over the areas that are dredged, leaving a clean surface which will be monitored to ensure that re-contamination does not occur. The areal extent of the capped areas will be approximately 13 acres.

Comment #27: To facilitate the implementation of the remedy at the Gowanus Canal, a commenter urged the EPA to seek input on the ongoing dredging and capping effort at the Onondaga Lake site.

Response #27: The Onondaga Lake site is a National Priorities List site. While NYSDEC has the lead for managing the project, the EPA was actively involved in remedy-selection process and the design effort and is assisting NYSDEC in the oversight of the implementation of the remedy at that site. Relevant lessons learned from that site will be applied to the Gowanus Canal site.

Comment #28: A commenter suggested that the EPA provide estimates on how much the dredging will lower the canal water depth.

Response #28: The water level in the canal is influenced by the tide and the water level in the Gowanus Bay and Upper New York Bay. Dredging the sediments will not affect the surface water level; it will only increase the distance between the water surface and the bottom of the canal. After soft sediment removal and native sediment capping is completed, the anticipated water depths in RTA[14] 1, RTA 2 and RTA 3 are -18 feet, -22 feet, and -28. 5 to -41. 5 feet (NVAD88), respectively.

Hazardous Waste Disposal

Comment #29: The Sediment Management Workgroup asserts that the FS report fails to account for the volume of wastes requiring disposal as hazardous waste.

Response #29: Representative, whole-core composite samples throughout the canal were collected during the RI and analyzed for toxicity characteristic leaching procedure, as well as reactivity, ignitibility, and corrosivity. These data are presented in Table I-20 (Appendix I) of the RI report. The definition of hazardous waste involves a range of highly specific parameters. The only parameter that exceeded any of the hazardous

[14] To facilitate the assessment and management of the canal, it was divided into three Remediation Target Areas (RTAs) that correspond to the upper reach (RTA 1), middle reach (RTA 2) and lower reach (RTA 3).

waste thresholds was benzene and only at two core locations collected from the central portion of the canal in RTA 2. Given the limited spatial extent of the sediment with this exceedance, it is expected that most if not all of the dredged sediment will be classified as a non-hazardous waste. Although not categorized as hazardous waste, the dredged sediment will contain an array of hazardous substances which require proper treatment, handling and disposal. During the remedial design, extensive confirmatory sampling will be conducted before disposal of the sediment to confirm the above assumption made in the FS and to assure that all dredged sediment is classified and managed appropriately.

Only a single sample contained PCBs above the 50 mg/kg threshold that triggers the Toxic Substances Control Act (TSCA). While it is possible that a small amount of sediment will require treatment as a TSCA-regulated waste, the spatial extent of elevated PCB concentrations is very limited and constrained to the turning basins.

Sites for Treatment/Disposal

Comment #30: Community Board Six asserts that in order to evaluate off-Site thermal desorption and beneficial use, off-Site disposal in a landfill and off-Site cogeneration and beneficial use treatment/disposal options, the facilities under consideration need to be identified, as does the evaluation criteria that will be used by the EPA.

Response #30: While facilities were contacted to explore these disposal options during the preparation of the FS report, specific facilities to be used during remedy implementation are not yet identified—identification of potential facilities is performed during the remedial design, and a specific facility is selected during the contracting and subcontracting process at the onset of remedy implementation. The treatment and disposal options presented in the FS report and ROD are representative examples of options and are not prescriptive to a specific facility or location.

All treatment and disposal facilities considered during the remedial design would be required to be EPA-approved facilities that meet the appropriate Subtitle D or Subtitle C designation per the Resource Conservation and Recovery Act, depending on upon the final waste classification determination. Additional considerations that are typically evaluated during the selection process include the distance from the site, available means of transportation, tipping fees, degree of pretreatment required and ability to handle the amount of waste generated in a given duration.

Beneficial Use

Comment #31: National Grid and NYCDEP asserts that the beneficial use options (off-Site stabilization and off-Site beneficial use and off-Site stabilization and on-Site beneficial use) should be defined to aid in the evaluation of these options.

Community Board Six inquired whether having an abundance of beneficial use material as a construction product under Options D and E make the necessary capital work in the Gowanus area more attractive to NYC as a cost-savings. The Board also inquired

as to who owns the product and can it be given back to the community in the form of making it available for capital projects.

Response #31: Identification of a beneficial use for the stabilized material is an iterative process that begins with the identification of a proposed beneficial use, development of the associated performance criteria for the stabilized material for that particular use (*e.g.,* material strength, leaching capacity, porosity/hydraulic conductivity, resistance to weathering or corrosion, etc.), and then treatability testing to determine the stabilization requirements (*e.g.,* reagents, mix ratios, curing times) that will result in the material meeting the established performance criteria. The remedial design will consider specific beneficial uses for the dredged materials. Since stabilization will occur off-Site under the selected remedy, it is unlikely that the stabilized material will be used for projects in the canal locality. Most likely, the stabilized material will be used for landfill cover at an off-Site facility.

Where a beneficial use is identified such that the material can be cost-effectively stabilized to meet the performance criteria, it is possible that some cost-savings are realized for capital projects; however, since the potential cost savings are specific to each particular beneficial application, the potential savings would be estimated once the application is identified.

The EPA anticipates that the PRPs who generate the waste and will be responsible for its disposal costs will be entitled to its residual value.

Treatment/Disposal Options D and G

Comment #32: Community Board Six noted that concerns with treatment/disposal options D (off-Site stabilization and off-Site beneficial use) and G (on-Site confined disposal facility) were expressed without a clear demonstration of community acceptance for either option.

Response #32: Option G has been removed based on the lack of public acceptance expressed during the public comment period. Option D will only be implemented if an appropriate and cost-effective means of beneficial use is identified during the remedial design.

Soft Sediment In-Situ Stabilization In-Lieu of Dredging

Comment #33: National Grid asserts that based on the data derived from its stabilization tests on soft, native and combined sediments, ISS of soft sediments and also combining soft and native sediment stabilization are viable alternatives to soft sediment removal.

Response #33: The EPA has reviewed National Grid's data and agrees that ISS of soft sediment can be performed to increase the strength of the soft sediment, as well as that of the combined soft and native sediments. However, the increased strength will come with a corresponding decrease in permeability over the length of the entire canal and a corresponding reduction in groundwater discharge to the canal. In addition, because the soft sediments contain a higher degree of water than the native sediments, more stabilization material will likely be required to solidify them. This would likely result in

an expanded mass of material, reducing canal depths and complicating the design of a protective cap. For these reasons, uniform application of ISS of the soft sediment to allow capping is not considered a viable option for the canal.

As for combining soft and native sediment stabilization, the extent of the area of native sediment to be stabilized was not precisely identified in the comment. While preliminary ISS target areas were identified in the FS report, the precise stabilization areas, which are dependent on whether mobile NAPL is present in the native sediments, will be identified during the remedial design. The EPA has tested two transects within the target area identified in the FS and only one of them (adjacent to Public Place) had mobile NAPL. The other one, near the former Metropolitan MPG facility, had relatively low NAPL impacts in native sediment which would not warrant stabilization. This indicates that the areas of native sediment stabilization will likely be discontinuous. If native sediment stabilization is discontinuous, stabilizing soft sediment only in these places could result in severe changes in canal bottom elevation because the soft sediment would be dredged to a lower elevation in other areas.

Nonaqueous Phase Liquid Migration After Soft Sediment Removal

Comment #34: National Grid asserts that since the soft sediment has less NAPL impacts than the native sediment, removal of soft sediment could actually increase NAPL migration to the canal.

Response #34: Existing subsurface NAPL is currently migrating to the canal by three mechanisms: lateral movement from an upland source via a connected mobile NAPL phase; upward transport by the hydrodynamic force of the groundwater discharge and ebullition[15] of biogenic gasses in the sediment that carry NAPL to the water surface. Upland source control actions are expected to remove the NAPL pathway from the upland areas. NAPL migration from hydrodynamic forces will be mitigated by stabilizing native sediment in potentially mobile areas and constructing an active cap to control NAPL and dissolved-phase releases.

Observations made by the EPA indicate that ebullition is a significant transport mechanism for NAPL migration.

NYCDEP has discussed the production of substantial biogenic gas production (ebullition) in several reports. NYCDEP noted the following in the Receiving Water Quality Modeling Report – Volume 4 – Gowanus Canal , City-Wide Long Term CSO Control Planning Project (September 2007):

> A sediment mound that is exposed at low tides has formed at the head end of the canal due to historical CSO discharges.…Particulate solids are discharged by dry weather overflows, CSOs and stormwater discharges. These particulate solids settle to the bottom sediments of Gowanus Canal, and promote a series of chemical reactions that utilize dissolved oxygen in the aerobic sediment layer

[15] Ebullition is a naturally-occurring process where degradation of organic matter in sediment releases gasses that can form bubbles and be transported up through the water column.

and the water column. As oxygen is depleted in the sediment layer, anaerobic reactions begin. Sediment reactions produce hydrogen sulfide, which either oxidizes in the aerobic layer of the sediment or migrates up from the sediment into the water column. The entire process is known as diagenesis. Physical indicators that such reactions are occurring in receiving waters are strong odors of hydrogen sulfide and sediment mounds at discharge points. Both indicators are apparent in Gowanus Canal.

NYCDEP also presents similar analyses in the Inner Harbor CSO Facility Planning Project – Task 4. 3B – Gowanus Canal Modeling, December 1993.

The EPA performed literature reviews on the conditions for NAPL migration by ebullition and has included a white paper on this topic as part of the Administrative Record for the Site. The conclusions from that analysis are as follows:

If NAPL is present in the sediment, through ebullition, it attaches to the bubble and migrates on the surface of the bubble (or in some cases within the bubble). When the bubble breaks on the water surface, a NAPL sheen is released. Alternatively, some droplets do not burst and eventually sink to the bottom of the water body as the gas escapes and the droplet becomes denser than water, thus redepositing the NAPL at a new location, depending on water velocities and other factors. The amount of ebullition gasses generated has a direct correlation to the amount of organic matter available in the sediment. Gasses released by ebullition can be a significant challenge to the long-term reliability of any sediment cap. The gasses can build up under the cap and cause a rupture through the cap, thus creating a preferential pathway. In order to prevent this buildup, the gasses need to be collected and vented.

The soft sediment has a much higher potential for ebullition than the native sediment. NAPL is transported through bulkheads and up from the native sediment by the NAPL gradient and groundwater discharge to the canal. Once in the soft sediment, the upward transport of NAPL is enhanced by ebullition in the soft sediments. Transport via ebullition likely accounts for the lower concentrations of NAPL in soft sediment compared to native sediment. NAPL in the soft sediment is being stripped by ebullition gasses, which result in transport through the soft sediment and migration to the surface water. The conditions that enhance ebullition in soft sediment compared to native are:

- The amount of TOC. TOC is a primary contributor to the potential for sediment ebullition. The TOC of the soft sediment ranges from six to 15 percent compared to a range in the native sediment of 0. 5 to 2. 5 percent. Some studies have indicated that the rate of ebullition increases proportionally with the amount of organic content, resulting in an increase in ebullition rate potential six times higher for soft sediment (15 % TOC) over native sediment (2. 5% TOC).
- Natural Organic carbon. Organic carbon in the native sediment is chemically bound in coal tar and other petroleum compounds that are not highly degradable. The soft sediment which is dominated by the CSO discharges contains high amounts of available natural organic carbon from sewage and humic materials and from more readily degraded organic compounds
- Higher temperature. The soft sediments are warmer than native sediments, since the soft sediments are in direct contact with the warmer surface water, whereas

native sediment temperatures are controlled by groundwater temperatures. The warmer soft sediment temperatures in the summer increase the rate of ebullition.

Removal of the soft sediment would result in much lower ebullition potential and, therefore, higher long-term reliability for the cap.

Nonaqueous Phase Liquid Expression

Comment #35: National Grid presented an analysis by one of its consultants for sediment samples tested under compressive forces and concluded that the NAPL would not migrate under the compressive forces of a sediment cap.

Response #35: The EPA has reviewed the test results and has concluded that the samples tested were not representative of the soft sediment strength and the NAPL impacts for many areas of the canal based on the observations stated below.

Sample Depth

The three Gowanus Canal sediment samples were collected "near the soft and native sediment" interface. A review of the boring logs and photographs from the RI report and a recent sampling event indicate that the exact transition between soft and native sediment layers can be difficult to identify. A more appropriate depth horizon for the samples used in the expression tests would have been from near the surface of the soft sediment, not near the soft-native interface.

Sample Location

The samples were not collected in the locations of the most severe NAPL impacts. This can be seen through comparison with Figure 6A of Appendix A of the FS report, which shows a graph of the NAPL impacts in soft and native sediment. A boring was taken near Public Place former MGP facility, but it was not tested due to poor recovery. Therefore, the most severe NAPL impacts in soft sediment were not tested in this analysis.

Sample Strength

The EPA notes that in the photographs that were provided, the samples are standing without support in the vertical position. The strength of these samples appears to be much firmer than the strength of the soft sediment samples collected by the EPA. The ability for soft sediments to "stand on their own" was not observed for the soft sediment samples collected by the EPA.

Beyond these direct technical conclusions regarding the soft sediment, the EPA believes that there are numerous additional considerations in support of soft sediment removal. These factors, which are discussed in detail elsewhere, include treatment of principal threat waste, increased cap reliability, reduction of potential vessel damage to the cap and decreased risk of contaminant migration in the event of cap failure.

Significance of Soft Sediment Contamination

Comment #36: National Grid asserts that the benefits of removal of complete sets of contaminants present only in soft sediment (PCBs and metals) should be weighed with the high costs of complete removal, the likelihood of cap failure and the higher concentrations of other contaminants (PAHs) in native sediments.

Response #36: While the costs of soft sediment removal are relatively high, so are the costs of the other feasible options that were considered. There are many factors, other than cost, that contributed to the EPA's decision to remove the soft sediment such as the technical considerations that were described above. Soft sediment removal would result in increased confidence in remedy reliability and effectiveness, implementability, and improved navigation.

Capping Soft Sediments As Alternative to Dredging

Comment #37: National Grid asserts that capping on top of soft sediments is a viable option.

Response #37: Constructing a cap on top of the soft sediment is technically feasible, but it would not be as reliable as the selected dredging remedy. Capping on top of the soft sediment has several uncertainties pertaining to the long-term reliability and short-term risks which were described in the screening of the remedial alternatives in the FS report.

Recent studies performed by National Grid have provided additional information on the geotechnical stability of the soft sediment to support a cap. The EPA's analysis of the geotechnical data for the soft and the native sediment indicates that the factor of safety for settlement increases by a factor of eight for capping on top of the native sediments compared to capping on top of the soft sediments. For example, continued decomposition of the soft sediment produces gas and liquid byproducts, complicating cap design. The increased factor of safety provides additional long-term reliability for the cap and justifies the removal of soft sediment.

Nonaqueous Phase Liquid and Dissolved Phase Loading of Active Cap

Comment #38: NYCDEP opines that additional study and analysis is required on the conceptual design of an active cap before it can be included in the remedy. These studies should address the NAPL and dissolved phase discharge.

Response #38: Oleophilic clay used for absorption of organic contaminants in sediment caps is a well developed technology. Numerous studies were listed in the FS report where oleophilic clay caps have been used successfully. Studies conducted by the EPA are being used to assess the potential range of expected discharge rates of NAPL and dissolved phase contaminants from the native sediments. These discharge rates will be largely influenced by the groundwater upwelling velocity into the canal. The EPA

is further planning to utilize Distributed Temperature Sensing (DTS)[16] or other technology in a portion of the canal to better understand the characteristics of groundwater upwelling. These data will be used to estimate groundwater discharge rates and refine the cap design as appropriate based on location-specific characteristics. However, additional technologies (such as ISS) will be used in combination with active capping in certain areas to limit contaminant loading rates and reduce the amount of oleophilic clay required.

Allowance for Alternative Cap Design Configurations

Comment #39: National Grid states that a cap with treatment, isolation and armor layers may be appropriate for some portions of the canal, however, since the dimensions and compositions of these layers will require a substantial design effort; they should not be prescribed in the ROD.

Response #39: The details of the active cap will be specified during the remedial design. The ROD includes only the conceptual cap configuration.

Need for Absorptive Layers on In-Situ Stabilization Treated Areas

Comment #40: National Grid states that a treatment layer of oleophilic clay is likely not needed over solidified sediment since the solidification process dramatically reduces contaminant mobility. An armor layer is also likely not needed over solidified sediments, since the sediments are less susceptible to scour. A benthic habitat layer could be installed over the ISS treatment areas.

Response #40: The EPA agrees that the use of ISS to stabilize highly impacted NAPL areas will be an effective technology to control NAPL migration. Results of studies performed since the Proposed Plan was issued verify the ability of ISS to limit NAPL and dissolved phase migration. This reduction in migration potential is largely the result of a significant reduction in sediment permeability. Although groundwater discharge through ISS-treated native sediment areas is greatly reduced, the low permeable ISS areas may still allow some groundwater flow under certain conditions. For example, groundwater flow could pass through the ISS treated area if fractures were to develop. To provide greater long-term reliability of the sediment remedy, some form of treatment layer cap over the ISS sediment is required. The type and thickness of the treatment layer in the ISS areas will be evaluated in pilot testing during the remedial design.

[16] DTS uses fiber optic cables, paired with specialized electronics and software, to precisely and continuously measure temperature at thousands of locations over long distances and large areas. By precisely monitoring temperatures in sediment it is possible to locate where groundwater is seeping through sediments and into bodies of water. Recent developments of this technology also allow groundwater discharge rates to be estimated.

Use of Low Permeability Caps in Remedial Design

Comment #41: National Grid opines that it is premature to eliminate the option of a low permeability cap before the design process identifies potentially appropriate technologies to address this concern. The EPA should have discussed the implications of an impermeable cap that could be subjected to potential uplift, and/or groundwater would be redirected around the cap and result in discharge along preferential pathways, such as bulkhead interfaces.

Response #41: Low permeability caps are listed in Table 3-3 of the FS report as a type of active cap and will be considered in the planned pilot-testing during the remedial design. The EPA does not consider low permeability caps alone to be as reliable for the conditions presented at the Site as absorptive caps in NAPL impacted areas and has, therefore, added ISS for added protection in these areas.

Gas Collection Under Active Cap

Comment #42: National Grid inquires as to how the cap will address methane and other gas generation beneath the cap which can cause potential uplift and deformation.

Response #42: The EPA agrees that the potential for gas collecting under the cap due to ebullition is a significant issue that needs to be evaluated during the pilot testing and the remedial design. The EPA considers remedial measures to reduce ebullition to have a significant effect on the long-term reliability of the active cap. As noted previously in the responses related to soft sediment removal, the potential for ebullition is much greater in soft sediment than in native sediment. Therefore, removal of soft sediment should reduce the ebullition potential significantly.

If the ebullition potential from the native sediment is found to be excessive, then the active cap design will incorporate mechanisms that will allow for the release of the generated gases without it damaging the active cap.

Varying Cap Requirements Within Different Areas of Canal

Comment #43: National Grid notes that cap requirements will vary along the length of the canal depending on sediment conditions, presence of NAPL, groundwater expression, ebullition and navigational requirements

Response #43: The remedial design of the active cap will take into account the varying characteristics and conditions of different areas within the Gowanus Canal, including the presence of NAPL, groundwater expression, ebullition and navigational requirements.

Studies Needed for Cap Design

Comment #44: National Grid notes that a number of studies are needed for final cap design:

- Identify the geotechnical characteristics of the sediment layer to be capped
- Identify contaminant physical characteristics, concentrations, and fluxes
- Identify potential capping materials and their characteristics, including any amendments that might be necessary to effectively contain contaminants
- Determine design cap thickness and composition
- Evaluate potential erosive forces that might impact a cap and the resulting impacts on cap design
- Evaluate appropriate equipment and placement techniques
- Monitor performance and apply adaptive management as necessary to achieve remedial goals

Response #44: The EPA agrees that the proposed studies will likely be necessary to complete the remedial design of the active cap.

Conceptual Site Model

Comment #45: NYCDEP asserts that the CSM reflects an insufficient understanding of NAPL transport.

Response #45: The CSM development is considered by the EPA to be an iterative process, with refinements made as additional information is collected as the project progresses from investigation/characterization, design, remedy implementation and post-remedy.

The EPA believes that the information in the characterization phase CSM is adequate to support the selection of a remedy. The characterization phase CSM integrates key geologic, hydrogeological and chemical data that supported an effective screening of remedial alternatives and selection of a remedy. Contaminant nature and extent and migration pathways are identified. The information in the characterization phase CSM is adequate for use in the FS and remedy selection.

Nonaqueous Phase Liquid Spatial Distribution

Comment #46: The PRP Group asserts that there is insufficient information regarding the spatial distribution of NAPL in the canal.

Response #46: The relative visual NAPL impacts in soft and native sediment were assessed in Appendix A of the FS report. This appendix shows the apparent distribution of NAPL in soft and native sediment from over 130 different borings throughout the canal, and includes plots of the spatial distribution of NAPL impacts at the soft and native sediment interface. The areas that appeared to contain NAPL-saturated sediment at the interface between the native and soft sediment layers were also identified. Areas where NAPL-saturated sediments occur at the soft-native sediment interface were considered to be areas of concern for continued NAPL

migration. In these areas, ISS was added as an additional remedy component in the FS. Additional investigations related to NAPL mobility along select transects were performed following the FS and will form the basis for confirmatory design investigations.

Quantifying Nonaqueous Phase Liquid Discharges

Comment #47: The PRP Group asserts that NAPL discharge into the canal has not been quantified.

Response #47: Design parameters, such as the NAPL mass transport rate, will be difficult to obtain and will vary substantially throughout the canal. NAPL flowing beneath the canal exists as a separate phase from the groundwater. The rate of NAPL movement is based on the same principles as groundwater flow, namely, the rate is dependent on the applied gradient and conductivity of the media. However, the NAPL flows as a separate phase along preferential pathways. In addition, the effective rate of NAPL flow in the upland soils and in the canal sediments varies with the degree of NAPL saturation in the pore spaces. Identifying the geometry of the NAPL flow paths and knowing the NAPL content in the pore space is difficult, if not impossible, to estimate over the entire canal. Certain conservative design assumptions will need to be made for the various areas within the canal based on specific data collected within these particular areas. These design assumptions will be continually refined as the CSM evolves through additional data collection.

Nonaqueous Phase Liquid Mobility Investigations

Comment #48: NYCDEP inquired as to the specific investigations that EPA will perform and the data that will be collected and evaluated to verify NAPL/coal tar mobility at specific locations.

Response #48: The EPA has already conducted NAPL mobility investigations along three transects in the canal. Two of them were in RTA 2, by the Public Place and Metropolitan former MGP facilities and one was in RTA 3 (south of NYC's transfer station, where the canal becomes wider and deeper). Access to two transects in RTA 1 was not possible because the draw bridges in the upper reach of the canal became inoperable following Superstorm Sandy.

Locations for these investigations were selected so as to sample a range of NAPL impacts that had been documented in the RI. Samples were collected and analyzed for pore fluid saturation (the percent of the pore volume occupied by NAPL), general chemistry and NAPL mobility. For the NAPL mobility tests, samples of undisturbed sediment (with the pore fluids retained) were tested with equipment that can simulate the groundwater discharge to the canal and qualitatively measure the NAPL discharge. These tests were performed to determine the range of NAPL impacts and hydrogeological conditions that will allow continued NAPL transport to the canal.

The tests have shown that NAPL can move upward from native sediment at the groundwater discharge rates predicted for the canal in higher impact areas. Figure 5, below presents a photograph of a native soil core segment held in a device that allows water to be pushed upward through the core and the resulting NAPL migration at the start and end of the test.

Photo Log (left to right)

1. Native soil core in test device
2. Soil core prior to water injection
3. Top view of mobile NAPL emerging from soil core
4. Top view after completion of water injection

Figure 5: Native soil core segment is held in device that allows water to be pushed upward through the core resulting in NAPL migration (dark brown material in the photo) at start and end of test.

Nonaqueous Phase Liquid Deeper than Six Feet in Native Sediment

Comment #49: NYCDEP inquired as to what investigation criteria will be utilized to determine the lateral and vertical dimensions of NAPL/coal tar in native deposits deeper than six feet beneath the soft sediments.

Response #49: Native sediment NAPL at depths greater than five feet beneath the native-soft interface were not investigated during the RI because this NAPL was considered to be unlikely to migrate to the canal surface or it could be controlled by actions taken in shallower native sediment. For deeper NAPL to be upwardly mobile, it

would need to have a migration pathway through the shallower native sediments. The migration pathways for the deeper NAPL can be effectively mitigated by remedial actions within the upper few feet of native sediment. The FS assumed that ISS would occur in the upper 5 feet of native sediment, but the actual depth of ISS required will be optimized during the design phase. Blocking these pathways with the ISS is considered an effective technology to prevent deeper NAPL from rising to the sediment surface.

Removal of Native Sediment

Comment #50: Community Board Six noted that the remedy does not include the removal of the native sediment which is impacted by NAPL.

Response #50: In general, removal of native sediment to deeper depths presents significant engineering structural challenges to the bulkheads and other structures along the canal. Additionally, boring logs from the RI and other studies have shown significant NAPL contamination at depths over 50 feet beneath the current bed of the canal, which is well outside the range for feasible removal. As noted above, by limiting the potential migration pathways through the stabilization of the shallower native sediments, the NAPL contamination at depth can be effectively immobilized and prevented from entering the canal.

Controlling Upland Nonaqueous Phase Liquid Sources

Comment #51: Community Board Six inquired as to how the upland sites that are discharging NAPL would be controlled. The Board noted that NAPL discharges may not be controlled from the former MGP facilities since remedial plan commitments do not exist for two of the three former MGP facilities. The Board also noted that the majority of the NAPL constituents are LNAPL, and it was found to be in greatest concentration in the native sediment in RTA 2 and LNAPL has a tendency to rise to the height of the water table over time.

Response #51: The former MGP facilities are being characterized and addressed under the State Superfund and Brownfield Cleanup programs by National Grid, a PRP for these facilities, as well as for the canal. The EPA believes that the upland remedial actions implemented by National Grid will be sufficient to prevent continued NAPL discharge to the canal from the NAPL sources identified in the former MGP facilities. For the Fulton former MGP facility, near the head of the canal, and the Public Place former MGP facility, at the middle of the canal, these measures include a cut-off barrier wall and NAPL collection system to prevent NAPL migration into the canal. Furthermore, at the Public Place former MGP facility, for which a remedy has been selected, excavation of tar source areas to a depth sufficient to prevent further releases to the canal is also part of the remedy. Source area excavation at the former Fulton MGP facility is also likely.

An investigation and partial source control cleanup was implemented at the Metropolitan former MGP facility, the third and most southerly former MGP facility. Since there are potential source areas at this former MGP facility that were not addressed by the actions taken to date, an RI is currently underway. Potential remedies for the Metropolitan

former MGP facility include the same components that will be implemented at the other two former MGP facilities: construction of a cutoff wall between the former MGP facility and the canal, removal of remaining major mobile coal tar sources and recovery of coal tar product collected in the approach to the cut-off wall. These control measures are expected to address releases from the three former MGP facilities. In the unlikely event that a timely and effective state-selected remedy is not implemented at a given former MGP facility, the EPA may implement actions pursuant to CERCLA to ensure the protectiveness of the selected canal remedy.

Nonaqueous Phase Liquid Discharges by Removing Soft Sediment

Comment #52: National Grid noted that the removal of soft sediment will expose native sediment which has relatively higher NAPL impacts and, thus, will increase NAPL mobility.

Response #52: NAPL can be mobilized upward through native sediment when the NAPL content is sufficiently high such that it can form an interconnected phase in the pore space. It can also mobilize upward when the groundwater upwelling velocity into the canal is sufficient to overcome the relatively high density of the NAPL compared to the groundwater. Testing has shown that NAPL in the canal can be mobilized upward, but only in areas of severe NAPL impacts and in areas where the groundwater upwelling velocities are high.

In certain areas of the canal, the removal of soft sediment will expose native sediment with high NAPL impacts. However, areas of mobile NAPL in the native sediment will be targeted for ISS which will result in preventing NAPL discharges to the canal bottom from these areas. The EPA has completed bench-scale testing on the application of ISS to control NAPL migration, which has demonstrated the effectiveness of this technology.

Nonaqueous Phase Liquid Discharges Overwhelming Active Cap

Comment #53: NYCDEP opines that NAPL discharges from the canal bottom will overwhelm the active cap.

Response #53: The active cap configuration utilized in the development of alternatives in the FS included an oleophilic clay cap with isolation and armoring layers above the oleophilic layer. This was selected as a representative cap configuration in accordance with Section 4. 2. 5 of the EPA Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA (EPA 1988) as noted in Figure 6.

4.2.5 Evaluate Process Options

In the fourth step of alternative development, the technology processes considered to be implementable are evaluated in greater detail before selecting one process to represent each technology type. One representative process is selected, if possible, for each technology type to simplify the subsequent development and evaluation of alternatives without limiting flexibility during remedial design. The representative process provides a basis for developing performance specifications during preliminary design; however, the specific process actually used to implement the remedial action at a site may not be selected until the remedial design phase. In some cases more than one process option may be selected for a technology type. This may be done if two or more processes are sufficiently different in their performance that one would not adequately represent the other.

Figure 6: Section 4.2.5 of the EPA *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA*

A generalized cap design was specified in the FS report for the purpose of evaluating remedial alternatives. However, the specific design elements and precise location of the active cap will be refined during the remedial design.

Integration of ISS with the active cap will prevent NAPL from overwhelming the oleophilic clay's NAPL absorption capacity. When applying ISS in the native sediment, adsorbents or other reagents are mixed into the sediment and contribute more adsorptive capacity to the overall cap configuration in comparison to a cap where the adsorption materials are provided only as a cover/cap on top of the sediment. Dispersing or mixing the reagents in the native sediment in such a manner to meet specific performance criteria may be more beneficial and cost effective than utilizing a single top adsorptive cap layer. In areas with suspected NAPL migration, a combination of these two approaches will increase remedy effectiveness. Oleophilic clay caps can absorb significant amounts of dissolved phase organic contaminants from the groundwater diverted around the ISS zones. Other active cap designs (*e.g*., the use of absorbent mats) will be evaluated in other areas of the canal where the potential for NAPL migration is low.

Sediment Processing

Comment #54: A commenter noted that the sediments dredged from the upper and middle reaches of the canal are to be subjected to "off-Site" treatment and disposal. The commenter sought confirmation that the off-Site treatment and disposal facilities are not the proposed Red Hook dewatering and treatment facility.

Response #54: Treatment and disposal of all of the dredged sediments from the canal, including upper, middle and lower reaches, will not occur in Red Hook or at any other location near the project area. Instead, such treatment and disposal will occur at a licensed, permanent off-Site facility.

As indicated in Response 25, staging areas may be needed for one or more operations, including de-watering, water treatment, construction material storage and sediment

transfer. The location of one or more potential areas for such operations will be determined during the remedial design. The EPA will conduct outreach with the community regarding the project design and implementation, including staging areas and associated monitoring and control measures to be implemented at the staging areas.

Comment #55: A commenter asked how the dredged sediments would be processed. Several commenters suggested that the sediments be dewatered on barges, rather than on the banks of the canal. Another commenter asked that the dewatering process be described. A third commenter suggested that consideration be given to dewatering the sediments on the water away from residential areas, such as in the south end of Atlantic Basin or near Industry City. A commenter asked where the on-Site dewatering of the dredged sediments will take place. A commenter suggested that the burden of dewatering be equally borne by all of the communities along the canal.

Response #55: To the extent practicable, dewatering may take place on barges. The dredged sediments would be loaded onto special barges which will allow the solids to settle to the bottom of the barge. The overlying water would then be pumped into holding tanks located at a temporary on-Site staging area (as noted, the location of the staging area will be selected during the remedial design), treated to remove contaminants in an on-Site temporary water treatment system and discharged back to the canal. The dewatered sediment will then be transported by barge to an off-Site treatment facility for stabilization.

Considering the narrow width of the canal, its active maritime use by a number of local companies and the need to use dredges and barges for, the dredging, capping and sediment dewatering will present a number of logistical complexities and challenges. These challenges will need to be worked out during the remedial design. Appropriate control measures will be used to monitor and reduce/address project impacts such as noise and odor.

The EPA acknowledges the desire of the community to minimize and distribute the burdens associated with comprehensively addressing the long-standing canal contamination currently impacting the various neighborhoods. As a practical matter, temporary project impacts related to the dredging, CSO controls, remediation of the three former MGPs and other project-related work will occur throughout the length of the canal.

Comment #56: A commenter asked where the dredged sediments would be stabilized.

Response #56: The stabilization of the sediments will be performed off-Site.

Comment #57: Two commenters asked where the off-Site stabilization and beneficial use will take place.

Response #57: The facility that will perform the off-Site stabilization and the location of the off-Site beneficial reuse will be determined during the remedial design. Typically, after the EPA has approved the remedial design, the parties carrying out the cleanup solicit bids from EPA-approved disposal facilities.

Comment #58: A commenter asked how dry dewatering would make the sediments.

Response #58: Maximizing the removal of water from the sediments will reduce the total sediment volume and mass, thereby reducing the cost of transportation and disposal. On the other hand, more aggressive removal of water from the sediments will increase the cost of handling and treating the sediments. To find a cost-effective approach, the extent of the sediment dewatering that will be performed will be determined during the remedial design.

Comment #59: A commenter expressed concern that an on-Site waste treatment facility would pose a threat to the residents of Red Hook.

Response #59: The intent of performing remedies at Superfund facilities is to protect public health and the environment. The EPA is required to implement Superfund remedies in a manner which is also protective of public health and the environment in the short term. In general, hazardous substances in contaminated sediment present long-term human health risks, rather than acute risks from short-term exposure. As a result, removing contaminated sediment from an uncontrolled environment to a carefully engineered and controlled manner reduces exposure.

As was noted previously, a CDF will not be part of the selected remedy. A temporary facility may potentially be required for de-watering and/or water treatment. The need for and the nature of any such on-Site facilities will be determined during the remedial design process.

If such a facility is needed, recognizing that the sediments in the canal are contaminated with a number of volatile organic compounds, the treatment facility would be designed to handle the sediments in a controlled manner that protects the remediation workers who are in regular proximity to the material and the public from air emissions or other releases. The specific measures to control the air emissions during the processing of the sediments will be developed during the design of the remedy. In addition, air monitoring equipment will be placed at various locations in the vicinity of the processing areas to ensure that the air emission and odor controls are effective. The EPA will conduct ongoing outreach with the community regarding the project design and implementation, including monitoring and control measures.

Sediment Treatment/Disposal

Comment #60: Two commenters asked for clarification regarding the disposition of the sediments dredged from the lower portion of the canal as compared to the middle and upper portions of the canal.

Response #60: Three former MGPs are located in the middle and upper reaches of the canal. As a result, the sediments located in the middle and upper reaches of the canal are much more contaminated than the sediments in the lower reach of the canal. The sediments from the middle and upper reaches will, therefore, require treatment and disposal at off-Site facilities. The sediments from the lower reach of the canal were determined to be more suitable for treatment via stabilization and either reuse off-Site or placement in an on-Site CDF. As noted above, an on-Site CDF will not be utilized, so the sediments from the lower portion of the canal will also be sent to an off-Site facility.

Comment #61: A commenter expressed the belief that any disposal or treatment options which include on- or off-Site beneficial use should be eliminated from consideration, since these options would require close monitoring for many years to make sure that the materials do not escape into the environment. Another commenter expressed concern about the long-term stability of the stabilized sediment if used as daily cover in a landfill.

Response #61: The most practical potential off-Site beneficial use option for the stabilized sediment would be use as daily cover in a sanitary landfill. Further evaluations would be required to confirm the amounts and types of stabilizing agents that would need to be added to the sediment to result in the desired physical and chemical properties. Tests to assess the leachability of contaminants, as well as the material strength, would need to be performed on the stabilized material in order to determine whether it would meet the beneficial use requirements.

Monitoring would be performed at the landfill regardless of whether stabilized sediments are used as daily cover.

Comment #62: Three commenters expressed concern that the off-Site transport of approximately six hundred thousand cubic yards of dredged sediments would require twenty thousand truckloads, assuming that trucks with a capacity of thirty cubic yards are used. Since the remediation would be taking place on the waterfront, several commenters suggested that barges be used for transport.

Response #62: The remedy calls for the utilization of barges for the transport of dredged sediment. Barges will also be used, to the extent possible, to limit traffic impacts related to the delivery of equipment and supplies and the transport of materials to the work area.

Comment #63: A commenter expressed concern that the Proposed Plan does not provide an example of an incinerator similar to the one proposed for the Site nor does it provide an example where incinerated waste mixed with cement was safely used as fill.

Response #63: The remedy includes off-Site thermal treatment of the NAPL-impacted sediments dredged from the upper and mid-reaches of the canal, not on-Site incineration. The treated sediment will be transported for beneficial use, such as daily cover at a landfill, at an off-Site location.

Comment #64: A commenter expressed concern that thermal desorption is not suitable for heavy metals. The commenter also expressed concern that a study of possible air pollution was not performed since some of the metals would vaporize during thermal treatment.

Response #64: The NAPL-contaminated sediments located in the upper and mid-reaches of the canal constitute source materials that act as a reservoir for the migration of contamination. These materials are highly toxic and mobile. For this reason, the remedy calls for the NAPL-impacted sediments to be treated off-Site with thermal desorption, followed by beneficial reuse off-Site (*e.g.,* landfill daily cover). Emissions resulting from thermal treatment process would be collected and treated. Tests to assess the leachability of contaminants, including metals, would need to be performed on the stabilized material in order to determine whether it would meet the beneficial use requirements.

Sediment Remediation

Comment #65: A commenter suggested that consideration be given to using Opflex® products to address the contaminants attributable to the CSOs and discharges from the former MGP facilities.

Response #65: Opflex® products are used to absorb oil and chemical spills on the water surface. While this product is suitable for accidental spills and may be appropriate to prevent the migration of contaminants during dredging, it does not appear to be suitable for CSOs and ongoing releases from the former MGP facilities because of the volume of contaminants that are being released. In addition, the placement of the product and its retrieval would be extremely labor intensive.

Comment #66: Given the possibility of an accidental spill, breakdown or storm damage, a commenter suggested that all dredged materials be treated off-Site.

Response #66: As was noted in a previous response, the implementation of remedies at Superfund sites must be undertaken in a manner which is also protective of public health and the environment. To prevent the migration of contaminants should a spill or breakdown occur, designs typically include berms or other containment measures. In addition, the treatment system can be secured in the event of an impending storm to prevent releases. The EPA will take into account lessons learned from Superstorm Sandy in siting and designing any materials handling operations. It should be noted that, due to the configuration of the canal and the logistical complexities of working at and around the canal, it is anticipated that the amount of dredged material being handled at any given time will be relatively limited.

Restoration of Turning Basins

Comment #67: Several commenters suggested that the 5th Street basin, an extension of the 4th Street basin that was filled in between 1953 and 1965, be included in the clean up. One commenter stated that although the Proposed Plan expressed concern that excavating the 5th Street turning basin could potentially damage structures near it, but that protecting the structures during the remediation would not be insurmountable.

Response #67: Analytical data obtained during the RI in the former 1st Street turning basin showed the existence of significant contamination in the fill and the underlying groundwater. As with other former turning basins along the canal, it is believed that contaminated sediments within the 1st Street turning basin were left in place when the basin was filled in. In addition, there are indications that the fill itself may have included waste materials. The filled-in turning basin may also have been subject to later spills and dumping. The basin is hydraulically connected to the canal (with no bulkhead standing between the canal and the basin) such that contaminants within the basin are an ongoing source of contamination. The Proposed Plan did not include the excavation of the 5th Street turning basin since the levels of contamination in the fill and groundwater associated with this turning basin were significantly less than the levels of contamination in the fill and groundwater associated with the 1st Street turning basin. In addition, there was concern about the impact that excavating the turning basin would have on the structural integrity of buildings on or in proximity to the 5th Street turning basin. In addition, the 5th Street turning basin is private property, while the 1st Street turning basin is owned by NYC.

Based upon suggestions made during the public comment period, the remedy now includes the excavation and restoration of the portion of the 4th Street turning basin underneath the 3rd Avenue bridge and the installation of a barrier or interception system on the 5th Street turning basin side of the bridge. This parcel is a small part of an area that was previously referred by the EPA to NYSDEC for investigation as an additional upland source area. The referral identified the property based on its owner, U-haul, rather than as the former 5th Street turning basin.

Canal Bottom Capping

Comment #68: A commenter asked if capping the sediments would raise the bottom of the canal, causing flooding.

Response #68: All of areas that would be capped would be dredged to depths ranging from, at minimum, the thickness of the cap to 20 feet or more. As a result, no portion of the cap would be higher than the bottom of the canal as it currently exists. It should be noted that the water level in the canal is influenced by the tide and the water level in the Gowanus Bay and Upper New York Bay, not the distance between the water surface and the bottom of the canal. Thus, even reducing the water depth by capping would not affect the surface water level under normal conditions. However, as a general matter, it

is anticipated that the depth of the canal will be increased in some areas. Under abnormal tides or surge conditions, this would result in a nominally increased flood capacity in the canal.

Comment #69: Two commenters expressed concern that the armor layer may be affected by future storms. One of the commenters also suggested that estimates be made as to how the dredging and capping will affect the canal's water depth, particularly during flooding events.

Response #69: The caps that will be installed in the canal following dredging will be subjected to a number of physical stresses, including tidal currents, wind wave-generated currents, ice and debris scour and propeller wash. The armor layer would consist of stone of sufficient size so as to prevent damage to the underlying layers. Altering the bathymetry of the canal by dredging and capping will not affect the canal's water holding capacity or minimize flooding under normal conditions. Unless dikes are installed along the canal to protect against increases in the effective sea level or against storm surges, as long as the areas surrounding the canal are within storm surge levels or below future increases in sea level, they will flood. As noted above, the anticipated increases in canal depth as a result of dredging will nominally increase the canal's holding capacity.

Canal Bottom Cap Maintenance

Comment #70: Since the cap that is placed over the dredged areas in the canal would be exposed continuously to salt water and would be subjected to tidal water movement and stormwater flow, a commenter inquired as to how the EPA will insure that the cap will remain effective.

Response #70: Caps are commonly used in salt and fresh water bodies to contain contaminated sediments. The details of the cap construction will be determined during the remedial design. The conceptual design for the cap for the Gowanus Canal consists of an armor layer, an isolation layer and an active treatment layer from top to bottom. The armor layer, which will prevent erosion of the underlying layers from future maintenance dredging, boat traffic and water currents, will consist of 1.5 feet of stone with a median diameter of 0.75 feet. Sufficient sand will be placed on top of the armor layer to fill in the voids between the stones and to establish sufficient depth of sediment for a habitat layer in order to facilitate benthic recolonization. The isolation layer will consist of 0.5 feet of gravel and 0.5 feet of sand to provide protection of the treatment layer from the overlying heavy armor layer. The active treatment layer, as conceptually configured, will consist of 1-1.5-foot of a specific type of clay that will absorb contamination that could well up from below.

Continuous exposure of the cap to salt water will have minimal impact on the cap.

Comment #71: A commenter asked if it would be necessary to remove the overlying sand and armor layers if the oleophilic clay needs to be replaced.

Response #71: If possible, the oleophilic treatment layer will be designed to have a sufficient life expectancy for absorbing contaminants without replacement. If this is not feasible, it may be possible to design targeted areas in the cap intended to facilitate replacement of the oleophilic treatment layer. If these options are determined to be unavailable during the design, the replacement of portions of the treatment layer may necessitate the removal and replacement of the overlying sand and armor layers.

Information on Commercial Availability of Sites to Treat Contaminated Sediment

Comment #72: NYCDEP noted that no information is provided on the commercial availability of facilities to treat the contaminated sediment. The availability of beneficial use sites is unknown. It is unlikely that the material would be accepted at a landfill for use as daily cover without being assessed a tipping fee.

Response #72: The identification of commercial facilities to treat the contaminated sediment and beneficial use sites will be determined during the remedial design. The costs associated with the treatment and beneficial use will be determined during the remedial design.

Stabilization of Dredged Sediments

Comment #73: A commenter asked for details related to the stabilization process.

Response #73: Stabilization mixes materials, such as cement, into the sediment to permanently bind the contaminants physically/chemically. Treatability studies would need to be performed to determine the best stabilization agent and other factors so as to ensure that contaminants are fully bound into the resulting material. Any stabilization conducted pursuant to the remedy will be performed off-Site.

Comment #74: A commenter expressed concern about the safety of an on-Site stabilization facility.

Response #74: At Superfund sites, treatment facilities are designed to comply with all safety and air emission standards to protect the workers and local residents. Air monitoring is conducted at the facility and along its perimeter. In the unlikely event that unacceptable levels of contaminants are detected, processing operations are terminated and measures are taken to promptly address such releases.

However, as was noted previously, any stabilization conducted pursuant to the remedy will be performed off-Site.

Comment #75: Several commenters expressed concern that if stabilization of the dredged sediments is performed in the vicinity of the canal, untreated contaminated sediments would need to be stored there, thereby allowing the potential to mobilize toxic substances during a storm event.

Response #75: Stabilization will be done off-Site. With respect to other storm event impacts, if a large storm is forecasted, all of the operations, including any materials staging areas, would be secured to prevent releases. As noted above, it is anticipated that the amount of dredged material being handled at any given time will be relatively limited. This in turn limits the amount of materials that must be secured during a storm event.

Use of Local Concrete Mixing Facilities

Comment #76: Community Board Six inquired as to how the EPA will evaluate local concrete mixing facilities relative to stabilization. The Board also inquired as to whether the Brooklyn Community Board Six Responsible Development Policy will be applied to the stabilization services component of the project.

Response #76: Vendors will be selected during the contracting process which will be conducted by the PRPs under the EPA's oversight. At a minimum, mixing facilities, regardless of location, would need to demonstrate the ability to perform the mixing to the selected performance specifications and to be able to handle the amount of material generated without causing project delays. As a general matter, the EPA supports the use of qualified local vendors. Strict standards will apply with respect to appropriate health and safety training measures.

The EPA has reviewed the Brooklyn Community Board Six Responsible Development Policy. While the EPA is not required to comply with local advisory policies, the EPA considers, to the extent possible, other project standards, such as sustainability. Consistent with the policy, the EPA supports the use of qualified local vendors where possible.

Comment #77: A commenter asked whether a local source of concrete would be used for stabilization.

Response #77: Since dredged sediment stabilization will be done off-Site, it is unlikely that a local source of cement will be utilized.

Understanding Potential Impacts in Remediation Target Area

Comment #78: NYCDEP asserts that the Proposed Plan shows a lack of understanding of the potential impacts from ISS and the parameters of applicability to the entire remediation target area.

Response #78: In the FS, the EPA estimated the remedial target area for ISS based on the visual impacts of samples collected near the soft-native sediment interface. NAPL-

saturated conditions on both sides of the interface were used as an indication of high NAPL migration potential and were selected for ISS.

The EPA has performed additional studies to determine the canal conditions (*i.e.,* NAPL saturation and groundwater discharge rates) that will allow continued upward NAPL discharge. The EPA has tested two locations in the ISS target area identified in the FS and only one (adjacent to Public Place, the former Citizens Gas Works MGP facility) had mobile NAPL. The other, near the Metropolitan former MPG State Superfund site, exhibited lower NAPL impacts in native sediment which would likely not warrant stabilization. This suggests that the areas of native sediment stabilization may be discontinuous. Analyzing the impacts to the entire target area is not justified at this time since the precise ISS target area(s) will be identified during the remedial design based on the results of confirmatory design sampling.

In-Situ Stabilization Benefits

Comment #79: NYCDEP and the PRP Group opine that the use of ISS is based on unproven assumptions about its potential benefits.

Response #79: ISS has well established benefits that are directly applicable to the Gowanus Canal. These benefits are listed in a recent Interstate Technology & Regulatory Council (ITRC) guidance document, *Development of Performance Specifications for Solidification/Stabilization* (ITRC, July 2011). The EPA was part of the development team.

ISS as presented in the FS report uses a combination of solidification and stabilization agents to gain the benefits of both solidification and stabilization mechanisms into the remedial technology.

ISS is being utilized in combination with dredging and multi-layer capping. The use of several remedial components is expected to provide an increased degree of reliability in addressing the impacted media at the Site. As a result, even if some portion of the NAPL is not fully addressed by ISS, the active and passive cap components will provide protective redundancy.

Need for Bench and Field Testing for Site-Specific Conditions

Comment #80: NYCDEP asserts that ISS has not been bench or field tested under conditions likely to exist in the canal.

Response #80: The EPA has performed bench-scale testing of ISS on native sediment from the canal. It is also anticipated that pilot-scale testing of ISS will be performed in the canal during the remedial design. There are three main considerations for ISS application in the Gowanus Canal that were evaluated as part of the bench scale testing and will also be evaluated during the pilot testing : 1) the development of successful mix designs; 2) field implementation under the canal conditions; and 3) integration with

an overlying reactive capping system. These considerations are further discussed below.

- The development of mix designs to successfully immobilize former MGP residuals is relatively straightforward (EPRI, 2009a, b). The EPA performed bench-scale testing to evaluate mix designs for native sediment. National Grid has also tested the application of ISS on native and a mixture of soft and native sediments.
- ISS implementation at the Gowanus Canal, where both landside and barge - mounted ISS equipment may be required, will be informed by experience in previous projects, such as the Columbus Georgia Superfund site (EPRI 2003; Antemir *et al.,* 2010) and others summarized by the EPA (EPA, 2000), and construction/installation will be evaluated as part of the planned pilot study.
- ISS-treated media are known to be much less hydraulically conductive than the sandy/silty media underlying the Gowanus Canal, typically achieving hydraulic conductivity values of less than 10^{-6} cm/s. Therefore, implementation of ISS could lead to significant reductions in contaminant mass fluxes into the canal and the immobilization of NAPL. The presence of monolithic masses may lead to flow bypassing of groundwater impacted by NAPL, which means that the ISS-treated masses must be properly integrated with an overlying reactive capping system to capture any groundwater flow bypass and strip it of its contaminants before it is ultimately released into the canal. Construction/installation will be evaluated as part of the pilot testing.

Comment #81: NYCDEP asserts that ISS treatability testing should be performed prior to remedy selection.

Response #81: The EPA agrees that the treatability testing is important. This testing however, will be part of the design and is not a prerequisite for remedy selection. Section 5. 1. 2 of *the EPA Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA* (EPA, 1988) presents the following guidance on when treatability testing should be conducted:

> A decision to conduct treatability testing may be made during project scoping if information indicates such testing is desirable. However, the decision to conduct these activities must be made by weighing the cost and time required to complete the investigation against the potential value of the information in resolving uncertainties with selection of a remedial action. . . . Project managers will need to make such decisions on a case by case basis. In some situations, treatability investigations may be postponed until the remedial design phase.

The EPA has conducted bench-scale testing of native sediment stabilization (EPA, 2013). This testing showed that ISS can be effective in increasing the strength and reducing the permeability of the stabilized sediments. The bench-scale testing also showed that NAPL migration could be controlled through the application of ISS.

ISS was field tested in 2005 under a program funded by the New Jersey Department of Transportation and administered by Rutgers University (Maher, 2005). This study demonstrated that sediments could be effectively stabilized in-situ.

Criteria for In-Situ Stabilization Performance

Comment #82: NYCDEP asserts that the EPA has not established any criteria for acceptable performance of the ISS or means for evaluating lab and pilot scale testing results.

Response #82: The FS report presents the following RAOs for NAPL-impacted sediments:

- Prevent direct human or ecological contact with NAPL-impacted sediments
- Prevent migration of NAPL from the sediment into the overlying water column
- Prevent NAPL from providing a source to groundwater discharging to the canal from adversely affecting sediment or surface water quality

In August 2012, the EPA issued a Quality Assurance Project Plan, *Addendum 1, Pre-Design Data Collection, Bulk Sample Collection and Stabilization Bench Scale Testing*. This plan presented the following criteria for ISS performance:

> A minimum strength criterion of 20 psi unconfined compression strength is used in this work plan. This criterion was primarily based on the required integrity of molded samples to be subjected to leachability testing (*e.g.,* the EPA LEAF Premethod 1315 testing).
>
> Targets for final leaching concentrations will be based on the Final Chronic Values presented in the FS and presented in the tabulation [in Table 1]. The SVOCs selected for leaching concentrations are based on the composition of NAPL from the former MGP facilities.

Table 1: Final Chronic Values

Description	**Final Chronic Values for PAHs**
Chemical	**Milligrams per Liter**
Napthalene	0. 1935
Acenapthene	0. 3069
Fluorene	0. 0393
Phenanthrene	0. 0191
Pyrene	0. 01011

Justification of and Alternatives to In-Situ Stabilization

Comment #83: NYCDEP asserts that the need for the ISS layer was not evaluated in a meaningful manner in the FS report, nor were alternatives to ISS considered. To justify the inclusion of ISS in the recommended remedy, additional evaluation and testing is required. The lack of specific information on the technical feasibility and

implementability of the ISS process makes its inclusion in the recommended remedy questionable.

Response #83: ISS was included in the Proposed Plan to address the RAO to "prevent migration of NAPL from the sediment into the overlying water column." Stabilization is a well-established technology for NAPL-impacted media associated with former MGP facilities that has recently been expanded to include application in sediment. The target area identified in the Proposed Plan for ISS application includes the areas most likely to have continued NAPL migration from the native sediment based on visual impacts as presented in the RI report.

No other in-situ technologies were included in the remedial alternatives developed in the FS because no other in-situ technologies were considered applicable based on the results of the technology screening. The technologies of enhanced biological oxidation/reduction, vitrification, chemical oxidation/destruction and absorption were not retained for the various technical reasons described in the FS report.

Migration of Sediments During Remediation

Comment #84: A commenter expressed concern that since there have been three 100-year storms in the area in the past 10 years, it is likely that such a storm will occur during the remediation effort, potentially mobilizing contaminants. Several commenters inquired as to what will be done to prevent the migration of contaminated sediments to land areas near the canal if, during the remediation of the canal, a storm event leads to flooding.

Response #84: Steps will be taken to ensure that any resuspension of contaminated sediment during the dredging is kept to a minimum. The EPA acknowledges the concern related to damage and contamination dispersion resulting from potential storm surges during the remedy construction. During remedial actions in coastal areas, it is common practice to monitor weather conditions. If storms with the potential for significant flooding or powerful storm surges are forecasted, work areas and treatment facilities are secured in advance of the storm. The process can include, but not be limited to, temporarily suspending removal operations in order to clear out any stockpiles to their final disposal destination to prevent the possibility of spreading dredged and stockpiled sediment into the area adjacent to the treatment facility.

Although project logistics and sequencing will be determined during the remedial design, it is anticipated that dredging operations will be conducted in a series of discrete areas at any one time, resulting in a limited area of operation, which will need to be secured during a storm event.

It should be noted that while the EPA's risk assessment performed during the RI assumed a worst-case situation whereby material from the bottom of the canal is transported via flood waters, it does not appear that that happened to any significant extent as a result of Superstorm Sandy in October 2012.

Comment #85: A commenter asked whether details related to storm preparations would be presented to the public.

Response #85: Specific details related to the implementation of the remedy will be developed during the remedial design. It is anticipated that the design will take three years to complete. During that time, it is the EPA's intention to continue the ongoing dialogue with the community since the Superfund process commenced three years ago. These discussions will give the EPA the opportunity to discuss the progress of the design and describe specific components of the remedy and consider public feedback.

Confined Disposal Facility

Comment #86: A commenter asked for details related to the configuration of the CDF that was proposed for Red Hook. Two commenters asked whether the CDF would be constructed in conformance with the new Federal Emergency Management Agency (FEMA) standards which require the "ground level" to be 12 feet above the mean high tide. Another commenter asked whether the CDF would be designed to withstand a hurricane and whether it would be in compliance with NYC Department of Buildings' codes.

Response #86: Although a CDF will not be constructed, to be responsive to the inquiry, details related to the CDF's construction will be provided.

It was assumed that the CDF would accommodate the entire volume of sediment removed from the lower canal (estimated at 281,000 cubic yards) and an expansion factor of 1.15 (stabilization increases the volume), resulting in a CDF capacity of approximately 323,000 cubic yards. Constructing a CDF with a stabilized sediment thickness of 20 feet, would have required 10 acres. The CDF would have bordered water on two sides and land on two sides. The layout would have included a single sheet-pile wall on the sides adjacent to land and a double sheet-pile wall on the sides adjacent to the water. The void in the double sheet-pile wall would have been filled with bentonite-augmented soil or a similar low-permeability material. Sufficient stabilization agents (*e.g.*, Portland cement) would have been added to the dewatered sediment such that a monolithic mass would have resulted. The material would have been transferred into the CDF before it was completely hardened. Once the stabilized sediment had hardened, leaching would be expected to be negligible, so a leachate collection system would not have been necessary. Upon placement of the stabilized sediment into the CDF, the top would have been capped. It is presumed that the top layer of the cap would have been asphalt, allowing use of the surface. The CDF design would have needed to ensure long-term effectiveness in a coastal marine environment and would have needed to be approved by NYSDEC and other appropriate governmental regulatory authorities.

Since the CDF would have been designed to securely contain the stabilized dredged sediments within a waterway, the FEMA mean high tide requirements would not have been relevant. The cap and sheet-piled sides would have protected the stabilized mass from damage associated with flooding and hurricanes. Since the CDF is not a building, NYC Department of Building codes would not have been relevant.

Comment #87: A commenter expressed concern about the potential to mobilize toxic substances from the proposed CDF, since it would be constructed in a flood zone.
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Response #87: As was described in the previous response, stabilizing the sediments and containing them in a CDF would have prevented the contents from releases.

Comment #88: A commenter asked for examples of where CDFs have been utilized.

Response #88: Confined disposal is a commonly used management approach for contaminated sediments. According to the Army Corps of Engineers (USACE), 45 CDF facilities have been constructed to store dredged sediment in the Great Lakes. CDFs have been constructed for the EPA facilities at the Milwaukee Waterway, Tacoma, WA, Waukegan Harbor, Inland Windmill Island, Holland, MI.

Comment #89: A commenter stated that if a CDF is constructed, it would require the preparation of an environmental impact statement (EIS).

Response #89: The National Environmental Policy Act of 1969 was enacted by Congress to establish a framework for environmental review of actions carried out by the federal government. The EPA mandates that all agencies of the federal government prepare an EIS when they undertake or fund "major federal actions significantly affecting the quality of the human environment." Both Congress and the courts have determined, however, that the EIS process is not applicable to the EPA actions under CERCLA, since the statutes that the EPA administers include information gathering and analytical requirements that are functionally equivalent to the EIS process.

Comment #90: A commenter expressed concern that due to the chance that the stabilization could fail, stabilized sediments should not be stored in a CDF. The commenter noted that the benefits of storing the stabilized sediments at Red Hook are not worth the risk of human exposure. A commenter asked if the CDF is constructed, how the EPA would guarantee the security and safety of his family.

Response #90: In the unlikely event that the entire stabilized sediment monolith or a portion of it failed, since the monolith would have been capped and surrounded by sheet-pile walls on the sides adjacent to land and a double sheet-pile wall filled with bentonite-augmented soil or a similar low-permeability material on the sides adjacent to the water, human exposure would have been unlikely.

Comment #91: A commenter asked how the EPA would protect the integrity the CDF from intrusive activities.

Response #91: Institutional controls are non-engineered instruments, such as administrative and legal controls, that help minimize the potential for human exposure to contamination and/or protect the integrity of remedies. Institutional controls play an important role in remedies because they reduce exposure to contamination by limiting land or resource use and guide human behavior at a site. If a CDF had been constructed, an institutional control, such as an environmental easement, would have been used to protect the integrity of the CDF (*i.e.,* prevent intrusive activities and restrict the overlying land use).

Comment #92: A commenter noted that since institutional controls would be required and since monitoring would be needed because of the potential for contaminants to leach, the CDF should not be sited in Red Hook.

Response #92: As was noted above, it is unlikely that contaminants would have leached from the monolith or the CDF. Periodic maintenance (primarily, the cap) would have been performed to assure that the CDF continued to function effectively. Monitoring would have been performed, primarily, to evaluate the integrity of the cap. The institutional controls would have been put into place to assure that the CDF would remain undisturbed.

Comment #93: Two commenters expressed concern that the proposed CDF does not address the impact that the placement of fill contiguous to a flood zone will have on future flood events.

Response #93: Creating a CDF in the existing slip would not have affected the canal's water holding capacity or increased the potential for flooding.

Comment #94: A commenter indicated that Environmental Justice (EJ) guidelines should prevent the siting of a land-based dewatering facility and a CDF at the GBX property. The property is adjacent to ball fields, a popular track, park areas and an Olympic sized swimming pool all of which are frequently used by Red Hook residents and residents of neighborhoods throughout Brooklyn.

Response #94: The operation of a land-based dewatering facility will not pose a health risk to the users of the park and pool. Similarly, the construction of a CDF at the GBX property, if this had been selected, would not have posed a health risk to the users of the park and pool. Health and safety precautions are implemented to protect the health of workers directly exposed to material being handled; this degree of controls and monitoring is also designed to ensure the protectiveness of residential and recreational users in adjacent areas.

Comment #95: A commenter suggested that the CDF might also be used in dealing with the 1st Street turning basin spoils, as well.

Response #95: There would not have been sufficient capacity in the CDF to accommodate sediments from the 1st Street turning basin, as suggested.

Comment #96: A commenter asked what the land overlying the CDF would be used for.

Response #96: The land overlying the CDF could have been used in any manner that is consistent with the current industrial zoning of the surrounding property, as long as the use did not entail intrusive activities into the CDF. In addition, there would have been limitations on the types of structures that could be placed on top of the CDF and limits on the types and size of plants, if any, which would have been allowed to grow on top of the CDF.

Comment #97: A commenter asked whether the completed CDF could be made available to the public for inspection.

Response #97: While the EPA could have arranged for the public to inspect the completed CDF (it would be located on private property), there would not have been much to observe, since the top layer of the cap would likely have been asphalt.

Comment #98: A commenter asked whether the EPA can use eminent domain to take from the property owner the slip where the CDF is proposed and once the CDF is created, build piers and then cede the ownership of the land to public housing residents in Red Hook. The commenter opined that this way, the residents of Red Hook could benefit from the profits stemming from the increased waterfront property, not just the property owner.

Response #98: While the EPA has the authority to take the property necessary to implement a remedy through eminent domain as long as the property owner receives just compensation, the EPA does not have the authority to develop it and turn it over to other private parties. The property owner proposed that the CDF would have allowed the expansion of the GBX terminal, which would have increased the docking capacity. The increased docking capacity would have benefited not only the property owner, but local businesses that rely upon the terminal.

Comment #99: Several commenters suggested that it be required that a CDF only be constructed if there is a community benefits agreement (CBA)[17] that represents equitable distribution of the benefits along with the community burdens of the cleanup. For example, states one of the commenters, since close to 60% of the Red Hook population lives in public housing and since the owner of GBX is only one person,

[17] A community benefits agreement is a contract signed by community groups and a real estate developer that requires the developer to provide specific amenities and/or mitigation to the local community or neighborhood. In exchange, the community groups agree to publicly support the project, or at least not oppose it.

delivering a result of the cleanup that only benefits the property owner, clearly, would not represent equitable distribution of the benefits. The commenter notes that if the EPA could gain public acceptance that the CDF would be safe, shared ownership of the CDF and deep sea port with the community would facilitate the CDF being built (the shoreline is a public good and using the EPA to change the shoreline is an end run around public processes states the commenter). Also, states a commenter, local jobs are not assured and creating jobs is not a compelling enough community benefit to justify supporting the construction of a CDF. The commenter notes that community members might not have proper qualifications and elderly or special needs populations could not be considered. In addition, states the commenter, community job numbers are usually lower than forecasted. While workforce development, through the Superfund Job Training Initiative (JTI), should be an integral part of the Superfund cleanup and jobs should be written into a CBA, the best way to share the proceeds of any public good resulting from the EPA cleanup would be collective ownership and dividend payments associated with the public good, suggests a commenter.

Response #99: The EPA cannot enter into a CBA, and it is not known if the PRPs that perform the remediation would have been willing to enter into such an agreement on their own.

The EPA has been a strong supporter of job training initiatives for people who find it difficult to get into the work force because of inadequate education or personal difficulties, such as a criminal record. The EPA anticipates supporting a job training program at the Site, regardless of the absence of a CDF.

Comment #100: A commenter asked whether there would be continuing operation of the CDF in Red Hook.

Response #100: Once the stabilized sediments from the canal were placed into a CDF, it would have been capped and all of the treatment equipment would have been dismantled. The only subsequent actions at the CDF would have been periodic monitoring and maintenance.

Comment #101: A commenter asked how the bidding process for the construction of the CDF would work if the location has not been identified.

Response #101: The location of the CDF would have been finalized during the design of the remedy. Therefore, any requests-for-proposals related to the construction of the CDF would have specified the location.

Comment #102: A commenter asked if the entity that would be constructing and maintaining the CDF has any environmental violations on its record. Another commenter suggested that on-Site stabilization and placement in on-Site CDF would make sense if a very experienced, reputable, reliable contractor is used.

Response #102: While the owner of the property where the CDF was proposed to be constructed may have some environmental violations, he would have had no role in constructing or maintaining the CDF. Superfund cleanup work is typically conducted by

experienced, specialized remediation companies that adhere to the EPA's high standards, under EPA oversight. All of the construction work at the Site is expected to be performed by the PRPs. The PRPs must provide documentation to EPA that each of their contractors is qualified.

Comment #103: Several commenters expressed concern about the long-term integrity of stabilized sediments placed in a CDF situated in a marine environment. Another commenter expressed concern about the potential for releases from the CDF should the cap be damaged through an earthquake or other event.

Response #103: Stabilization mixes materials, such as cement, into the sediment to permanently bind the contaminants physically/chemically. Treatability studies would have been needed to determine the best stabilization agent and other factors. The CDF into which the stabilized sediments would have been placed would have been designed to ensure long-term effectiveness in a marine environment. Maintenance of the CDF cap would have been a component of the remedy. If the CDF's cap were to become damaged, it would have been repaired. Like other components of the remedy, the CDF cap was considered for the purposes of redundancy.

Comment #104: A commenter expressed concern that the property owner would be able to dump the spoils back into the canal without treatment.

Response #104: Since after stabilization, the sediments would have become a monolith and would have been contained in a CDF, it would not have been possible for the spoils to be dumped into the canal. Beyond providing the property, the property owner would have had no involvement in the handling of the materials.

Comment #105: A commenter expressed concern that the filling in of privately owned lands in the Gowanus Bay section of New York Harbor with contaminated material used to create the CDF could leach from the CDF and further pollute the harbor.

Response #105: As was noted in a prior response, the stabilized sediments that would have been placed into the CDF would not have leached and would have been contained in the CDF, by design. The EPA would not have proposed or selected an option which would have increased pollution to the harbor.

Comment #106: Several commenters asked about the health risk that the stabilized sediments placed in the CDF would pose to nearby residents and children playing in the nearby ball fields.

Response #106: Stabilized sediments would not have leached after treatment. In addition, the CDF design would have provided multiple layers of additional protection.

Comment #107: Two commenters noted that for more than 20 years, noxious facilities, such as waste transfer facilities, have been sited in Red Hook. One of the commenters further stated that there is a serious lack of trust in the owner of and the lobbyist for the GBX property. While a commenter recognizes that GBX has the right to build whatever

the zoning allows, the commenter does not want to give the company more land mass by constructing a CDF to facilitate such construction. Another commenter stated that the expanded utilization of the property as a result of the construction of a CDF would undermine the value of the adjacent park and recreation areas. Another commenter noted that while the pollution in the canal stretches through many neighborhoods, the CDF would place an undue burden in perpetuity in Red Hook and will only benefit the PRPs and the property owner. A commenter asked why the EPA would consider placing a CDF in a flood zone. Another commenter asked how it is justified that the property owner would get essentially free land. Several commenters noted that while there would be substantial cost savings constructing a CDF, only the property owner and his company would benefit from the CDF. Several commenters expressed concern that while the CDF would reduce the cleanup expenses of the PRPs, it would not benefit the community. Several commenters state that there was a paucity of outreach to the general public with regard to the CDF option before it was proposed as an option during a limited public comment period. Several commenters opined that the number of jobs that would be created by this effort would not be significant to justify the construction of the CDF. Several commenters noted that while leveraging the cleanup for local jobs is a strong motivating factor, a significant majority of Red Hook residents are opposed to the proposed CDF, believing that the creation of jobs should not be at the risk of physical harm to humans.

Response #107: During studies done by USACE on behalf of NYC, consideration was given to the placement of untreated sediment in the 4th Street turning basin. As part of an associated navigation report, the owner of the GBX facility proposed to USACE that a CDF be constructed in Red Hook.

The draft FS report, which identified a CDF option, was released to the public in December 2011. The EPA's conceptual CDF approach differed from the original consideration in that the sediment would be treated through stabilization. A public meeting to discuss the results of the FS was held on January 24, 2012. The concept of a CDF was introduced at this public meeting. In addition, at the meeting, it was noted that two locations were under consideration–the 4th Street basin or in Red Hook. Discussions about the CDF were also conducted at a number of CAG meetings. Following discussions with the property owner, the EPA identified a potential CDF location on the GBX property. The CDF could be constructed within an existing slip there or within other areas of the property.

While cost is one of the criteria that is assessed in evaluating remedial alternatives, the EPA's primary focus is on protecting public health and the environment. Although the CDF would create "free land" for the property owner and would result in cost savings for the PRPs, it would also provide a viable and safe means of disposing of the lesser contaminated sediments. The stabilized sediments that were targeted for placement in the CDF would no longer be toxic. In addition, constructing the CDF in Red Hook would have provided some local jobs. Although this proposed option would have resulted in operations occurring in Red Hook, all of the proposed cleanup components would have resulted in a significant net reduction in existing impacts to the Red Hook community. The selection of a remedy is based upon nine evaluation criteria–one of which is

community acceptance. As was noted in the Proposed Plan, the decision to stabilize the less contaminated sediments and either reuse them off-Site or place them in an on-Site CDF was evaluated based upon community acceptance. As a result, a CDF will not be constructed, and the materials will be sent off-Site.

Comment #108: A commenter opined that since several thousand people expressed opposition to the construction of the CDF via petitions, postcards, emails, letters and in meetings, the community does not accept the CDF.

Response #108: While approximately 900 parties located in Red Hook, elsewhere in New York State and in other states expressed opposition to the construction of the CDF via letters, emails and postcards and approximately 2,500 business owners, residents, users of the recreation area and concerned citizens signed two petitions opposing the construction of the CDF, 15 local businesses and approximately 700 Red Hook residents located in close proximity to the proposed location of the CDF expressed support for the construction of the CDF via letters and emails.

Comment #109: A commenter opined that since GBX is located in an industrial section zoned M-3, an active marine terminal, next to the largest barge port in the region, expanding the industrial base by constructing a CDF here is a perfect fit for Red Hook. Two commenters stated that on-Site management of dredge spoils at the proposed Red Hook CDF or some other local Site is the most sustainable (less impact on the environment in terms of the carbon footprint) minimal long-term effect on the environment and cost-effective solution. Fifteen local commercial entities expressed support for the CDF, stating that due to a lack of docking space for full-sized ships, the CDF would allow the expansion of the GBX terminal, which would increase the docking capacity. A number of other commenters stated that limited industrial space is available in Brooklyn; increasing the footprint of the property would allow industrial expansion in the area. Approximately seven hundred Red Hook residents located in close proximity to the proposed location of the CDF expressed support for its construction, noting that it would result in the improvement to a local business, provide economic benefits and create local jobs–things which are important to the community of Red Hook.

Another commenter opined that it appears that the concerns about the construction of the CDF were more about “zero expansion of industrial land in Red Hook than whether the project was going to be safe or beneficial to the Red Hook community.” Another commenter suggested that a group opposing the Red Hook CDF pursued a campaign of misinformation about the nature and safety of the CDF in an attempt to stop the expansion of industry in the area, thereby negatively impacting a community with a significant unemployment rate. The commenter notes that not only will the CDF generate temporary local jobs, but expanding the waterfront property will allow further industrial expansion, which would result in permanent local jobs. According to the commenter, the GBX property owner currently hires Red Houses residents. Allowing his business to expand would result in additional hiring potential.

Response #109: Disposing of the lesser contaminated sediments dredged from the lower portion of the canal at a local CDF would be arguably more sustainable than transporting those sediments off-Site for treatment and disposal.

Comment #110: Approximately 900 parties located in Red Hook, elsewhere in New York State and in other states expressed strong opposition to constructing a CDF in Red Hook, expressing health and safety-related concerns, concern about its proximity to ball fields and a pool and concern about the fact that the owner of the property has been assessed fines for environmental violations. One commenter asked how community input in the form of votes for and against the proposal to construct the CDF at Red Hook will be considered in the remedy selection process.

Response #110: With regard to the health and safety concerns, the operation of an on-Site stabilization facility would have been designed to comply with all safety and air emission standards to protect the workers and local residents. Air monitoring would have been conducted at the facility and along its perimeter. In the unlikely event that unacceptable levels of contaminants were detected by the samplers, processing operations would have been terminated and measures would have been taken to prevent future releases. The stabilized sediments placed into the CDF would not only have not leached, but would have been contained in the CDF. Therefore, the stabilized sediments would not have posed a health risk to children playing ball in the ball field or using the pool.

The selection of a remedy for Superfund sites is not a direct vote process with the alternative with the highest acceptance being selected. The selection of a remedy is based upon nine evaluation criteria–one of which is community acceptance. As was noted in the Proposed Plan, during the comment period, the utilization of a CDF was one of two disposal options that would be evaluated based upon community input and acceptance.

As a result of concerns that were expressed by the public about the on-Site stabilization of the lesser contaminated sediments and their placement in an on-Site CDF, this disposal option was eliminated from consideration. The lesser contaminated sediments will be stabilized off-Site and will be beneficially used.

Upland Sources of Contamination

Comment #111: A commenter noted that the Whole Foods property, located along the 5th Street turning basin, is currently being developed. The commenter asked whether or not the property is a source of contamination to the canal.

Response #111: The contamination on the Whole Foods property has been addressed by NYSDEC under its Brownfields program. The EPA obtained additional sampling data from Whole Foods, has been in contact with the construction company and has reviewed its construction plans. In addition, the EPA independently installed wells on the property and took soil and groundwater samples. The EPA assessed the

implemented remedy at the Whole Foods site and, in combination with the results of the groundwater sampling, concluded that the Whole Foods site does not constitute a potential source for recontamination of the canal

Comment #112: Two commenters asked whether or not the Whole Foods property remediation, which included capping, took into account the fact that the property is subject to flooding.

Response #112: The EPA assessed the implemented remedy at the Site and concluded that it does not constitute a potential source for recontamination of the canal, regardless of the fact that portions of the property are low-lying and have been subject to flooding. The construction plans include the collection and treatment of stormwater runoff.

Comment #113: A commenter asked whether or not NYC requested that the EPA not take over the remediation of the upland facilities.

Response #113: By mutual agreement, NYSDEC and the EPA decided that NYSDEC would be responsible for the investigation and remediation of the upland facilities and the EPA would be responsible for the investigation and remediation of the canal itself. NYC has not participated in such discussions.

Comment #114: A commenter expressed concern that the EPA is not applying a comprehensive approach to address the upland sources of contamination to the canal.

Response #114: To prevent recontamination, the upland sources of hazardous substances must be controlled. The former MGP facilities are being addressed by National Grid, a PRP for these facilities and the federal Site, under NYSDEC oversight. Based on the results of the EPA's RI, additional upland areas were found to have the potential to contribute contaminated groundwater to the canal and were referred to NYSDEC for investigation and, if necessary, remediation under the State Superfund program. Remediation schedules for all of these facilities will be coordinated with the schedule for the canal remedy. In the unlikely event that a timely and effective state-selected remedy is not implemented at any of these facilities, the EPA may implement actions pursuant to CERCLA to ensure the protectiveness of the selected remedy.

Combined Sewer Overflows

Comment #115: A commenter noted that there's a sizable difference between the EPA's and NYCDEP's position related to the reduction of CSOs. Another commenter inquired as to the quantity of CSO reductions needed in the upper canal.

Response #115: NYCDEP is currently committed to a number of CSO improvement projects that primarily affect the middle and lower portions of the canal. Together, those projects are projected to reduce annual CSO in the whole canal by 34 percent. NYCDEP also plans a sewer separation project in a 96-acre area around Carroll Street for flood control purposes. It is projected that this effort would result in an additional

overall CSO reduction of 5 percent when it is completed in 2022. NYCDEP is also undertaking a green infrastructure effort that would result in an estimated 10 percent CSO reduction in stormwater discharges to the entire canal over an extended period of time (20-30 years).

Under the current projections, two major outfalls in the upper portion of the canal are not going to be reduced at all. The EPA has determined that CSO solids reductions in the upper portion of the canal in the range of 58 to 74 percent are needed to maintain the sediment PRGs in the surface sediments after remedy implementation for the protection of benthic (sediment-dwelling) organisms and herbivorous birds. Put in a different way, every year, there are approximately 54 storm events. Using two in-line retention tanks as proposed would capture all but five of those events, which translates to an almost 90 percent reduction in overflow events, based on current analysis. Updated analysis will be done during the remedial design and as part of the contemporaneous long-term control plan (LTCP)[18] process.

Comment #116: A commenter noted that although the Proposed Plan details the polycyclic aromatic hydrocarbon (PAH) load reductions that would be achieved through the capture of twice the "first flush," there are no estimates of reductions in the other contaminants contained in the discharge, such as VOCs, PCBs, pesticides and metals. The commenter suggests that the EPA quantify the reductions in these additional contaminants and analyze whether additional CSO capture may be required to fully protect the remedy from discharges of these toxics.

Response #116: The baseline ecological risk assessment (BERA) for the Site documented a number of contaminants of potential ecological concern (COPECs). The BERA concluded that total PAHs and certain metals were risk drivers, accounting for the majority of the unacceptable risk. Based on this, preliminary remediation goals were developed for those risk drivers under the assumption that all other COPECs would be addressed concurrently with the risk drivers. It is assumed that CSO reductions that address the risk drivers will also address the other COPECs since the contaminants generally tend to adhere to organic particles and be commingled.

Comment #117: Several commenters asked that the EPA insure that the canal remediation also address the CSOs. Several commenters stated that it is important that the remediation of the canal be performed thoroughly and that the canal remains clean post-remediation.

Response #117: Dredging and capping the contaminated sediments will eliminate the migration of the contaminated sediments and human and ecological exposure to them. To prevent recontamination, the upland sources of hazardous substances, including discharges from three former MGP facilities, CSOs to the canal, other contaminated areas along the canal and unpermitted pipes along the canal, must be controlled. The

[18] An LCTP is a phased approach for control of CSOs that requires a permittee to develop and submit an approvable plan that will ultimately result in compliance with CWA requirements and New York State water quality standards.

selected remedy would control the aforementioned sources so that the canal remains clean following the remediation. Post-remediation monitoring will ensure the effectiveness of the implemented remedy.

Comment #118: A commenter noted that NYCDEP is not precluded from implementing CSO controls beyond what is mandated through the LTCP development process and nothing in the CSO order between NYSDEC and NYCDEP diminishes the EPA's authority under Superfund to address toxics being discharged to the canal and protect the long-term viability of the selected remedy.

Response #118: NYC is under order with New York State to achieve the water quality goals of the CWA and must ultimately meet the "highest attainable use" per the EPA's LTCP guidance. The CERCLA and CWA processes are separate. However, EPA and NYSDEC are committed to work together and with NYCDEP throughout the development of the remedial design and the contemporaneous LTCP development process to ensure that both the Superfund and CWA goals are met in a timely, cost-effective manner. The EPA's remedial design will be informed and refined by the results of additional sampling and modeling and by coordination with NYSDEC and NYCDEP as they develop the LTCP, provided that it does not delay the remedial process. The LTCP, which is due to the State in June 2015, will address, at a minimum, the EPA's remedial performance goals for further CSO solids control in the upper reach of the canal.

Comment #119: A commenter asked whether the EPA will take an enforcement action if NYC is not willing to address the CSOs to prevent post-remediation recontamination of the canal.

Response #119: It is the EPA's expectation that we will reach a negotiated settlement with NYC, as well as with the other PRPs, to perform the design and construction of the remedy selected in the ROD. If the EPA is unable to reach a settlement with any of the PRPs, a variety of enforcement options are available under the Superfund law. The EPA will take appropriate actions to ensure that the canal cleanup is not jeopardized by the post-remediation recontamination of the canal from the CSOs or other ongoing sources of hazardous substances to the canal.

Frequency of Discharge with Changing Climate Conditions

Comment #120: National Grid and Gowanus Conservancy asserts that the potential frequency and volume of stormwater that may be discharged is uncertain, especially in light of climate change predictions that storm events will be more frequent and severe.

Response #120: NYCDEP is a vocal leader in climate change and resiliency planning issues, and has included climate change considerations in its overall sustainability effort, PlaNYC.[19] The New York City Panel on Climate Change was established by Local Law 42 to review scientific data on climate change and its potential impacts and to make recommendations for projections from time to time. In this context, NYCDEP's

[19] http://www.nyc.gov/html/planyc2030/html/home/home.shtml; accessed June 2013.

climate change reports have consistently warned of the potential for increased future rainfall and storm event intensity (see NPCC Report, May 2010).

The EPA agrees that prudent planning during the remedial design will require CSO reduction levels which give consideration to changing climate conditions in order to ensure a sustainable CERCLA remedy. Absent this, the planned CERCLA CSO reductions might not meet the level needed to maintain the cleanup in the canal.

Throughout the EPA's involvement at the Site, the public has expressed concern that NYCDEP is underestimating CSO discharge volumes to the canal. NYCDEP does not regularly collect data to track actual CSO discharge volumes. Instead, NYCDEP estimates CSO discharges for the Gowanus Canal and other watersheds using modeling. The modeling is based on a range of parameters and data which are calibrated through various studies. See NYCDEP, 2008 and NYCDEP, 2007.

The WWFP utilized an annual rainfall value of 40.7 inches. This figure was derived from rainfall data for John F. Kennedy International Airport (JFK) for the year 1988. Although total annual rainfall is a consideration, it should be noted that storm duration and intensity determine whether a CSO event occurs. NYCDEP modeling estimates the baseline annual CSO discharge volume to be 377 million gallons. After the completion of the Flushing Tunnel and pump station upgrades, the estimated annual volume is 250 MG.

NYCDEP already plans to determine if adjustments are needed to the rainfall baseline as part of the upcoming LTCP process (see Alley Creek LTCP Kickoff Presentation, October 2012, page 21). Use of a higher figure would arguably be consistent with NYCDEP's June 2013 Climate Risk Information Report (NPCC, 2013), which provides a current annual baseline rainfall amount of 50.1 inches (see http://www.nyc.gov/html/planyc2030/downloads/pdf/npcc_climate_risk_information_2013_report.pdf). NYCDEP's "Notify NYC – CSO Advisory Notification System" program, begun in October 2012, includes rainfall data for the National Oceanic and Atmospheric Administration (NOAA) rain gauges at JFK, LaGuardia and Central Park.

That figure is roughly 25% higher than the Gowanus Canal CSO modeling baseline, and is based on Central Park rainfall data. In addition to JFK and Central Park, NYCDEP also considers data for LaGuardia and Newark Airports (see Alley Creek LTCP Kickoff Presentation, October 2012, page 21). Of the four stations considered by NYCDEP, JFK is typically the lowest of the four.

Actual annual rainfall levels for JFK since 1988 have been as high as 56 inches in 2011 (that year Central Park experienced over 72 inches of rain). See Figure 8 and Table 2, below.

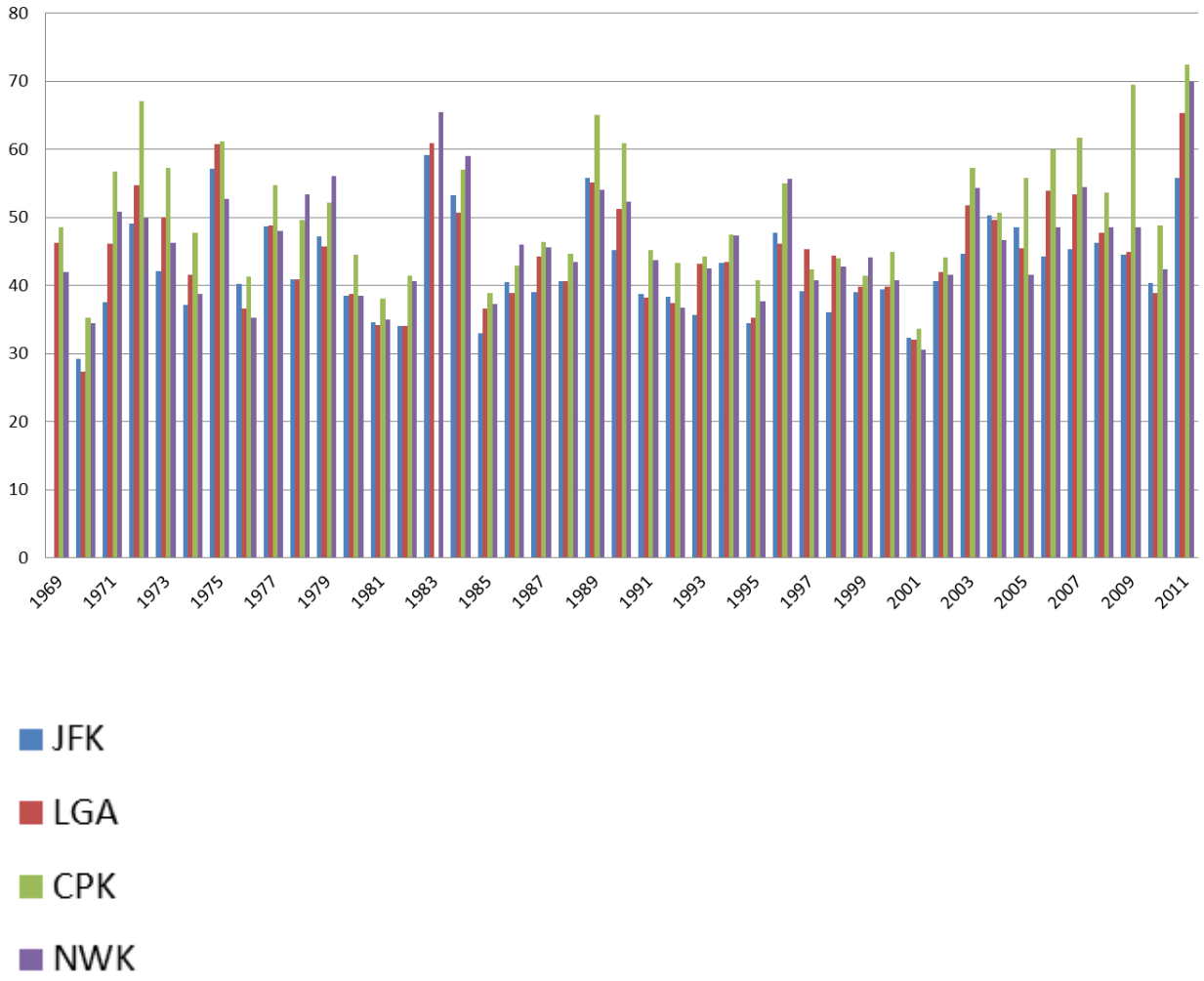

Figure 8: New York City Annual Precipitation

			NYC Annual Precipitation (inches)
Year	**Central Park**	**JFK**	
1989	65.11	55.73	
1990	60.92	45.24	
1991	45.18	38.73	
1992	43.35	38.38	
1993	44.28	35.61	
1994	47.39	43.33	
1995	40.42	34.42	
1996	56.19	51.45	

1997	43.93	39.87
1998	48.69	37.55
1999	42.5	40.1
2000	45.42	41.02
2001	35.92	32.72
2002	45.21	43.13
2003	58.56	44.77
2004	51.97	50.95
2005	55.9	49.55
2006	59.9	44.8
2007	61.7	46.91
2008	53.61	46.26
2009	53.63	45.88
2010	49.37	42.47
2011	72.81	55.77
2012	38.51	39.85
Average	50.85	43.52

[1] JFK data from National Oceanic and Atmospheric Administration (NOAA) National Climate Data Center, available: http://www.ncdc.noaa.gov/cdo-web/datasets/ANNUAL/stations/COOP:305803/detail

[2] Central Park data from NOAA, Historical Climatological Data - Central Park, NY, Annual Precipitation Report. Available: http://www.erh.noaa.gov/okx/climate_cms.html

JFK is located in Queens County. Notably, NYCDEP modeling utilizes JFK 1988 rainfall data not only for the canal, located in Brooklyn, and Newtown Creek, located on the border of Brooklyn and Queens, but also for more distant sewersheds, such as the Bronx River. See NYCDEP, 2010, page 8-13.

NYCDEP's Climate Change Report provides a potential basis for the differential between the four NOAA stations: "Because some parts of New York City, including parts of coastal Brooklyn and Queens, currently experience significantly fewer extreme precipitation days than Central Park, they may experience fewer extreme precipitation days than those shown in the table for Central Park in the future as well." NPCC 2013, page 20. However, it is not clear that this stated differential is applicable to each of the separate sewersheds, including the canal.

In addition to any update of the 1988 standard, future impacts need to be considered as well. The June 2013 Climate Change report projects a middle range (25th to 75th

percentile) estimate of 0-10% increase in precipitation above the current rainfall baseline during the 2020's. See NPCC 2013, page 5. Storm intensity is also likely to increase:

> Heavy downpours are very likely to increase in frequency, intensity, and duration. "Very likely" is defined as ">90% probability of occurrence. [T]he four years with the most occurrences of 2 or more inches of rain (1983, 1989, 2007, and 2011) have all occurred since 1980. Over the larger Northeast U. S. region, intense precipitation events (defined as the heaviest 1 percent of all daily events) have increased by approximately 70 percent over the period from 1958 to 2011 (USGCRP, 2013). NPCC, pages 4 and 13.

The CSO discharge modeling is also exclusive of extraordinary events which result in releases to the canal. For example, during Superstorm Sandy, approximately 13 million gallons of untreated sewage was discharged due to pump stations not being on-line. See NYCDEP presentation to Community Board Six regarding Gowanus Canal Infrastructure Improvement/Post-Hurricane Sandy Updates, January 28, 2013, page 4. As a result, there is at least the potential that actual CSO discharge volumes into the Gowanus Canal may be greater than the current estimate of 377 million gallons per year. In order to achieve the remediation goals, these factors will need to be taken into account during the remedial design for CSO solids controls.

Criteria for Combined Sewer Overflow Reductions

Comment #121: Community Board Six commented that the separation of the CERCLA remedy from the CWA requirements is troubling and it suggested an even more aggressive approach to CSO controls.

Response #121: Sampling data indicate that CSOs are among the sources which are discharging hazardous substances to the canal. If these are not reduced, surface sediment concentrations will exceed the PRGs following remedy implementation. These discharges are primarily from RH-034 at the head end of the canal and OH-007 in the middle of the canal.

As discussed elsewhere, in addition to contributing COCs at levels above the PRGs, CSO solids also contribute several other deleterious impacts to the selected remedy. The CSO solids adsorb and concentrate other canal contamination which binds to the organic sewage components. The CSO solids also decompose, leading to ebullition which results in transport of NAPL from the sediment to the water column.

NYCDEP is currently implementing infrastructure repairs and upgrades which will decrease CSO discharges to the lower section of canal and will also reduce the discharge of floatable debris throughout the canal. This work is being done pursuant to the above-noted CSO Consent Order under authority of the CWA. The broad purpose of the CSO Consent Order is to achieve the fishable/swimmable goals of the CWA. Following the completion of the current work, the LTCP process will assess if additional CWA-related improvements are necessary. The contaminated CSO solids controls

which the EPA is separately requiring are for the purpose of assuring the long-term effectiveness of the remedy, rather than for CWA purposes. These additional controls will, however, result in additional CWA benefits.

The EPA and NYSDEC recognize the value in coordinating CERCLA and the CWA efforts to the extent practicable. In order to ensure that the LTCP process is consistent with the CERCLA remedy, NYSDEC has required that the LTCP must meet, at a minimum, the requirements of the Superfund remedy.

The LTCP process includes a one-year, post-construction monitoring program to determine if NYCDEP's current repairs and upgrades will have achieved the planned effectiveness for CWA purposes. The LTCP will then be developed by NYCDEP and approved by NYSDEC. The EPA plans to closely review NYCDEP's monitoring efforts both to assure that the current actions achieve what is planned for the lower canal and as a source of information in the remedial design of the contaminated CSO solids controls selected for the CERCLA remedy. The data developed during the remedial design, as well as through the LTCP process to the extent that it is moving in parallel, will be utilized to refine the CSO reduction range and the CSO retention tank size necessary to achieve the PRGs.

Combined Sewer Overflow Controls

Comment #122: A commenter stated that sewage retention tanks would not address the cause of the problem–stormwater. Instead of sewage retention tanks, the commenter suggested smaller, strategically-located rain water holding tanks in upslope sites that would make retention tanks unnecessary by diverting overland flow from the sewers.

National Grid asserts that high-level sewer separation for some of the largest CSO outfalls on the canal will not be adequate to control CSO discharges.

Response #122: The WWFP evaluated numerous CSO control strategies including, but not limited to sewer separation, treatment, storage, and combinations of these strategies. While all of these approaches were found to be feasible by NYCDEP, NYCDEP screened out all of the options based on cost effectiveness, a factor to which the CWA gives higher import than CERCLA, which requires protectiveness to be considered first. In order to understand how NYCDEP calculated its CSO retention tank costs and determined that such tanks were not cost effective, the EPA requested NYCDEP's supporting documents for its CSO retention tanks costs from the WWFP. NYCDEP did not provide any documentary support for its costs (New York City Response to the EPA Request for Information, November 21, 2012). It should be noted that the costs in the WWFP exceeded the as-built cost per million gallons of other retention tanks previously constructed by NYCDEP.

During 2012, NYCDEP and the EPA each performed separate screenings and evaluations of technologies for CSO solids controls. NYCDEP's analysis was performed at the request of NYSDEC under the CWA. NYSDEC specified eight options for NYCDEP to evaluate, including use of silt curtains at RH-034, developing maintenance dredging metrics, upgrades and improved maintenance of the OH-007

weir, yearly monitoring of solids, advanced implementation of NYCDEP's required CSO sediment mound dredging, and additional regular sewer cleaning. NYCDEP concluded that optimizing the OH-007 weir, already done in March 2012, was feasible. NYCDEP found three options – routine cleaning of the OH-007 weir, monitoring solids and maintenance dredging - to have some potential effectiveness. NYCDEP found the remaining options to not be feasible.

The feasibility analysis performed by the EPA evaluated the same contaminated CSO solids control options as NYCDEP and included the additional option of providing retention tanks. The no-action case in the screening analysis performed by the EPA was based on NYCDEP's WWFP and the controls it plans to achieve - an overall 34% estimated reduction of CSO discharges (when compared to NYCDEP's modeled baseline assumption, and subject to post-construction confirmation). While the CSO reductions from NYCDEP's current repair and upgrade work are calculated with respect to the canal as a whole, these reductions will, in fact, only occur for the middle and lower reaches of the canal.

Like NYCDEP's WWFP, the EPA's analyses concluded that contaminated CSO solids controls are feasible in the canal. The EPA concluded that storage in below-ground tanks or other structures would achieve much higher levels of CSO reductions than the other options considered by NYCDEP's report. The EPA's analysis concluded that such tanks could be implemented at a fraction of the cost specified in the WWFP, at costs consistent with other CSO tanks constructed by NYCDEP.

The NYCDEP intends to implement two projects beyond its WWFP. The contribution of these will be taken into consideration, along with other information developed during remedial design, in determining the final tank sizes and costs.

The first, to be completed by 2022, is for high-level sewer separation along 3rd Avenue in the vicinity of Carroll Street to reduce flooding. It may also reduce CSO discharges to the canal by an additional 5%. However, the storm sewers would discharge runoff directly from the streets to the canal at Carroll Street with potentially no capture of the solids in the runoff. Contaminant load reduction will likely be less than 5%, and may be unchanged if no solids are captured. As with discharge points from new development along the canal, the EPA plans to seek to have appropriate solids and contaminant capture technology implemented at the outfall in order to reduce loading to the canal.

NYCDEP also has a green infrastructure implementation plan over the coming 20 years that NYCDEP expects will further reduce runoff entering the combined sewers and, and reduce CSOs to the canal by an additional five percent. The EPA supports the efforts being made by NYCDEP in green infrastructure and other source controls which may be included in the LTCP. However, details about the full range of future green infrastructure projects in the Gowanus Canal drainage area are not known and the degree of CSO solids reductions has not been established. It should also be noted that NYCDEP's green infrastructure plan will be scaled up over time, such that the bulk of the CSO reductions will occur later in the 20-year planning period. See "New York City Green Infrastructure 2012 Annual Report," April 2013, page 14.

Detailed Calculations on Combined Sewer Overflow Reduction Benefits

Comment #123: Community Board Six suggested that since remedy success is dependent on the implementation of CSO controls, the ROD should clearly show how a reduction in volume and toxicity from the CSO discharges will be achieved. The Board also suggested that the ROD present clear calculations on the future projected volume of contaminants entering the canal, address the uncertainty associated with the "presumed" future scenarios and provide estimates of contaminant loading under interim and long-term sediment control measures.

Response #123: As noted previously, the EPA developed alternatives and provided cost estimates for both the canal remedy and the anticipated contaminated CSO solids controls in the FS report and FS report addendum. The anticipated benefit of the contaminated CSO solids controls is that they will result in achieving the RAOs for canal sediments and the long-term effectiveness and sustainability of the implemented remedy. The EPA believes that the proposed contaminated CSO solids controls are consistent with the EPA policy and that no additional level of calculations of CSO reduction benefits is needed.

The following section from the EPA's 2005 Contaminated Sediment Remediation Guidance for Hazardous Waste Sites indicates the following concerning uncertainty in decisions:

> No two sites are identical and therefore the risk-management strategy will vary from site to site. . . The strategy selected should be one that actually reduces overall risk, not merely transfers the risk to another site or another affected population. The decision process necessary to arrive at an optimal management strategy is complex and likely to involve numerous site-specific considerations. . .
>
> Management decisions must be made, even when information is imperfect. There are uncertainties associated with every decision that need to be weighed, evaluated, and communicated to affected parties. Imperfect knowledge must not become an excuse for not making a decision.

As noted previously, during the remedial design, additional information will be developed in order to optimize the CSO solids controls to achieve the appropriate level of CSO reduction. As discussed elsewhere, the EPA intends to require that consideration be given to future development impacts in designing the appropriate level of control.

NYCDEP has taken the position that the work currently being implemented will result in minimum compliance with the SD water body classification for the canal. As a result, NYCDEP believes that no further investment will be needed for CWA purposes at the canal. However, additional conditions in the canal are considered to be in violation of applicable standards, such as the "narrative criteria" standards. In addition, the goal of the CWA is to achieve fishable, swimmable waters. Even if full compliance with this standard cannot be achieved, the intent of the statute is to obtain the maximum degree of progress toward this goal.

As noted previously, NYSDEC has already determined that NYCDEP's LTCP for the Gowanus Canal must, at minimum, comply with the CSO-related remedial requirements

for the CERCLA remedy (see NYSDEC's Proposed Plan concurrence letter, December 21, 2012). The State's determination in this regard indicates that the State believes that there are sufficient benefits under the CWA to justify the additional contaminated CSO solids controls in the selected remedy.

Although not considered for CERCLA purposes, the additional contaminated CSO solids controls in the selected remedy will produce CWA benefits, including reduced exposure to pathogens and improvement to dissolved oxygen levels.

Industrial Sources to Combined Sewer Overflow

Comment #124: National Grid notes that to adequately control the inflow of sediments and contaminants from the CSOs and stormwater discharges, other industrial sources need to be identified and controlled.

Response #124: NYCDEP, like most municipalities, has historically allowed and continues to allow industrial discharges to its sanitary and combined sewer systems. CSO events, however, may result in the discharge of sanitary sewage and hazardous substances disposed of by non-regulated users or picked up from captured stormwater. Some of these hazardous substances tend to bind to the organic solids present in the sewage.

NYCDEP has operated an Industrial Pre-treatment Program (IPP), as required by federal regulations, since 1987 in order to help protect the sewers, the wastewater treatment plants and NYC's receiving waters. As part of the IPP, NYCDEP issues permits for and inspects IPP facilities to control the quantity and quality of the industrial wastewater discharged to it its system. In addition to issuing permits, as part of its water and sewer rates, NYC charges for such disposal through the sewers. Ultimately, NYCDEP is responsible for the industrial wastewater discharged to its system. NYCDEP is also responsible for the lack of treatment which occurs when the industrial discharges are directed to the canal via CSO events.

The EPA's evaluation of CSO solids and its subsequent determination of the need of contaminated CSO solids controls is based on the CSO solids characteristics under current combined flow conditions (industrial discharges and other flows to NYCDEP's sewer system) based on data collected in CSOs discharging to the Canal that is documented in the EPA's RI report.

Timing of Combined Sewer Overflow Reductions and Remedy Implementation

Comment #125: NYCDEP asserts that the EPA should:

- Wait for the implementation of permanent CSO controls until the currently planned infrastructure upgrades for the mid and lower reaches of the canal are completed.
- Evaluate permanent CSO controls as part of the CSO LTCP process.

- Not require any permanent CSO controls to be implemented prior to the commencement of the canal sediment remedy.

Response #125: The EPA recognizes the importance of timing the implementation of all source controls relative to the implementation of the CERCLA remedy for the canal in order to prevent recontamination of the canal. To that end, the EPA has developed a schedule for the CERCLA remedy implementation that integrates the timing of the required source controls, including the former MGP facilities, CSOs and other sources identified along the canal.

While the EPA's preference is to have the contaminated CSO solids controls implemented in conjunction with dredging the upper and middle reaches of the canal, interim control measures may be necessary. The cost of implementing any interim control measures will need to be assessed against the value of accelerating the final control measures.

The EPA is committed to working closely with NYSDEC and other parties, including NYCDEP and National Grid, to fully integrate the source control work with the implementation schedule of the remedy for the canal. The remedial design will also be informed by, but not dictated by, NYCDEP's work in developing the LTCP for submission in June 2015 pursuant to NYCDEP's Consent Order with the NYSDEC. The LTCP will serve as an assessment of CWA progress.

Characteristics of Combined Sewer Overflow Solids

Comment #126: A number of comments were received that related to the impacts of CSO solids on sediment quality in the canal. NYCDEP argued that CSO solids are not contaminated to a level that requires action under CERCLA or constitute only a small portion of the total mass of solids deposited in the canal, while other commenters argued that CSOs have a major impact on sediment quality and will require more than the 58 to 74 percent solids reduction, specified in the Proposed Plan, to prevent recontamination of the canal after the sediment remedy is implemented. Specifically, the commenters stated that:

- Total PAH and total PCB concentrations of CSO solids do not exceed the PRGs (NYCDEP).
- The lines of evidence related to CSO impacts provided in EPA's FS report addendum are not valid (NYCDEP).
- The recently accumulated sediments adjacent to CSO outfalls are contaminated by PAHs, PCBs, pesticides, metals, pathogens, pharmaceutical and personal care products (PPCPs), and other chemicals that pose a risk to human health and the environment and threaten the success of any remedy (National Grid).

Response #126: Contamination or recontamination of sediments by CSO and stormwater discharges has been documented at a number of sites (*e.g.,* ASTSWMO, 2013; AWTA, 2002; Cohen, 2013; Stern, 2013; Dalton and Fuglevand, 2013). In 2011, NYCDEP performed the dredging and capping of contaminated CSO sediments in the

Hendrix Street Canal (see Mahoney *et al*. CSO Sediment Removal in an Urban Tributary, 2011). Although this is a non-industrial canal on Jamaica Bay, the 7,000-foot long canal is similar in that the uppermost 1,400 feet near a major outfall have a contaminated CSO mound which is causing odor problems. Cadmium, total DDT, total chlordane and total PCBs were the primary contaminants of concern (COCs) detected in the sediment relative to their respective NYSDEC Technical & Operational Guidance Series (TOGS) 5. 1. 9 screening values for Class C sediment. Additional metals (copper, lead and mercury) and dieldrin were detected above TOGS screening values for Class C sediment. Arsenic and total polycyclic aromatic hydrocarbons (PAHs) were also frequently detected above TOGS 5. 1. 9 screening values for Class B sediment. Total benzene, toluene, ethylbenzene and xylene (BTEX) were detected above TOGS 5. 1. 9 screening value for Class B sediment in one of twenty samples collected. The detection of benzene was below TOGS 5. 1. 9 screening values for Class A sediment.

The EPA's investigations have established that CSO solids and associated contaminants accumulate in the canal and contribute to unacceptable risks that require action under CERCLA.

Solids and associated contaminants discharged by CSOs pose a risk of accumulating in and recontaminating the canal because of the highly urbanized nature of the watershed; the percentage of the watershed served by combined sewers and storm drains (94 percent); the large annual discharges from CSO outfalls RH-034 and OH-007 and incomplete flushing of CSO solids from the canal that are expected to occur even after the improvements currently being implemented under NYC's Waterbody/Watershed Facility Plan (WWFP) (Facility Plan; NYCDEP, 2008) are completed. The EPA has reviewed the newly-collected data and information related to CSO solids provided by NYCDEP and National Grid in their comments on the Proposed Plan and has concluded that, overall, the results confirm the data and information used by the EPA to develop and select the remedy for the canal. In particular, all of NYCDEP's data confirms that the CSOs contribute CERCLA hazardous substances to the canal. NYCDEP's comments emphasize the need to control non-CSO discharges, such as from unpermitted pipes. The EPA's conclusion regarding the need to control CSO discharges, however, is consistent with the WWFP's findings that the CSOs are the largest source of pollutants by volume to the canal. Therefore, CSO reductions are a required component of the remedy for the canal.

Comment #127: NYCDEP commented that the contaminant concentrations on CSO solids are below PRGs.

Response #127: NYCDEP collected wet weather CSO samples from the four major outfalls contributing 95 percent of the annual CSO discharge (RH-034, RH-035, RH-031 and OH-007).[20] Samples were collected in six wet weather events as time-composited whole water samples between September 2012 and January 2013. The whole water samples were subsequently filtered using a 0.7 µm filter and the dissolved (<0.7 µm)

[20] Dry weather samples and wastewater treatment plant samples were also collected.

and particulate (>0.7 µm) fractions were analyzed separately. NYCDEP provided the EPA with unvalidated data tables,[21] and the EPA converted the particulate sample results to CSO solids concentrations using the total suspended solids (TSS) results.

It should be noted that particle size distributions in CSO and stormwater samples are continuous and that the selection of a specific filter size to separate "particulate" and "dissolved" phase contamination is an arbitrary operational definition. Some particles will pass through a 0.7 µm filter and will be misclassified as dissolved. In particular, the colloidal fraction of the solids load (and associated contaminants) will pass through a 0.7 µm filter, but these particles may ultimately be deposited with the rest of the solids on the sediment bed in the canal. Therefore, the fraction that is classified as "dissolved" should not be excluded as a component of the overall contaminant load to the canal.

Comment #128: NYCDEP commented that the average total PAH concentration on the CSO solids based on its 2012 data set for the particulate fraction (30 mg/kg) is significantly lower than the EPA's estimate (61 mg/kg).

Response #128: Comparing average concentrations (and confidence limits) does not take into account the variability in contaminant concentrations in CSO discharges over time. The long-term average PAH concentration on CSO solids cannot be reliably determined from these data sets. Only the ranges of total PAH concentrations on CSO solids from the EPA and NYCDEP data sets are compared in Table 3, below, because the sample numbers are not large enough for a robust statistical comparison. In general, the EPA sought to address the uncertainty associated with a given sampling set by utilizing multiple lines of evidence relating to the hazardous substance contaminant loadings and impacts of CSO solids.

Table 3: Total PAH Concentrations on CSO Solids from the Four Major CSO Outfalls

Data Set	Sample Type	Number of Samples	Total PAH17* (mg/kg)	
			Minimum	Maximum
EPA 2010	Whole Water Grab	7	4	185
NYC 2012	Particulate (> 0.7 µm) Time-composited	12	18	44

* Sum of detected 16 Priority Pollutant PAHs and 2-methylnaphthalene

NYCDEP's results are within the range of the EPA's estimated concentrations, and presumably, are less variable because they are based on time-composited samples. The data collectively indicate that PAHs are present in CSO discharges at levels that

[21] Many of the unvalidated PAH and PCB sample results were flagged "B" indicating that the associated blank sample contained an unspecified level of contamination.

could lead to the recontamination of surface sediments in the canal to levels that exceed the PRG of 20 mg/kg at 6 percent TOC.

Additionally, NYCDEP calculated the average total PAH concentration on CSO solids on an organic carbon-normalized basis (30 mg/kg at 40 percent TOC, which is equivalent to 5 mg/kg at 6 percent TOC), compared the result to the PRG (20 mg/kg at 6 percent TOC) and concluded that PAHs on CSO solids are not a concern. However, the concern is that the PAHs discharged in CSOs will accumulate in canal sediments to levels that pose a risk to aquatic organisms. The PAHs and organic carbon in the CSOs are subjected to a variety of weathering and degradation processes after they are deposited on the sediment bed, so their composition and relative concentrations in surface sediment will not be the same as they are in the CSO solids. Benthic organisms are exposed to the contaminants after they have been incorporated into the surface sediments, so the PRG is compared to the total PAH concentrations on an organic-carbon normalized basis in the surface sediment, not the CSO solids.

Comment #129: NYCDEP commented that the average total PCB congener concentration on CSO solids based on the 2012 particulate samples (0.44 mg/kg) is slightly lower than the PCB PRG (0.48 mg/kg).

Response #129: The EPA did not measure PCB congeners in CSO samples. The range of total PCB congener concentrations on CSO solids based on NYCDEP's data set is 0.24 to 0.94 mg/kg, indicating that PCBs are present on CSO solids at levels that could cause recontamination.

Combined Sewer Overflow Impacts on Sediments in Upper Reach of Canal

Comment #130: NYCDEP questioned the lines of evidence presented in the "Impact of Combined Sewer Overflows on Gowanus Canal Sediments," section of *Feasibility Study Report Addendum, Gowanus Canal, Brooklyn, New York,* December 2012 (hereinafter "CSO Impacts section of the FS report addendum").

Response #130: The referenced CSO Impacts section of the FS report addendum examines the characteristics of the top two feet of sediment in the upper reach of the canal, where the influence of CSO solids on sediment quality is most apparent. The EPA believes that the physical and chemical characteristics of the top two feet of sediment in the upper reach of the canal are indicative of substantial CSO impacts. While NYCDEP disagrees in its Proposed Plan comment submissions, as noted in other responses, NYCDEP reports on the Gowanus Canal which predate the Site's listing on the national priorities list as a Superfund site are consistent with the EPA's position.

Total Organic Carbon Content of Sediments

Comment #131: NYCDEP commented that the surface sediments (0-0.5 feet) in the upper reach of the canal are primarily composed of harbor solids because their average total organic carbon (TOC) content (six percent) is closer to harbor solids (three percent on average) than CSO solids (40 percent on average based on NYCDEP 2012 CSO data set).

Response #131: As is noted later in NYCDEP's comments, TOC is not a conservative tracer than can be used to estimate relative contributions of CSO and harbor solids to the surface sediments. NYCDEP's receiving water quality modeling report for the canal (NYCDEP, 2007) describes the breakdown of organic matter in CSO discharges through the process of diagenesis. After CSO solids settle to the sediment bed, a series of chemical reactions occur that contribute to the conversion and decay of organic matter. According to the modeling report, physical indicators that these reactions are occurring are strong odors of hydrogen sulfide and sediment mounds at discharge points. NYCDEP notes that both indicators are apparent in Gowanus Canal. NYCDEP performed a "peeper" study in 1989 specifically to investigate diagenesis. This study measured gases produced in the anaerobic sediment layer due to the decay of settled organic solids; pore water equilibrators, or "peepers," were deployed in the upper mile of the canal where "sediment activity is expected due to the settling of outfall solids" (NYCDEP, 1993). Given the direct evidence of diagenesis, the TOC content in the canal surface sediment would not be expected to reflect directly the TOC content of the CSO solids prior to deposition or a simple ratio of the TOC content of CSO solids and harbor solids.

In the EPA's CSO Impacts section of the FS report addendum, total PAH concentrations on CSO solids are compared to concentrations in surface sediment in the upper canal without adjusting (normalizing) for TOC content. NYCDEP commented that the PAH and PCB contamination in the canal surface sediments could not be attributed to CSOs if TOC is used to normalize the contaminant concentrations in the CSO solids and sediments prior to comparison. However, organic carbon normalization is based on the assumption of equilibrium conditions (EPA, 2002), which is not likely to be the case when contaminated solids in stormwater are mixed with sewage over a short time frame during an overflow event. Organic contaminant data are typically reported on an organic carbon normalized basis to evaluate potential bioavailability after equilibrium has been established at the point of exposure (*i.e.,* in the surface sediments). It should be noted that the mass of PAHs or PCBs discharged to the canal in CSOs is the same regardless of how the data are reported.

Relationships Between Contaminant Concentrations in Combined Sewer Overflows and Surface Sediments

Comment #132: NYCDEP concluded that surface sediment PAH concentrations in the upper canal are substantially higher than concentrations on CSO solids, and, therefore, CSOs cannot be responsible for the sediment contamination.

Response #132: The PAH concentrations measured in NYCDEP's 2012 CSO samples are within the range measured in surface sediment samples in the upper canal and are significantly higher than Upper New York Bay and Gowanus Bay reference area concentrations, indicating that the CSOs do contribute to PAH contamination in the upper canal. While the EPA agrees that CSO solids are not the only source of PAHs to surface sediments in the upper canal, the CSO contribution of PAHs (and other hazardous substances) is significant in mass and volume. As discussed elsewhere, the CSO solids contribute other negative impacts to the sediment, including acting as a sink

by adsorbing other contaminants and transporting NAPL through ebullition caused by decay of the sewage. NYCDEP's current comments and prior submissions acknowledge this adsorptive nature of sediment particles with regard to the fate and transport of sediments. See NYCDEP Proposed Plan comment #3.1, page 20, and NYCDEP, 2011, pages 29-34.

Comment #133: NYCDEP asserts that the EPA's assumption that whole water concentrations of all PAHs are entirely particle-bound is incorrect.

Response #133: The PAH concentrations on CSO solids that NYCDEP measured in the particulate (>0. 7 µm) fraction of 2012 CSO samples was within the range estimated by the EPA based on whole water samples. Although the EPA's estimated PAH concentrations on CSO solids are more variable than NYCDEP's, the new data do not invalidate the EPA's interpretation of the data. The EPA recognizes that 100 percent of the contamination is not particle bound; however, the literature related to the distribution of PAHs and metals on various particle size fractions in stormwater and urban runoff indicates that this simplifying assumption is reasonable (Brown *et al.,* 2012; Grant *et al.,* 2003; Hwang and Foster, 2005; DeGroot and Weiss, 2008; Bathi *et al.,* 2012). As noted above, the fraction that is classified as "dissolved" (*i.e.,* <0. 7 µm) also includes the colloidal fraction, which should not be excluded as a component of the overall contaminant load to the canal. It should be noted that in a presentation to the EPA in February 2011, NYCDEP used the EPA's CSO whole water data to evaluate potential human health risks (NYCDEP, 2011), also making the assumption, at that time, that all of the contamination was particle-bound and associated with the TSS; NYCDEP's treatment of this data utilized the same simplifying assumption as the EPA--that all of the contamination is particle-bound.

Comment #134: NYCDEP asserts that the EPA's CSO data set is limited and, apparently, not representative.

Response #134: The total PAH, copper and lead concentrations on CSO solids as estimated by the EPA (based on whole water samples) and NYCDEP (based on the analysis of the particulate samples) show the same pattern – the ranges of concentrations measured by NYCDEP fall within the range estimated by the EPA, and NYCDEP's data are less variable. The EPA believes that the data collected is, together with the many other multiple lines of evidence considered, including NYCDEP's CWA reports and CSO sampling data, provide strong support for the Agency's conclusions regarding the impacts of CSOs on canal sediment quality.

Comment #135: NYCDEP asserts that the EPA's comparison of PAH concentrations in CSO solids and surface sediments in the upper canal excluded surface sediment data collected on four transects by the EPA's Environmental Response Team (ERT),[22] which averaged approximately 950 mg/kg.

Response #135: The surface sediment (0-0.5 foot) samples collected by ERT in the upper reach of the canal were reviewed by the EPA as part of the RI. The EPA determined that the ERT data was not appropriate for use in the surface sediment data

[22] The ERT collected supplemental samples during the RI.

set since the samples were collected using vibracore sampling technology. The tops of cores taken in soft, very wet and unconsolidated sediments typically do not remain intact when the core is placed in a horizontal position for sub-sampling (i.e., the soft sediment at the top of the core tends to slump). The surface sediment samples utilized in the RI were collected with a grab sampler, and acceptability criteria were applied to ensure that the top six inches of the grab were representative of surface sediments. Finally, although NYCDEP reported that the average PAH concentration in the surface sediment intervals from the ERT cores collected along four transects was 950 mg/kg, the average and median total PAH concentrations in these ten samples were 386 mg/kg and 153 mg/kg, respectively. Even if one were to assume that NYCDEP was correct in asserting that the EPA data effectively understated the PAH concentrations in surface sediments, this would result in a corresponding understatement of the risk presented by exposure to the PAHs in those surface sediments.

Comment #136: NYCDEP asserts that an average total PAH concentration of 56 $\pm$ 40 mg/kg is not representative of surface sediment in the upper canal because it is less than the average total PAH concentration measured in the samples collected by ERT and the average concentration in samples collected by NYCDEP for toxicity testing.

Response #136: As noted above, the 0-0.5 foot samples collected by ERT were not included in the surface sediment data set because they were collected with a vibracore, which adversely affects surface sample integrity. NYCDEP collected only three samples from the upper canal for toxicity testing, and two of these locations are adjacent to each other. The EPA's average concentration was based on samples collected from ten locations throughout the upper reach. National Grid collected three additional rounds of surface sediment samples from the same ten locations in January-February 2011, August 2011 and May 2012 (GEI, 2011, 2012a and 2012b). There are no statistically significant differences in the median total PAH concentrations in the four sets of surface sediment samples considered by the EPA.

Comment #137: NYCDEP asserts that the EPA failed to consider other sources of PAHs, especially in the middle reach of the canal, that likely impact the upper reach of the canal.

Response #137: NYCDEP reports and other data support the EPA's conclusion that CSO solids discharges are a source of PAHs to the canal:

> Wet-weather discharges from a combined sewer system contain a mixture of sanitary sewage and urban runoff that is significantly stronger in pollutant concentrations than natural runoff. These pollutants include coliform bacteria, oxygen-demanding materials, suspended and settleable solids, floatables, oil and grease, and others. (NYCDEP, 2008, page 3-32).

The EPA agrees that CSOs are not the only source of PAHs in the upper canal; however, the large volumes associated with CSOs and the migratory effect of Flushing Tunnel discharges are likely to have a far greater impact on surface sediments in the upper canal than the upstream transport of PAHs from the middle reach of the canal because tidal circulation is weak.

NYCDEP also suggests that the CSO solids are not the source of PAHs to the surface

sediment largely by seeking to differentiate contaminant concentrations of CSO samples from those of surface sediments. However, the level of PAHs associated with a given discharge of CSO solids is unlikely to remain unaltered after entering the canal (even setting aside statistical effects created by collection methods such as time-composited samples). NYCDEP's 1993 hydrodynamic modeling report noted that CSO solids tend to settle within six hours following an overflow event.[23] The report further noted that "[Sediment Oxygen Demand (SOD)] is the greatest when the solids initially settle and the reactive solids have an immediate impact."[24] The CSO solids begin decomposing. In addition, the CSO solids may begin absorbing other contaminated substances; NAPL may be transported via ebullition caused by the sediment off-gassing and mixing with other contaminated surface sediment may occur, such as by storm event disturbances.

Comment #138: NYCDEP asserts that the EPA did not consider the impact of other metal sources to the canal (such as active junkyards on the canal that have been cited for numerous violations) and the effect of harbor solids in diluting the inputs of metals discharged from the CSOs.

Response #138: CSO contributions of metals are well documented, including by NYCDEP's own recent and historic sampling data reports. NYCDEP's comment acknowledges that copper and lead are higher in CSO solids than in reference areas. NYCDEP then asserts that "the EPA's inference that solids from CSO dominate the Canal cannot be supported given the significant dilution by harbor solids to explain copper concentrations. . ."

The EPA's finding that CSO solids dominate the canal, particularly the upper canal, is based on multiple lines of evidence, detailed further elsewhere. Moreover, the EPA's findings are fully consistent with NYCDEP's own, predominately pre-Superfund listing, technical findings:

> Historical discharges by CSOs and stormwater have impacted almost the entire Canal bottom, which can be described as "black mayonnaise" - a dark, black material containing large amounts of organic matter and a low percentage of solids. This is most predominately observed upstream of Hamilton Avenue. (NYCDEP, 2008, page 4-30).
>
> CSOs dominate the loadings of biochemical oxygen demand (BOD), total suspended solids (TSS), and total coliform bacteria to Gowanus Canal. (NYCDEP, 2008, page 3-27)

[23] Both the data and model results indicate that outfall solids, having the greatest impact in the head of the canal, settle out within about six hours after a storm event occurs. Based on the agreement between model results and solids data these settling rates will be applied in projection analyses." (NYCDEP 1993; Inner Harbor CSO Facility Planning Project – Task 4.3B – Gowanus Canal Modeling) at 4-11, 4-20.

[24] (NYCDEP 1993; Inner Harbor CSO Facility Planning Project – Task 4.3B – Gowanus Canal Modeling) at 2-18.

> Discharges from the single outfall at the Gowanus Pump Station (RH-034) dominate the CSO impacts throughout the entire Canal. (NYCDEP, 2008, page 4-41).

As noted in response to a prior comment, NYCDEP's attempt to directly compare and contrast CSO sampling results with surface sediment sampling results is not technically sound, given the variety of physical and chemical alterations which the solids are subject to between the time of discharge to the canal, settling to the sediment bed, and finally sampling as part of a six-inch thick surface layer. For example, surface sediments are likely to be impacted by ongoing mixing with older sediments disturbed by vessel traffic, storms and other causes of re-suspension.

Regarding the processes which may alter the CSO solid metals levels after their discharge to the canal, the EPA believes that harbor sediments have relatively little impact on surface sediment concentrations. The harbor sediments have a much smaller metals loading. As the NYCDEP stated in this regard:

> When compared to "natural" sediments in Jamaica Bay, the naturally occurring metals concentrations in the earth's crust and to the same extent the Inner Harbor water quality station sediments, CSO mounds and tributaries dominated by CSO discharge have much higher sediment metals concentrations (Table 5-16). (Inner Harbor CSO Facility Planning Project – Final Draft Facilities Planning Report. July 1993, page 5-32.)

Next, the lighter harbor solids tend to settle much less than CSO solids, consistent with standard scientific understanding of the issue. As the NYCDEP concluded in 1993, consistent with the EPA's current position:

> Total suspended solids are a critical component of the model framework since CSO's contribute significant amounts of solids that settle to the bed producing an oxygen demand in the Canal. Two solids systems are modeled; background and outfall. The reason for this is that background solids concentrations are similar throughout the Canal while outfall solids concentrations vary depending on outfall locations. In addition background solids settle slowly while outfall solids settle more quickly thereby having a greater flux to the sediment… Based on settling tests performed for this project settling rates for outfall solids of 50 ft/day were applied in the model. Background solids were settled at 1 ft/day in accordance with previous model analyses and calibrations done here. (NYCDEP Inner Harbor CSO Facility Planning Project – Task 4. 3B – Gowanus Canal Modeling. December 1993, page 4-11).

NYCDEP's most recent modeling report update reached the same conclusion:

> Modeling of total suspended solids (TSS) was separated into outfall and background components to distinguish between the heavier, more-settleable solids discharged from sewers and the lighter, less-settleable solids suspended in receiving waters. (NYCDEP Receiving Water Quality Modeling Report – Volume 4 – Gowanus Canal. City-Wide Long Term CSO Control Planning Project – September 2007, page 4-32.)

Despite these repeated, consistent conclusions, NYCDEP, with respect to Superfund matters in the canal, has taken the contrary position that the majority of sediment load at the head of the canal – where the EPA seeks additional CSO solids reductions - are from the harbor. During technical presentations in March 2012, NYCDEP placed the harbor input at 90%. (NYCDEP, March 26, 2012, page 26). In comments submitted in May 2012 to the EPA's National Remedy Review Board, NYCDEP revised this number downward slightly:

> Thus, NYCDEP's analysis shows that under the conservative supposition that all the CSO solids settle in the Canal, only 20 percent of solids accumulating in the Canal are from CSOs and the remaining 80 percent are from tidal exchange and other sources under current baseline conditions… Even in areas such as the head end (from the bulkhead to Carroll Street) where the FS asserts that all the solids are due to CSOs, City's evaluation shows that less than 20 % of the solids can be attributed to the CSOs. (NYCDEP (2012), National Remedy Review Board [NRRB] comments, page 12).

NYCDEP has elsewhere repeatedly determined that the sediment accumulation at the head of the canal is from CSO solids and must be dredged:

> Gowanus Canal's limited capacity for exchange produces a stilling effect that allows suspended solid materials to settle to the bottom of the waterbody. Heavier solids and organic material discharged during wet-weather from CSOs and stormwater have created a sediment mound near the head of the Canal. (NYCDEP WWFP (2008), page 4-29)
>
> The NYCDEP is committed to removing the CSO sediment mound to eliminate the exposure of CSO sediments during low tides. (NYCDEP WWFP (2008), page 8-13).
>
> Gowanus Canal's limited capacity for exchange produces a stilling effect that allows suspended solid materials to settle to the bottom of the waterbody. Heavier solids and organic material discharged during wet-weather from CSOs and stormwater have created a sediment mound near the head of the Canal. This mound becomes exposed at some points during low tide, when noxious odors are released from the anaerobic decay of the highly organic material. Similarly, lighter materials discharged during wet-weather or imported from waters beyond the Canal have settled throughout the Canal. These settled materials build up over time and need to be removed via periodic dredging to maintain navigable depths throughout the Canal. (NYCDEP, 2008, page 4-29).
>
> Tributary to Upper New York Bay, the estuarine Gowanus Canal system experiences a semi-diurnal tidal cycle varying between 5 and 7 feet. There is no freshwater inflow other than CSO and stormwater discharges during wet weather events. The lack of freshwater inflow created a stilling effect on pollutant discharges that allows heavy organic material and grit to settle to the bottom of the waterbody. A sediment mound that is exposed at low tides has formed at the head end of the canal due to historical CSO discharges. (NYCDEP Receiving

Water Quality Modeling Report – Volume 4 – Gowanus Canal. City-Wide Long Term CSO Control Planning Project – September 2007, page 2-1.

Using labile and refractory ratios and decay rates described above total carbon diagenesis was computed and converted to SOD and H2S flux according to equations 4-2 and 4-3. Figure 4-5a to 4-5d depicts total carbon diagenesis and dissolved oxygen limited SOD computed for the four calibration periods. The plots indicate that the upper 500 feet of the Canal are most effected by outfall solids...BOD and solids which respectively exert direct and indirect demand on oxygen have their greatest impact in the upper reach of the Canal. The data indicates that the CSO mound has a significant impact on water quality in the upper reach of the canal. (Inner Harbor CSO Facility Planning Project – Task 4. 3B – Gowanus Canal Modeling. December 1993, page 4-23, 4-37.)

The depth of flow in a combined sewer during normal dry weather conditions is quite low. During rain events the combined sewer flows fuller and faster which may flush out any solids that may have settled during dry weather… Accumulating sediments are a major problem at the head of Gowanus Canal. Several feet of sediment have accumulated in the canal during the past several years and each new overflow continues to contribute new sediment. During wet weather overflows, sediment particles enter the canal and the coarser grained sediments settle to the bottom. Finer grained particles are transported farther downstream. (Inner Harbor CSO Facility Planning Project – Final Draft Facilities Planning Report. July 1993, pages 3-1 to 3-2 and 5-13.)

Notably, NYCDEP is legally obligated under its NYSDEC administrative order to dredge the CSO sediment mound at the head of the canal. This work, to be conducted at an estimated cost ranging from $8.5 - 21.4 million (depending on bulkhead replacement costs), has been attributed by NYCDEP to CSO sedimentation, rather than harbor solids (NYCDEP WWFP (2008), pages 8-5 to 8-6).

NYCDEP suggests that two active junkyards are additional potential metals sources. However, NYCDEP provides no data or rationale to support an assertion that these active junkyards are meaningful additional sources of metals to surface sediments in the upper reach of the canal, as compared to NYCDEP's estimate of 377 million gallons per modeled year of CSO discharges. The scrap metal facilities in question are located at the 4th Street basin and immediately north of Hamilton Avenue. The sediment surface and coring data for metals do not exhibit a pattern of concentration and diffusion which would be expected if these scrap yards were a source impacting the upper canal reach.

Comment #139: NYCDEP asserts that its analysis of metals data indicates an additional source of lead in the upper canal.

Response #139: NYCDEP's conclusion is based on the comparison of average lead concentrations in CSOs and surface sediments and does not take into account the variability in the data. The ranges of lead concentrations measured in CSOs by the

EPA (74 to 2086 mg/kg) and NYCDEP (127 to 940 mg/kg) overlap with the range measured in surface sediment in the upper canal (201 to 776 mg/kg, excluding the unusually high lead concentration measured in the sample collected near 2nd Street [4220 mg/kg]).

Fecal Coliform

Comment #140: NYCDEP asserts that the presence of fecal coliform in the surface sediments does not indicate that these sediments are derived exclusively from CSOs.

Response#140: The Proposed Plan does not state that sediments in the upper canal are derived exclusively from CSOs, but rather that the presence of fecal coliform in the upper portion of the canal, where most of the CSOs are located, confirms that the CSO discharges contribute significantly to the formation of the top surface layer of sediment. As noted above, however, NYCDEP's modeled rate of CSO sediment/harbor sediment settling is at a rate of 50/1, not 20/80, as NYCDEP has suggested since 2012.

Again, NYCDEP's data is consistent with the EPA's findings. Fecal coliform data for the period from 1984 to 1998 are presented in NYCDEP's WWFP (NYCDEP, 2008), which describes the trend as generally decreasing from the head of the canal downstream toward Gowanus Bay. The fecal coliform data summarized in the CSO Impacts section of the FS report addendum confirm this trend. The WWFP also states that for the baseline condition, "CSOs dominate the loadings of . . . total coliform bacteria to Gowanus Canal . . . CSOs were estimated to contribute 99 percent of the baseline load of total and fecal coliform, while stormwater contributes 1 percent." The high levels of fecal coliform measured in surface sediments in the upper reach of the canal are virtually certain to be attributable to CSOs.

Volume of Solids from Combined Sewer Overflow Discharges

Comment #141: NYCDEP asserts that the net annual sediment volume change in the upper canal is estimated to be 675 metric tons of solids per year based on bathymetric differences between 2003 and 2010. The average CSO solids load to the upper canal is estimated at 95 metric tons of solids per year. By inference, the harbor solids are likely the most significant contributor to the net accumulation of solids in the Upper canal.

In a related manner, NYCDEP asserts that the EPA fails to acknowledge the uncertainty in its bathymetric analysis and interpretation, resulting in insufficient understanding of sediment transport:

> From sediment transport science, the suggestion that sediments eroded from areas near the Flushing Tunnel exit would quickly resettle downstream is without merit. If the water velocity were sufficient to scour the sediments 100 feet or more from the Tunnel outlet, it would also have been sufficient to distribute those sediments throughout the Canal and possibly out to the harbor. Fine grained sediments, which constitute the vast majority of surface sediments in the Canal, require a high shear stress (and high flow velocity) to be re-suspended due to

> their inter-particle attraction." (NYCDEP Proposed Plan comment #3.6, page 29.)

Response #141: Even before the canal was constructed, the historical record shows that there was concern that the lack of tidal exchange would result in the canal being a stagnant, polluted waterway. The 1849 state legislation which authorized the City of Brooklyn to construct, own and operate the canal provided for a basin at the head of the canal, part of a conceptual flushing reservoir and "a sufficient number of self-acting flushing gates to keep the said canal clean and healthy..." See Chapter 79 of the Laws of 1849, Sections 2 and 3. Despite the known risk, no preventative infrastructure was incorporated into the canal as built. By 1877, the canal was declared a nuisance by the same municipal authorities, NYCDEP of Brooklyn, predecessor-in-interest to NYCDEP of New York, which oversaw its construction. The next series of "improvements" consisted of adding more sewage lines in order to increase flow. This approach failed for obvious reasons, while contributing sediments which likely still remain in part, given the limited dredging which has occurred historically. (See Hunter Research, Inc. *Final Report National Register of Historic Places Eligibility Evaluation and Cultural Resources Assessment for the Gowanus Canal , Borough of Brooklyn, Kings County, New York in Connection with the Proposed Ecosystem Restoration Study*. Prepared by Hunter Research, Rabner Associates and Northern Ecological Associates, December 2004.)

The Flushing Tunnel, a fairly unique municipal engineering endeavor, was completed in 1911 for the specific purpose of ameliorating the conditions which directly result from the lack of tidal exchange. The Flushing Tunnel is currently undergoing renovation to increase its flow as part of a project costing approximately $150 million. The next phase of this project is the dredging of the upper canal to remove CSO sediments, for which NYCDEP has submitted permit application documents. The origin of these sediments–the CSOs--and the need to remove them has been established in repeated NYCDEP reports, submitted to and approved by New York State, since at least 1983 (see WWFP, pages 5-15 to 5-27). The cost of this dredging is estimated to be $8. 5 - 21. 4 million, depending on bulkhead replacement costs. (NYCDEP, 2008, pages 8-5 to 8-6).

In addition to CSO solids references cited in Response #138, above, NYCDEP's February 2012 Environmental Dredging Permit Application describes the upper canal sediments mounds:

> The currently proposed DEP dredging project was developed to dredge CSO-impacted sediments; it was not intended to address the more extensive sediment contamination discussed in the USEPA's RI related to PAHs, PCBs, metals, and other toxic contaminants. (NYCDEP, 2012, Environmental Assessment, page 1.)

The application acknowledges that CSO-impacted sediments will continue to be a problem:

> Shallower dredging would either not remove sediment mounds currently exposed at low tide or would result in an earlier recurrence of exposed sediments due to ongoing CSO discharges. (NYCDEP, 2012, Joint Application, page 7.)

The application further states that dredging of such CSO sediments is needed from the head of the Gowanus Canal and from several other waterways in NYC:

> [NYCDEP] is required to conduct environmental dredging at several tributaries within the City of New York to remove combined sewer overflow (CSO) mounds that contribute to nuisance odors and dissolved oxygen deficits at the head end of these tributaries. (NYCDEP, 2012, Essential Fish Habitat Assessment Citywide Dredging Engineering Design Contract Services, page 1.)

NYCDEP's June 2013 PlaNYC Progress Report (NYCDEP (2013), page 64) reports on progress on CSO dredging at the canal and the other CSO-impacted waterways. Similarly, the NYCDEP Commissioner's July 12, 2013 and August 5, 2013 letters to NYSDEC identifies the canal sediment mound work as the "CSO dredge project" in providing an updated status regarding its progress and NYCDEP's desire to avoid unnecessary costs and interference with the anticipated CERCLA dredging.

NYCDEP's position, that "deposition on the post-remediation cap surface will be comprised of solids from a number of sources, with the majority coming from Upper New York Bay, as is now the case via tidal action" (NYCDEP 2012, NRRB, page 4) not only contradicts facts first established in the mid-1800s, but would show that NYCDEP is currently expending almost $200 million to resolve a problem – lack of tidal exchange – which its public comments state does not exist.

Addressing NYCDEP's assertions more specifically, the two mass estimates derived by NYCDEP are not directly comparable. The mass estimate based on bathymetric differences between 2003 and 2010 is based on direct field measurements. The mass estimate based on the average CSO solids load to the canal is based on a water quality model that was not calibrated or validated for suspended solids (NYCDEP, 2007). Additionally, the modeled annual CSO discharge to the upper canal used in NYCDEP's calculations (95 metric tons) represents a "baseline" condition rather than current conditions. The "baseline" condition is described in the canal WWFP report as "generally [representing] the current state of the watershed and sewer system, with certain exceptions specifically used for planning purposes" (NYCDEP, 2008). The baseline condition was determined using numerical models of the watershed and sewer systems, with separate models for the Red Hook and Owl's Head Wastewater Pollution Control Plant service areas. The baseline condition is based on a design meteorological condition (calendar year 1988), and the exceptions used for planning purposes are described by NYCDEP as assuming an estimated future sanitary flow for the year 2045, past wastewater treatment and pumping capacities, and sedimentation levels in sewers associated with reasonable maintenance. An unspecified level of uncertainty is associated with each of the parameters used in the models to determine the baseline condition. NYCDEP does not discuss the uncertainty associated with its estimate of the annual CSO solids load for the baseline condition, and it is not known whether NYCDEP's TSS annual load calculations to the canal are a reasonable approximation of current conditions.

NYCDEP's conclusion that harbor solids are likely the most significant contributor to the net accumulation of solids in the upper canal is contrary to the data and assumptions

used as the basis for the water quality model developed for the Inner Harbor CSO Facility Planning Project and subsequent WWFP. The 1993 modeling report (NYCDEP, 1993) states:

> Total suspended solids are a critical component of the modeling framework since CSOs contribute significant amounts of solids that settle to the bed producing an oxygen demand in the canal. Two solids systems are modeled: background and outfall. The reason for this is that background solids concentrations are similar throughout the canal while outfall solids concentrations vary depending on outfall locations. In addition background solids settle slowly while outfall solids settle more quickly thereby having a greater flux to the sediment.

The 2007 modeling report compares water quality conditions before and after reactivation of the Flushing Tunnel in 1999 (NYCDEP, 2007). While noting improvements in bacteria and dissolved oxygen levels, changes in sedimentation patterns were either not evaluated or not reported. The reintroduction of Flushing Tunnel flow (with suspended sediment from the harbor) apparently did not affect NYCDEP's assessment of impacts from CSO solids or modeling of TSS impacts:

> In summary, CSOs and stormwater discharges are primary causes of periodic waterbody use impairments. Discharges of TSS, BOD, settleable solids, and floatables induce nuisance conditions in the upper reaches of the canal and to a lesser extent near the mouth of the canal. These nuisance conditions include odors and depressed dissolved oxygen in the water column that reaches anoxic conditions in summertime due to BOD and sediment oxygen demand, which is sustained by CSO settleable solids discharges.

The updated model separated TSS into outfall and background components "to distinguish between the heavier, more-settleable solids discharged from sewers and the lighter, less settleable solids suspended in receiving waters. A constant settling rate of 50.0 ft/day was used for sewer-outfall solids, while a settling rate of 1. 0 ft/day was used for the background (receiving-water) solids." (NYCDEP, 2007, page 4-32).

The disparity in these outfall rates is also relevant to NYCDEP Proposed Plan comment #3.6 citation, quoted above. As noted previously, NYCDEP described the surface sediments as such:

> Historical discharges by CSOs and stormwater have impacted almost the entire Canal bottom, which can be described as "black mayonnaise" - a dark, black material containing large amounts of organic matter and a low percentage of solids. This is most predominately observed upstream of Hamilton Avenue. (NYCDEP, 2008, page 4-30).

The physical properties of the surface sediments closest to outfall RH-034, which led to the creation of an extensive CSO sediment mound, also dictate that these sediments, if re-suspended, would tend to fall out quickly as Flushing Tunnel velocities diminish, consistent with the EPA's transport analysis.

In response to NYSDEC questions regarding sediment transport created by the original reactiviation of the Flushing Tunnel, NYCDEP's 1994 observations on transport conditions are generally consistent with the EPA's analysis:

> Velocities anticipated at the Gowanus end of the Flushing Tunnel will be approximately 4.0 feet/second. After passing through the inlet/outlet structure, which increases in width from 12' to 50,' and upon entering the Gowanus Canal whichis 100' wide the velocity of the water coming from the Flushing Tunnel will drop significantly to approximately 1.5 feet/second. Based on observations that a velocity of 3.5 feet/second or greater is required to resuspend deposited solids (Tchobanoglous, 1981), it is estimated that only very fine particles from the top 3 to 5 millimeters of a standard muddy sediment may be resuspended and that the displacement of any resuspended material can be measured in terms of hundreds of feet (*i.e.*, less than 500 feet) downstream before it is redeposited to the bottom.
>
> The effects of the resuspension of particles due to the reactivation of the Flushing Tunnel would be similar to existing conditions at the head end of the canal due to the existing combined sewer overflows (CSOs). Bathymetric surveys of the head end of the Gowanus Canal indicated that the CSOs cause sediment mounding to occur for a maximum distance of approximately 500 feet down the canal. Similarly, any sediment resuspended at the head of Gowanus Canal due to the reactivation of the Flushing Tunnel will remain within the head end of the canal and most likely resettle to the bottom before reaching the Union Street Bridge. Unlike the irregular discharge from CSOs, the effects of resuspension from the reactivation of the Flushing Tunnel will occur only within the first few months of its operation after which time the particles will settle and re-establish their location within the head end of the canal. NYCDEP Permit Application documents relating to implementation Inner Harbor CSO Facility Planning Project, page 10, DEP_P_SEW_00065355.pdf

That analysis also appears consistent with information set forth in NYCDEP's dredging application (NYCDEP, 2012). NYCDEP submitted this permit to implement an additional element of the 2008 WWFP. The WWFP called for dredging 750 feet of the CSO sediment mound which extends from the RH-034 outfall. NYCDEP's permit application extended the dredging length to 825 feet based on updated bathymetry data from the EPA (2010) and NYCDEP (2011). After dredging the upper layer of CSO sediments, NYCDEP proposes a clean sand cap to cover the remaining accumulated contaminated canal sediments. To protect against cap scour from the Flushing Tunnel and outfall RH-034, NYCDEP's permit calls for the installation of 200 feet of cabled concrete block mat system. (See NYCDEP, 2012, Joint Application for Permit, page 8). The proposed length of the scour protection system is not inconsistent with the EPA's bathymetric or sediment transport analysis.

It should be noted that the WWFP acknowledges that solids associated with CSO events will continue to be discharged to the canal following implementation of the current upgrades. In response, the WWFP Modeling Report includes an analysis which suggests that the upgraded Flushing Tunnel will disperse the solids more evenly throughout the canal and into the harbor than in the past:

> With respect to settleable solids, analyses of the projected sedimentation of settleable solids indicate that a significant reduction in sedimentation and the

accumulation of sediment at the bottom of the canal can be expected, particularly for the areas located near the head of Gowanus Canal (in the vicinity of the RH-034 outfall and the outlet of the Gowanus Canal Flushing Tunnel.) The reduction of sedimentation can be attributed to a combination of factors. The reduction in discharged CSO volumes will also decrease the amount of settleable solids discharged into the canal. In addition, the flushing action of the upgraded Gowanus Canal Flushing Tunnel will increase horizontal velocity profiles and will thereby help to reduce settling in the canal itself. The resulting transport of solids will result in a more even distribution of settleable solids within the Canal and Bay and will also help to transport solids into the open waters beyond the assessment area. (NYCDEP, 2007, page 5-19.)

The associated figure from this modeling report excerpt depicts a sediment mound, under current modeled conditions, extending 1,000 feet from RH 034:

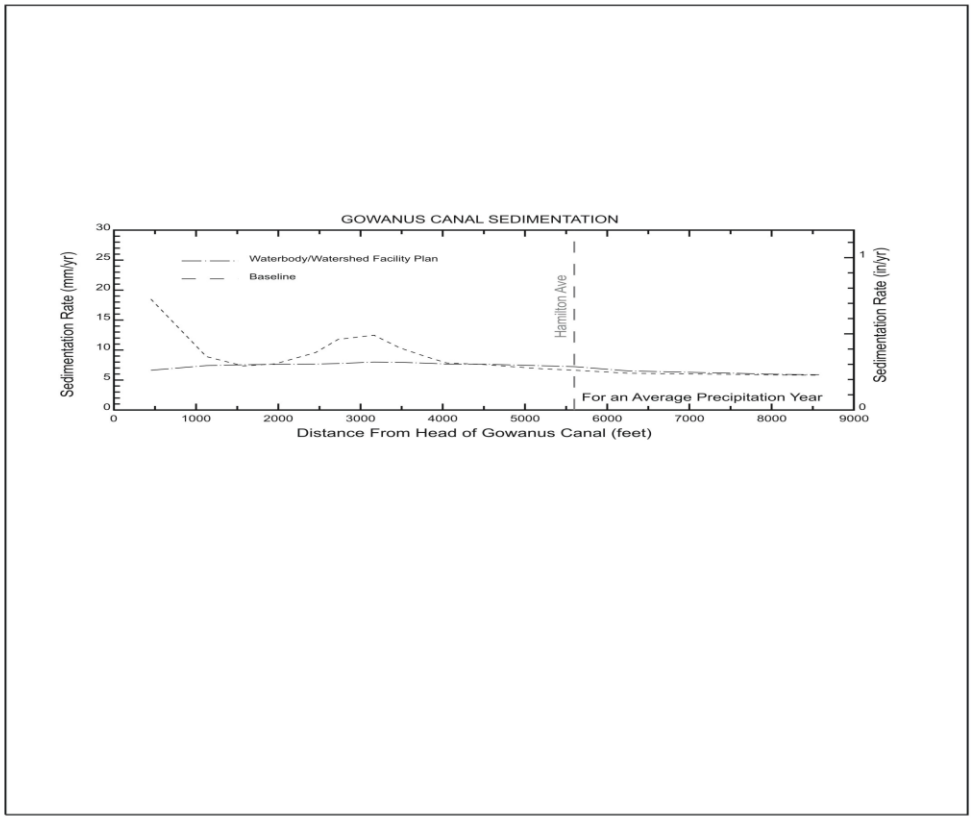

Figure 5-9
Gowanus Canal Projected Sedimentation

The WWFP similarly states:

According to the modeling analysis, reactivating the Flushing Tunnel would deliver Upper New York Bay water to the Canal and would not only supply higher dissolved oxygen concentrations but would also improve the Canal's assimilative capacity for pollutant discharges by enhancing circulation and exchange with the

> Gowanus Bay boundary. The artificial circulation would provide for a flushing action that would help to minimize sedimentation near the head of the Canal. (NYCDEP, 2009, page 4-44.)

The suggestion that widespread dispersion of outfall solids will occur, rather than more limited fine particle transport, is inconsistent with the settling rates reported by NYCDEP and its 1994 permit application responses to NYSDEC. Nevertheless, in conducting this analysis and describing future operations, the WWFP has effectively memorialized the historic role of the canal, which is owned and operated by NYC, as an extension of its sewer system. The canal, particularly the upper canal, has and will continue to function as a sewage retention basin in the absence of additional contaminated CSO solids controls. In contrast to other typical urban water bodies with CSO discharges, the canal is effectively a managed sewage solids disposal unit.

Comment #142: NYCDEP noted that it developed an empirical mass balance based on the enrichment of various chemicals relative to aluminum and assuming that CSOs and harbor solids were the only sources of the solids and the chemicals. NYCDEP indicated that none of the hypothetical mixing scenarios could account for the observed contaminant mix in upper canal surface sediments.

Response #142: The fact that a mass balance could not account for all of the surface sediment contamination in the upper canal is not surprising, given the uncertainty associated with the sample data, the use of averages to represent CSO and harbor inputs and the complex and continually changing site conditions (*e.g.,* changes over time in weather conditions, CSO discharge volumes, chemical concentrations in CSO discharges, Flushing Tunnel operations, contributions from other sources, etc.). Additionally, NYCDEP did not provide a full description of the methods that were used or a discussion and verification of the assumptions in the underlying methods.

Again, NYCDEP's comments are contrary to its CWA-related reports. The WWFP not only recognized the need to dredge previously discharged CSO sediment mounds, but also the expense of future maintenance dredging for continued solids discharge, in the absence of CSO controls, stating:

> Dredging would be conducted as an alternative to structural CSO controls such as storage. Bottom water conditions between dredging operations would likely not comply with dissolved oxygen standards and bottom habitat would degrade following each dredging. This technology allows CSO settleable solids to exit the sewer system and settle in the waterbody generally immediately downstream of the outfall, but without regular or periodic dredging, such mounds can extend a thousand feet or more. (NYCDEP, 2008, page 7-25.)

NYCDEP's October 2012 Engineering Feasibility Report regarding CSO solids controls, submitted to the State at NYSDEC's request, estimated that maintenance dredging, following either the planned removal of the CSO mounds or implementation of the Superfund dredging remedy, would cost $4 million every 5 years, while still degrading water quality, as acknowledged above. (NYCDEP, 2012, pages 3 and 14 and Table 1). The EPA believes that directing those funds to capital investment to avoid repeated

multi-million dollar maintenance costs would produce greater benefits than continued use of the canal as a sewage retention basin.

Radioisotope Profiles in Sediment Cores

Comment #143: NYCDEP asserts that the radionuclide profiles obtained by National Grid do not indicate a high degree of disturbance from CSOs in the canal. Specifically, NYCDEP comments that the radionuclide (cesium-137 and lead-210) profiles in cores collected by National Grid in the upper reach of the canal are typical of profiles obtained elsewhere in the harbor (*i.e.,* Newark Bay) and, thus, are indicative of typical sediment accumulation processes rather than episodic disturbances. NYCDEP contends that the lead-210 profiles are not interpretable, because they show no decline over time, similar to the lead-210 profiles in cores collected in Newark Bay.

NYCDEP also comments that the cesium-137 profiles in cores from the upper reach of the canal are indicative of "typical sediment accumulation processes" and do not show evidence of CSO-related disturbances.

Response #143: The canal infrastructure has been subject to a series of on-going changes. Until 1987, for example, when the Red Hook wastewater treatment plant (WWTP) came on-line, dry weather discharge from outfalls in the Red Hook system, such as RH-034, were continuous, at a rate of at least 15 million gallons per day (MGD), with wet and dry weather discharges totaling 21 MGD. (NYCDEP, 1983, pages 2-9 to 2-10, 2-32). In a similar manner, a pump station was not installed near OH-007 until 1990, such that sewage generated in the vicinity of the outfall discharged to the canal. (NYCDEP, 2008, page 3-17). In 1999, the Flushing Tunnel was restarted. As a result of such infrastructure changes, as well as vessel movement, storms and other re-suspension causes, it is unlikely that ideal profiles would be found consistently. Despite this, the lead-210 profiles in cores collected in the 4th Street and 6th Street turning basins, which are in relatively undisturbed areas of the Gowanus Canal, do resemble the ideal profile of exponential decline with depth (see Figure 6-5b of the Gowanus Canal RI report). The nature of a CSO discharge is visually evident after a large storm (as seen in the photograph of a CSO discharge in Figure 2 of the CSO Impacts section of the FS report addendum) and sand layers indicative of CSO deposition are evident in boring logs for sediment cores collected by the EPA and National Grid upstream of the area between DeGraw and Douglass Streets. Based on the multiple lines of evidence available, including those discussed above, there can be no serious dispute that the CSOs have been an ongoing source of solids and contaminant discharge to the canal from its construction to the present.

Polycyclic Aromatic Hydrocarbon Composition

Comment #144: The CSO Impacts section of the FS report addendum included several representative high resolution hydrocarbon fingerprints of sediments from the upper reach of the canal and associated interpretations from a 2007 report prepared by NewFields for National Grid (NewFields, 2007) to demonstrate that the surface sediments were not predominately affected by contamination from the former MGP

facilities. NYCDEP notes that the NewFields data set is of poor quality because it did not analyze field duplicate, field blank, equipment blank, or trip blank samples.

Response #144: The samples were collected by National Grid in accordance with a work plan approved by NYSDEC. Appendix G of "Draft Remedial Investigation Technical Report, Gowanus Canal (GEI, 2007) provides the data usability summary report. Field duplicates and field blanks were analyzed for all chemical constituents including SVOCs, and trip blanks were analyzed for VOCs. The samples selected for forensic analysis were a subset of the core samples collected for the full suite of chemical analyses. Although the field quality control samples did not undergo forensic analysis, the SVOC results did not indicate any systematic pattern of contamination indicative of improperly cleaned equipment or poor sampling techniques. The EPA's consideration of the NewFields data set is simply one of multiple lines of evidence.

Comment #145: NYCDEP notes that both NewFields and the EPA arbitrarily selected a limited number of samples to draw their respective conclusions that CSOs contribute the bulk of PAHs to the shallow sediments in the canal.

Response #145: The EPA only reviewed the hydrocarbon fingerprints for samples collected from the top two feet of sediment in the upper reach of the canal because this sediment layer was the focus of the CSO Impacts section of the FS report addendum. Representative chromatograms indicative of coal tar in the native sediment were provided for comparison only. Additional hydrocarbon fingerprints for shallow sediments in the upper reach of the canal that were provided by National Grid in its comments on the Proposed Plan are consistent with the NewFields samples Namely, the PAH mixtures in the samples vary by location, and include both petrogenic and pyrogenic components. It should be noted that the EPA has placed an equal emphasis on the need to control major sources. Based on preliminary cost estimates, the total cost of the former MGP facility cleanups is estimated to be $500-600 million. The EPA's estimate of the cost of CSO retention tanks is $78 million.

Comment #146: NYCDEP notes that there is an uneven application of the assignment of unresolved complex mixture (UCM) to the chromatograms used for illustration purposes in the NewFields report.

Response #146: Once the baseline begins to rise (which is directly proportional to the temperature of the oven/column during analysis), it does not tend to decrease. Any signal above the highest point of the baseline at the end of the analysis can be considered part of UCM. Both the chromatograms (reproduced in the CSO Impacts section of the FS report addendum) show the presence of a UCM above the baseline rise.

Comment #147: NYCDEP comments that the EPA should not attribute the presence of petrogenic (petroleum-based) PAHs in the shallow sediments primarily to urban runoff associated with CSOs.

Response #147: In the CSO Impacts section of the FS report addendum, the EPA stated that unresolved complex mixtures with multiple sources of PAHs are consistent with impacts from urban runoff in CSO discharges. This is a reasonable conclusion given the urbanized setting and fact that the entire upper canal is replete with CSO

discharge points. The Gowanus Canal was listed on New York State's Section 303(d) List of Impaired Waters Requiring a Total Maximum Daily Load in 2007; the listed cause of the impairment was "dissolved oxygen/oxygen demand," and the listed sources of oxygen demand were urban runoff, storm sewers and CSOs (NYCDEP, 2008). As noted previously, the WWFP also indicates:

> Wet-weather discharges from a combined sewer system contain a mixture of sanitary sewage and urban runoff that is significantly stronger in pollutant concentrations than natural runoff. These pollutants include coliform bacteria, oxygen-demanding materials, suspended and settleable solids, floatables, oil and grease, and others. (NYCDEP WWFP (2008), page 3-32).

Comment #148: NYCDEP commented critically on various other data analyses in the NewFields report (*i.e.,* diagnostic PAH ratio analysis, mixing model).

Response #148: Since the noted data analyses were not reviewed or used by the EPA in the development of the FS report addendum or Proposed Plan, these comments will not be addressed here.

Combined Sewer Overflow Contribute Variety of Hazardous Substances to Sediment

Comment #149: National Grid commented that the results of sampling that it conducted show that continuing discharges from the CSOs pose an ongoing risk to both human health and the environment and that the proposed reductions will not eliminate canal recontamination.

Response #149: National Grid collected sediment cores from a depth of 0 to 4 feet below the sediment surface in the vicinity of the CSO outfalls in 2012 and analyzed sediment samples for a variety of constituents. The sediment samples contained a range of contaminants, including PAHs, PCBs, metals, pathogens and PPCPs. The EPA agrees that the CSOs continue to discharge a variety of chemical and biological contaminants to the canal. The data collected by the EPA and others are sufficient to establish that CSO reductions are necessary to address unacceptable risks and prevent recontamination of the canal after the remedy is implemented. Although pathogens and PPCPs were not considered for CERCLA risk assessment purposes, the presence of these constituents indicates that substances discharged by CSOs persist and accumulate in canal sediments. The preliminary estimates of CSO solids reductions that were provided in the Proposed Plan (58 to 74 percent) were based on the information available at the time. These estimates will be refined during remedial design as additional information is gathered.

Combined Sewer Overflow Solids

Comment #150: The PRP Group noted that the Proposed Plan did not define the term "shallow sediment" in the section titled "Solids Impacts from Combined Sewer Overflows."

Response #150: “Shallow sediments” in the upper reach of the canal refers to the 0-2 foot depth interval. The Proposed Plan reported that a high TOC content of about 6 percent is evidence that the 0-2 foot interval of sediment in the upper reach of the canal is dominated by CSO loading. However, Table 2 reports that soft sediments throughout the canal have a substantially higher TOC average of 11.9 percent as a result of the contribution of NAPL contamination in sediments adjacent to the former MGP facilities.

Comment #151: The PRP Group noted that the Proposed Plan reported that PAH, copper and lead concentrations are similar in surface sediments from the upper reach of the canal and in CSO solids. The commenter notes that aluminum and iron are mentioned in this section, but their likely sources are not identified.

Response #151: Iron and aluminum are not enriched in canal surface sediments or CSO solids relative to sediments from Upper New York Bay and Gowanus Bay (with a few localized exceptions). Therefore, the iron and aluminum in sediments and CSO solids are naturally-occurring components of the mineral matrix. CSO impacts cannot be identified based on analysis of iron and aluminum content alone.

Combined Sewer Overflow Challenges and Investment

Comment #152: NYCDEP asserts that the EPA’s approach to controlling CSO discharges to the canal does not adequately address the challenges and the investment required for these controls to be effective. Additional items that NYCDEP suggested should be considered include:

- Ongoing control measures.
- Impacts associated with locating large tanks in a highly urbanized area.
- Complexities of constructing and operating two multi-million gallon CSO retention tanks.

Response #152: The EPA recognizes the challenges associated with implementing contaminated CSO solids controls in the urbanized canal area and NYCDEP’s investment in improving water quality through a variety projects, including an upgrade of the Flushing Tunnel. While NYCDEP’s current and planned projects will have a positive impact on water quality, such as dissolved oxygen levels in the canal, these projects will have limited effect on the CSO discharges that settle in the canal. Contaminated CSO solids controls are a critical element in achieving the CERCLA objectives of the remedy and ensuring its overall success and sustainability.

Evaluation of Combined Sewer Overflow Controls

Comment#153: With respect to the CSO controls, NYCDEP asserts that the EPA did not identify the Applicable and Relevant and Appropriate Requirements (ARARs) for the CSO measures evaluated in the FS Addendum Report, and failed to provide a detailed evaluation of the alternatives.

Response #153: In a June 28, 2012 letter to NYCDEP, NYSDEC identified eight possible options that might be effective in addressing solids from CSOs and suggested that NYCDEP evaluate them. The eight options were:

- Optimizing existing sedimentation trap at outfall OH-007.
- Improved maintenance program at the outfall OH-007 sediment trap.
- Installation of silt curtains and/or netting facilities at all CSO outfalls discharging to the canal.
- Yearly monitoring of CSO solids deposition in the canal.
- Development of metrics for maintenance dredging of CSO solids in the canal.
- Additional regular sewer cleaning in the drainage area.
- Engineering evaluation of an interim or permanent sedimentation trap at outfall RH-034.
- Advance NYCDEP's dredging of CSO mounds at the head end of the canal to comply with the CSO Order on Consent, while seeking synergetic opportunities to advance the demonstration and development of remedial design protocols for dredging, dewatering, disposal, stabilization and capping pursuant to the Superfund program.

NYCDEP completed this evaluation (*Evaluation of Possible Measures for CSO Solids Control, Gowanus Canal Superfund Site, Brooklyn, New York*, October 3 2012). In parallel, the EPA evaluated possible options identified by NYSDEC and added CSO retention tanks. The results of the EPA's evaluation were presented in the CSO Impacts section of the FS report addendum. The evaluation utilized a comparative ranking system from 1 to 4 (1 being the poorest and 4 being the highest) to identify the source control option that would be most effective. The results of the EPA's source control evaluation were as follows:

- The trap chamber at OH-007 could serve as an auxiliary/temporary CSO measure for OH-007, but not for RH-034 at the head of the canal (effectiveness ranking 2).
- Maintenance dredging will not facilitate CSO solids reduction but is a feasible technology (effectiveness ranking 2).
- CSO retention tanks will reduce the CSO solids discharged to the canal for both RH-034 and OH-007 (effectiveness ranking 4).

Below-ground retention tanks, the contaminated CSO solids controls presented in the FS report addendum and in the Proposed Plan, are an established technology for controlling CSO discharges. Regarding the siting of these storage facilities, the EPA has made a number of suggestions to NYCDEP that include innovative strategies, such as using the Flushing Tunnel for CSO storage or burying CSO storage retention tanks underneath the canal in RTA 1. The EPA's long-term objective for the canal, following the creation of a clean bottom surface after remedy implementation, is the prevention of recontamination of this clean surface. A recent report by a committee from the EPA and state agencies (ASTSWMO, 2013) noted that "recontamination and source control are important issues for consideration when planning, remediating and monitoring contaminated sediment sites." The document further notes "Recontamination and source control are emerging as concerns at a number of contaminated sediment sites where remediation has been completed."

The EPA believes that the documents which are part of the remedy selection process provided sufficient detail with respect to the contaminated CSO solids controls for meaningful public comment. CSO solids controls were evaluated by multiple reports which were available as part of the Administrative Record during the comment period, including the FFWP, NYCDEP's October 2012 CSO Control Engineering Feasibility Report and the FS report addendum and Proposed Plan.

The FS report lists the ARARs for the remedy, categorized into three areas: chemical-specific, action specific and location-specific. The EPA believes that the ARARs list incorporates all of the necessary regulatory requirements for the range of contaminated CSO solids controls considered. It should be noted that CSO solids reduction will result in a decrease in discharges which currently occur, as opposed to a new discharge point, such as water treatment for decanted sediment water, one of various categories listed in the ARARs table. Similarly, a CSO retention tank in particular will result in material which is currently released to the canal in being handled at a wastewater treatment plant under NYCDEP's standard treatment process. No ARAR evaluation is necessary for sending the sewage to the existing treatment plants for proper handling.

Although the NYCDEP comments do not specify any ARARs (aside from the potential alienation of parkland), which should have been considered but were not identified, the selected remedy is required to comply with applicable regulations.[25] During the remedial design process, the list of ARARs will be updated as necessary to ensure proper compliance.

Comment #154: NYCDEP asserts that CSO controls were not evaluated using the nine NCP criteria for remedy selection.

[25] If it is determined that parkland is affected in a manner which requires regulatory compliance, such compliance will occur. A determination will be required as to whether work being performed to remediate a NYC-owned property which is part of both state and federal Superfund sites constitutes alienation of parkland.

Response #154: In the Proposed Plan and ROD, the EPA evaluated the implementation of contaminated CSO solids controls in the upper portion of the canal as part of the overall remedy using the NCP evaluation criteria.

Uncertainty Regarding Combined Sewer Overflow Volume Reduction Required

Comment #155: NYCDEP expressed concern about the uncertainty related to the CSO volume reduction required.

Response #155: The toxicity test data indicate that the surface sediments in the upper reach of the canal, which is the reach most heavily influenced by CSO solids, are toxic relative to reference stations in Gowanus Bay and Upper New York Bay, which establishes the need for remedial action. The CSO sample data collected by the EPA and NYCDEP indicate that PAHs are present in CSO discharges at levels that could lead to the recontamination of surface sediments to levels that exceed the PRG. The CSOs also discharge metals and PCBs to the canal.

Following the implementation of the remedy, the anthropogenic background level of PAHs in surface sediment will depend on the level of CSO reductions. Storm sewers and direct runoff drain only two percent and six percent, respectively, of the canal watershed and are, therefore, considered minor contributions. See the WWFP. The goal of the contaminated CSO solids controls is to reduce the contribution of CSO solids so that the average total PAH concentration in Gowanus Canal surface sediments after remediation does not exceed 20 mg/kg.

The improvements that are being implemented under NYCDEP's Gowanus Canal WWFP will achieve an overall 34 percent reduction in CSO discharge volume. Additional reductions through limited sewer separation and green infrastructure are planned by NYCDEP to be achieved over time. No CSO reductions are planned by NYCDEP for the upper reach of the canal at RH-034; in fact, CSO discharges at RH-034 will increase by approximately five percent after the current improvements are completed. Preliminary estimates of CSO solids reductions needed to the upper and middle reaches of the canal to meet the RAOs were presented in the FS report addendum and range between 58 to 74 percent. Therefore, CSO solids reductions to reduce hazardous substance loading, beyond those currently planned by NYCDEP for CWA compliance, will be required to meet the objectives of the CERCLA remedy.

Annual Combined Sewer Overflow Volume Capture Compliance with Clean Water Act and Combined Sewer Overflow Control Policy

Comment #156: National Grid and the PRP Group assert that the maximum achievable CSO reductions must be achieved before the remedy is implemented. The extent of CSO reductions should be carefully evaluated. The commenters also suggested that the EPA consider using the 85% capture of the annual CSO volume as a discharge volume criteria, which is the standard set forth in the EPA's CSO policy under the CWA.

The commenters also noted:

- Even if NYCDEP is successful in reaching its estimated reductions as a result of its Flushing Tunnel-related upgrades, the CSOs will continue to contribute 66% of current loadings into the canal and the remedy will not be sustainable.
- Planned development in the area has the potential to increase sewage flows further and it is unclear whether such projects have been incorporated into the projected 34% reduction of CSO discharges.

Response #156: The 85% volumetric capture metric is applied in the presumptive approach to CSO controls in the CSO Control Policy. However, a CSO discharger such as NYCDEP may choose to follow the CSO Control Policy's demonstrative approach to controls. Ultimately, the discharger is required to not impair fishable/swimmable water quality conditions. The conditions which exist in the canal today do not comply with the CWA; NYCDEP is implementing improvements as part of the WWFP to move toward compliance. NYCDEP is applying the demonstrative approach with an adaptive management component to improve water quality conditions via its CSO Consent Order with the State of New York. However, sediment quality in the canal needs to be addressed, as well, in order to achieve the CERCLA objectives for canal sediments and contaminated CSO solids controls are needed to reduce the discharge of CSO solids.

The CERCLA objectives are based on avoiding recontamination that would result in remedy failure, rather than being based on dissolved oxygen levels for fish populations and pathogen levels. While the EPA anticipates that implementation of the required CSO solids controls will lead to improved CWA compliance, a separate assessment of such CWA compliance will be performed by NYCDEP as part of the LTCP process.

Flooding

Comment #157: NYCDEP stated that the remedy must not exacerbate flooding in the canal, including through impacts of adsorption of NAPL by the active layer of the engineered cap.

Response #157: In general, flooding within the Gowanus area is highly dominated by the low lying, level topography of the former wetlands area, and its urbanized, highly impervious nature. As a result, the selected remedy will have only marginal impacts. Implementation of the selected remedy may provide slight increases in capacity of the canal to handle flooding under certain conditions with restoration of deeper canal levels and as a result of restoration of the 1st Street basin. The volume between the bank height and pre-flood water level will provide some extra flood capacity. Providing contaminated CSO solids controls through retention tanks will also help alleviate flooding conditions during storms, including the sewage component.

Impermeable sheet pile barriers were selected in the FS as the representative option for bank-stability related bulkhead work along the canal during the implementation of the remedy. In areas of low groundwater discharge, impermeable barriers may be effective without significant groundwater mounding. Bulkheads may be made permeable, where appropriate. On clean parcels, sheet piling may have below-grade discharge openings. On contaminated parcels, where needed, treatment gates could be incorporated into the

bulkhead wall design to funnel groundwater through the treatment gate, allowing for discharge of treated groundwater to the canal. In low impact areas, permeable treatment barriers could potentially be used to absorb groundwater impacts before discharge to the canal. These design and other design elements will be considered to address flooding as a result of groundwater mounding.

Studies conducted by the EPA are being used to assess the potential range of groundwater upwelling velocity into the canal. During the remedial design, the EPA plans to utilize DTS or other technologies in a portion of the canal to better understand the characteristics of groundwater upwelling. These data will be used to estimate groundwater discharge locations and rates to the canal. These data will be incorporated into the remedial design to reduce the effects of groundwater mounding near the canal from remedy implementation.

In its comments, NYCDEP states with respect to upwelling:

> If the clay swells due to adsorption of NAPL (as happens when used to treat other contaminants) and blocks flow paths, contaminated groundwater and NAPL could be diverted to other locations, either in the Canal or into basements, utility corridors, or other subsurface openings around the Canal. (NYCDEP Proposed Plan comment #9.2.a., page 60).

Elsewhere in Proposed Plan comment #9, however, NYCDEP states that "the soft sediment… currently retards upward groundwater flow..." (NYCDEP Proposed Plan comment #9.1, page 59). As noted previously, the contaminated CSO solids partially adsorb NAPL. Given these current conditions, the EPA believes that the overall change in post-remedial upwelling conditions will be much less significant than suggested. The EPA also believes that an engineered cap can be designed to both absorb NAPL contamination and accommodate groundwater upwelling more effectively than the current layers of contaminated CSO solids and other accumulated soft sediments.

As noted previously, NYCDEP has submitted a CSO Sediment Mound Dredging Permit Application. That work entails the partial dredging and capping of the northernmost 825 feet of the canal, where groundwater upwelling is the greatest. As NYCDEP's design of its CSO sediment dredging and capping work will present many of the same issues regarding groundwater upwelling and sediment transport, the EPA will make itself available to coordinate and collaborate with NYCDEP if that work proceeds separately from the selected remedy.

Comment #158: A commenter asked what measures will be taken to prevent the overflow of the Gowanus Canal as a result of storm events such as Superstorm Sandy?

Response #158: The remediation of the canal does not include flood prevention measures. As noted earlier, this issue is dominated by the topography of the area, among other factors. Minor improvements in flood capacity may be created through implementation of the selected remedy. The most significant improvement will result

from addressing the contaminated sediments through the selected remedy, so that when flooding occurs, the heavily-contaminated sediments that currently exist in the canal will not be available for the storm to transport, creating potential exposure for residents near the canal. Implementation of contaminated CSO solids controls will reduce recontamination of the canal and reduce the CWA risk from sewage pathogens which, depending on conditions, are discharged to the canal, into streets during backups or transported by flooding.

Comment #159: Several commenters opined that sewer backups into homes when there are heavy rains and storms and the flooding of the adjacent neighborhoods with sewage during Superstorm Sandy makes resolving the CSO problem a priority.

Response #159: Although not considered for Superfund remedy selection purposes, a screening level risk assessment for CSO pathogens that was performed by National Grid found significant risk to child and adult recreational users and workers from CSO-related pathogen exposure. The CSO water quality issues and impacts to the community will be addressed independently by the LTCP. The potential impacts of CSO discharges of toxic contaminated solids to a completed canal-bottom remedy are addressed by the selected remedy. As noted previously, a secondary benefit of the contaminated CSO solids controls to be implemented as part of the selected remedy will be reductions in sewage releases and associated pathogens.

Comment #160: A commenter recommended that the dredging of the canal be delayed two years while the circumstances of the silt and mud entering the homes and business along the Gowanus Canal from Superstorm Sandy are assessed.

Response #160: Based on sampling conducted by the EPA, it does not appear that material from the bottom of the canal was transported via flood waters to any significant extent as a result of Superstorm Sandy. Under different conditions, the EPA believes that sediment transport could potentially occur. The EPA believes that implementing the selected remedy is the most appropriate way to reduce this exposure pathway.

Comment #161: A commenter expressed concern that since the sampling of the sediments to determine their composition and toxicity was performed prior to Superstorm Sandy, the data is no longer valid. Another commenter expressed concern that the amount of contamination in the “lesser contaminated” sediments located in the lower portion of the canal may now be higher as a result of the storm.

Response #161: The sample results from the RI show significant levels of contamination in the canal sediments. It is unlikely that the CSO and surface discharges to the canal during Superstorm Sandy significantly altered the toxicity of the sediments. Contamination is present throughout the accumulated sediment, which varies in thickness but is an average of ten feet. In addition, as was noted in the prior response, it does not appear that material from the bottom of the canal was affected by the flood waters to any significant extent as a result of Superstorm Sandy. Although the contaminant levels in the lower portion of the canal are relatively less contaminated than

the very heavily contaminated upper or middle portion, the lower canal sediments still have high contaminant levels.

Comment #162: A commenter expressed support for excavating the buried turning basin at 1st Street to reduce flooding. Several other commenters suggested that the fill in the 5th Street turning basin be excavated to restore as much original water holding capacity as possible to minimize flooding in the area.

Response #162: Since the water level in the canal is influenced by the tide and the water level in the Gowanus Bay and Upper New York Bay, restoring the 1st and 5th Street turning basins would not greatly increase the water holding capacity or minimize flooding. Unless dikes are installed along the canal, as long as the areas surrounding the canal are near sea level, they can potentially flood during storm events.

Interim Combined Sewer Overflow Controls

Comment #163: National Grid noted that the Proposed Plan recognizes that retention tanks will take time to design and install and, therefore, proposes to use unidentified interim CSO controls. National Grid suggested that these interim controls be identified in the ROD.

Response #163: The Proposed Plan and ROD recognize that planning and construction of permanent long-term contaminated CSO solids controls for the remedy may not fully align with implementation of the remedial dredging. Despite this, the EPA's goal is to implement the contaminated CSO solids controls as soon as possible to minimize interim impacts and the need to resort to interim controls.

If interim contaminated CSO solids controls are necessary, the EPA plans to work closely with NYSDEC and NYCDEP during the remedial design to establish effective interim CSO solids control measures to be implemented until the permanent contaminated CSO solids controls are in place. While interim controls may be employed, critical to the sustained long-term performance of the CERCLA remedy is the implementation of permanent controls such as CSO retention tanks as presented in the proposed plan.

Effectiveness and Locations of Retention Tanks

Comment #164: National Grid states that the proposed CSO controls are inadequate. The Sediment Management Workgroup stated that while retention tanks may be an appropriate control as a general matter, it is unclear whether they will be sufficient to appreciably reduce the contaminant loadings to the canal from the CSOs. Community Board 6 suggests that:

- Use of large in-line retention tanks appears to have great merit; however they were not evaluated in detail.

- Other potential beneficial elements that would add further value to CSO controls , such as deodorization treatment and other possible in-vessel pre-treatment, should be considered.

Response #164: In-line and off-line retention tanks capture combined sewer flow for subsequent treatment. Off-line retention tanks are constructed as either flow-through facilities where all CSO volume that would otherwise be discharged into a body of water passes into the tank, with volumes exceeding the capacity of the tank being discharged to receiving waters, or are constructed as surge tanks that when filled to capacity, are shut off from the system and then opened later to dewater. Closed concrete tanks are generally constructed below grade and provide a completely enclosed unit for the storage of captured CSO.

NYCDEP has constructed and operates four CSO retention facilities at Spring Creek, Flushing Creek, Paerdegat Basin and Alley Creek. Storage tanks are sized to provide the desired level of CSO control for a particular site. Pollutant removal is achieved by retaining the CSO in the tank then draining and treating the effluent at the wastewater treatment plant when the storm event has passed and the tank contents can be directed to the WWTP. The pollutant removal is achieved by the volumetric reduction of discharges provided by the volume of the tank and the hydraulics of the system. If a facility is a flow-through storage system that discharges, it may achieve a preliminary if not primary level of wastewater treatment on discharges if designed to do so. Some facilities have enhanced treatment capabilities by adding chemicals to enhance settling of solids in the tanks and disinfection to further reduce bacteria discharges.

The two retention tanks presented in the Proposed Plan and ROD would achieve volumetric CSO reductions by providing either in-line or off-line storage depending on the locations and how sewer routing is designed to and from the tanks.

The two CSO retention tanks described in the Proposed Plan were conceptually presented as being installed on NYC-owned properties to minimize the time and expense of acquiring property. One of the tanks was conceptually presented as being installed at the Douglass & Degraw Pool/Thomas Greene playground. This location was identified as a possible location because the property is owned by NYC and is a former MGP facility that will likely need to be remediated. Although a remedy for this parcel has not yet been selected, such a remedy may potentially include excavation of contaminated MGP-related waste beneath the pool. As an owner of this contaminated State Superfund property, NYCDEP is also a PRP. The EPA recognizes that there may be temporary impacts on the community during the remediation of the contamination at the park and the construction of a CSO tank, if located there. Construction of a CSO tank at the park would reduce uncontrolled CSO discharges which currently impact the community.

It should be noted that NYCDEP has located its four CSO retention facilities in NYC parks in Brooklyn and Queens. Similarly, NYCDEP is currently constructing its Croton Water Filtration Plant at the Mosholu Golf Course in Van Cortlandt Park in the Bronx. Although such actions may have required state legislative authorization, such approvals are routinely sought and obtained. (See, *e.g.,* http://www.nytimes.com/

2013/07/25/nyregion/city-council-approves-tennis-stadium-plan-in-queens.html) In each of the CSO retention tanks instances, NYCDEP has located, designed and constructed its facilities to minimize short- and long-term impacts on the communities, if not enhance the services it provides the communities. NYCDEP's Flushing Creek, Paerdegat Basin and Alley Creek facilities all provide enhanced environmental, community and recreational benefits to their local residents.

The EPA intends to work collaboratively with NYCDEP and the State of New York to locate the CSO storage tanks such that they will provide the most cost-effective contaminated CSO solids controls that sustain the remedy while minimizing the cost and impact on the local community.

Retention Tank Costs

Comment #165: NYCDEP states that the costs for CSO controls are not accurate. NYCDEP suggests that the following items should be included:

- Several construction cost items
- Operation and maintenance (O&M)
- Property acquisition and development costs
- Permitting
- Demolition
- Soil and groundwater management costs
- Dewatering costs
- New York general contractor costs
- Health and safety costs
- Operation and maintenance equipment costs
- Site constraints
- Foundations
- Construction access
- Construction parking

Response #165: NYCDEP provided an extensive list of cost items potentially applicable to constructing belowground retention tanks. Although the EPA agrees that these items may be needed for a budget authorization estimate, this level of detail is not needed for an FS cost estimate. The 2000 EPA document "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study" (EPA 540-4-00-002) states the following (underlining added for emphasis):

> While cost estimates are developed at different stages of the Superfund process (Chapter 2), this guide specifically addresses the FS phase. Cost estimates are developed during the FS primarily for the purpose of comparing remedial alternatives during the remedy selection process, not for establishing project budgets or negotiating Superfund enforcement settlements. During remedy selection, the cost estimate of the preferred alternative is typically carried over from the FS to the Proposed Plan for public comment.

In addition, the Association for the Advancement of Cost Engineering indicates that a feasibility level cost estimate is considered a Class 5 estimate and can be developed with one to two percent project definition. The following provides a description of the Class 5 estimate:

> Class 5 estimates are generally prepared based on very limited information, and subsequently have very wide accuracy ranges. Often, little more than Proposed Plant type, location, and capacity are known at the time of estimate preparation.

The 2000 EPA Guide further states:

> At the FS stage, the design for the remedial action project is still conceptual, not detailed, and the cost estimate is considered to be "order-of-magnitude." The cost engineer must make assumptions about the detailed design in order to prepare the cost estimate. As a project progresses, the design becomes more complete and the cost estimate becomes more "definitive," thus increasing the accuracy of the cost estimate."

The EPA developed conceptual cost estimates for the construction costs of below-ground storage tanks to retain CSO at outfalls RH-034 and RH-007. The sizes of the tanks range from 2 million gallon to 17 million gallon at outfall RH-034 and 2 million gallon to 8.2 million gallon at outfall OH-007. These ranges of tank sizes are the same that the NYCDEP previously evaluated in its WWFP.

The EPA's construction cost estimate ranges from about $25 million to $79 million at RH-034 and from about $24 million to $46 million at OH-007. For costing purposes, an 8-million-gallon in-line storage tank was estimated by the EPA to cost $46,429,000 for outfall RH-034 and a 4-million-gallon in-line storage tank was estimated by the EPA to cost $31,272,000 for outfall OH-007.

The EPA acknowledges that these conceptual construction costs are significantly less than those estimated by NYCDEP in its WWFP and Proposed Plan comments. The EPA's costs are distinguishable from NYCDEP's cost numbers for a number of reasons, discussed below.

In 2011, the EPA informally requested that NYCDEP provide the basis for NYCDEP's estimates of tank costs in its WWFP. When NYCDEP did not do so, in September 2012 the EPA requested this information using CERCLA formal information gathering authority. As was noted previously, NYCDEP screened out CSO tanks for not being cost effective based on the cost estimates set forth in the WWFP. In its response to the formal request, NYCDEP replied that this information was not available. As a result, no direct NYCDEP cost data was included in the EPA's formulation of the conceptual costs for the Proposed Plan.

The EPA's costs assume the use of NYC land, which was not the case in the WWFP.

The EPA's cost estimate may be considered in context with these CSO tanks recently built by NYCDEP:

- $291 million was spent on its 43 million gallon capacity Flushing Bay CSO facility completed in 2009.

- $33 million was spent on the five million gallon capacity CSO retention tank at Alley Creek CSO facility in Bayside, Queens, completed in May 2011.
- $404 million was spent on the 50 million gallon capacity Paerdegat Basin CSO facility in Brooklyn, which began operation in May 2011.

A comparison of costs is complicated by the fact that the construction costs of these facilities include more than just the costs of constructing below-ground storage tanks. All three of the examples were integrated with other municipal and community amenities, including operation support facilities, community centers and additional park facilities. The actual construction costs of the storage tank component of the facilities would be only a portion of the overall costs shown above.

NYCDEP provided a breakdown of the $101 million tank-related costs for the Alley Creek CSO facility in its comments on the Proposed Plan. The construction cost of the CSO control elements in NYCDEP's 2007 Alley Creek Waterbody/Watershed Facility Plan was, however, estimated to be only $28,000,000 (NYCDEP, 2007) after construction was underway, which is significantly less than the final actual costs incurred of $101 million that NYCDEP reported and consistent with the EPA's estimate for the Gowanus Canal storage tanks for the selected remedy. NYCDEP has also reported to the public in other forums regarding the cost of the Alley Creek tank itself (see NYCDEP Presentation, Public Outreach for Alley Creek LTCP, Queens Borough President Office, September 12, 2012 ("Phase 2: 5 [Million Gallon] CSO Storage Tank ($33M)"), page 4 and NYCDEP Presentation, Combined Sewer Overflow/Long Term Control Plans - Alley Creek Kickoff Meeting, October 24, 2012 ("5 [Million Gallon] CSO Storage Tank ($29M)"), page 16). The basis and components of the conceptual costs estimated by the EPA are well documented in the FS report addendum and will be further developed during detailed design. Based on the EPA's best estimate of the direct tank-related construction costs for the Alley Creek facility, NYCDEP's as-built construction cost of storage tanks is approximately $5.60 to $6.60 million per million gallons in terms of 2007 to 2012 dollars. This range of costs is consistent with the EPA's estimate for the selected remedy considering the limited Site-specific information available to the EPA.

Regarding operation and maintenance costs, the EPA reviewed the WWFP for such information in connection with the document's cost-effectiveness screening of CSO options. It does not appear that non-capital costs, such as operation and maintenance, were included in NYCDEP's cost screening for either non-selected elements, such as CSO tanks, or selected elements, such as the Flushing Tunnel upgrade. See WWFP, Section 7. Such costs could be significant, since, for example, the Flushing Tunnel upgrade will result in operational costs 24 hours per day in perpetuity.

Although, as noted above, NYCDEP's Proposed Plan comments list CSO retention tank cost categories which NYCDEP asserts should be included, NYCDEP's comments do not provide any unit cost estimates derived from NYCDEP's existing CSO tank operations. In its comments on the Proposed Plan, NYCDEP does, however, state:

> for the Alley Creek tank, [NYCDEP's] operating costs have been approximately $1 million per year and grit removal at the Flushing CSO storage tank facility has cost up to $2 million per year (NYCDEP comments, page. 99).

NYCDEP information indicates that the Flushing Creek CSO retention facility consists of a 28 million gallon tank and plus 15 million gallons of in-line storage from the sewer line capacity, for a total of 43 million gallons. See NYCDEP 2011 Flushing Creek, Section 8. This is significantly larger than the estimated combined volumes for CSO retention facilities in the selected remedy. Presumably, the costs would be fractionally smaller.[26]

Regarding the disposal cost for solids and grit which accumulate in the CSO tanks, cost increases related to O&M for the retention tanks should reflect reductions in maintenance in the canal. Constructing CSO storage tanks will reduce the need for maintenance dredging. NYCDEP evaluated maintenance dredging as part of its CSO solids controls FS and estimated the costs to range between $10.8 million to $28 million (NYCDEP, 2012). NYCDEP concluded that there will be some effectiveness of maintenance dredging. The EPA agrees that there will be some effectiveness, but it will not keep hazardous substances out of the canal and will most likely result in periodic toxicity in the sediments. Furthermore, the design of the cap would have to account for more-frequent maintenance dredging in the future such that the cap construction cost will be higher than what is estimated for the proposed plan. NYCDEP savings from the costs of this maintenance dredging would offset the cost for constructing and operating CSO storage tanks.

Although the EPA did not include the cost of O&M for the CSO tank in the Proposed Plan, the EPA has addressed those costs in the ROD.

While the CSO tank construction will be a moderately complex engineering project, the EPA believes that project synergies and the ability to utilize CERCLA-specific authorities related to, for example, project siting and the environmental impact statement process, will significantly reduce the cost of implementation when compared to a non-CERCLA NYCDEP-lead project.

Consideration of First Flush Effect for Sizing Retention Facilities

Comment #166: NYCDEP and National Grid assert that sizing the CSO control volume using the first flush volume underestimates the storage volume needed.

Response #166: The concept behind the term "first flush," is that in the early stages of a storm event or CSO event, a relatively small percentage of the total flow contains a disproportionately large percentage of the total pollutant mass associated with the

[26] NYCDEP comments elsewhere suggest that the solids contribution from CSOs is small relative to harbor solids. (See Comment/Response #138, above). Although the EPA believes that this assertion is not supported by the record, if correct, the disposal costs for captured solids would also be reduced.

overall storm event (EPA, 1993). The first flush phenomenon is well documented in the scientific literature. Capture and storage of the first flush component of CSO discharges using retention basins are often one of the best measures for attenuating peak runoff flows and pollutant loads (EPA, 1999). The fundamental concept of first flush is applicable for both combined sewer systems and separated storm sewer systems, because both collect precipitation and go through some of the same hydrological and physical processes, such as pollutant build-up and wash-off on surfaces, as well as solids accumulation in sewers that are flushed out during rain events.

NYCDEP and National Grid questioned the validity of the study by Stein *et al.* (2006) cited in the Proposed Plan and whether it represents an appropriate basis for using first flush information to evaluate CSO controls. The first flush phenomenon under urban settings with regard to the discharge of contaminants, such as PAHs and metals, has been studied in various geographic regions in the U. S. that experience different hydrologic patterns and various levels of urbanization. The studies noted below demonstrate that first flush phenomenon is observed for various precipitation patterns and different chemical compositions, including those for metals and PAHs:

- The study "Water Quality Characterization of Highway Stormwater Runoff from an Ultra-Urban Area" in Maryland and District of Columbia (Flint and Davis, 2007) reported that median values for the mass flushed in the first 25% of runoff volume were greater than the mass flushed in any 25% portion afterwards for all pollutants (*e.g.,* metals and nutrients). On average, management of the first half-inch of runoff was able to capture 81-86% of the total pollutant mass at this ultra-urban site. The ultra-urban area in this study is similar to the neighborhoods around the canal.
- A study funded by California Department of Transportation (Stenstrom and Kayhanian, 2005) found that 30% to 50% of the pollutants in highway runoff from a single storm event are contained in the first 10% to 20% of the runoff volume, which would mean that capturing the first 20% of the discharge flow can capture 50% of the pollutants. Specifically for PAH loading, particulate PAHs were dominant and in most cases, first flushes of particulate PAHs were exhibited. The mass first flush ratio generally was above 2 for the first 20% of the runoff volume, and in some cases as high as 2. 8. The results suggest that controls that address particulate phase contaminants in the initial runoff can have greater effectiveness for particulate PAH removal than other types of control strategies (Stenstrom and Kayhanian, 2005).
- In another study in California (Lau *et. al.,* 2009), approximately 30% to 35% of mass (for metals and PAHs) is discharged in the first 20% of the runoff volume. This study agreed with other highway runoff characterization studies, in that strong correlations were observed among the heavy metals and between heavy metals and total PAHs, and TSS were well correlated with most heavy metals.

In summary, the findings of these studies across the country are consistent with the study by Stein et al. (2006), cited in the Proposed Plan, which states that "within individual storms, PAHs exhibited a moderate first flush with between 30% and 60% of the total PAH load being discharged in the first 20% of the storm volume." Therefore, the use of the first flush concept is valid and applicable to developing preliminary estimates of contaminated CSO solids controls for the canal. It should be noted that

absent the EPA's planning assumption with respect to the first flush, the size of the retention facilities would have to be larger than those described in the Proposed Plan.

Miscellaneous Retention Tank Concerns

Comment #167: Two commenters asked how the locations for the proposed retention tanks were selected. Another commenter asked why other locations, such as the empty ConEd lot located at the intersection of Nevins and Butler or one of the numerous parcels of land that is for sale in the immediate vicinity, were not considered either for the siting of the retention tank or for relocation of the pool and services.

Response #167: The EPA has not selected a location for construction of CSO retention tanks. The EPA anticipates that the locations of the retention tanks will be finalized during the remedial design. A review of the FS process and critical background information is helpful in understanding how the EPA proposed Thomas Greene Park as one potential location for a tank.

NYCDEP is currently undertaking a number of CSO-related improvements in the canal. The improvements will result in substantial reductions of CSO discharges to the mid- and lower canal reaches, but no reduction to the upper canal.

The EPA determined that CSO solids contaminated with hazardous substances could result in recontamination of the canal. Such organic solids also act as a contaminant "sponge," adsorbing and effectively concentrating other hazardous substances released into the canal. The CSO reductions that the EPA is seeking for the upper canal are consistent with those being made by NYCDEP to the mid and lower canal.

After screening the engineering options which could be used to prevent recontamination, the EPA determined that in-line retention tanks are the most suitable technology to capture and reduce contaminated sediment from CSO discharges. While the empty Con-Ed lot and the parcels of land that are for sale are potential locations for sewage retention tanks, for the purpose of developing construction cost estimates for the contaminated CSO solids controls, it was assumed that the retention tanks could be located most inexpensively on NYC-owned land in the vicinity of the outfalls. One such property is the Thomas Greene Park.

The EPA acknowledges that the pool and community services provided at the Thomas Greene Park are vital local community resources. As is generally known within the community, the park is located on a portion of the former Fulton MGP State Superfund site (see: http://www.fultonmgpsite.com). Like the two other former MGP facilities along the canal, Public Place (see http://www.citizensmgpsite.com and Metropolitan http://www.metropolitanmgpsite.com), the land beneath the park is heavily contaminated with coal tar. To understand the scale of the former MGP cleanups needed along the canal, the combined remediation of the three former MGP facilities is expected to cost roughly the same as the cleanup of the canal itself.

The largest CSO outfall is located one block from the park. A remedy has not yet been selected for the former Fulton MGP State Superfund site (National Grid is currently conducting an FS under NYSDEC oversight), but the EPA believes it will likely include the removal of contaminated soil and coal tar beneath and/or near the pool and community center. For this excavation to occur, it is likely that the pool would have to be removed and rebuilt, regardless of whether a CSO tank is sited there. If the remedy involves significant excavation, then there would be significant efficiencies in terms of time and money savings that could be realized for both NYC and National Grid by using the former Fulton MGP State Superfund site for the CSO retention tank. NYC would save money needed to excavate the hole for the tank because National Grid would be doing the excavation as part of the Site remedy and National Grid would save money that would otherwise be spent to backfill the entire hole, because NYC would be placing a tank in a portion of the hole. NYC would also save the cost of acquiring a separate property. The pool, which is over 40 years old, also requires upgrading. Overall, combining such cost savings could be considerable. CSO retention tanks, which are essentially concrete tanks, have been successfully constructed beneath parks and other publicly used areas in other cities. The EPA presented examples of such tanks at public meetings during the comment period.

It should be noted that in 2008, prior to the nomination of the Gowanus Canal to the NPL, reconstruction of the aging pool was considered by NYC. In 2010, NYC proposed closing the park for budgetary reasons, which remained open after efforts by local supporters. Although a park design was finalized which would move the pool to the western side of the park from its current position, that plan was not implemented due to budget constraints. As a result, only the uncontaminated eastern section of the park has been renovated, to date, with work being completed in early 2013.

Even if the pool does not have to be removed, the utilization of heavy construction equipment at the park and in surrounding areas of the Site could require the temporary closure of the pool and community center for health and safety reasons. The empty Con-Ed lot and the numerous parcels of land that are for sale could be viable locations for a temporary or permanent replacement pool or for an alternative CSO retention tank location.

NYC acquired the contaminated land from Brooklyn Union Gas Co. in or around 1938 and constructed the park. As an owner of a portion of former MGP facility, NYC may also be a PRP under NYS law for the MGP cleanup. NYC could negotiate with National Grid for compensation for the loss of the park during the time that the remediation effort blocks public use of the park and possibly reach an agreement related to the provision of temporary facilities. As part of implementing the comprehensive remedy for the canal and collaborating with the NYSDEC and the PRPs, the EPA will continue to conduct appropriate outreach with the community in order to minimize project impacts to the extent practical.

Comment #168: A commenter asked whether retention tanks which can store excess sewage and stormwater flow until the wet weather subsides so that it can be pumped to the wastewater treatment plants would be a permanent solution to the CSO problem.

Response #168: Installing retention tanks to store excess sewage and stormwater flows is one permanent way to address the CSO problem. NYCDEP has built four retention tanks elsewhere in NYC--in Spring Creek, Flushing Bay, Alley Creek and Paerdegat Basin. Two of these retention tanks are significantly larger than what would be needed for the Gowanus Canal.

Comment #169: Several commenters expressed concern that the proposed installation of a CSO retention tank at the former Fulton MGP State Superfund site would require the temporary removal of the community pool and the community center that provides a free breakfast and lunch program. A commenter requested a guarantee that there would be no disruption to the facilities and services.

Response #169: The EPA is committed to achieving cost savings by working closely with NYCDEP to accomplish an effective Superfund cleanup while also realizing CSO benefits through synergies and economies of scale. The EPA anticipates that the remedy that is ultimately selected by NYSDEC for the former Fulton MGP State Superfund site will require the excavation of contaminated soils underlying the pool and community center. A retention tank could be installed in the excavated area before backfilling. Even if the pool does not have to be removed, the utilization of heavy construction equipment on and around the former Fulton MGP State Superfund site will likely require the temporary closure of the pool and community center for safety reasons. As was noted previously, NYC could negotiate with National Grid for compensation for the loss of the park during the time that the remediation effort blocks public use of the park and possibly reach an agreement related to the provision of temporary facilities. As part of implementing the comprehensive remedy for the canal and collaborating with the NYSDEC and the PRPs, the EPA will continue to conduct appropriate outreach with the community in order to minimize project impacts to the extent practical.

Comment #170: A commenter noted that NYC's planning standards outlined in the 2010 City Environmental Quality Review Technical (CEQR) Manual encourages 2. 5 acres of open space within half a mile for every 1,000 residents. The commenter noted that a CAG member estimated that northern Gowanus residents only have access to 7 acres of parks instead of the 70 acres that the standard requires. The commenter asked how the EPA would enforce NYC open space standards for the already underserved part of the Gowanus Canal community.

Response #170: Under the CEQR Manual (updated in 2012), an analysis of open space is conducted to determine whether or not a proposed project would have a direct impact resulting from the elimination or alteration of open space and/or an indirect impact resulting from overtaxing available open space. Since the excavation of contaminated soils underlying the pool and community center and the installation of a retention tank in

the excavation before backfilling would only be a temporary loss of the open space, it would appear that the open space requirements under CEQR may not be applicable.

The EPA does not have the authority to enforce NYC open space standards, nor are such standards considered an applicable and appropriate requirement for the federal Superfund process. The EPA supports open space efforts that may benefit the remedy for the Site, such as the Sponge Park, green street ends and other green infrastructure projects. The EPA has also encouraged NYC to re-start the area-wide re-zoning process which may result in additional open space through the application of waterfront esplanade requirements.

Comment #171: A commenter asked whether the proposed sewage retention tanks could be sited to take into consideration the expected sea level rise and the attendant ramifications.

Response #171: The retention tanks will be buried in the ground well below the surface. Rising sea levels will not have an impact on such watertight tanks. Construction of the retention tanks would be expected to partially alleviate sewage discharges from increased storm events.

Comment #172: Several commenters expressed concern that the size and number of retention tanks will not be sufficient, given the significant amount of planned residential development.

Response #172: Contaminated CSO solids reductions needed to achieve the PRGs in surface sediments after remedy implementation are estimated to be in the range of 58 to 74 percent. Scientific literature suggests that it can be assumed that the "first flush" comprises approximately 20% of the total discharge volume and contains between 30% and 60% of the total PAH load of the discharge. It is anticipated that capturing approximately twice the amount of the "first flush" of the design storm event from CSO outfalls RH-034 and OH-007 would ensure that the protectiveness of the remedy is maintained. In order to achieve this minimum level of CSO solids control, based on the preliminary screening, in-line retention tanks are presumed to be constructed near outfalls RH-034 and OH-007; tank volumes of 6- to 8-million gallons and 3- to 4-million gallons were preliminarily selected for outfalls RH-034 and OH-007, respectively, on the basis of their capacity to reduce CSO volume and solids that will be protective of the Superfund remedy. During the remedial design process, further refinement of the CSO reduction targets will occur.

The ROD requires that current and future high density residential redevelopment along the banks of the canal and within the sewershed be consistent with current NYCDEP criteria to ensure that hazardous substances and solids from additional sewage loads do not compromise the effectiveness of the permanent CSO control measures (*i.e.,* the tanks) by exceeding their design capacity. The ROD also requires that the size of the tanks, which will be determined during the remedial design, accommodate projected additional loads to the combined sewer system as a result of current and future residential development, as well as a result of increased rainfall due to climate change.

Therefore, it is likely that the tanks will need to be larger to accommodate the aforementioned factors.

Comment #173: A commenter asked whether the proposed retention tanks would have sufficient volume to be able to retain 40% (twice the amount of the "first flush" of the design storm event) of the discharge volume that would be expected from storms equivalent to Hurricane Irene or Superstorm Sandy.

Response #173: While the retention tanks would retain twice the amount of the "first flush" of the design storm event, it is likely that extraordinary storm events, which cause widespread flooding, would exceed the design storm event. As was noted in the previous response, it is likely that the tanks will need to be larger to accommodate projected additional loads to the combined sewer system as a result of current and future residential development and increased rainfall.

Comment #174: Several commenters expressed concern about the potential loss of the Thomas Greene Park and the Douglass-Degraw Pool should a CSO retention tank be sited there. Another commenter asked how the EPA will protect residents from temporarily or permanently losing green and recreational space. Several commenters asked about the time frame that the pool would be closed.

Response #174: The specific locations of the retention tanks will be selected in consultation with NYCDEP. The EPA is committed to achieving cost savings by working closely with NYCDEP to accomplish an effective Superfund cleanup while also realizing CSO benefits through synergies and economies of scale. Accordingly, the EPA intends to work with NYCDEP to evaluate locating CSO control facilities in areas where upland Site-related source removal work might take place, creating a synergy between programs that potentially could save time in property acquisition and permitting and save significant construction costs.

As was noted above, the swimming pool and park are located on the former Fulton MGP State Superfund site, which is currently owned by NYC. The former Fulton MGP State Superfund site is a current source of contamination to the canal through the migration of contaminated groundwater and coal tar. The facility is being addressed under the State Superfund program by National Grid, a PRP for the facility. As a current owner of the park, NYC may also be a PRP for the remediation of the Fulton MGP site under NYS law. It is likely that the remedy for contamination beneath the park facility will include the excavation of contaminated soil and coal tar. To do so, it is likely that the pool would have to be removed. The EPA has suggested that a retention tank be installed before backfilling as a means of solving several problems at the least cost. The EPA is open to other locations that NYC (the party that will be responsible for building the tank) may propose as appropriate and advantageous.

Even if the pool does not have to be removed, the utilization of heavy construction equipment on the Site will likely require the temporary closure of the pool and community center during the MGP cleanup for health and safety reasons.

The EPA acknowledges that there may be some temporary impacts to the users of the pool if the pool is temporarily closed due to excavation of contamination on or near the park, and/or construction of a tank. As was noted previously, NYC could negotiate with National Grid for compensation for the loss of the park during the time that the remediation effort blocks public use of the park and possibly reach an agreement related to the provision of temporary facilities. As part of implementing the comprehensive remedy for the canal and in collaboration with NYSDEC and the PRPs, the EPA will continue to conduct appropriate outreach with the community in order to minimize project impacts to the extent practical.

While detailed construction schedules are not developed until the design phase, it is anticipated that work associated with the construction of an underground retention tank would take two to three years.

Comment #175: Two commenters asked about the potential exposure pathway a sewage retention tank beneath the pool would create.

Response #175: Temporarily storing sewage in an underground tank is a common practice in NYC and elsewhere. While somewhat more complex, sewage tanks are fundamentally similar in nature to other subsurface sewer infrastructure like sewage lines in streets.

Parks and other public accessible facilities have been successfully constructed above such tanks and other sewage-related infrastructure. For example, a public park is located above the North River Wastewater Treatment Plant on the West Side Highway (see http://nysparks.com/parks/93 and http://www.nyc.gov/html/dep/html/wastewater/northri.shtml). In Marseille, France, a CSO tank is being constructed beneath a park, adjacent to an historic monumental arch.

During the public comment period, the EPA's presentations to the public included several examples of CSO tanks constructed beneath a park and other public areas. A CSO retention tank would not pose a threat to an overlying swimming pool.

Comment #176: A commenter noted that more than $900,000 was spent by NYC to renovate the playground at the Thomas Greene Park, which is located on the former Fulton MGP State Superfund site, but the underlying land was not first remediated. Two commenters note that the new playground has large tree pits with exposed dirt and a new sprinkler fountain for children and suggests that both be evaluated as potential new exposure routes. A commenter suggested regular testing of the water in the Douglass & Degraw Community Pool and drinking and shower water at the pool. One commenter expressed general concern about the potential health risks posed to the users of the park and pool. A commenter also expressed concern about potential exposure through contaminated groundwater infiltrating the bottom of the toddler and regular pools. Several commenters suggest that the EPA conduct a thorough review of the remedial investigation results at the former Fulton MGP State Superfund site and address new potential exposure pathways with a human health risk assessment.

Response #176: The playground at the park is located on an area where contamination was not detected, allowing work to proceed on the recent playground renovation. By contrast, substantial contamination was found under the remaining portions of the park.

Current and future human health risks associated with the Site were assessed in the former Fulton MGP State Superfund site RI report prepared by National Grid under NYSDEC oversight. The RI report concludes that under current conditions, the contaminated soils pose no risk to human health because the contamination is located underground and is, thus, not readily accessible. The RI report also concludes that there are potential future pathways by which human receptors could come into contact with contaminated soils and groundwater, soil vapor and indoor air. In addition, utility and construction workers may come into contact with contaminants in subsurface soils at each of the parcels and beneath the streets during excavation activities. Since the soil surrounding the trees was likely imported and since the piping for the sprinklers, showers and drinking water is under pressure (water can leak out of the pipes, but infiltration of contaminants into the piping from the groundwater is virtually impossible due to the positive water pressure in the pipes), the potential for exposure via these routes is unlikely.

Comment #177: Several commenters noted that, although concern has been expressed about the placement of retention tanks at Thomas Greene Park, the soil in a portion of the park is contaminated and needs to be cleaned up. The commenters note that the loss of a swimming area for several seasons is a small price to pay to eliminate the CSO discharges.

Response #177: The Thomas Greene Park swimming pool is located on a portion of the former Fulton MGP State Superfund site. As was noted above, it is likely that the remedy for the former Fulton MGP State Superfund site will include the excavation of contaminated soil and coal tar, which could necessitate the removal of the pool.

The EPA has suggested that a retention tank be installed beneath the park before backfilling and reconstruction of the pool as a means to reduce NYC's property acquisition and construction costs. This approach would solve several problems at once, including reducing the community's exposure to CSO discharges, which can occur both into the canal and into public streets, depending on the circumstances. Although the park has been proposed by the EPA as a potential location, NYC will be given the opportunity to select a location for the retention tank during the remedial design process.

Comment #178: A commenter requested groundwater testing at the park after wet weather events.

Response #178: Since the groundwater underlying the park is known to be contaminated, sampling it after wet weather events would only confirm that which is already known about the MGP-related contamination there.

Comment #179: A commenter asked about the likelihood that a public park could be placed on top of the retention tanks.

Response #179: Construction of a park on top of the retention tanks is readily feasible. Moreover, in this case it could potentially save significant costs by combining the solutions for multiple capital-intensive projects. During the public comment period, the EPA's presentations to the public included several examples of CSO tanks constructed beneath a park and other public areas. See: http://www.epa.gov/region02/superfund/npl/gowanus/pdf/present_cagmtg_02-2013.pdf.

As noted above, there is also a park atop the North River Wastewater Treatment Plant in NYC.

Comment #180: Councilmember Brad Lander indicated that his office is partnering with the NYC Department of Sanitation and the Gowanus Canal Conservancy, with the support of Councilmember Stephen Levin and Councilmember Sara González, to construct a composting facility on the NYC-owned property located at 2nd Avenue and 5th Street, another potential location for an in-line retention tank. It is anticipated that the construction of the facility will begin in summer 2013, pending regulatory approval. Councilmember Lander requested that before any final decisions are made about the siting of a retention tank at this location, he would like details about the proposal and what the potential impacts might be.

Response #180: The EPA has reviewed the composting facility's plans and met with the Gowanus Canal Conservancy in April 2013 at the composting facility to work out an arrangement that would allow both the composting and in-line retention tank projects to move forward (*i.e.,* the components of the composting facility will be portable). The EPA will continue to conduct appropriate outreach with the community in order to minimize project impacts to the extent practical on this and other efforts along the canal.

Comment #181: A commenter asked how the locations of the CSO retention tanks would be selected and approved.

Response #181: It is up to NYCDEP—the party that will be responsible for building the retention tanks—to propose even further CSO controls if additional steps are necessary to achieve the water quality goals of the CWA and meet the "highest attainable use" for the water body.

The EPA is seeking to coordinate the CWA and CERCLA processes to the extent practicable to ensure that the selected CERCLA remedy is implemented in an effective and timely manner. NYSDEC is the lead agency for implementing the CWA in the State; the EPA will be participating closely in the LTCP process. The EPA is the lead agency for the CERCLA remedy, with NYSDEC as the support agency. The EPA plans to coordinate closely with NYSDEC and NYCDEP.

It is anticipated that NYCDEP will be performing additional sampling, modeling and engineering work which should serve to inform both the remedial design and LTCP processes, assuming that both efforts are moving in parallel.

In the event that there are delays in the LTCP process, the EPA will require NYCDEP to proceed on the remedial design schedule rather than the LTCP schedule so as to prevent delays in the implementation of the CERCLA remedy. It should be noted that the EPA does not believe it is necessary for NYCDEP to finalize the LTCP in order to complete the remedial design, particularly since the State has already determined that the LTCP must, at a minimum, meet the CERCLA remedy requirements.

The EPA's incorporation of the CSO solids control into the remedy allows the EPA to conduct the siting, remedial design and remedial action pursuant to certain CERCLA statutory authorities, including, but not limited to, the availability of permit exemption and environmental impact statement equivalency. The CERCLA exemption and equivalency authorities will help avoid delays in implementing the remedy.

As a result, the EPA anticipates that final retention tank site selection will be done under the EPA's oversight, in consultation with NYSDEC. As noted previously, for the purpose of developing estimated construction costs associated with CSO control, it was assumed that these tanks could potentially be located on available NYC-owned land in the vicinity of the outfalls. The EPA is open to other locations that NYCDEP may propose, as appropriate and advantageous. NYCDEP's proposed location(s) will be subject to approval by the EPA and NYDSEC during the remedial design and the contemporaneous LTCP development process.

Comment #182: Two commenters expressed concern that the language in the Proposed Plan calling for the construction of retention basins to address the CSO problem is suggestive, rather than compulsory. They note that since NYC is strapped for funds, it may not "take the hint."

Response #182 While the EPA evaluated several CSO control measures and determined that retention tanks would be the most viable, the EPA wanted to allow NYCDEP the maximum amount of flexibility in selecting CSO control measures. Therefore, instead of mandating retention tanks, the Proposed Plan suggested retention tanks. It should be noted that the selected remedy includes the installation of retention tanks.

Comment #183: Two commenters indicated that while the Proposed Plan takes the critical step of calling for CSO retention tanks for two of the canal's worst outfalls, many details will not be solidified until NYCDEP submits its LTCP. The commenters further stated that it is critical for the EPA to stand firm on requiring retention tanks to control CSOs and to work with NYSDEC and NYCDEP toward the eventual goal of 100% elimination of CSOs from the canal.

Response #183: NYSDEC is currently overseeing work being performed by NYC (NYC) to reduce CSOs to the canal by approximately 34 percent in lower and mid-canal outfalls. To significantly reduce overall contaminated solid discharges to the canal, the selected remedy includes the construction of two in-line sewage/stormwater retention tanks in the vicinity of the two major CSO outfalls in the upper reach of the canal. The selected remedy also calls for interim controls to mitigate sediment from the CSO

discharges until the permanent retention tanks are installed if the tanks cannot be constructed prior to the commencement of the dredging remedy.

While complete elimination of all CSOs from the canal is technically possible, it is not the goal of the ROD; the goal is a protective remedy. Scientific literature suggests that it can be assumed that the "first flush" comprises approximately 20% of the total discharge volume and contains between 30% and 60% of the total PAH load of the discharge. It is anticipated that capturing twice the amount of the "first flush" of the design storm event from the two major outfalls located in the upper portion of the canal (while at the same time making adjustments for additional loads from projected future development and increased precipitation due to climate change) would ensure that the protectiveness of the remedy is maintained.

Comment #184: A commenter suggested that legal assurances be put into place to ensure that NYCDEP maintains the retention tanks.

Response #184: It is the EPA's expectation that the performance of the maintenance related to the retention tanks will be included in the terms of the negotiated agreement with NYC.

Comment #185: A commenter notes that the Proposed Plan states that the EPA and NYSDEC are committed to work together throughout the development of the remedial design and the contemporaneous LTCP development process. The commenter seeks clarification on the timing for the development of CSO controls.

Response #185: The LTCP is due in June 2015. The EPA will proceed with the design of the selected remedy anticipating the contemporaneous completion of the LTCP. Recognizing that planning and construction of permanent long-term contaminated CSO solids controls for the Superfund remedy might not take place by the time remedial dredging commences, the EPA in consultation with NYSDEC, would develop, or require NYCDEP to develop, interim CSO solids control measures during the remedial design to control the CSO discharges until the permanent measures are implemented.

As was noted previously, in the event that there are delays in the LTCP process, the EPA will require NYCDEP to proceed on the remedial design schedule rather than the LTCP schedule so as to prevent delays to the implementation of the CERCLA remedy. It should be noted that the EPA does not believe it is necessary for NYCDEP to finalize the LTCP in order to complete the remedial design, particularly since the State has already determined that the LTCP must, at a minimum, meet the CERCLA remedy requirements.

Compensation for Temporary Loss of Pool Facility

Comment #186: A commenter asked what compensation would be provided to the community for losing a recreational open space facility. Another commenter requested

that the EPA ensure that if a sewage retention tank is placed in Thomas Greene Park under the pool, that the pool and any park be replaced for the entire time that there is disruption to this critical community resource. The commenter also requested that the design of the replacement pool and park have meaningful involvement from the community. Community Board Six asked if an in-line retention tank is sited at the Thomas Greene Park and Douglass-Degraw Pool, will the EPA help offset the resulting temporary loss of access to this public facility.

Response #186: NYC, as owner of the contaminated park property, may be a PRP for the former Fulton MGP State Superfund site and therefore, along with National Grid, the successor to the former owner/operator, are the PRPs partly responsible for the former MGP facility's remediation. As the property owner, it is within NYC's authority to identify a temporary or permanent location for the pool and implement the transition of the pool services to this new location. As was noted previously, NYC could negotiate with National Grid for compensation for the loss of the park during the time that the remediation effort blocks public use of the park and possibly reach an agreement related to the provision of temporary facilities. As part of implementing the comprehensive remedy for the canal and in collaboration with NYSDEC and the PRPs, the EPA will continue to conduct appropriate outreach with the community in order to minimize project impacts to the extent practical.

If selected as a CSO retention tank location, the EPA will allow enough lead time during the development of the design for the transitioning of the pool and other community services to an alternate location outside the construction area.

Comment #187: Two commenters expressed concern about who will pay for an alternative pool and park and the salaries of the 35 employees.

Response #187: National Grid is the primary PRP for the former Fulton MGP State Superfund site. As owner of the park, NYC may also potentially responsible for some portion of the former MGP facility's remediation. As was noted previously, NYC could negotiate with National Grid for compensation for the loss of the park during the time that the remediation effort blocks public use of the park and possibly reach an agreement related to the provision of temporary facilities.

Navigation

Comment #188: National Grid provided comments related to navigation in the canal and the potential for its impact on the benthic layer and cap armor layer. The main comments referred to the likelihood of the benthic layer to be disturbed and mobilized by the Flushing Tunnel and commercial vessel traffic that currently traverses the area. A secondary comment suggested that the armor cover size is underestimated.

The comments were based on a National Grid study which noted that impacts on sediment mobility result from:

- Increased flow velocities associated with tug and barge activity
- Propeller wash
- Direct vessel contact with the bed

National Grid cited the conclusions from the study by remedial target area as follows:

RTA 1

- When the Flushing Tunnel becomes active, there will be significant sediment erosion and transport from RTA 1 from the increased flow in the canal.
- The Flushing Tunnel flows, when activated, will scour the sand layer proposed to help establish the benthic community after completion of the remedial action preventing ecological restoration in the canal.

RTA 2

- The Proposed Plan does not account for the full range of vessel impacts such as vessel grounding and propeller scour that remobilize and redistribute bed sediments.
- A sand benthic layer will be unsustainable under the combined effects of propeller wash and Flushing Tunnel flow at depths as deep as 30 feet. A significantly deeper dredge depth will be required to accommodate commercial vessel traffic in RTA 2 if the sand layer is required to support a benthic community.
- The size of stone assumed in the FS and Proposed Plan for the cap armor layer is underestimated for the estimated elevation of the bed in RTA2.
- The environmental goals of the proposed remedy are not achievable with commercial navigation in RTA 2, therefore removing commercial navigation in RTA 2 must be evaluated.
- In the event that a strategy of eliminating commercial vessel traffic is not pursued as part of remediation of the canal, there must be flexibility within the Proposed Plan to be able to evaluate bed elevations and the configuration of any proposed cap and armor layer in light of detailed vessel impacts.
- If RTA 2 is dredged to accommodate navigation by commercial vessels, RTA 2 will suffer ongoing accumulation of sediment. However, a deeper bed configuration in RTA2 would be ineffective because it would increase sediment and contaminant accumulation, and would lessen the ability of the Flushing Tunnel to address water quality issues in this section of the canal.

Response #188: Although the Flushing Tunnel will operate at a greater overall capacity, the velocity of the water is expected to be the similar to before the current upgrades. The upgrades will allow the Flushing Tunnel to operate during more hours of the day, increasing the overall volume of water. Due to the geometry of the Flushing Tunnel and the canal (*e.g.,* tunnel discharge angle and curve of the canal) most of the tunnel flow diminishes by mid-canal. As a result, alterations in scouring and sediment transport are expected to be limited. The most significant effect of the Flushing Tunnel is to reduce stagnant water conditions in the upper reach of the canal. (NYCDEP 2007 Modeling Report; NYCDEP 2008 WWFP).

There is a balance that the remedial design must accomplish to maintain a benthic habitat, maintain dissolved oxygen concentrations in the canal above regulatory levels, and maintain canal use in RTA 2 for commercial navigation. With the Flushing Tunnel reactivated, scouring of the sand layer in RTA 1 could affect benthic community restoration. In RTA 2, scouring of the sand layer from navigation could have the same effect.

Despite scouring of the sand in the benthic habitat area, benthic organisms will continue to exist in the canal for the following reasons:

- Although it is accurate to assume that unstable sediment conditions will affect the benthic community, scouring will not be uniform across all areas of RTA 1 and RTA 2.
- Sediment transport will likely also not be uniform across the entire RTA. National Grid has collected benthic macroinvertebrate samples throughout the canal under the existing shallow bathymetry conditions, with and without the Flushing Tunnel in operation and with the apparent effects of disturbance from tug boat movement in the canal.
- Under the aforementioned current conditions of surface disturbance, National Grid's sampling results showed that benthic macroinvertebrates were found at all locations sampled. The quality of the community depended on the quality of the habitat and sediment type. The post-remediation habitat should be considerably improved over current conditions.
- In areas that will not be subject to significant scouring, the sand layer would remain in place to support the presence of benthic communities of a quality corresponding to the habitat type.
- In areas with scour, it is reasonable to expect the presence of benthic communities that are adapted to more rocky substrates (like the stones that will comprise the armor layer).
- The reduction in CSO discharges and removal of sediment creating SOD in the selected remedy will improve dissolved oxygen conditions in the canal. This in turn will reduce the need for the design flows of the reactivated Flushing Tunnel to maintain dissolved oxygen levels since the organic load to the canal will be reduced. With lower water velocities, sediment scour would be lower.

The balance of the need to maintain a benthic habitat, maintain dissolved oxygen concentrations in the canal above regulatory levels, and maintain canal use in RTA 2 for commercial navigation will be addressed during the remedial design based on the established CSO control systems.

The FS presented only the conceptual layouts and sizing of the various components of the evaluated remedial alternatives in accordance with the EPA guidance.

Conceptual layout of the armor layer was based on guidance from the EPA guidance document by Palermo *et. al* (1998). The influences of twin propellers and rudders were not included in the conceptual layout and these could certainly result in potentially larger

bottom velocities and the need for a larger armor layer. However, the size of the stone assumed in the FS for the armor layer is not expected to increase significantly enough so as to affect the feasibility of the alternative.

Final cap configuration and precise dimensions will be determined during the remedial design and will include a detailed study of tug-boats and operations in the canal.

Odors and Pathogens During Construction

Comment #189: The PRP Group stated that there is a need to evaluate migration and exposure to airborne bacterial and chemical substances (pharmaceuticals, personal care products, etc.) during dredging under the proposed plan. The comment also noted that the EPA has not considered recent studies by Columbia University that evaluated air quality during the ongoing in-canal aeration activities by NYCDEP at Newtown Creek and suggest that aeration provides a pathway for microbial exposure.

Response #189: Dredging of sediments containing pathogens in waterways with CSO discharges has been performed by NYCDEP (*e.g.,* in the Hendrix Canal) and by many other entities at many locations across the United States. Dredged sediments are wet and airborne pathogens are not expected from the wet sediments. When sediment is dredged, the pathogens are located in the sediment pore water and on the sediment solids. The pathogens would become airborne if particulate matter from the dredged sediment becomes airborne. The potential for this happening would be limited by the high moisture content of the sediment, which will limit the potential for airborne dust particles. Pathogens represent a concern during direct contact. For workers involved in the dredging operation, personal protective equipment will prevent direct contact with the sediments. Hepatitis vaccinations may also be used for added protection by workers in direct contact. Worker exposures to pharmaceuticals and personal care products in the dredged sediments would also be addressed through personal protective equipment.

Aeration is not planned during sediment dredging as part of the selected remedy. Under existing conditions, the public is exposed to pathogens through CSO discharges to the canal, through flooding during storm events and through sewage overflows onto the streets and sidewalks neighboring the canal when high water levels close the tide gates at CSO outfalls, causing the sewer backups to occur away from the canal. The selected remedy should reduce these conditions. Odor controls will be implemented to control odors to the degree practicable. Under current conditions, the CSO sediment mounds and frequent CSO events cause uncontrolled odors. The selected remedy, once implemented, should significantly reduce the formation of mounds and the occurrence of uncontrolled odors.

1st Street Turning Basin

Comment #190: NYCDEP provided the following comments on the EPA's proposed excavation of the 1st Street turning basin:

- The proposed excavation is based on very limited data and an evaluation of alternatives was not completed.
- The proposed excavation is not consistent with the handling of other upland sites along the Canal and does not comply with any remedy selection requirements under CERCLA.
- The estimated costs for the proposed excavation underestimate the project costs.
- There is no indication that property owners or neighboring landowners were contacted and offered an opportunity to participate in the process.
- The EPA should consider the land use impacts of the proposed change.

Response #190: The former 1st Street turning basin was originally utilized to deliver coal via barges to the former Brooklyn Rapid Transit Power House. The Power House consumed large quantities of coal. During its operating era, large coal piles surrounded the building until the plant became obsolete and was removed from service. The 1st Street basin was filled in between 1953 and 1965.

Analytical data obtained during the RI in the former 1st Street turning basin showed the existence of significant contamination in soil and groundwater above cleanup standards. As with other former basins along the canal, it is believed that contaminated sediments within the 1st Street basin were left in place when the basin was filled in. In addition, there are indications that the fill itself may have included waste materials. The filled-in basin may also have been subject to later spills and dumping.

The EPA installed a paired set of wells within the former 1st Street turning basin, which the EPA believes is an appropriate number of wells for the aerial extent of the parcel, and collected sufficient data to characterize the contamination. The data included soil borings, visual observations of contamination and multiple rounds of groundwater samples. The wells were installed in a location from which groundwater samples would provide adequate characterization of the groundwater contamination flowing through the narrow parcel of land that constitutes the former 1st Street turning basin. In its comment, NYCDEP indicated that monitoring well MW-27, which does not show contamination at levels of concern, is within the 1st Street turning basin. Monitoring well MW-27 is located on the adjacent Power Station property, not the 1st Street turning basin.

The basin is hydraulically connected to the canal (with no bulkhead standing between the canal and the basin) such that contaminants within the basin are an on-going source of contamination. Finally, unlike other filled in portions of former turning basins, the 1st Street basin has no standing structures on it, thus making excavation to remove this continuing source a preferred option compared to other upland sites. Based on this combined set of considerations, the EPA determined that the preferred approach for the 1st Street basin is removal of the contaminated soil and restoration of the basin. Alternatives that remove or destroy hazardous substances, pollutants or contaminants to the maximum extent feasible are key criteria for the effectiveness evaluation of remedial alternatives.

The FS report addendum presented an example potential excavation and restoration approach with associated estimated costs. The costs are order-of-magnitude cost estimates that provide an accuracy of +50 percent to – 30 percent and are based on the quantities and assumptions in the presented potential excavation and restoration approach. A confirmatory investigation will be performed during the remedial design to collect the additional data necessary to develop the final approach and design for the excavation and restoration activities.

The principal benefit derived from the cleanup and restoration of the former 1st Street turning basin and the portion of the 5th Street turning basin beginning underneath the 3rd Avenue bridge and extending approximately 25 feet to the east is the mitigation of wetlands impacts that may be associated with the cleanup of the canal from a series of incremental intrusions into the canal from cut-off walls and/or bulkhead restoration work.

Regulations relating to the filling of water bodies are Site-specific ARARs. As noted previously, the State seeks to limit or offset encroachment on the canal when bulkheads are repaired. In its comments, NYCDEP noted with respect to other potential project-related wetlands impacts that "[t]he average cost for purchase of credits from a mitigation bank is currently approximately $700,000 per acre, or $21 million. This cost was not included in the cost estimate for RTA 3" (NYC 2013, page 71). The EPA agrees that it is appropriate to consider and evaluate the cost of wetlands mitigation.

The excavation of the 1st Street turning basin offers several additional potential benefits:

- Shallow water habitat restoration could be incorporated to establish vegetative growth appropriate for an urban setting.
- Flood storage capacity within the canal would be marginally increased.
- A boat launch can be constructed in the restored turning basin so that members of the community can launch canoes or other shallow-draft recreational vessels.
- Public access to the canal may be increased.

Like the main channel of the canal, the 1st Street turning basin is owned by NYC. Two major parcels abutting the basin, the Power Station and 420 Carroll Street, have recently been purchased. If these properties are redeveloped around a restored 1st Street basin, NYC's waterfront guidelines suggest that the required esplanade area may include both the canal and basin frontage, resulting in more public open space. The EPA contacted these property owners in connection with the Proposed Plan to ensure that they were aware of the proposed restoration of the basin. No formal comments were submitted by these property owners with respect to the overall remedy or the 1st Street basin restoration specifically.

As part of the confirmatory design investigation and throughout the design, property owners along the 1st Street turning basin will be contacted to coordinate the planned activities.

Differing Conditions Along Canal

Comment #191: National Grid asserts that the benefits of dredging all of the soft sediment in RTA 3B, as called for in the Proposed Plan, are disproportionate with the localized nature of the impacts and the disruption, associated worker and public risk from the construction, and extended construction duration. The remedy for RTA 3B should be re-evaluated and less-intrusive alternative approaches including hot spot removal and monitored natural attenuation should be considered, especially given that RTA 3B represents nearly 50 percent of all sediments slated for removal in the Proposed Plan.

National Grid also asserts that the sediment chemistry is different in RTA 3 and sediments in RTA 3B contain lower concentrations of potentially toxic chemicals than much of the rest of the canal.

Response #191: The EPA has reviewed the data set cited in the comment concerning contaminant distribution and hot spot and non-hot spot locations in RTA 3B. The total PAH distribution for hot spot and non-hot spot locations are presented in Figure 8, below. The EPA elected to divide the data sets in two depths: depths from zero to four feet below the sediment surface and depths greater than four feet below the sediment surface to match the depth intervals used by the commenter in their analysis. The basis for this division was that in the near surface sediments exposure to benthic communities occurs and natural recovery could be expected to have a greater effect.

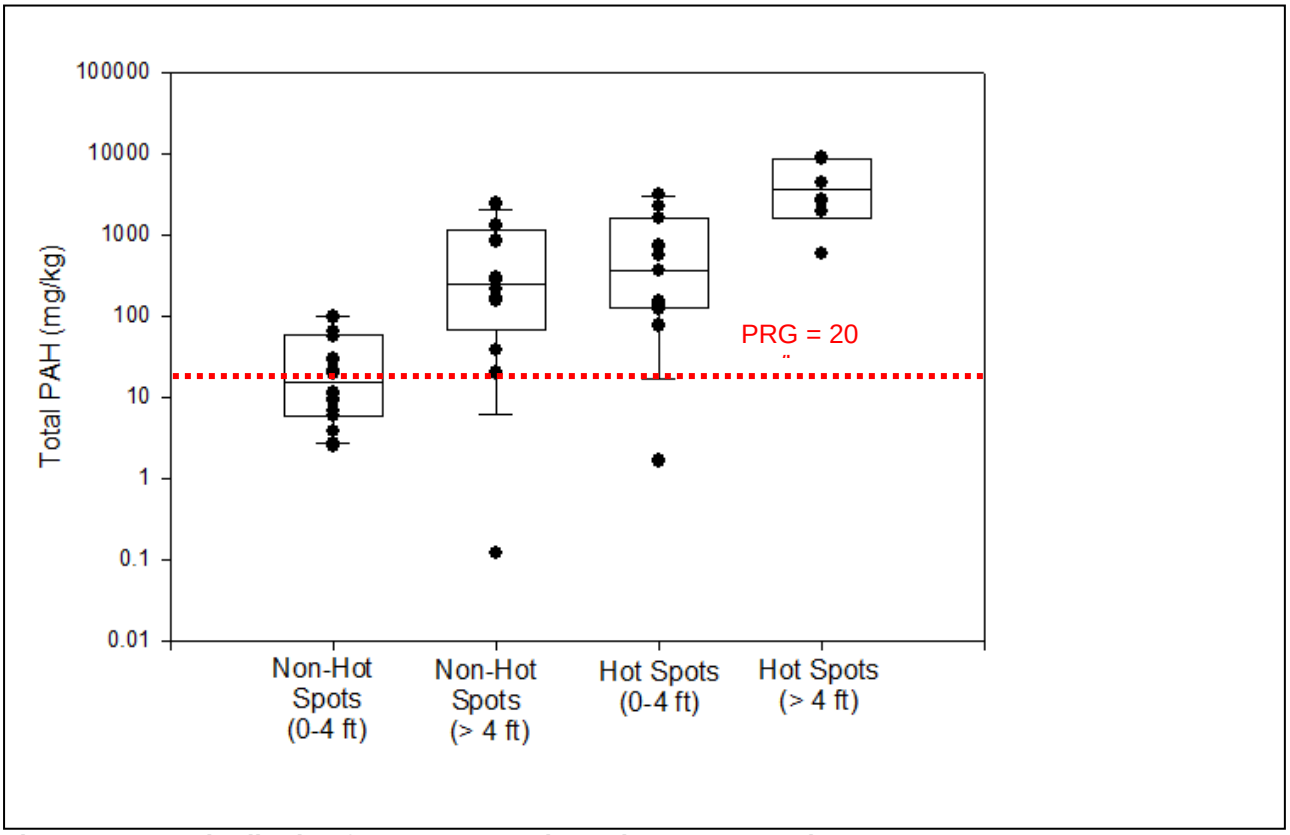

Figure 8: PAH Distribution for Hot Spot and Non-hot Spot Locations

The data analysis confirms the comment that the non-hot spot locations have lower total PAH concentrations in the sediment in the top four feet compared to the deeper sediments at the same locations. However, the data also show that whereas the median concentration for the non-hot spot locations in the upper four feet of sediment is near the PRG approximately 50% of the samples collected were above the PRG. All non-hot spot locations at depths greater than four feet were also above the PRG. The above analysis confirms the EPA's previous conclusion that soft sediment removal is required in RTA 3B.

The EPA has already accounted for the different characteristics of RTA 3 relative to the other two RTAs by reducing the active cap conceptual layout for RTA 3 compared to the other two RTAs. This determination was based both on reduced groundwater discharge velocity and NAPL impacts in RTA 3. The absorptive layer was reduced to six inches in RTA 3 compared to one foot in the other two RTAs. As stated in other summary comment sections, the active cap design in the PRAP represents a conceptual design for alternative development and not the actual remedial design. Different active cap configurations for RTA 3B will be evaluated during the remedial design.

Although the EPA has characterized RTA 3 as the least contaminated, this is relative to RTA 1 and 2, rather than relative to background levels. The level of sampling, design and targeted removal costs, together with the risk associated with leaving untreated contamination in place, as compared to full removal does not justify an altered approach.

Hydrology and Nonaqueous Phase Liquid Impacts in Remediation Target Area 3

Comment #192: National Grid asserts that the hydrology and NAPL Impacts are different in RTA 3 and warrant different treatment than the other areas of the canal.

Response #192: The EPA agrees that the hydrology and NAPL impacts in RTA 3B are different than in the other RTAs. The groundwater model provided by National Grid indicates that only 12 percent of the groundwater discharge into the canal is in RTA 3 even though RTA 3 occupies over 50 percent of the canal bottom.

NAPL impacts are also lower than other RTAs. Over 70 percent of the cores collected of native sediment showed no NAPL impacts and no NAPL saturated cores were observed.

The EPA has already accounted for the different characteristics of RTA 3 relative to the other two RTAs by reducing the active cap conceptual layout for RTA 3 compared to the other two RTAs.

Natural Attenuation for Remediation Target Area 3

Comment #193: The PRP Group and the Sediment Management Workgroup asserts that natural attenuation should be considered for RTA 3.

Response #193: The complex mix of contamination in RTA 3, which contains a very large number of chemical compounds resistant to degradation (as in the rest of the canal) has arguably been subject to natural attenuation for an extended period of time, pre-dating the Superfund process by over a century, with no indication that contaminants will ever drop to acceptable levels.

Sediment Toxicity and Benthic Community Health in Remediation Target Area 3

Comment #194: National Grid asserts that sediment toxicity and benthic community health are different in RTA 3. The toxicity was not uniform throughout RTA 3B.

Response #194: National Grid has collected benthic macroinvertebrate samples throughout the canal. Under the existing conditions of surface disturbance, the overall conclusion was that benthic macroinvertebrates were found at all locations sampled. The quality of the community depended on the quality of the habitat and sediment type.

The EPA agrees that RTA 3B has more hospitable conditions to support a benthic community than RTAs 1 and 2, but does not agree that monitored natural recovery (MNR) is an acceptable remedy for this section of the canal. MNR was screened out as an alternative for the lower reach of the canal since the accumulated sediments are grossly contaminated with a broad range of pollutants that are unlikely to naturally attenuate and which may be subject to some degree of transport via propeller wash, storms, and tidal action to areas of the canal that were capped.

Remedy Effectiveness

Comment #195: A commenter suggested that the ROD aim for the highest cleanup standards and apply and enforce those standards to the upland NYSDEC-managed sites, as well.

Response #195: Because there are no promulgated standards or criteria that apply to the cleanup of contaminated sediments in New York, Site-specific PRGs for sediments in the Gowanus Canal were developed. PRGs are used to define the extent of cleanup needed to achieve the RAOs. A “clean” surface will be established at the bottom of the Gowanus Canal at the end of remedy construction.

To prevent recontamination of the canal following the implementation of the remedy, the upland sources of hazardous substances, including discharges from three former MGPs, CSOs, other contaminated upland areas and unpermitted pipes along the canal must be addressed prior to the commencement of, or in phased coordination with the implementation of the selected remedy.

The former MGP facilities are being addressed by National Grid under NYSDEC oversight. Based upon the first NYSDEC-selected remedy at one of these former MGP facilities and NYSDEC guidance for presumptive remedies at former MGP facilities, it is

assumed that a range of actions will be implemented at the facilities (that may include removal of mobile sources, construction of cut-off walls along the canal and active recovery of NAPL near the cut-off walls for each of the former MGP facilities) which will prevent the migration of contamination from the former MGP facilities into the canal.

The EPA and NYSDEC will coordinate measures to control discharges from upland contaminated areas adjacent to the canal that have already been referred to NYSDEC for action. In addition, under the selected remedy, unpermitted pipe outfalls will be either controlled or eliminated.

Since CSOs to the canal will not be entirely eliminated as part of the sediment remedy, the newly-established background level of PAHs in surface sediment will depend on the level of CSO reductions achieved. The goal is to reduce the contribution of CSO solids so that the average total PAH concentration in canal's surface sediments after remediation does not exceed the PRG of 20 mg/kg.

Comment #196: National Grid asserts that remedy performance should be based on post- remedy operation of the canal and that appropriate performance measures and monitoring plans to assess remedy performance in both the short term and long term should be developed.

The Gowanus Conservancy asserts that remedy performance standards should address historical sources, as well as CSO discharges and storm sewers. The performance standards should be adapted as conditions in the canal change. The Gowanus Conservancy also asserts that long-term performance monitoring should be closely linked to the CSM so that the hypotheses and assumptions that led to the selected remedy can be tested and refined.

Response #196: Specific performance measures were developed in the Proposed Plan for total PAH concentrations in sediment of 20 mg/kg (the PRG) and for surface water concentrations (final chronic values-FCVs). The FCVs presented in the FS report and in Table 4, below, are considered performance measures for pore water near the sediment surface.

Table 4: Final Chronic Values

Chemical	**Final Chronic Values for PAHs in Pore Water (mg/L)**
Napthalene	0. 1935
Acenapthene	0. 3069
Fluorene	0. 0393
Phenanthrene	0. 0191
Pyrene	0. 01011

A performance monitoring plan to assess whether and how these performance standards are met will be developed as part of the remedial design.

In addition, because contaminants are left in place beneath the cap (treated by ISS or left without treatment) following the implementation of the remedy, five year reviews will be performed to assess whether the remedial goals are being achieved.

Dredging and Sediment Management Costs

Comment #197: NYCDEP asserts that the dredging and sediment management costs consistently underestimate likely costs based on Site-specific conditions. The costs of implementing the remedy are likely to be in a range that is twice those amounts, which is outside the acceptable tolerance for a CERCLA FS compared to the final remedy cost (*i.e.,* -30 to +50 percent). Insufficient Site characterization and overly optimistic technical assumptions are used to justify the design concepts have resulted in an underestimation of the probable costs for each of the alternatives.

Response #197: The EPA's FS cost estimating guidance (EPA, 2000) states the following (underlining added for emphasis):

> While cost estimates are developed at different stages of the Superfund process (Chapter 2), this guide specifically addresses the FS phase. Cost estimates are developed during the FS primarily for the purpose of comparing remedial alternatives during the remedy selection process, not for establishing project budgets or negotiating Superfund enforcement settlements. During remedy selection, the cost estimate of the preferred alternative is typically carried over from the FS to the PRAP for public comment. The subsequent cost estimate included in the record of decision (ROD) reflects any changes to the remedial alternative that occurs during the remedy selection process as a result of new information or public comment.

The guidance further states:

> As a project moves from the planning stage into the design and implementation stage, the level of project definition increases, thus allowing for a more accurate cost estimate. An "early" estimate of the project's life cycle costs is made during the FS to make a remedy selection decision.
>
> At the FS stage, the design for the remedial action project is still conceptual, not detailed, and the cost estimate is considered to be "order-of-magnitude." The cost engineer must make assumptions about the detailed design in order to prepare the cost estimate. As a project progresses, the design becomes more complete and the cost estimate becomes more "definitive," thus increasing the accuracy of the cost estimate.

While the -30 to +50 percent is the expected cost estimate accuracy at this stage, the guidance expressly notes that "the specific percentages correlate with generally

accepted rules of thumb for cost estimating accuracy and are not meant to imply that these goals will be precisely achieved."

The cost estimate developed for the FS and subsequently revised in the FS report addendum and used in the Proposed Plan is sufficient to support the selection of an alternative. The EPA acknowledges that as the remedy becomes increasingly more defined during the remedial design, the cost estimate will change. These changes will be reflected and documented in the 30 percent, 60 percent and final remedial design documents generated during the remedial design process.

Figure 8, below, from the EPA's FS cost estimating guidance (EPA, 2000) shows how the accuracy of the cost estimate is refined during the different project stages.

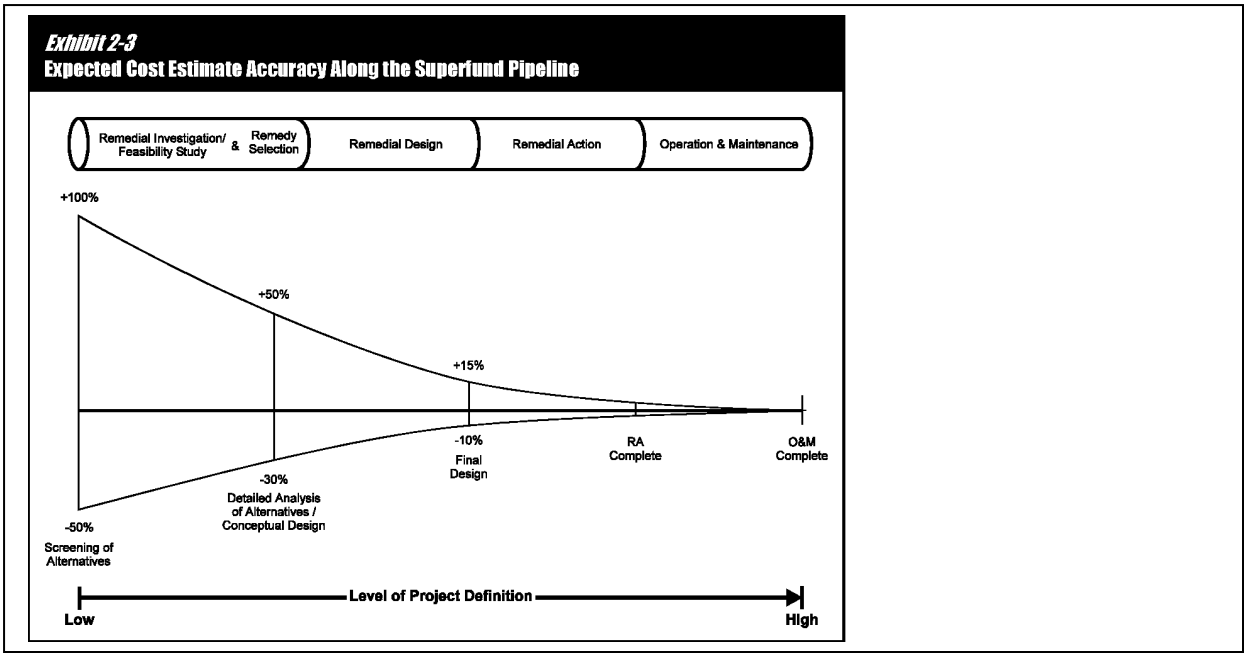

Figure 8: Exhibit 2-3, Expected Cost Estimate Accuracy Along the Superfund Pipeline, from the EPA's Feasibility Study Cost Estimating Guidance

Of the specific cost elements commented upon, the fundamental assumptions for every single element are the same for each of the evaluated alternatives, except for the costs associated with in-situ stabilization, which are specific to Alternative 7. Any changes to the specific elements listed would affect both alternatives to the same degree and, as a result, the relative cost ranking would not change.

The selected remedy incorporates several approaches which should limit remedial design and remedial action costs relative to other sediment sites. The disposal volume is well quantified, and limited by the defined project area boundaries. Sediment contaminant levels are also well defined. These conditions limit the purposes for which remedial design sampling will be required. Because full removal of accumulated sediments has been selected, and residual contamination is expected in native sediments, post-excavation confirmatory sampling will also be limited as compared to other sediment sites.

Confirmatory Design Sampling and Testing Costs

Comment #198: NYCDEP notes that the FS report assumed that pre-design sampling and testing could be performed for a cost of $500,000–including sample collection which is unrealistic. No details are provided regarding these activities. No information is provided regarding geophysical testing. Geotechnical analysis is not included in the estimate and this will be a major concern of the design process. Equipment mobilization/demobilization costs are not addressed in the estimate.

Response #198: Confirmatory design sampling and testing will be performed at the start of design. The costs were estimated at $500,000 in the FS, but could be higher, potentially of the same magnitude as the remedial investigation costs.

Remedial Design Costs

Comment #199: NYCDEP asserted that the remedial design costs are too low at four percent of remediation costs and are typically five to 15 percent of project costs.

Response #199: While the range of design costs cited in the comment (five to 15 percent of project costs) is generally reasonable for typical projects, a lower percentage near the lower end of this cited range (4%) was selected since the overall project costs were relatively high due to the sheer volume of sediment that requires removal. The 4% was not applied to the sediment transportation and removal costs and the ISS. If the assumption made in the FS is changed and the percent is applied to the sediment transport and removal and ISS costs, the cost of the design would increase by approximately $6.5 million. A detailed estimate of the design costs will be prepared at the start of the design.

Pre-Remediation Site Work Costs

Comment #200: NYCDEP asserts that pre-remediation Site work costs for fencing and temporary roadwork do not appear to be applicable for work in the canal. Costs for temporary docking facilities should be considered.

Response #200: The full details of the pre-remediation Site work will be developed during the design when the process layout will be developed and specific locations will be identified.

Debris Management Costs

Comment #201: NYCDEP noted that debris management costs were not considered.

Response #201: For the Kinnickinnic River project (a mechanical dredging project conducted in an urban environment, from a portion of the river that had not been

dredged in 60 years), debris was processed and disposed off-site as part of the dredging operation. The dredging costs for the Gowanus Canal estimate used the actual Kinnickinnic River dredging costs as a basis, which included a debris screening process. Costs for off-site disposal of debris for the Kinnickinnic River were 0.1% of the total dredging costs and 0.04% of the total project costs. Debris from the Kinnickinnic River was disposed in a landfill, as opposed to the sediment, which was disposed at a confined disposal facility. For the Gowanus Canal, for most disposal options, debris can be disposed along with the sediment and does not need to be separated.

Temporary Access Roads and Temporary Storage Area Costs for In-Situ Stabilization

Comment #202: NYCDEP noted that the temporary access roads and temporary storage area costs for ISS were not clear. The ISS process is subject to the same space and other canal limitations and the production rate might need to be adjusted similarly to the dredging rate. Additional equipment might be needed to maintain the proposed ISS operations or delays might be incurred.

Response #202: These considerations will be analyzed in detail during the remedial design and detailed costs will be derived accordingly.

Space and Other Canal Constraints

Comment #203: NYCDEP asserts that space and other canal constraints impacting the dredging operations will also affect cap placement operations.

Response #203: These constraints will be analyzed in detail during the remedial design.

Water Treatment System Proposed for Treating Water Within Temporary Sheet Pile Cells

Comment #204: NYCDEP asserts that the water treatment system proposed for treating the water within the temporary sheet pile cells does not have redundancy in components, does not have excess capacity to treat decontamination water or surface runoff and its operation does not incorporate downtime for media change out.

Response #204: The description of the water treatment system for treating the water within the temporary sheet pile cells is conceptual in nature. The components of the water treatment system will be developed during the remedial design.

Long-Term Monitoring and Maintenance Program for Sediment Cap

Comment #205: NYCDEP noted that the long-term monitoring and maintenance program for the sediment cap does not address PAH contamination. It is unclear how the assumed five percent replacement of the cap footprint every ten years will be accomplished. The need to replace the oleophillic materials in the cap has not been addressed; including costs for design and construction oversight, dredging of the canal to remove the old cap and accumulated sediment, and disposal of these materials, cost for placement of new multi-layered cap could be approximately $200 million per round of replacement.

Response #205: The operation, maintenance and monitoring components of the remedy will be developed during the remedial design.

Pre-Design Investigation, Modeling, Treatability Testing and Pilot Testing

Comment #206: National Grid, NYCDEP and the Sediment Management Workgroup stated that additional studies are needed to finalize the remedy and to support the remedial design. The specific studies noted to be needed include navigational studies, groundwater modeling, hydrodynamic modeling, geotechnical investigations, cap design and performance studies, performance standards evaluation, dredging production and throughput evaluation, contaminant release studies, sediment re-suspension and contaminant release control evaluations, operations plan, monitoring and management plan, field pilot studies, handling and transport study, sediment treatability studies, beneficial use studies, landfill investigation and others.

Response #206: While the EPA believes that it is appropriate to complete such studies and plans prior to implementation of the remedy, there is sufficient information at this time to move forward with remedy selection. As is customary, additional confirmatory data gathering, evaluations and plans will be completed during the remedial design. The remedial design phase will begin with the identification of the data needed to support the specifics of the design.

Adaptive Management

Comment #207: National Grid commented on the need for an adaptive management approach resulting from remaining uncertainties regarding specific design requirements for remedy components, such as for example dredging, capping, and sediment disposal. It was noted that the ROD should contain language that allows for the application of alternative methods and techniques that are acceptable to the EPA. It was further commented that the ROD should be flexible enough to allow application of such potential alternatives and allow for real-time modification of the remedy even while it is being implemented. Such an adaptive management approach will enable the parties to work together to design an appropriate and sustainable remedy.

It was noted that, going forward, the EPA should utilize an adaptive management approach consistent with the Adaptive Management Technical Guide published by the U. S. Department of Interior. This technical guide describes adaptive management as an "iterative process of management, monitoring, and evaluation" that "actively engages stakeholders in all phases of a project over its timeframe, facilitating mutual learning and reinforcing the commitment to learning-based management." Adaptive management also involves "ongoing, real-time learning and knowledge creation" with the objective of achieving an "improved understanding and improved management over time.

Response #207: The EPA is committed to an adaptive management approach during the implementation of the remedy for the Gowanus Canal. Confirmatory investigations will be performed during the remedial design in order to collect additional data on which to base the design specifics. For example, the Proposed Plan provided a conceptual design for the active cap that included a 6-inch or one-foot adsorptive layer. Final determination on the active cap configuration will be made during the design based on the additional collected data.

From the start of the project, the EPA has consistently informed and provided multiple opportunities for meaningful input to the community and stakeholders. The EPA continues to be committed to involving and working closely with the community and stakeholders, throughout the project's design and construction phases. The EPA is committed to keeping the public informed of the progress of the remedial design and remedial action activities.

Retention Tank Community Effects

Comment #208: NYCDEP states that community effects of belowground tanks for CSO controls were not considered.

Response #208: As mentioned in previous responses, NYCDEP has already built and operates below-ground CSO storage tanks and facilities in NYC with no adverse effects to the surrounding communities.

Community Involvement

Comment #209: A commenter noted that the EPA has been actively engaged with the public at this Site. The commenter asked what future communications with the community can be expected after the ROD is signed.

Response #209: The EPA is fully committed to continue the same level of interaction with the community as in the past throughout the design and remediation process. While formal public comment is limited under the Superfund process to the Proposed Plan and selected legal settlements, the EPA intends to continue to be publicly available and to seek the community’s valued input. The EPA’s ultimate goal is a protective remedy which is informed by the input of and beneficial to all of the interested stakeholders.

Comment #210: A commenter asked whether or not Site-related documents are available to the public.

Response #210: At every Superfund site, the EPA establishes information repositories to provide the public access to supporting documentation. Copies of supporting documentation for the Site are available on-line at http://www.epa.gov/region02/superfund/npl/gowanus/ and at three information repositories: Carroll Gardens Library, 396 Clinton St., Brooklyn, NY; Joseph Miccio Community Center, 110 West 9th Street, Brooklyn, Nandi the EPA-Region II Superfund Records Center, 290 Broadway, 18th Floor, New York, NY.

Comment #211: Two commenters asked how public comment is considered in the remedy selection process.

Response #211: The EPA relies on public input to ensure that the concerns of the community are considered in selecting an effective remedy for each Superfund site. Community input is one of nine evaluation criteria the EPA uses to evaluate site remedies. The EPA does not select a remedy until after considering all of the comments that are received during the public comment period.

Comment #212: Two commenters asked whether or not there would be additional public meetings during the comment period.

Response #212: Follow up meetings were held with the CAG on February 11, 2013, the Red Hook community on February 13, 2013, the residents of public housing located immediately north of the canal on March 27, 2013, the Red Hook community on April 16, 2013, the CAG on April 23, 2013 and the residents of public housing in Red Hook on April 25, 2013 to further engage the community in conversation about the details of the proposed cleanup plan.

Comment #213: A commenter asked that the EPA provide a well-publicized proposed cleanup schedule and a tentative community/EPA meeting schedule. Another commenter requested that local residents and other stakeholders receive notification of the EPA's expected timeline for the project and of potential meeting and feedback opportunities. A third commenter stated that the CAG proposed that a local public information center be provided.

Response #213: From the start of the project, the EPA has consistently informed and provided multiple opportunities for meaningful input to the community and stakeholders. The EPA continues to be committed to involving and working closely with the community and stakeholders, throughout the project's design and construction phases. The EPA is committed to continue to keep the public informed as to what is going on and what is planned at the Site via its website and community meetings. The EPA will consider the establishment of a local public information center.

Comment #214: A commenter complained that contradictory and confusing information was disseminated by the EPA with respect to the planned construction of a waste treatment/dewatering facility in Red Hook.

Response #214: Due to the technically complex issues at the Site, the EPA greatly augmented its interaction with the community beyond what is typical for the Superfund remedy selection process. The intent of the two public meetings and the follow up meetings was to clarify the issues in a clear and concise manner. The EPA also met with the CAG, which is composed primarily of local community group representatives whose role in part is to disseminate information to their groups. The EPA also provided documentary materials on our website.

In the Proposed Plan, the EPA proposed a potential location for dewatering the dredged sediments and for stabilizing the sediments. As was noted at several of the public meetings and follow up meetings, the specific details related to the dewatering and treatment processes, such as its location, will be determined during the remedial design.

Comment #215: Several commenters expressed concern that the large Spanish-speaking population that lives in the Gowanus area is mostly uninformed and uninvolved in the cleanup process due to the language barrier. Another commenter expressed concern that many of the Spanish-speaking residents were not aware of the fact that the levels of contamination in the canal pose serious health risks. Several commenters requested that the EPA ensure that the Hispanic and Latino residents and businesses have equal opportunity and access to information about the Superfund public processes and have the opportunity to participate in the planning discussions and meetings involving the future of the neighborhood. The commenters expressed a desire for more direct outreach and engagement during the design and implementation phases.

Response #215: Flyers in Spanish announcing the January 23 and 24, 2013 public meetings were distributed and fact sheets in Spanish were provided at the meetings. In addition, simultaneous Spanish translation was provided at both public meetings.

Despite posted warnings, the canal is regularly used for fishing, particularly subsistence fishing by several separate EJ communities surrounding the canal. The fact sheets (in both Spanish and English) that were distributed at the above-noted public meetings stated “the EPA recommends that the public avoid direct contact with canal water and sediment due to risks from exposure to toxic chemicals, and the risk from exposure to elevated levels of bacteria carried in the sewage from CSOs. No one should eat any fish or crab from the canal.” The EPA has also provided dual-language risk information on its website. The EPA has also sought to have the CAG include representative members of a broad range of constituencies.

The EPA believes that the selected remedy will reduce risks to these communities by reducing sources which contribute to these risks. Because the selected remedy will not fully eliminate the need for fishing advisories due to contaminants from New York

Harbor, the EPA intends to continue to coordinate fishing advisory education and awareness efforts with the appropriate governmental agencies.

The EPA will continue to engage the entire community throughout the design and implementation phases of the project.

Comment #216: A commenter stated that Red Hook residents have not had significant involvement in the Gowanus Canal Superfund process or the CAG until very recently and therefore, has had limited opportunity to develop a trusting relationship with the EPA. The commenter also stated because of the Red Hook community's late involvement, the residents were surprised to learn that a CDF was proposed for their community.

Response #216: The EPA sought to have the CAG include representatives from a broad range of constituencies to ensure that Red Hook and other neighborhoods are engaged in the process.

The EPA also held meetings in Red Hook to increase awareness in that community. The draft FS report, which identified a CDF option, was released to the public in December 2011. The EPA held an informal Red Hook meeting on January 19, 2012 for representatives of various Red Hook community organizations. At this meeting the concept of the CDF was discussed and it was noted that two locations were under consideration–the 4th Street turning basin or in Red Hook. A public meeting to discuss the results of the FS was held on January 24, 2012. The CDF was discussed at this meeting and the two proposed locations under consideration were also noted. The EPA held an informal informational meeting for the Red Hook community on March 22, 2012 to discuss the FS and the CDF.

To ensure the Red Hook community's participation in the Proposed Plan process, one of the two initial public meetings to discuss the proposed remedy was held in Red Hook in an attempt to bolster the Red Hook community's participation. In response to questions and concerns from the Red Hook community, the EPA returned for additional public meetings in Red Hook on February 13, 2013, April 16, 2013 and April 25, 2013.

Comment #217: A commenter requested that the EPA's Gowanus Canal EJ Assessment and Community Involvement Plan (CIP) be shared with the CAG prior to the finalization of the ROD to ensure that the current and upcoming community needs are addressed and to ensure that a preliminary burden analysis is performed that takes into account the impact of the retention tank(s), as well as the possible CDF or dewatering in Red Hook or Sunset Park, and the environmental burdens that could result to these particular communities.

Response #217: The EPA provided a draft CIP to the CAG on August 27, 2013 so that the CAG could assess whether the community's concerns have been adequately characterized. The draft CIP includes the EJ Assessment. The EPA made revisions to the CIP in September 2013 based on the community input.

Comment #218: Friends of Community Board Six, Inc. commented that in considering the proposed remedial alternatives and the lack of access to professional and objective technical assistance for members of the community has become a significant constraint. The group requested a written response to its Technical Assistance Grant (TAG) application. The TAG would provide funding that would give the community access to such resources.

Response #218: The EPA conducted a number of meetings with the public and the CAG to explain various aspects of the remedy. The EPA also provided technical assistance to the community through "Technical Assistance Services for Communities" (TASC)[27] technical advisors. The technical advisors reviewed the EPA's RI/FS reports and provided the CAG with reports with a focus on issues raised by the CAG.

A letter was sent to the Friends of Community Board Six, Inc. on August 12, 2013 indicating that based on the group's ranking against the other applicants, it was not selected for the grant. The TAG was awarded to Friends and Residents of Greater Gowanus in 2012.

Post-Remediation Restoration

Comment #219: A commenter noted that the canal was originally constructed from a creek to open the area to barge traffic, flush away sewage, receive stormwater and drain the adjacent marshes for development. The commenter asked whether or not some of the areas around the canal could be restored as wetlands to capture the water as it collects to prevent flooding.

Response #219: While extensive restoration of the wetlands is not possible since the vast majority of the shoreline of the canal is lined with retaining structures or bulkheads, the EPA plans to include wetlands and to consider the use of soft shoreline edges in such situations where it may be possible and appropriate. The remedy includes the excavation and restoration of the majority of the filled-in 1st Street turning basin, a small portion of filled-in 5th Street turning basin beneath the 3rd Avenue bridge and the dredging of the 4th, 6th, 7th and 11th Street turning basins. The EPA plans to consider sloped, wetland-style restoration for the 1st and 5th Street portions. It is possible that wetlands could be created at the terminus of the 4th, 6th, 7th and 11th Street turning basins. During the design process, and in consultation with the PRPs and the public, the EPA will also consider whether other areas may be appropriate for additional wetland areas. The flat topography is the dominant factor in how flooding impacts areas

[27] TASC provides funding for technical assistance to communities affected by hazardous waste sites. The funds are used to hire non-EPA experts to explain hazardous waste issues and interpret the EPA's plans for cleaning up that waste.

around the canal. As a result, the addition of minor areas of wetlands is unlikely to add sufficient water capture to provide any noticeable improvement.

It should be noted that NYCDEP is undertaking a green infrastructure effort[28] that will result in an estimated 10 percent CSO reduction in stormwater discharges to the entire canal over an extended period of time (20-30 years). In addition, a pilot project for the Gowanus "Sponge Park," supported by federal and NYC grants, is currently under way for the control of street runoff along the Gowanus Canal using green street ends.[29]

Comment #220: A commenter asked whether the installation of a barrier wall alone at the former Fulton MGP State Superfund site will be sufficient to address the contamination problem.

Response #220: A remedy has not yet been selected for the former Fulton MGP State Superfund site. In order to comply with the EPA's projected schedule for the coordinated cleanup of the upland areas and the canal, National Grid, after consultation with NYSDEC, agreed to accelerate the installation of a barrier wall at the facility as an interim remedial measure (IRM). This IRM is likely to be one of several components of the remedy that will ultimately be selected for the facility. While a barrier wall will reduce the migration of contamination from the facility to the canal, it will not remove the sources of contamination at the facility.

Sediment and Contaminant Mass Balance

Comment #221: NYCDEP asserts that a sediment and contaminant mass balance is needed.

Response #221: Development of a quantitative sediment and contaminant mass balance for the canal is not feasible or beneficial at this point. The canal is subject to constantly changing inputs, which makes it difficult to precisely quantify sediment and contaminant mass balances. Changes include the frequency, size and nature of storm events; the ongoing development in the watershed and the variable Flushing Tunnel operations. Furthermore, broader changes in sediment and contaminant transport conditions in the canal may occur after implementation of the WWFP. In particular, rehabilitating the Flushing Tunnel will increase its average capacity by 40 percent, and reconstructing the Gowanus pump station and replacing the force main will reduce the annual volume of CSO discharges to the canal by 34 percent in a typical precipitation year, while the CSO solids load at the head of the canal (outfall RH-034) will increase by approximately five percent and still contribute 97 percent of the CSO solids load to the upper reach of the canal. These improvements are scheduled to be completed in

[28] A network of open spaces and natural areas, such as rooftop gardens and vegetated swales, which naturally manage stormwater, thereby reducing storm runoff into the storm sewers.

[29] Green street ends employ vegetation planted between the end of the street and the canal to prevent particulate matter and oils from discharging into the canal.

2014. While the net effect of these changes can be best quantified after the improvements are completed, other planned and anticipated storm sewer separation and redevelopment projects thereafter will continue to alter the CSO loadings, creating a steadily moving and variable baseline condition.

The EPA's review of the existing record regarding the canal resulted in a conclusion consistent with NYCDEP's prior findings, that extensive data and studies had been performed:

> *"*The City has been studying the CSO problems in Gowanus Canal for decades." (NYCDEP, 2008, Appendix H, page 12).
>
> "As part of the Gowanus Canal and Bay Ecological Restoration Project and other environmental studies, extensive environmental sampling has been conducted in the Canal to evaluate the quality of sediments." NYCDEP, 2009, page 7.

As noted elsewhere, the EPA has reviewed modeling reports developed by the USACE, NYCDEP and National Grid relating to the various aspects of transport to and within the canal. NYCDEP has, to date, declined to provide its model to the EPA. The EPA believes that more than adequate information has been collected, to date, upon which to base a remedial decision and to move in a timely manner to address the potential human health and ecological risks. As NYCDEP noted with respect to its 2009 proposal for a Superfund alternative cleanup plan:

> The entire lifecycle of the project through remedial construction completion would take just over nine years, significantly shorter than the average New York State Superfund listing**.** The City believes that the critical advantage of the shorter cleanup provided by the Alternative Cleanup Plan will be sooner elimination of potential human health and environmental exposures. NYCDEP, 2009, page 31.

For purposes of its Proposed Plan comments, NYCDEP has performed a simplified chemical mass balance calculation that attempts to reflect the observed surface sediment contaminant levels in the upper reach of the canal by mathematically "mixing" various ratios of contaminant concentrations in CSO solids and suspended sediments from Upper New York Harbor. NYCDEP argues that the lack of agreement between observed and modeled surface sediment concentrations indicates that "there is no correlation between sediment inputs and contaminant burden in the canal." As noted previously, the EPA does not agree that the lack of a good fit between a simplified calculation and observed surface sediment concentrations in the upper canal indicates that CSOs do not have a substantial influence on sediment quality, or that there is no correlation between sediment inputs and the contaminant load in the canal. The more likely explanation for the lack of agreement is that this calculation is not adequate for predicting the contaminant distribution patterns in this type of setting. The chemical mass balance calculation relies on several key assumptions that are not likely to be valid for the Gowanus canal setting, including the assumptions that (1) the average concentration of each contaminant on CSO and harbor solids does not change over time; (2) the average concentration of each contaminant measured in CSO and surface

water samples accurately represents a long-term average; (3) the relative contributions of CSO solids and harbor solids to the upper reach of the canal do not change over time, and (4) no post-depositional chemical, physical or biological weathering or degradation take place after the solids are deposited. The continuously changing conditions in the Gowanus Canal watershed and the variability in the CSO and Flushing Tunnel discharges create complex conditions that are not easily modeled, particularly by the simplified chemical mass balance calculation used by NYCDEP.

Relative Magnitude of Polycyclic Aromatic Hydrocarbon Sources

Comment #222: NYCDEP and National Grid noted that there are uncertainties in determining the relative magnitude of PAH sources and identifying specific sources of the PAHs found in surface sediments.

Response #222: The EPA has identified a number of sources of PAHs to the canal, including the former MGP facilities, CSOs, unpermitted outfalls, contaminated groundwater discharge from upland sites other than the former MGP facilities and stormwater runoff. These sources need to be controlled as part of the remedy.

In August 2012, National Grid collected sediment cores to a depth of four feet in the upper reach of the canal north of Union Street, as well as from the areas adjacent to CSO outfalls RH-035 and OH-007 in the middle reach of the canal and RH-031 in the lower reach. Sediment samples from the cores were analyzed for a variety of chemical constituents. The sample results, which were reviewed by the EPA and include an analysis of the nature of the PAH mixtures in the samples, indicate that the PAHs in the shallow sediments (top two feet) in the upper reach of the canal, which is the layer most heavily impacted by CSO solids relative to other sources of contamination, originate from a mix of petrogenic (petroleum related) and pyrogenic (combustion-related) sources. A mix of PAHs from petrogenic and pyrogenic sources is also seen in the cores collected near the CSO outfalls in the middle and lower reaches of the canal, with considerable variation between individual samples and cores. These results indicate that the shallower (top two to four feet) sediments near the CSO outfalls are not dominated by tar-related (pyrogenic) contamination from the former MGP facilities, but rather contain a mix of PAH types from various sources. Given the complexity of and variation in PAH mixtures in different parts of the canal and the complexity of the Site setting, it would be nearly impossible to quantify the contribution of PAHs from each source. Although the information on the mix of PAHs in the sediment is useful for identifying sources that need to be controlled in order to ensure the sustainability of the remedy, these contributions do not need to be quantified in order to select a remedy for the canal sediments. The selected remedy includes measures to address each of the sources.

As discussed in an earlier response, the mass of PAHs transported into the canal by groundwater discharge is considered to be low compared to other sources. Nevertheless, upland sites with the potential for discharging contaminated groundwater to the canal have been referred to and will be investigated by NYSDEC as part of the source control strategy. Furthermore, unpermitted pipes will be either sealed or permitted as part of the remedy and, therefore, their contributions need not be

quantified. Finally, direct runoff is considered to be a less significant contaminant transport pathway for PAHs and other contaminants to the canal compared to CSOs and the former MGP facilities (only six percent of the watershed is unsewered and the land surrounding the canal is relatively level.)

Bathymetric Change Analysis

Comment #223: NYCDEP noted that there is uncertainty in the analysis of bathymetric changes in the upper canal from 2003 to 2010

Response #223: The EPA's 2010 bathymetric survey and analysis presented in the RI report indicates that the shallow sediments (top one to three feet) in the upper reach of the canal (north of 3rd Street) were recently deposited (*i.e.,* after the 2003 bathymetric survey). The details regarding the methodology used to compare the two surveys and the limitations of the comparisons are provided in Appendix B of the RI report. The combined error of the 2003 and 2010 surveys used in the analysis was determined to be as high as ±0.6 feet, with greater uncertainty in shoreline areas and less uncertainty along the centerline or deepest part of the channel. The elevation changes between Sackett and 3rd Streets in the upper canal were on the order of one foot to greater than three feet, which are higher than the uncertainty of the surveys (elevation changes within ±0.6 feet were not quantified). Although the level of certainty varies by location in the canal, the objective of the bathymetric change analysis was to broadly characterize elevation changes within each reach of the canal rather than determine changes on a small-scale (*i.e.,* location-specific) basis.

Vessel Activity as Sediment Transport Mechanism

Comment #224: NYCDEP questioned whether vessel activity in the middle reach of the canal was sufficient to explain the lack of sediment accumulation.

Response #224: The RI/FS attributed the lack of sediment accumulation in the middle reach of the canal between 2003 and 2010 to sediment re-suspension and redistribution by propeller wash from vessel activity. The Vessel Impacts Study completed by National Grid in December 2012 concluded that sediments were regularly mobilized into the water column by vessel activity in the middle reach of the canal due to changes in flow patterns and velocities around tugs and barges, propeller wash and vessel groundings. The number of vessel trips into the canal from 2008 to 2012 was estimated at 376 to 532 trips per year, and evidence of vessel disturbance on the sediment bed can be seen in the high resolution multibeam bathymetric surveys performed by National Grid in 2010 and 2011. This detailed information confirmed and expanded the interpretation provided in the RI/FS and will be incorporated into the refined CSM for the canal.

Nonaqueous Phase Liquid Migration Estimates

Comment #225: NYCDEP and the PRP Group assert that NAPL loading estimates should be developed.

Response #225: NAPL mass transport rates are difficult to obtain in this particular setting and will vary substantially throughout the canal. NAPL beneath the canal bottom exists as a separate phase from the groundwater and flows as a separate phase along preferential pathways. Certain conservative design assumptions will have to be made for different areas within the canal based on specific data collected within a particular area. These design assumptions will be refined as the CSM evolves through additional data during the remedial design. NAPL source removal and containment walls have been selected for the Public Place former MGP facility. These measures should eliminate lateral NAPL flow and may also reduce flow from beneath the canal by decreasing NAPL pressure. The EPA anticipates that similar control measures will be applied to the Fulton and Metropolitan former MGP State Superfund sites. Because it is not technically feasible to excavate NAPL beneath the canal, a cap is the necessary and appropriate remedial approach for the canal bottom. The NAPL transport rate from beneath the canal is, therefore, only relevant to the design of the cap, not to selection of the cap as a remedial component.

Watershed-Based Conceptual Site Model

Comment #226: The Gowanus Conservancy noted that a complete and accurate understanding of the dynamics of the entire Gowanus Canal watershed is needed in order to achieve a successful and sustainable remedy.

Response #226: The EPA's CSM, which will be refined during remedial design and remedy implementation, considers the broader watershed perspective. Over 90 percent of the watershed is sewered and the CSO and stormwater conveyance systems are integral to remedial planning. The operations of the Flushing Tunnel, which connects the canal to Upper New York Bay, are also an important component of the CSM and remedial planning efforts. The new "background" sediment and water quality conditions that will be established in the canal after the remedy implementation are directly related to the regional watershed and harbor conditions. A good understanding of these conditions is fundamental in achieving the RAOs.

As noted previously, the approach utilized in the selected remedy reduces the parameters which will need to be refined for the CSM. Full removal of the accumulated sediment eliminates this as a post-construction source of sediment transport. CSO solids control measures, combined with the work currently being implemented by the NYCDEP will significantly reduce CSO solids inputs. While suspended harbor sediments will remain at or near their current level, to the extent that such cleaner sediments continue to contribute to the capped canal bottom after construction, they will do so at a relatively higher proportion than at present.

Basis for Preliminary Remedial Goal Development–Ecological Toxicity Testing

Comment #227: NYCDEP commented on the usability of the whole-sediment toxicity test data collected by the EPA for deriving valid PRGs. The concerns focused on two test series that did not meet performance standards and, therefore, required re-testing.

In addition, the need for re-testing raised concerns about extended holding times of test sediment.

Response #227: The EPA believes that the test series presented in the BERA and used to derive PRGs is valid and that the data can be used for determining sediment toxicity in the canal for the following reasons:

- Toxicity test series are independent events and the performance of one failed series does not reflect on the quality of a subsequent successful test series.
- The amphipods used in the tests are not cultured in the laboratory, but rather field collected. Although two tests did not meet performance standards, the third test was successful. It should be noted that this third test used organisms collected from a different location than the unsuccessful tests.
- Prior to running the successful test series, a reference toxicant test was performed using the species from the new collection site to assure their overall health. The reference toxicant test was performed in accordance with the long-term average for the laboratory, indicating the species were suitable for use in the tests.
- For the test series, the negative controls met performance standards.

While the extended holding time for the sediment required by the re-testing adds some uncertainty to the tests results, the extended holding time did not invalidate the test results for the following reasons:

- Sediments samples used for the tests were stored at $4^{o}C$ in anoxic conditions per EPA (2001a, b) and ASTM (2010a, b) guidance.
- Sufficient sediment was available from the original collection event to be used in all re-tests.
- Guidance (EPA 2001a, b and ASTM 2010a, b) generally recommends that sediment tests be initiated as soon as practical and before eight weeks post collection. However, guidance (EPA 2001a, b and ASTM 2010a, b) also indicates that if the toxicants are not labile (for example, ammonia or volatile organic compounds are labile) and their chemistry is expected to be stable (as for example, for PAHs and PCBs), then extended the holding times beyond eight weeks may not be of concern. It has been shown that some contaminated sediments can be stored at 4°C for up to 12 months without significant alterations in toxicity (Tatem, 1988). Furthermore, PAH toxicity in freshwater sediment has been shown to be stable over several years (Mount 2011, personal communication).

The EPA has reviewed additional sediment toxicity test data that was provided by NYCDEP and considers the data, along with the EPA's data, to be valid and interpretable. Furthermore, the two data sets are comparable in their uncertainties. Therefore, the EPA considers that the data collected for the RI/FS to be representative of Site conditions and appropriate for use in developing PRGs.

Preliminary Remediation Goal Development Methodology

Comment #228: NYCDEP expressed concern regarding the definition of a reference envelope relative to the derivation of the PRG for total PAHs from the EPA sediment toxicity test data set.

Response #228: Sediment toxicity investigations historically have used a variety of approaches to classify a sample as toxic (causing adverse effect) or non-toxic (associated with no adverse effects). One approach is to compare site samples to a reference sample. This approach helps to evaluate whether or not toxic responses in the site samples are due to site-specific or ambient regional conditions. For the canal BERA and PRG development, the EPA chose to use comparison of canal stations to a series of reference stations from Upper New York Bay and Gowanus Bay. Matching reference stations to site stations for comparison can be problematic. Therefore, the EPA chose to use a "reference envelope" approach to differentiate between site- and non-site-related toxic responses. A reference envelope represents the variance in reference endpoint response, which can be established in a number of ways depending on the number of reference samples and endpoints (*e.g.,* maximum or 5^{th} percentile of responses). For the canal BERA and PRG development, the "reference envelope" was operationally defined as the lowest result for the reference samples tested. For example, the reference envelope based on survival is the lowest survival measured in the reference samples. The approach was chosen based on the number of reference stations.

There are certainly other approaches to define a reference envelope, such as the method described in Ingersoll and others (2009). However, the EPA believes that the operational definition for a "reference envelope" used to develop the PRG for total PAHs is appropriate and not overly conservative.

Comment #229: NYCDEP expressed concern regarding the definition of the no-observable-adverse-effects-concentration (NOAEC) and lowest-observable-adverse-effects-concentration (LOAEC) used in the PRG development.

Response #229: Some analyses define the LOAEC as the lowest exposure concentration where the response is statistically different from the control response. For the purpose of PRG development at the canal, the EPA defined the LOAEC and NOAEC based on the reference envelope discussed above. Two thresholds were used to derive PRGs from the sediment toxicity tests for the protection of benthic organisms. The first threshold was the lowest response measured in the reference stations or the reference envelope. A second threshold was set as a response of 20% reduction relative to control. The lower of these two was considered the LOAEC. The PRG for each endpoint was determined first by identifying the lowest concentration that was outside the lower of the two thresholds and then selecting the chemical concentration immediately below that as the NOAEC. The selection of a NOEC and LOAEC presented in the FS report and FS report addendum was correctly done using these operational definitions of a NOAEC and LOAEC.

Although there are other approaches for defining NOAECs/LOAECs and for deriving PRGs, the approach used in the FS report and FS report addendum to develop the PRG for total PAHs is appropriate and not overly conservative.

Comment #230: NYCDEP commented on the use of statistical versus graphic estimation methods to derive a PRG for total PAHs.

Response #230: In developing the PRG for total PAHs presented in the FS report and FS report addendum, the EPA considered two approaches as potential methods to define PRGs. One was based on graphical estimation, using the "reference envelope" approach described above and one based on a statistical estimation technique. Toxicity Response Analysis Program (TRAP) software, version 1.2[30] was used to attempt to fit a model to the data so that effects concentrations could be determined. In the end, the graphical method was chosen over the statistical estimation due to the large confidence intervals estimated by TRAP.

There are other methods to model and estimate toxic responses, the strength of each method depends on a number of factors including the size of the data set, variability of replicate response within a test, and the measured dose response relationship for a given contaminant. The EPA chose to use a graphical approach because, given the particular data set in Gowanus Canal, the graphical approach provides a method for deriving a PRG for total PAHs that is appropriately protective and not overly conservative. Because of the sample size and the variability of the Site-specific dose-response relationships, there is uncertainty in the specific NOAECs and LOAECs identified using the approach. The EPA chose to address that uncertainty by identifying a range of NOAECs and LOAECs from the test series that bounded the operational definitions, and then calculating a measure of their central tendency (*i.e.,* the geometric mean). In addition, TOC content was accounted for in the calculations given its variability in the samples. TOC is a key parameter that influences PAH bioavailability. Therefore, the calculations were performed on an organic carbon (OC) normalized basis to address this variation. The geometric means of the potential OC-normalized NOAECs and LOAECs were calculated and then converted to a dry weight basis assuming the mean canal-wide surface sediment TOC concentration of 6 percent.

As discussed previously, the additional data provided by NYCDEP was reviewed and considered. NYCDEP presented alternative PRGs based on its data set using a statistical approach, as well as different expressions of the growth and reproduction endpoints (while the EPA expressed reproduction as number of offspring per surviving female, NYCDEP expressed it as number of offspring per surviving adult.) When using the graphical methods employed by the EPA to develop a PRG and the same expressions of growth and reproduction, NYCDEP data yield PRGs similar to those developed from the EPA's data set.

Preliminary Remediation Goals for Metals

Comment #231: NYCDEP questioned the need for development of PRGs for lead and copper given the current geochemical conditions of the canal sediment.

[30] http://www.epa.gov/med/Prods_Pubs/trap.htm.

Response #231: In the Proposed Plan, the EPA identified metals, in particular copper and lead, as potentially contributing to unacceptable ecological risks to benthic organisms. However, the EPA acknowledged that geochemical analyses (*i.e.*, acid-volatile sulfide/simultaneously extracted metals) indicated that these metals currently are not bioavailable. Following implementation of source control measures and the sediment remedy, sediment conditions are expected to change so that in the future, geochemical conditions in the canal may not favor the formation of insoluble sulfides that make these metals not bioavailable. Therefore, in order to assure the long-term effectiveness of the sediment remedy, PRGs for copper and lead are necessary to verify that the RAO for the protection of benthic organisms is achieved and sustained. If PRGs are exceeded, then toxicity testing will be performed to assess the potential risks to the benthic community. Given the uncertainty in the contribution of metals to the degraded sediment quality in the canal, selecting reference conditions as the PRGs for copper and lead as outlined in the FS report and FS report addendum is appropriate and not overly conservative.

Post-Remedy Sediment Transport and Deposition

Comment #232: National Grid identified a number of specific aspects of sediment transport and deposition that will be affected by the sediment remedy, including the effects of the post-remedy bathymetric profile on Flushing Tunnel effectiveness and sedimentation behavior, the possibility that enhanced sedimentation of organic-rich solids will lead to low dissolved oxygen conditions, effects of navigation on ecological recovery, effects of Flushing Tunnel flows on benthic habitat and effects of higher flow velocities from implementation of some remedy components on sediment stability. National Grid also noted:

- Canal hydrodynamics in conjunction with external factors like the Flushing Tunnel, sediment disruption by vessels and barges and CSO flows present significant problems for the proposed remedy.
- Hydrodynamic and sediment transport modeling indicates that solids discharged in CSOs after the remedy is implemented will settle out and re-contaminate the surface sediments in the canal, even with the Flushing Tunnel operational. Sand deposition near the outfalls will continue (depending on their location) and fine sediments will be redistributed and settle in deeper areas of the canal.
- The uncertainties related to the effects of the CSO reductions and Flushing Tunnel improvements currently being implemented under the WWFP on sediment transport and deposition throughout the canal must be clarified and addressed prior to remedy selection because these effects have an impact on the recontamination potential.

Response #232: Baird and Associates, on behalf of National Grid, developed hydrodynamic and sediment transport models to evaluate the transport and fate of sediments under post-remedy conditions, including particle tracking to determine the likely pathways of sediments over longer time periods. The preliminary modeling analyses are useful and informative and the EPA agrees that modeling to better understand sediment transport and deposition under post-remedy conditions is a key

component of the remedial design. However, it is not necessary to delay the remedy decision so that hydrodynamic and sediment transport models can be further developed and refined. As indicated in the EPA's 2005 Contaminated Sediment Remediation Guidance, "[m]anagement decisions must be made, even when information is imperfect. There are uncertainties associated with every decision that need to be weighed, evaluated, and communicated to affected parties. Imperfect knowledge must not become an excuse for not making a decision" (EPA, 2005).

The hydrodynamic and sediment transport modeling documented by National Grid illustrates some of the difficulties associated with developing a model for the canal that represents current and predicted future conditions. For one, since no information was made available by NYCDEP on flow and solids inputs from the CSOs, the CSOs have not been incorporated into the model. Also, the flow measurements used to calibrate the model were taken while the Flushing Tunnel was inactive. Flow in the canal was driven primarily by tidal pumping which results in relatively low flow velocities with portions of the canal being effectively stagnant. Therefore, the model could not be calibrated or validated for the higher flows that are expected after the Flushing Tunnel is reactivated. Nevertheless, the preliminary modeling results are a necessary first step in preparing for remedial design which must consider the combined effects of CSO solids loads, canal depth, Flushing Tunnel flow, dissolved oxygen concentrations, benthic habitat, and commercial navigation.

Alternatives to Soft Sediment Removal

Comment #233: NYCDEP, National Grid and the Sediment Management Workgroup asserts that other viable remedial alternatives for the soft sediment were arbitrarily eliminated because they were not subjected to detailed evaluation.

Response #233: Alternatives that included partial sediment removal were included in the FS report. These alternatives were screened using the NCP criteria of effectiveness, implementability and cost. EPA guidance indicates that screening of alternatives is appropriate to "aid in streamlining the feasibility study process while ensuring the most promising alternatives are being considered." The three screening criteria parallel the nine criteria for detailed alternative evaluation. Therefore, the screening of these alternatives was consistent with the NCP and EPA guidance. The EPA considered that partial sediment removal would not be adequately effective or implementable based on factors which include soft sediment instability, potential cap failure, the degree of dredging needed for project implementation and future navigation and the preference for treatment of principal threat waste.

Depth of Sheet Piles in Conceptual Design

Comment #234: NYCDEP asserts that that the depth of the sheet piles in the FS Report is not sufficient, referencing a "rule of thumb" for embedment that typically applies to cantilevered sheet piling (*i.e.,* no lateral support from tieback anchorages).

Response #234: The vast majority of the bulkheads along the canal consist of historic timber crib-style structures. These bulkheads are roughly 10 feet wide (from canal edge back) at the surface, wider below grade, and filled with boulders and rubble. Due to the nature of their construction, the original bulkheads cannot be removed when upgrades are necessary. Collapses would occur, including where structures rest near or within the width of the bulkheads. As a result, although newer appearing steel or timber bulkheads are visible along the canal, these new sections are typically built seaward of the older structures. During previous studies performed in collaboration with NYCDEP, the USACE determined that the historic bulkheads were eligible for listing on the National Register of Historic Sites. The bulkheads will, therefore, remain in place for historic and structural purposes. Accordingly, when bulkhead replacement is discussed in the context of the canal remedy, this term refers to upgrades which will provide additional support to the older bulkheads which will remain in place.

In limited circumstances at the canal, a completely new bulkhead wall may need to be installed that will need to resist lateral forces from ground surface to dredge line (a situation where the "rule of thumb" may apply). For timber crib walls which make up the majority of the bulkheads, the lower submerged timber cribbing is still intact and able to resist lateral forces, and just the upper portion (*i.e.,* above low tide) has degraded. In this case, a shallower embedment depth for the steel sheet piling could be justified.

The FS assumed that sheet piling will include tieback anchors. During the design phase, each section of replaced bulkhead will be designed to the specific conditions of the location where the bulkhead is being replaced. The depth of embedment will be determined for each section of bulkhead to be replaced and will be based on multiple considerations specific for that section: soil strength, ability to develop tiebacks, seepage beneath the wall, and any physical constraints.

In-Situ Stabilization Layer for Additional Strength for Bulkhead Support

Comment #235: NYCDEP asserts that the purpose of the proposed ISS layer is to strengthen the native sediment under the cap, which suggests that the native sediment is not competent; otherwise no ISS layer would be needed.

Response #235: The mixing of the proposed ISS layer is not intended to provide strength for the native sediment (although that is certainly a secondary benefit), but rather to impede the upward flux of NAPL in select portions of the canal.

Active Cap for Additional Strength for Bulkhead Support

Comment #236: NYCDEP asserts that the conceptual design assumes that the 3-foot capping layer will provide additional support to the wall. While this may be true in the long term, the critical time for wall stability will be during excavation of the sediment when the cap will not be in place.

Response #236: The EPA agrees that the critical time for ensuring wall stability is immediately following the removal of the sediment. The EPA anticipates that improvements to or replacement of many sections of bulkheads along the canal will occur prior to remedy implementation through the EPA's efforts to coordinate and expedite bulkhead replacement regardless of the extent to which such bulkhead replacement is required for the implementation of the remedy.

Design analysis will consider all stages and sequencing of construction, sediment removal, and cap placement. If necessary, temporary support measures can be implemented to prevent bulkhead movement during sediment removal and cap placement.

Pipelines, Utility Crossings and Bridges

Comment #237: NYCDEP asserts that the conceptual design does not consider the number of pipelines, utility crossings, and bridges in the canal that will impact the ability to construct a bulkhead in the manner proposed.

Response #237: Crossings of pipelines and other utilities will need to be identified and specifically addressed during the design and installation of bulkhead repair, augmentation or replacement. Bulkheads crossing utility lines will require design on a case-by-case basis. Soldier pile/waler systems are often used to span a gap in a bulkhead made for a utility. The solder piles can typically be spaced far enough apart to avoid conflicts with buried utilities. Following dredging and cap construction, backfill can be placed against the bulkhead. Relocation of individual utilities can also be considered on a case-by-case basis, but such relocations are costly and should be kept to a minimum.

Bridges are anticipated to be less of an issue because abutments for active bridges have been designed and maintained so that they are not relying on the limited support provided by soft sediment in the canal. If bulkheads adjacent to bridge abutments require repair or replacement, the transition between the two can be developed during the design. If dredging below bridges shows the potential to undermine abutments, special designs may be needed.

Bulkhead Stabilization Tiebacks

Comment #238: NYCDEP asserts that the conceptual design includes tiebacks to help stabilize the wall. There are a number of locations along the canal where structures are located such that tiebacks cannot be installed. It is not clear that tiebacks can be installed at a suitable depth to stabilize the wall without major excavation on adjacent properties.

Response #238: Evaluation of individual sections of bulkheads requiring repair, augmentation or replacement, and the means of providing the upgrade will be performed as part of the remedial design. Placement of anchored tiebacks can be

hampered by issues such as locations of buildings, utilities, and unsuitable soils. Sections of sheet piling can be designed for cantilever support, temporary internal support, or other methods, as specific Site conditions necessitate. Also, grouted tieback installation are typically drilled at an angle between 20 and 30 degrees (or as steep as 45 degrees) from the horizontal, which can put them deeper in the soil than most surface utilities, and the drill holes can be performed with relatively small equipment, from a barge, thus precluding the need for large excavations adjacent to the canal.

Land- or Water-Based Construction

Comment #239: NYCDEP asserts that no information is provided as to whether installation would be land-based or water based. If land-based, there are a number of locations where existing structures will impact access in portions of the Site. The FS repeatedly states that the reason to dredge portions of the canal would be to allow access to the upper reaches – what assurances are there that the bulkheads can be installed without first removing the sediment, undermining the integrity of the existing bulkheads. For land-based construction, it is not clear that the existing bulkheads and the material behind the bulkheads are strong enough to support the equipment loads necessary to construct a sheet pile wall.

Response #239: Equipment to be used for bulkhead repair, augmentation, or replacement will likely be a combination of land-and marine-based equipment. Where it is not feasible to deploy land-based equipment, floating equipment will be considered. If floating equipment requires removal of four or five feet of sediment in order to float the equipment , the existing bulkhead will be evaluated for stability following dredging. If necessary, the bulkheads will be replaced incrementally, and the canal will be dredged in short segments to allow for bulkhead replacement.

Sheet Piling Installation Vibrations

Comment #240: NYCDEP asserts that the vibrations from sheet pile wall installation can destabilize or damage surrounding structures if constructed on soft materials.

Response #240: Potential damage from vibrations during sheet piling installation will be assessed during the design phase and appropriate measures will be implemented during construction. Design tasks could include:

- Noise and vibration background studies
- Surveys of nearby structures
- Vibration and noise limits specifications for different locations along the canal
- Vibration and noise monitoring specifications during construction
- Evaluation of the use of alternative hammers (such as a variable moment hammer or impact hammer) during construction

Bulkhead Historic Studies

Comment #241: NYCDEP noted that the Proposed Plan refers to a historical and archaeological study. One of the recommendations of the study was removal or stabilization of the timber cribwork bulkheads with documentation of sample bulkheads and potentially mitigation of the adverse effects of remediation. NYCDEP also notes that the Proposed Plan also states: "Where new bulkhead construction is required, bulkhead configurations that are in keeping with the historic character of the setting should be considered." NYCDEP opines that sheet pile bulkheads are hardly in keeping with the historic character of the setting.

Response #241: Evaluation of the need for bulkhead replacement will be a property-specific activity to be conducted during the design phase and will integrate considerations from the performed historic survey.

Steel sheet piles were selected as the representative technology for bulkhead replacement in the FS report as it would be the most economical approach. Sheet pile bulkheads have been utilized previously at various locations along the canal.

For containment walls such as that selected as part of the Public Place former MGP facility remedy and the interim remedial measure for the former Fulton MGP State Superfund Site, both of which will be constructed by National Grid, a sealed bulkhead would be inconsistent with drilling numerous holes into the bulkhead to affix a facing. Similarly, at properties where active barging is conducted, the timber facing may be damaged by vessels.

Some modifications to a typical sheet pile installation could be made, where appropriate, such as use of timber facing consistent with the existing crib wall pattern on new sheet piling. Cost and implementation issues may, however, limit the use of such facing. In addition, based on the EPA's most recent discussions with the State Historic Preservation Office regarding bulkheads, the use of imitation materials is generally not favored. The appropriate combination of approaches will be considered for individual parcels during the design phase.

Catastrophic Effects of Bulkhead Failure

Comment #242: NYCDEP stated that the implications of failure of a significant portion of the bulkheads along the canal due to dredging operations can be catastrophic but are given little consideration in the FS. No evaluation was done assessing the potential impact of reducing the depth of dredging on the need to replace the bulkheads.

Response #242: The FS assumes that improvement or replacement of bulkheads is necessary to prevent failure as a result of dredging operations. Alternatives to steel sheet piling, or augmentation with other technologies to provide containment of any existing contamination behind the bulkhead, will be considered on a property-specific basis as part of the design.

The selection of a remedy for sediments within the canal is not dependent upon performing a detailed investigation and analysis of the bulkhead along each property along the canal. This detailed analysis is typically part of the remedial design.

Potential Releases from Behind Bulkheads

Comment #243: The PRP Group noted that the Proposed Plan does not explain how the sediment remedy will deal with new releases of contaminants from behind the bulkheads that may occur if the sediment remedy is implemented before bulkhead replacement or repair. The PRP Group also noted that the Proposed Plan does not indicate whether bulkheads are being considered in some areas as an engineered source control structure.

Response #243: The groundwater model quantified the discharge of groundwater to the canal. In areas of low groundwater discharge, impermeable barriers may be effective without significant groundwater mounding. If needed, treatment gates could be incorporated into the bulkhead wall design to funnel groundwater through the treatment gate, allowing for discharge of treated groundwater to the canal. In low impact areas, permeable treatment barriers could potentially be used to address groundwater impacts before discharge to the canal. The former MGP facilities constitute the major groundwater impacts to the canal from upland sites. It is anticipated that the barriers at the primary sources (*i.e.,* the former MGP facilities) will be in place before the remediation of the canal commences from the top of the canal to the bottom. The remaining upland sites with much lesser groundwater impacts to the canal have been referred to NYSDEC and the groundwater contamination will be addressed in their remedy selection. In the interim, measures will be taken to mitigate groundwater impacts to the canal.

In some areas, mobile NAPL appears to be present in the cribbing of the existing bulkheads and in soils immediately behind the cribbing. In cases where such contamination is severe and where it is located at elevations which could allow it to flow back into the canal, it may be necessary to design bulkheads to function as engineered source control structures. This will be evaluated as the design process proceeds.

Responsibility for Bulkhead Repair

Comment #244: NYCDEP asserts that the implications of failure of a significant portion of the bulkheads along the canal due to dredging operations can be catastrophic but are given little consideration in the FS report. No evaluation was done assessing the potential impact of reducing the depth of dredging on the need to replace the bulkheads.

Response #244: The responsibility for the bulkhead-related work will vary, depending on the nature of the work required. In the absence of the dredging remedy, property owners are legally required to maintain their bulkheads in a structurally-adequate manner and which does not result in soil or materials falling into the canal.

National Grid will be responsible for constructing any containment walls as part of the former MGP facility cleanups; the depths of these designs should permit dredging to

occur. The EPA has conducted preliminary negotiations with developers and property owners who wish to upgrade their bulkheads at their own expense and are willing to construct deeper bulkheads which will not require temporary shoring. As noted previously, the EPA intends to facilitate and standardize such work to the extent practicable in order to make it as cost-effective as possible. Between former MGP facility-related and owner-related work, the EPA anticipates that a significant portion (25-40%) of the bulkheads may be upgraded at a cost which is outside of the selected remedy amount.

In early August 2013, a partial bulkhead collapse occurred at the Benson Metals facility on Smith Street. On August 16, 2013, the EPA issued an administrative consent order for Benson Metals to conduct a CERCLA removal action which will include, among other things, removal of the debris in the canal and construction of a upgraded bulkhead which will not require temporary shoring. The EPA is coordinating with the other involved agencies regarding this order, which may serve as a template for similar additional bulkhead work.

On August 22, 2013, a partial bulkhead collapse also occurred at a facility adjoining Benson Metals, the Greco Bros. Ready Mix Concrete Co., Inc. The EPA has requested that the owner submit reports regarding the stability of the bulkhead, and may enter into an additional administrative order for bulkhead repairs, if necessary. The EPA recognizes the potential extent of the issue, which presents a problem regardless of the depth of dredging in the selected remedy.

For the remaining parcels, the EPA anticipates that temporary shoring will typically be required. The purpose of the temporary shoring is to support the existing bulkheads; the bulkheads will not normally be repaired. The PRPs will generally be responsible for these remedy-related costs. It is possible that project-related work may cause damages which require repairs for which the PRPs will also be responsible. The EPA intends to work with the property owners in cases where substandard bulkheads remain, and, if necessary, with NYC and other agencies, to enforce the bulkhead standards. If the continued presence of such substandard bulkheads is judged to present a threat to the integrity of the canal remedy, available CERCLA authorities and/or resources would be used as necessary to ensure their repair.

Cost Burden for Bulkhead Upgrade/Stabilization

Comment #245: Community Board Six noted that the capital costs should include the cost of bulkhead upgrade/stabilization, which is expensive. The PRPs should bear those costs, and non-PRP property owners should not have to shoulder the cost of bulkhead work that is necessary because of the remedies selected.

Response #245: As noted above, the responsibility for the bulkhead-related work will vary, depending on the nature of the work required. In the absence of the dredging remedy, property owners are legally required to maintain their bulkheads in a structurally-adequate manner and which does not result in soil or materials falling into the canal.

If a non-PRP property owner's bulkhead is in adequate condition, that property owner is not expected to bear the cost of temporary shoring which is necessary for the dredging or of any repairs for damage that may occur.

If any property owners wish to upgrade their bulkheads, the EPA will seek to coordinate and facilitate that work, as described above, in order to minimize the owner's costs and streamline the process.

Plan for Minimizing Bulkhead Upgrade/Stabilization Disruptions

Comment #246: Community Board Six noted that the bulkhead upgrade and stabilization work has the potential to be extremely disruptive to existing property owners and businesses. Community Board Six asked about a plan for minimizing interruptions to existing businesses and compensating for temporary relocations if needed, business losses, and other undue negative economic impacts.

Response #246: The bulkhead condition and the associated upgrade and stabilization work that will be required will need to be assessed on a property-by-property basis. The degree of disruption will also vary accordingly. A limited number of businesses utilize commercial navigation. These businesses will require the most coordination. The EPA anticipates that the majority of the temporary shoring and bulkhead work will be performed from the canal; however, tie-backs and other work, including structural assessments, will occur on the property. As the dredging progresses down the canal, remedial work is not expected to occur in any location for an extended period of time. As a result, most businesses should not experience significant operational disruptions. Business interruption compensation may be available in appropriate circumstances. The EPA will work with the PRPs and the property owners to limit disruptions to the extent possible.

Use of Soft Edges in Bulkhead Design

Comment #247: Community Board Six urged the integration of soft edges as an alternative to metal bulkheads wherever practicable, and the introduction of flora and fauna appropriate for the absorption of run-off and natural treatment of contaminants and toxins that may be present.

Response #247: The use of soft edges will be considered where appropriate. In general, the structural requirements of the bulkheads and the configuration of buildings and structures limit the areas where soft edges can be implemented. Green street ends are more readily implemented, since these do not require the same structural considerations. The EPA supports the use of green street ends, which may be configured to tie into soft canal edges in certain areas. In general, construction of soft edges will require the voluntary cooperation of individual property owners. Soft edges as an alternative to metal bulkheads above an appropriate water level could be used where practicable with natural treatment systems installed to absorb, reduce or treat stormwater runoff. The EPA intends to review the use of soft edges in the restoration of the 1st Street basin and the area of the 4th Street basin beneath the 3rd Avenue bridge. The EPA will continue to interact with the stakeholders and community on issues relating to bulkheads, including soft edges, during remedial design.

Quantification of Groundwater Impacts

Comment #248: The PRP Group and NYCDEP assert that groundwater impacts on the canal have not been evaluated by the EPA and the flux of contaminants to the canal has not been quantified.

Response #248: Based on the analysis presented below, contaminant discharge to the canal through groundwater is low compared to other sources. NYCDEP and National Grid, provided estimates of the groundwater flux to the canal based on groundwater models. These two estimates agreed within 25 percent of each other, which is relatively close considering two different groundwater models were used. A more detailed estimate provided the groundwater discharge based on the characteristics of each remedial target area.

The EPA reviewed the distribution of total PAH concentrations in groundwater in monitoring wells that border the canal screened in the shallow or intermediate water bearing zones, which are the primary discharge to the canal, and pore water data provided by National Grid. The monitoring well data exhibited a wide range of concentrations, as did the pore water data. Histograms of the groundwater total PAH concentrations illustrated that the data are not normally distributed and using the mean groundwater concentration to calculate mass flux is not representative of prevailing conditions. Use of the median value would be more appropriate in this case. Evaluation of the range of pore water total PAH concentrations also indicated that using a median total PAH concentration in conjunction with the groundwater discharge rates provides a more representative estimate of the mass flux resulting from groundwater discharge.

Estimates of total PAH mass flux were calculated using both the median and mean concentrations for each RTA (based on EPA data, which was comparable to that of the commenter), and the RTA-specific groundwater discharge rates and pore water concentrations provided by National Grid. The resulting estimates of total PAH discharge rates to the canal are presented in Table 9, below, and exhibit a wide variation ranging from 19 to 1,500 kg/yr. The mean groundwater concentration estimate is significantly higher but, as noted previously, the mass flux calculations performed using the mean concentrations are not considered representative. The estimated mass discharge calculated using the median pore water concentration is considered the most representative of the four values. Median pore water concentrations represent the equilibrium PAH concentrations in near surface sediment associated pore water throughout the canal and are indicative of what may actually be fluxing into the surface water. Furthermore, the data set includes a wide range of pore water concentrations, and has appropriate spatial coverage, including several samples in the central, most contaminated portion of the canal.

Table 9: Total PAH Mass Discharge Rates for Different Concentration Statistics

Concentration Statistic	Total PAH* Mass Discharge Rate (kg/yr)
Groundwater Data – Median Concentration	49
Pore Water Data – Median Concentration**	**19**
*Groundwater Data – Mean Concentration***	*1,500*
Pore Water Data – Mean Concentration	*130*

*Total PAH is the sum of the 16 priority pollutant PAHs and 2-methylnaphthalene.

** Italics denote values determined using mean concentrations, which are not as representative as the median. Bold denotes most representative mass loading estimate.

The EPA's analysis indicates that the total PAH discharge to the entire canal from groundwater is in the order of 20 kg/yr. Given the relatively small magnitude of this release pathway, a groundwater remedy which includes extraction and treatment is not warranted and would not be cost effective.

The EPA believes that the selected remedy contains an appropriate array of prioritized measures to address the array of sources at the canal, including the sediments, the former MGP facilities, CSOs, and upland source areas to groundwater. The EPA has developed a schedule to coordinate the prioritized implementation of the remedy. The EPA agrees that it would be beneficial to accelerate, to the extent possible, remedial work to address groundwater source areas at National Grid's former MGP facilities (of which NYCDEP owns Public Place and Thomas Greene Park), and at other potential upland sources areas owned by various parties, including NYCDEP (Hamilton Street asphalt plant).

Groundwater Discharge as Source

Comment #249: NYCDEP asserts that groundwater discharge is the primary source of PAH contamination to surface water in the canal, as well as the entire sediment column, including the surface sediment.

Response #249: NYCDEP is using data which show PAH impacts in the surface water of the canal as a basis to attribute the impacts to the NAPL and groundwater discharge and to dispute that the CSO discharges are a contributor to surface water impacts. The EPA considers all three sources, NAPL, groundwater discharge and CSO discharges to be contributors to of PAHs to the canal surface water. The selected remedy provides controls for all three of these sources.

Groundwater discharge through sediment is unlikely to be a significant source of PAHs to the sediment because the total PAH discharge from groundwater is only in the order of 20 kilograms per year and cannot account for the high concentrations of total PAHs measured in soft sediment, particularly in the shallow soft sediments.

Active Capping to Address Groundwater Discharge

Comment #250: NYCDEP asserts that groundwater discharge will be insufficiently addressed by active capping.

Response #250: The EPA believes that the mass discharge of PAHs and other constituents of concern in groundwater can only be effectively controlled by using active capping. Treatment "gates" may be needed in the active cap design to allow for the use of replaceable media to control the contaminant discharge in high groundwater discharge areas.

Groundwater Discharge from Non-Former Manufacture Gas Plant Facilities

Comment #251: NYCDEP inquires as to how the impacted groundwater discharge from sites other than the former MGP facilities will be addressed.

Response #251: In order for the canal remedy to be effective, the groundwater discharge from the former MGP facilities will need to be controlled. Impermeable barriers along the canal are currently included in the remedial designs for the Fulton and Public Place former MGP facilities. In addition, the remedy selected for Public Place includes excavation and removal of major tar sources and collection of mobile tar at the approaches of the cut-off wall. It is anticipated that similar measures will be included in the forthcoming remedy for the former Fulton MGP State Superfund site. Additional remedial measures for the Metropolitan former MGP facility are also being considered (see the section with responses to comments related to source control). Each of these former MGP facilities may need to incorporate groundwater management mechanisms behind the barrier wall during the remedial design.

The former MGP facilities constitute the major groundwater impacts to the canal from upland sites. The remaining upland sites with much lesser groundwater impacts to the canal have been referred to NYSDEC and the groundwater contamination will be addressed in their remedy selection. In the interim, measures will be taken to mitigate groundwater impacts to the canal.

Variation in Groundwater Discharge Patterns

Comment #252: NYCDEP, the PRP Group and National Grid inquire as to how the variation of groundwater discharge patterns to the canal will be addressed.

Response #252: Measuring variations in groundwater discharge patterns will be evaluated during the remedial design. National Grid has prepared a groundwater flow model that the EPA has reviewed. The model provides an overall summary of how groundwater discharges to the canal and the results show that groundwater discharge is variable along the canal with the higher discharge volumes and greater groundwater flux occurring in the upper reaches of the canal.

Although the groundwater model provides an overview of how groundwater discharges to the canal, it cannot provide accurate details on the spatial distribution of the

groundwater discharge. The EPA has already initiated discussions with a specialty vendor, SelkerMetrics LLC (http://www.selkermetrics.com) to provide DTS technology at the canal. By precisely monitoring temperatures in sediment it is possible to locate where groundwater is seeping through sediments and into bodies of water. Recent developments of this technology also allow groundwater discharge rates to be estimated. The aforementioned tests and measurements will be performed during the remedial design to accurately locate groundwater seeps and to more precisely determine discharge rates.

Impermeable Barriers and Flooding

Comment #253: National Grid and the Gowanus Conservancy express concern that the impermeable barrier walls proposed for bulkhead support will mound groundwater behind the wall and will increase the potential for local flooding. These effects will be magnified if climate change raises sea levels and increases groundwater levels.

Response #253: Impermeable sheet pile barriers were considered in the FS as a representative option for all bank-stability related bulkhead work as described in Section 4. 2. 5 of the EPA Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA (EPA, 1988).

The specific type and design of the bulkhead improvements will be more precisely determined, for each area where improvements will be required, during the remedial design. Sheet pile barriers will likely be needed to address areas adjacent to significant upland NAPL and dissolved phase impacts, such as at the former MGP facilities. These barriers may be augmented with groundwater extraction systems to prevent groundwater mounding behind the barrier. In areas of low groundwater discharge, impermeable barriers may be effective without significant groundwater mounding. Bulkheads may be made permeable, where appropriate. On clean parcels, sheet piling may have below-grade discharge openings. On contaminated parcels, where needed, treatment gates could be incorporated into the wall design to funnel groundwater through the treatment gate, allowing for discharge of treated groundwater to the canal. In low impact areas, permeable treatment barriers could potentially be used to absorb groundwater impacts before discharge to the canal.

General Bulkhead Concerns

Comment #254: A commenter noted that years ago, when the canal was dredged, because the bulkheads were in such poor condition, the dredges could not remove sediment located within ten feet from the bulkheads on both sides of the canal. The condition of the bulkheads has not improved. Since the remedy includes dredging of the sediments in the canal again, the commenter inquired as to how all of the contaminated sediments will be removed if the dredges will have to stay away from the bulkheads.

Response #254: To allow the dredging of the contaminated sediments to be performed without constraints attributable to the integrity of the bulkheads, it is anticipated that temporary sheet-piling will be required in locations where the condition of bulkheads warrants additional structural support. The EPA also anticipates that several planned activities will result in major portions of the bulkheads being upgraded. As part of the remedy selected for the former MGP facility at Public Place, National Grid is required to construct a bulkhead containment wall. As noted above, NYSDEC has also directed National Grid to design a similar containment wall for the former Fulton MGP State Superfund site. It is possible that a third such wall will be required for the former Metropolitan MGP facility. Redevelopment work, such as the Lightstone Group project, will also involve bulkhead upgrades. Finally, a number of property owners have contacted the EPA regarding their plans to upgrade their bulkheads. The EPA is working with all of these entities to ensure that the bulkhead upgrades will be able to support dredging activities.

Comment #255: Two commenters expressed concern that carrying out the dredging remedy will have deleterious effects on the bulkheads throughout the canal area and that the cost of replacing deteriorated bulkheads may be a burden that will have adverse financial impacts on numerous canal bank property owners. A commenter noted that there is strong interest in how standards for bulkhead replacement and maintenance will be promulgated, including bulkhead height and design, where soft edges are possible and where wetlands could be restored.

Response #255: As was noted in the prior response, it is anticipated that temporary sheet-piling will be required for dredging in locations where the condition of bulkheads warrants additional structural support. It is also anticipated that a significant amount of bulkheads will be replaced as part of the former MGP facility cleanups and by developers and property owners, reducing the amount of temporary sheet-piling which is needed.

The EPA believes that there are a number of locations where the bulkheads are so deteriorated that they may fail when the temporary sheet-piling is removed after dredging. The cost of the temporary sheet- piling will be borne by the PRPs. In such cases, the sheet-piling will be left in place until the property owner replaces the bulkhead. The EPA intends to cooperate with NYC on inspection and enforcement of existing NYC bulkhead maintenance requirements. To reduce costs for affected bulkhead owners, the EPA will facilitate the permitting approval, design and construction process with interested owners. As noted above, the EPA will consider soft edges in areas where this is suitable and appropriate.

Comment #256: A commenter noted that the replacement of a bulkhead at the western terminus of 5th Street illegally encroached upon the canal by ten to fifteen feet, creating two issues--the original canal bed in this area is now an upland area and the constriction is adversely affecting the maritime industry.

Response #256: The EPA has referred the matter to the appropriate regulatory authorities. Removal of such prior encroachment areas will only be considered to the

extent that it is necessary for engineering reasons in order to implement the dredging remedy.

Comment #257: A commenter expressed concern that the current bulkhead proposal will further worsen the already congested canal by adding a third generation of bulkheads that will extend even further into the water. Another commenter requested that any bulkhead replacement not infringe on the existing width of the canal waterway. Furthermore, states the commenter, all efforts should be made to restore the historical width of the canal where and when bulkheads are replaced.

Response #257: Other than in locations where bulkhead replacement will likely be a component of the canal or former MGP facilities' remedy, it is anticipated that bulkhead replacement will not be part of the remedy, unless a substandard bulkhead is judged to present a threat to the integrity of the remedy or in cases where deep cutoff walls are required to protect the canal from recontamination. Nominal bulkhead encroachment into the canal will likely be unavoidable. The excavation of the 1st Street and a limited section of the 5th Street turning basins will, however, mitigate the loss of surface water area as a result of new bulkhead encroachment into the canal. As noted above, the EPA acknowledges that encroachment may have occurred in areas such as the curve of the canal opposite Public Place. Removal of such prior encroachment areas will only be considered to the extent that it is necessary for engineering reasons in order to implement the dredging remedy.

Comment #258: A commenter stated that the remedy needs to integrate various community plans into the design of the new bulkheads. For example, existing plans for new residential developments include canoe dock and waterfront access proposals, which will require custom bulkhead designs (*e g.,* steps to water access) and the canal remedy must be flexible enough to accommodate these proposals.

Response #258: The bulkhead approach in the FS report does not represent the design of the remedy. The FS report developed remedial alternatives which contain representative technologies that may be used to achieve the RAOs. The installation of steel sheet piling with tieback anchors was selected in the FS report as the representative approach for bulkhead upgrades along the canal. As the remedy is implemented, there will likely be specific sections and specific conditions along the canal where an alternative approach will be appropriate. Specific designs for bulkhead segments along the canal will be developed during the design phase.

Bulkhead-Related Geotechnical and Groundwater Modeling Studies

Comment #259: NYCDEP asserts that the lack of Site-specific data on geotechnical conditions and groundwater modeling in the canal prevent a realistic assessment of bulkhead replacement requirements. No geotechnical calculations are provided to suggest that the system is capable of supporting the anticipated loads or whether the native sediment is even capable of supporting the proposed sheet pile wall (*i.e.,* is competent soil).

Response #259: Pre-design investigations will be performed to obtain the detailed geotechnical information necessary to support the specific bulkhead approach and design along the canal. Geotechnical information is already available from a variety of sources. Geotechnical investigations have been performed by National Grid and other parties, such as Benson Metals, who are contemplating bulkhead upgrades. National Grid has also performed groundwater modeling. National Grid has submitted the results of both of these efforts. The geotechnical investigations showed that the strength of the native sediments is variable along the canal. The soil strength, together with the structural elements of the bulkheads such as sheet piles, tiebacks, walers and depth of embedment, are all considered in bulkhead design. Overall, the data showed that the native sediment is compatible for various bulkhead designs.

National Grid's groundwater model quantified the discharge of groundwater to the canal. In areas of low groundwater discharge, impermeable barriers may be effective without significant groundwater mounding. If needed, treatment gates could be incorporated into the bulkhead wall design to funnel groundwater through the treatment gate, allowing for discharge of treated groundwater to the canal. In low impact areas, permeable treatment barriers could potentially be used to address groundwater impacts before discharge to the canal.

Bulkhead Replacement/Upgrade Evaluation

Comment #260: The PRP Group asserts that bulkhead replacement/upgrade evaluation must be integrated into the remedy prior to addressing sediments in the canal and not deferred until the design phase because it represents a component critical to the selection of an appropriate remedy.

Response #260: The EPA recognizes that bulkhead conditions are a significant public concern and an important consideration for the implementation of the remedy. However, the bulkhead replacement/upgrade evaluation does not need to be completed prior to remedy selection. Bulkhead reconstruction is a well-developed technology in the construction industry and can be readily addressed during the design phase and in a sequential manner, as the remedy is implemented from the upper to the lower canal.

As was noted in the Proposed Plan, the EPA prepared a series of approaches to coordinate and expedite bulkhead replacement. The EPA has held talks with the USACE, NYSDEC and NYC about cooperative approaches to address bulkhead replacement and restoration along the canal. To the extent that bulkhead replacement occurs, appropriate consideration would be given to bulkhead preservation, aesthetics, the use of soft edges and wetlands mitigation.

For the replacement of bulkheads, other than the structural sheet pile bulkheads that will be required for remedy implementation, the possible methods include a standardized design and promoting coordination among interested owners to reduce their costs through economies of scale. Where replacement is not needed for purposes of the remedy, the EPA will seek to utilize a streamlined permitting approach to reduce transaction costs and expedite approval. Where replacement is needed for

implementation of the remedy, the EPA will apply the CERCLA permit exemption to further expedite the process.

The EPA has met with several property owners who are interested in replacing their properties' bulkheads. The EPA is developing a standard approach for performing such work which would ensure that the bulkheads are upgraded in a manner consistent with the canal remedy and the substantive NYSDEC requirements. This work would be carried out under an administrative order with EPA oversight. Such an order can also provide appropriate CERCLA liability protection for the owners performing work in the canal.

The EPA believes that there are a moderate number of locations where bulkheads are so deteriorated that they may fail when the temporary sheet-piling is removed after dredging. In such cases, the EPA intends to cooperate with NYC on inspection and enforcement of existing NYC bulkhead maintenance requirements. To reduce costs for affected bulkhead owners, the EPA will assist with coordinating the permitting approval, design and construction.

While the EPA will continue working with all of the stakeholders, it recognizes that it is not possible to insure that all of the bulkheads that need to be replaced will be replaced. Therefore, some substandard bulkheads may still remain. If the continued presence of such substandard bulkheads is judged to present a threat to the integrity of the canal remedy, available CERCLA authorities and/or resources would be used, as necessary, to ensure their repair.

At the present time, a number of property owners along the canal have initiated replacement of their bulkheads and are coordinating their designs with the layout of the preferred remedy.

Sheet Piling for Bulkhead Upgrades and Restoration

Comment #261: NYCDEP asserts that costs for sheet piling for bulkhead upgrading and restoration are based upon sheet piling lengths that are too short and, therefore, the costs are too low. Impacts due to presence of debris, outfalls, bridge abutments, and utilities have not been considered. Compliance with historical and archaeological study recommendations have not been considered.

Response #261: As stated in Table F-1 of Appendix F in the FS report, p. 3 of 11, sheet piles in RTAs 1 and 2 would be 35 feet long, and sheet piles in RTA 3 would be 50 feet long.

Using an estimated ground surface elevation in RTA 1 of +6, and a dredge elevation of -18 feet, 35 foot sheets would leave an average embedment of 11 feet in the underlying native sediment. These replacement walls assume installation of tieback anchors, which reduces the length of embedment required. Also, 3. 5 feet of cap will be placed over the dredged surface which will enhance the long term stability, giving a long-term embedment of 14.5 feet on average. During the design, 40-foot long sheets may prove to be more appropriate in RTA 1, and 45-foot long sheets in RTA 2 where the dredge elevation is -22 feet. Fifty foot-long sheets would be appropriate in the first segment in

RTA 3, where the dredge depth is 28.5 feet, but perhaps 70 foot sheets may be needed in the second segment of RTA 3 where the dredge depth is 41.5 feet. As expected, re-running the costs with this set of assumptions does change the base implementation capital costs (as shown in Table F-2a of Appendix F in the FS) – in this case from $93 million to $112 million. The final depth of sheet piles will be determined during the design.

The comments on the cost estimate do not acknowledge the conservative assumption made in the FS that 80% of all of the existing bulkheads would need complete replacement with new sheet piling. As stated in responses to previous comments , a thorough analysis to determine what percentage of the existing bulkheads would need complete replacement, what percentage require improvement with remedial measures (such as replacement of wales and tieback anchors in existing sheet piling), and what percentage are satisfactory as is, is customarily done during the remedial design and not during the FS. NYCDEP points to a 2000 report that states 40% of the existing bulkheads are in fair or worse condition. It can be assumed that at least this percentage, and maybe a little more by now, require complete replacement. One reasonable scenario would be that 50% of the bulkheads require complete replacement, 30% would require remedial measures equal to one-half the cost of complete replacement, and 20% require no remedial measures at all. Using these assumptions, and the revised sheet pile lengths outlined above, the total cost would be $94 million, essentially the same as the original FS estimate.

As noted previously, the EPA anticipates that a significant fraction of the canal bulkheads will be upgraded for non-project related work, including by National Grid for containment walls at the three former MGP facilities, and by property owners and developers.

Sheet Piling for Temporary Cells

Comment #262: NYCDEP asserts that costs for the installation and removal of sheet piling for the temporary cells are not consistent with sheet piling installation costs for upgrading of the permanent bulkheads.

Response #262: There is a significant difference between the sheet piling installed as part of the temporary remedial cells and sheet piling installed as a permanent replacement bulkhead wall. As stated in Table F-1 of Appendix F in the FS report, p. 4 of 11, sheet piling for the remedial cells would be used to contain turbidity and NAPL release during remedial activities, but would not be designed to withstand differential head pressures created by lowering water within the cell (except for up to five feet differential due to tidal fluctuation). Sheet pile wall joints would not need to be completely watertight because no significant pressure differential would exist. A less robust section of sheet pile is assumed for the cells versus the bulkhead replacement sheet piling due to the significantly lower bending moments acting upon those sheets. The extraction and reinstallation cost for the remedial cell sheet piling is lower still since there is no new material cost associated with this work.

Sediment Dredging Production Rate

Comment #263: NYCDEP asserts that the assumed sediment dredging production rate is too high. It should be less than half of the assumed rate. Dredging should be assumed be on a five 12-hour day schedule instead of a seven 12-hour day weekly schedule. The increase in dredging time will add a minimum $10 million to $15 million to the project costs.

Response #263: The estimated costs were based on a specific assumption regarding the dredging schedule. If this assumption is changed and the work schedule is 5 days, the estimated costs would increase by an estimated $15 million for Alternative 5 and an estimated $16 million for Alternative 7. The work schedule will be determined during the design. Work hours may vary depending on Site-specific factors. For example, the work day could be longer in RTA 3 as it is an industrial area without the likely noise impacts as compared to RTA 1.

Current and Future Conditions

Comment #264: National Grid commented on the need to understand navigational uses, strike the proper balance between commercial traffic and restoration of ecological conditions, maintain dissolved oxygen conditions meeting surface water standards for the canal and understand how the canal will perform under canal future uses and conditions. Also, National Grid suggested that the implementation of the remedy should not preclude the wide variety of industrial, commercial and residential activities currently ongoing in the canal's vicinity.

Response #264: The EPA recognizes that there is a balance of optimum conditions between several factors, such as future commercial and community navigational uses of the canal, canal depth, Flushing Tunnel flows, dissolved oxygen concentrations and benthic habitat that the remedial design must address, while ensuring that the CERCLA RAOs are being met. The remedial design will address the balance between these conditions in a manner that meets the CERCLA objectives.

The Proposed Plan and ROD do not preclude current or future uses of the canal or any individual type of development in the canal's vicinity. The only requirement will be that any such development cannot contribute contaminant loads to the canal that would reduce the protectiveness of the remedy. Stormwater from future development will need to be treated prior to discharge in the canal and sewer use regulated so as to not be inconsistent with the contaminated CSO solids controls required in the ROD.

Future Use of Canal

Comment #265: National Grid notes that given that the canal has had limited use (as revealed by the present state of sediment accumulation) and given the plans for residential/recreational development along the canal, it is unlikely that there will be a need for deeper navigation depths. At the very least, it appears that the upper portion of the canal will eventually be limited to recreational traffic, which reduces any

requirement for depth and thus reduces the need for dredging. NYCDEP asserts that the EPA is proposing to expand the existing navigational channel into the middle and upper reaches of the canal.

Response #265: The EPA has reviewed a information relating to the current and anticipated future use of the canal and the Gowanus area. This includes, but is not limited to, documents on the NYCDEP's WWFP (Section 2), NYCDEP's preliminary Gowanus area re-zoning (presently on hold), the Gowanus Community Development Corp. Comprehensive Community Plan (2006), the Brooklyn Waterfront Greenway Plan (2005), the U. S. Army Corps of Engineers (USACE) draft Navigation White Paper (2007) and the New York City 2020 Waterfront Vision Report and Community Board Six comments.

The EPA has had ongoing interactions with developers, including the Whole Foods store project, the Lightstone Group and Gowanus Green residential projects, as well as an array of current business owners, prospective developers and purchasers. The EPA is also participating in Community Board Six's Brownfields Opportunity Area (BOA) Grant process, which has reviewed a range of area zoning issues and needs with the goal of promoting redevelopment.

NYCDEP, in its Proposed Plan comments, made observations regarding the mixed use of the canal and surrounding areas and the need to coordinate with the community regarding a range of short- and longer-term project impacts, noting:

> While the zoning along the Canal itself consists mostly of manufacturing districts, allowing a variety of commercial and industrial uses, there is also zoning that permits residential development. Additionally, longstanding residential districts are mapped in very close proximity to the Canal. Scattered throughout the manufacturing zoning districts are also long existing, non-conforming residential uses. Based on the historical development of the neighborhood, there are no clear functional boundaries between industrial and residential areas. (NYCDEP Proposed Plan comment #11.7, page 80.)

The EPA generally agrees with this land use characterization. Based on the current and pending projects noted above and continued prospective residential development activity, increasing dining and entertainment businesses around the canal, and formal requests to NYC to restart the re-zoning process, (*e.g.,* a Community Board Six October 12, 2012 resolution regarding the Lightstone Group), the EPA believes that there will likely be an increased intensity in land use around the canal over a broad range of sectors.

Commercial navigation is currently limited to the lower and middle canal. Limited draft in the canal presently hinders such navigation. The limited draft, together with vessel traffic and barge mooring, affect sediment accumulation and re-suspension patterns and impacts. The EPA has also received requests from business owners engaged in commercial navigation regarding potential bulkhead upgrades for their operations. The EPA anticipates that such commercial navigation will continue and may possibly increase following implementation of the selected remedy, which would reduce navigational impediments.

In the upper canal, navigation is limited to recreational use, infrastructure upgrade and repair, and remedial-related work. Future navigation will need to be maintained for infrastructure and redevelopment work as well as post-construction remedial maintenance. Future residential development may also potentially create a demand for other water-related navigation, such as water taxis, which have been depicted in upper canal residential redevelopment renderings.

Overall, the increased population living on and around the canal, together with the corresponding increase in recreational use of the canal, would tend to increase the potential for exposure in the absence of a comprehensive cleanup.

Property Values

Comment #266: A commenter expressed concern that once the canal is remediated, property values and rents in the area between Carroll Gardens and Park Slope, where the residential properties have been undervalued because of flooding, will increase significantly, potentially displacing those that cannot afford a substantial rent increase. Another commenter expressed a similar concern about the Red Hook area.

Response #266: Under CERCLA, the EPA must select a remedy which is protective of human health and the environment. Such a remedy must take into account reasonably anticipated future land use so that the cleanup is appropriate for that land use. Future property valuation, however, is not among the selection criteria.

Property values in Brooklyn generally have been rising, and in Gowanus in particular, even in advance of any clean up. It is likely that property values in the area will continue to rise as investment and redevelopment (*e.g.,* the Whole Foods project) advances. While the EPA acknowledges the comment, other agencies have jurisdiction for such issues. It is suggested that concerns about rents and property values be directed to elected officials.

Long-Term Monitoring

Comment #267: A commenter seeks confirmation that long-term monitoring will be performed to ensure that the implemented remedy works.

Response #267: Long-term monitoring would be performed to insure that the implemented remedy continues to function effectively. A long-term monitoring plan will be developed by the PRPs as part of the remedy, with oversight and input from the EPA, NYSDEC and other participating agencies. Such documents will be provided to the public for informal input as part of the ongoing community involvement process.

Sediment Toxicity Reduction

Comment #268: A commenter asked why the goal for sediment toxicity reduction is based on the Gowanus Bay and Upper New York Bay reference area.

Response #268: As a general rule, Superfund does not clean up hazardous waste sites beyond background conditions. The judgment of Superfund is that it does not make sense to have a completely clean area surrounded by contaminated areas. In this instance, the background areas were determined to be sufficiently protective of the ecosystem for the purposes of the canal cleanup.

Restoration of Fishing in Canal

Comment #269: A commenter asked whether it is likely that fishing will ever be allowed in the canal.

Response #269: Fishing advisories promulgated by the New York State Department of Health (NYSDOH) currently apply to the New York/New Jersey Harbor area, including tributaries, such as the canal. These advisories vary based on species and the age and gender of the consumer (see http://www.health.ny.gov/publications/2784.pdf). In general, fish consumption is not advised for children and women of childbearing age. NYCDEP signs are posted along the canal at CSO outfalls indicating that fishing is prohibited.

The EPA has also produced a Gowanus-related fact sheet regarding fish consumption (see http://www.epa.gov/region02/superfund/npl/gowanus/pdf/gowanus_colorcoding-041212.pdf).

Despite the fish advisory, posted warnings and public outreach efforts, the canal and harbor areas near the canal are regularly used for fishing, particularly subsistence fishing by surrounding EJ communities.

Although implementation of the canal remedy should slightly reduce contaminant loadings to the New York/New Jersey Harbor, it is unlikely that fishing advisories will be lifted in the foreseeable future. While the EPA believes that ecological conditions in the canal should improve following implementation of the remedy such that water and sediment conditions will more closely resemble those of the harbor, post-remediation monitoring will be necessary to determine whether fishing, other than catch-and-release, is advisable within the canal.

In addition, NYSDOH looked at the data that was collected as part of the RI and concluded that exposure to the high levels of bacteria that are present in the canal due to the sewer outflows pose an acute (short-term) public health threat. Although pathogen exposure was not considered for CERCLA remedy selection purposes, the contaminated CSO solids controls which are part of the selected remedy will also reduce human health risks associated with pathogens.

Public Health Assessment

Comment #270: A commenter expressed concern that the Agency for Toxic Substances and Disease Registry's (ATSDR's) public health assessment was not presented in the human health risk section of the proposed plan.

Response #270: A HHRA is an analysis of the potential adverse health effects caused by hazardous substance releases from a site in the absence of any actions to control or mitigate the hazardous substances under current- and future-land uses. It is the basis for determining whether or not a remedial action is necessary at a site.

ATSDR, through a cooperative agreement with NYSDOH, prepares public health assessments for facilities independent of the EPA remedy selection process (*i.e.*, public health assessments are not included in the human health risk section of proposed plans). During the preparation of the public health assessments, NYSDOH and ATSDR review the environmental information available for the Site and prepare conclusions and recommendations for public health actions.

ATSDR and NYSDOH expect to release the public health assessment for the Site in late 2013.

Human Health Risk Assessment

Comment #271: Several commenters asked that the threat to public health be identified.

Response #271: An HHRA for the Gowanus Canal was performed as part of the RI. The HHRA evaluated potential current and future risks to recreational users, anglers, residents and industrial workers in and near the canal. The HHRA evaluated the potential human risks from exposure to surface water, sediment, ambient air and ingestion of fish and shellfish, concluding that unacceptable long-term (more than 30 years) exposure risk levels are posed by surface water/sediment contact and fish/crab consumption..

In addition, NYSDOH looked at the data that was collected as part of the RI and concluded that exposure to the high levels of bacteria that are present in the canal due to the sewer outflows pose an acute (short-term) public health threat.

Human Health Risk Assessment Assumptions

Comment #272: ConEd asserts that the HHRA relies on exposure assumptions that are overly conservative and do not represent a reasonable maximum exposure (RME) as defined by the EPA and that the human health risk estimates were described in the RI as "likely overestimates," but were not refined.

Response #272: At the time that the HHRA was initiated, no specific information was available for fishing/crabbing and ingesting fish or crab caught from the Gowanus Canal. Observations by the EPA and anecdotal information suggested that regular fish consumption was occurring both within the canal and near the mouth of the canal. This is supported by studies which show that many people in the area ignore fish advisories that are placed on local waterways. Therefore, fish ingestion rates from local studies for the Newark Bay Complex (Burger, 2002) were used in the HHRA. These fish ingestion rates are similar to the ingestion rates used in HHRAs prepared for other local water bodies.

The risk estimates for fish and crab ingestion were supplemented in the FS report addendum by evaluating a subsistence fishing scenario. The subsistence fishing ingestion rate was based on information obtained from a 2010 Fish Consumption Education Project in Brooklyn (Going Coastal Inc., 2010). The purpose of the project was to identify who is fishing and what is being caught and eaten along the shores of Brooklyn in order to reduce the consumption of contaminated fish and lessen potential health problems among the local subsistence and recreational fishing population. Of the respondents, 57 percent said they were trying to catch striped bass and more than half responded that they were trying to catch bluefish. The survey showed that most of the fish caught were consumed. Almost all of the fish are eaten either by the anglers themselves (62 percent), shared with their family and friends, and/or given to other anglers. More than a quarter of the respondents explicitly said that children under the age of 15 eat the fish they catch. The fish ingestion rate for the subsistence fishermen risk calculations was based on the median consumption value of eight fish meals per month for those who feed their catch to children. Given the evidence of both recreational and subsistence fishing in and near the canal, a RAO was developed to address the potential risks associated with fish and shellfish ingestion.

Additionally, the sediment remedy for the canal is expected to create conditions that will encourage greater recreational use (including fishing and ingestion of fish). Therefore, the use of the recreational and subsistence exposure assumptions is appropriate for determining the actions that need to be taken to reduce potential future unacceptable risks.

Comment #273: ConEd asserts that unrealistic assumptions about the relative percentages of species consumed by anglers were used.

Response #273: The EPA believes that the technical basis for establishing the mix of species consumed by anglers is reasonable, but recognizes that other reasonable assumptions also could be used. It should be noted that revising the percentages as suggested in the comments would not change the results of the risk calculations.

Contribution of Gowanus Canal to PCB Levels in Fish

Comment #274: ConEd asserted that the EPA provided no data or analyses to support the assumption that PCBs in Gowanus Canal sediments contribute to the PCB levels in fish tissue .

Response #274: Because the species targeted in the HHRA (striped bass, white perch, American eel and blue crab) inhabit areas that are larger than the canal, the PCB concentrations in their tissue reflect cumulative uptake from all of the areas in which they forage. Therefore, the PCB concentrations in fish and shellfish caught in the canal cannot be directly linked to PCB concentrations in the canal sediments alone. However, this does not mean that fish and crab do not accumulate PCBs from Gowanus Canal sediments; it simply means that it is not technically feasible to determine the relative contributions of PCBs from the canal (and other areas) to the overall tissue burden of PCBs in the fish. The EPA acknowledges the uncertainty in directly linking tissue concentrations of PCBs to sediment concentrations; however, both sediment and fish and crab tissue PCB concentrations appear to be elevated in the canal samples relative to the reference area samples, suggesting a contribution from canal sediments.

To address this uncertainty, the RAO for the consumption of fish and shellfish was developed to specifically target PCB concentrations in sediments rather than fish tissue:

> Reduce the contribution of PCBs from the canal to fish and shellfish by reducing PCB concentrations in surface sediment to levels that are within the range of Gowanus Bay and Upper New York Bay reference concentrations.

The EPA believes that this RAO accurately describes what the cleanup is expected to accomplish, and is considered to be achievable.

The EPA's sampling has established the presence of PCBs in fish in both Upper New York Bay and the canal. These results are consistent with broader studies and the New York State fish advisories which ConEd advocates reliance on. The EPA's position regarding the contribution to fish tissue from PCBs in canal sediments is consistent with the EPA's experience at other sediment sites. See, for example, the EPA's Hudson River PCBs Record of Decision and Responsiveness Summary, February 2002. Conversely, ConEd's comments do not provide any technical support for the suggestion that PCB uptake would occur only while fish are in Upper New York Bay, then either not occur or discontinue while exposed to PCBs within the canal.

PCB Toxicity to Benthic Organisms

Comment #275: ConEd asserts that the EPA has not demonstrated that PCBs are toxic to benthic organisms.

Response #275: In the baseline ecological risk assessment (BERA), contaminants were identified as potential contributors to toxicity if concentrations exceeded risk-based screening levels and were significantly higher than reference area concentrations. The EPA acknowledges that there are multiple approaches for assessing whether a contaminant may contribute to sediment toxicity. Each of these approaches has its own strengths and uncertainties in terms of correctly predicting sediment toxicity. In the case of Gowanus Canal sediment, the EPA believes that the approach used in the BERA is sufficient to show that PCBs have the potential to contribute to the observed toxicity. However, because PAHs are the primary cause of sediment toxicity and the driver of ecological risk at this Site, the EPA does not believe that it is necessary to use more sophisticated approaches to develop PCB toxicity thresholds. Because the

selected remedy will also remove PCBs that co-occur with the PAHs targeted for remediation, the level of evaluation of PCBs conducted in the BERA was determined to be adequate to support a risk management decision.

The RAO for the protection of the benthic community focuses on the reduction of toxicity, regardless of the source. As stated, the EPA believes risks to the benthic community to be primarily associated with PAHs but there are potential contributions from PCBs and metals that cannot be ruled out.

Ecological Threats

Comment #276: A commenter expressed concern that the contamination in the canal could adversely affect the fish that live in the canal.

Response #276: The contamination in the canal has already impacted fish that live in the canal. The average concentration of PCBs in canal fish samples collected by the EPA is about two times higher than the average PCB concentrations in the reference area samples collected from Gowanus Bay and Upper New York Bay. Because PAHs normally metabolize quickly, fish tissue samples were not analyzed for PAHs. As noted above, NYSDOH has issued a fish advisory covering the entire Gowanus Canal.

During the remedial design, appropriate controls will be selected to limit contaminant re-suspension and transport during dredging. The EPA will also consider whether additional measures will be necessary to restrict fishing during dredging.

Air Emissions

Comment #277: A commenter expressed concern about the potential wind transport of contaminants from surface sediment exposed during low tides in the upper reach of the canal.

Response #277: It is unlikely that the wind will mobilize a significant amount of contamination from surface sediment exposed during low tides in the upper reach of the canal due its grain size and moisture content. During the RI, air samples were collected from street-level locations along the length of the canal and from three background locations (two blocks west of the canal). The results from this sampling indicate that the types and concentrations of contaminants detected in air samples were similar, regardless of the sample location. The constituents detected were typical of those found in urban environments.

Comment #278: A commenter expressed concern about atmospheric releases during dewatering. Other commenters expressed concern about releases into the atmosphere during the dredging and processing. Two commenters urged the EPA to collect real-time air data and make that data available to the public. Two commenters noted that the ongoing Onondaga Lake site dredging has resulted in odor complaints. The

commenter expressed concern that the processing of the Gowanus Canal sediments would also create an odor problem. Two commenters asked whether the dredging and processing would pose risks to the community through air emissions. Another commenter asked whether it will be safe for the 700+ residents that will occupy the rental building that the Lightstone Group wants to erect along the canal since the canal cleanup will not be completed for at least 10 years. Another commenter expressed concern that allowing the area to be developed prior to remediation, thereby placing greed before public health, would be akin to the tragedy of Love Canal--citing Commissioner of the State Health Department Dr. David Axelrod's 1998 statement that Love Canal will likely long endure as a "national symbol of a failure to exercise a sense of concern for future generations. "

Response #278: The intent of implementing remedies at Superfund facilities is to protect public health and the environment. The implementation of the remedies themselves must be implemented in a manner which is also protective of public health.

The sediments in the canal are contaminated with a number of volatile organic compounds that could be released when brought to the surface. Odors described as "organic," "septic-like," "sulfur-like" and "hydrocarbon-like" are commonly detected during low tide. To prevent the exposure of the remediation workers and the surrounding community to volatile organic emissions and to prevent noxious odors, measures to control the air emissions and odors during the dredging and processing of the sediments will be developed during the design of the remedy. In addition, air monitoring equipment will be placed at various locations in the vicinity of the areas where dredging is conducted and in the processing areas to determine if the air emission and odor controls are effective or if modifications and corrective actions are necessary. The monitoring data will be made available to the public.

While there were odor complaints at the Onondaga Lake site once the dredging and processing of lake bottom sediments commenced last year, the contractors have implemented a number of odor-control measures which appear to have significantly reduced the odor complaints.

The EPA will continue its proactive public outreach and interaction efforts during the remedial design and subsequent dredging in order to properly address such concerns.

Comment #279: Two commenters expressed concern about the potential adverse health effects attributable to air releases associated with the remediation efforts in the canal, noting air release concerns related to the dredging effort at the Onondaga Lake site expressed by residents in the Town of Camillus, New York. One of the commenters stated that a consultant hired by the Town of Camillus and some of its residents indicated in a report that air toxic concentrations are pervasive throughout the community and that short- and long-term safe levels are being exceeded, contrary to the stated findings of a supplemental HHRA produced by the EPA for the Onondaga Lake project, which indicated that residential risks associated with the management of contaminated sediment would not result in Exceedances of acceptable risks to the nearby communities. The commenter also alleged that the Supplemental HHRA was

conducted because an air pathway analysis (APA) for the project was never performed, even though detailed project planning documents specified that an APA be conducted, and that an APA is required under Superfund.

Response #279: The EPA acknowledges the comments with respect to the Onondaga Lake site remediation. The EPA believes that the public's questions and concerns related to air monitoring are being addressed with respect to that project. Although there is no CERCLA requirement that one be performed, an APA to assess the extent of potential emissions from technologies being considered and evaluated for the Onondaga Lake site was conducted during the FS phase of the project.

Given the odors currently associated with the Gowanus Canal even in the absence of remedial work, the EPA acknowledges the need for adequate odor controls and air monitoring during dredging and any sediment handling. During the remedial design, the EPA will work with the community in the development of a community health and safety plan as part of our continued public outreach and interaction efforts in order to properly address such concerns.

Comment #280: A commenter opined that it is not clear what impact the dewatering of contaminated material will have on the air quality, since an APA was not performed in connection with such a facility. The commenter asserts that the failure to perform the APA is not in accordance with the law. If an APA had been performed, opined the commenter, it would clearly show unacceptable risks to nearby residents owing to very high predicted levels of airborne exposure.

Response #280: Although an APA was not performed during the RI/FS, the short- and long-term impacts of the dredging and capping alternatives were evaluated as part of the FS. An APA will be performed during remedial design, once the material handling specifications and rates have been determined. The results of the APA will then be used to identify the design requirements for perimeter air monitoring systems for the Site, including the removal and treatment areas, as well as other controls to limit releases to air.

Air monitoring will be conducted and mitigation measures will be implemented during the remedial activities to control the release of hazardous compounds. Dredging best management practices will be used to minimize the disturbance of sediments during the dredging process, thereby limiting releases to the air. The potential for airborne distribution (*e.g.,* dust generation) will be limited by the high moisture content of the sediment, even after any dewatering procedures. Odor controls will be implemented to the degree practicable.

As noted above, an APA will be performed before the remedy is implemented. The EPA has, therefore, correctly identified the regulatory standards for this pathway that will require compliance during project construction, and, therefore, the selected remedy is in accordance with the law. After conducting the APA, the appropriate air monitoring, mitigation and other health and safety measures will be utilized during construction. During both the remedial design process and dredging, the EPA will continue to interact with the public regarding the APA and other project impact concerns.

National Oil and Hazardous Substances Pollution Contingency Plan

Comment #281: NYCDEP asserts that the EPA has not followed the NCP by relying on the NYSDEC to be the lead agency for the former MGP facility cleanup remedies, other upland parcels referred to the NYSDEC for evaluation by the EPA and unpermitted pipe outfalls, rather than directly evaluating (*e.g.,* alternatives, cost, Applicable or Relevant and Appropriate Requirements, etc.) and selecting these former MGP facility and upland cleanups as part of the remedy selection process for the Gowanus Canal.

NYCDEP also asserts that the EPA is delegating remedy selection to the State, contrary to the NCP requirements.

Response #281: The EPA has, by agreement with the NYSDEC, divided the lead responsibilities for various aspects of the Site. NYSDEC has the primary lead on uplands cleanups under its State Superfund and Brownfields programs. The State, which had long-term experience and familiarity with the former MGP facility cleanups prior to the NPL proposal of the Site, retained this responsibility. NYSDEC oversees almost all of the former MGP facility cleanups within the State, and has extensive experience with its former MGP program.

Such a division of agency roles, particularly for upland cleanups at sediment sites, is not an unusual approach. At the Hudson River PCBs Superfund site, for example, NYSDEC is the lead agency for the upland plant site cleanups while the EPA is the lead for the river portion of the site.

The EPA has reviewed the data, technical reports and remedial documents generated to date with respect to the former MGP facilities and incorporated these documents into the administrative record. The EPA has provided, as a contingency measure in the Proposed Plan and ROD, “In the unlikely event that a timely and effective State-selected remedy is not implemented at a given former MGP facility, the EPA may implement actions pursuant to CERCLA to ensure the protectiveness of the preferred remedy.” In a similar manner, NYSDEC has the lead on CWA compliance under state law, with the EPA having the ability to take separate enforcement action under federal authority ,if necessary.

With respect to the additional upland parcels which were referred to NYSDEC, the EPA generated the information regarding these sites during the RI. The EPA has determined that while these additional parcels require investigation and potential remediation, they likely contribute a smaller potential contaminant load as compared with the other sources to the canal. The investigation and potential cleanup of these parcels is of a lower priority than the sediments, former MGP facilities and the CSOs. As with the former MGP facilities, the EPA retains the authority to implement additional actions under CERCLA, if necessary.

Because the EPA is not directly selecting the remedy for these upland sites, the complete evaluation process for these are not addressed in the FS and other documents for this remedy. The selected remedy, which is intended to be a comprehensive overall approach for the canal, addresses the method through which

each source is handled. Additional decision documents may be necessary to select the remedy for a given parcel.

With respect to the handful of unpermitted pipe outfalls which may be active and need to be addressed, the WWFP determined:

> Overall, the total contribution of flow from these additional point sources was determined to be insignificant relative to CSO and stormwater inputs. The 154 MGD average induced flow resulting from the Flushing Tunnel, as described elsewhere in this report, further diminishes the significance of these inputs.
> NYCDEP WWFP (2008), page 4-39

The Proposed Plan and ROD state that the EPA will work in coordination with NYCDEP and NYSDEC to either permit or permanently seal these pipes. The cost of sealing a limited number of pipes is nominal. The cost of permitting would be borne by the pipe owners, not the PRPs, and is, therefore, outside of the selected remedy cost.

Comment #282: ConEd asserts that the EPA has not complied with the requirements of the NCP with respect to human health and ecological risk from exposure to PCBs that the EPA did not develop sufficient information regarding PCBs with respect to the Site, and that the PRGs and RAOs were not developed following the NCP requirements, primarily because impacts of PCBs to fish are regional as well as local to the canal.

Response #282: The EPA believes that the information developed with respect to the presence of and effects of PCB and its application through the PRGs and RAOs is not inconsistent with the NCP. Although a broader regional problem will remain for PCB exposure through fish consumption, the selected remedy indicates that the risk from this exposure pathway will be reduced. By nature, a regional problem can often only be addressed in a step-wise fashion, of which the selected remedy is one part. The documents in the administrative record adequately demonstrate both the exposure risk and the risk reduction which is anticipated. Finally, because the PCBs are co-located with other COCs within the canal sediments, it is not possible to avoid addressing the PCBs.

Sediment Bioremediation

Comment #283: Two commenters expressed concern that bioremediation is not being considered as a strategy to address the contaminated sediments. One of the commenters noted that plants have been utilized to detoxify waterways and soil. The other commenter cited an ecological designer's work in restoring a polluted canal in China to its natural beauty (http://toddecological.com/PDFs/100623.casestudy.baima.pdf) and suggested that bioremediation would be a less expensive and safer option with a better long term investment for the community.

Response #283: The cited ecological designer's effort was related to sewage discharges to surface water. This could be a potential option to address the CSOs. Bioremediation was considered in the FS as a potential technology for the cleanup of the canal. While bioremediation can successfully destroy organic contaminants in sediment, since there are so many different organic contaminants at such high concentrations present in the sediments and since the contaminants are very deep, bioremediation cannot be practically applied to this Site. Therefore, it was screened out.

Comment #284: A commenter cited phytoremediation and mycoremediation (using plants and fungi to degrade or sequester contaminants, respectively) studies conducted by the EPA's Superfund Innovative Technology Evaluation Program and suggested that they might be applicable to the Site. The commenter noted that fungi have been shown to break down the same PCBs and PAHs found in the Gowanus Canal sediments and they also have the ability to accumulate heavy metals which can then be extracted. Heavy metals, once extracted with mushrooms or other bioaccumulators do not pose the risk of leaching. The commenter also noted that mycoremediation is significantly less environmentally taxing than heat-treating the sediment to rid it of PCBs and PAHs.

The commenter also suggested the EPA conduct treatability studies on a small portion of the dredged sediment as a means to not only inform future Superfund cleanups, but serve to promote ecologically and economically effective practices.

Response #284: While phytoremediation and mycoremediation might be appropriate technologies to address some of the contaminants found at the Site under certain conditions, the physical state (volume and texture) and the chemical complexity (hundreds of organic chemicals and metals that are chemically bound in ways that make them unavailable to plant or biological uptake) of the contaminated sediments in the canal do not render these technologies suitable for either in-situ or ex-situ treatment of the sediments.

Comment #285: A commenter asked whether the data suggests that the contaminants in the canal have been increasing or decreasing as a result of microbial action.

Response #285: While some microbial degradation of the contaminants in the sediments is likely to be occurring, since the level of contamination in the canal sediments is so significant and since CSOs and upland sources continue to contribute contamination to the canal, there is no practical way to measure such degradation. The continued presence of high levels of hazardous substances which were disposed of from decades to a century ago suggest that microbial action is not having a significant effect.

Canal Dewatering

Comment #286: A commenter urged the EPA to dewater the canal, treat the water and then use natural processes to treat the contaminated sediments instead of dredging.

Response #286: While the temporary draining of all or portions of the canal to facilitate implementation of the remedy was considered, it was ruled out for the entire canal because removal of canal water could induce canal wall and bottom instabilities due to increased exerted pressures. Draining of the canal for remedy implementation would limit remedial and commercial barge access and conflict with the current configuration for CSO and stormwater discharges and odor control for such a large area of dewatered sediments would be difficult. In addition, groundwater influx, which varies throughout the canal, would require significant on-going pumping capacity.

While natural processes, such as bioremediation, can successfully destroy some of the organic contaminants in the sediment, since there are so many different organic contaminants at such high concentrations present in the sediments and since the contaminants are very deep, bioremediation cannot be practically applied to this Site.

Contractual

Comment #287: Two commenters asked who will operate the dewatering facility. Another commenter asked whether a local contractor that has pollution violations would be barred from bidding on the remediation work contracts.

Response #287: The EPA anticipates that some local workers and subcontractors may be hired by the prime contractor to provide secondary support services and materials, but Superfund cleanup work is typically conducted by experienced, specialized remediation companies that adhere to the EPA's high standards. The work will be performed by contractors bidding to construct the EPA-approved engineering designs. The contractors will be subject to EPA review, approval and oversight.

Remediation Schedule

Comment #288: A commenter stated that increasing large-scale development along the banks of the canal in combination with predicted average annual rainfall increases and rising sea levels contribute to the urgency to address the CSOs and contaminated sediments in a timely manner. Several commenters stated that they want the EPA to move forward as quickly as possible with the remedy selection, design and construction process. Another commenter asked when the remediation of the canal would be completed. A third commenter stated that those parties that are responsible for the contamination should pay for the implementation of the remedy.

Response #288: Following the selection of a remedy for the Site, it is the EPA's intention to use its enforcement authorities to compel the PRPs to undertake the performance of the design and construction of the remedy at their own expense. It is anticipated that the negotiations related to the performance of the design and construction of the selected remedy will take several months to complete. The design will take an estimated three years to perform. It is anticipated that the remediation, will

commence with the upper reach and progress downstream. Each of the three areas will take approximately two years to complete. Therefore, it is anticipated that the design will be completed in 2016 and the remediation by 2022.

Surface Water Classification

Comment #289: A commenter indicated that the community strongly supports a higher level of reclassification of the canal (swimmable) and habitat restoration at all levels (benthic, aquatic and available canal bank areas).

Response #289: The canal upstream of the Gowanus Expressway has been designated "Use Class SD," which is suitable for fish survival. The area downstream of the Gowanus Expressway is designated "Use Class I," which is suitable for finfish propagation and survival. Currently, background surface water contaminant concentrations are not suitable for swimming and habitat restoration at all levels. The degree to which the Gowanus Canal will be able to achieve a higher classification level is unclear. The primary forum to address this issue is under the LTCP and other provisions of the CWA.

Remedy Reviews

Comment #290: A commenter suggested that, given the likelihood of greater storm events in the future, the implemented remedies, in particular, the CSO abatement measures and the remedies at the former MGP facilities, should be reviewed more frequently than once every five years, particularly after storm events.

Response #290: The purpose of five-year reviews is to ensure that implemented remedies protect public health and the environment and that they function as intended by the decision documents. To conduct five-year reviews, the EPA reviews site monitoring and maintenance data. At this Site, maintenance of the cap will be performed, as necessary, to insure that it is still protective and periodic long-term monitoring will be performed to insure that the remedy continues to function effectively. Under enforcement agreements, NYCDEP will be responsible for the maintenance and monitoring related to the CSO abatement measures and National Grid will be responsible for the maintenance and monitoring related to the former MGP facilities. The EPA will review all of the monitoring data on a routine basis. It is anticipated that monitoring data following storm events will be closely scrutinized.

Wetlands Mitigation

Comment #291: A commenter suggested that the remedial plan needs to detail the issues of wetlands mitigation banking[31] as it applies to the CDF portion of the remedy, since 10 acres of what is currently legally protected open waters of the United States would be filled in. The commenter also noted that three acres of the Gowanus Canal have been filled in over the past several decades and are legally outstanding violations of the CWA.

Response #291: The EPA agrees that wetlands mitigation is an important component of the remedy. Since a CDF is no longer a component of the remedy, mitigation of the affected area is no longer necessary. A secondary benefit derived from the cleanup and restoration of the former 1st Street turning basin and the portion of the 4th Street turning basin underneath the 3rd Avenue bridge is the mitigation of wetlands impacts that may be associated with the cleanup of the canal from a series of incremental intrusions into the canal from cut-off walls and/or bulkhead restoration work. While portions of the Gowanus Canal may have been filled in violation of the CWA, other than the turning basins noted above, addressing these filled in areas under the remedy would not consistent with CERCLA.

Land Development

Comment #292: A commenter suggested that the development of the land contiguous to the canal should be thoroughly studied to determine the long-term effects and should be subject to a full environmental impact study. Another commenter expressed concern about the EPA granting special endorsements to projects like Lightstone's 700 apartment building on the canal, which the commenter believes will have a negative impact on the local environment.

Response #292: The EPA's responsibility is related to addressing the contaminated sediments. Evaluating environmental impacts associated with developing the land is outside the EPA's authority.

One of the objectives of remediating hazardous waste facilities is to restore them to productive use. There are a number of contaminated facilities along the banks of the canal that require remediation. The nature of the post-remediation use of these properties will be determined by local authorities, not the EPA. The EPA has not endorsed any particular future use of the properties located on the banks of the canal.

[31] The creation, restoration, or under certain circumstances the increased protection, of an area of functioning wetland in advance of, and to offset anticipated wetland impacts within the same ecoregion.

Comment #293: A commenter suggested that the EPA mandate that any new housing in the area not add to the CSO and that new developments that border the canal should take extensive flood precautions. A commenter suggested that high density residential redevelopment may not be the appropriate form of development along the canal banks given what is known about environmental impacts and potential meteorological changes. Another commenter asked whether the EPA will review whether future high density residential redevelopment along the banks of the canal and within the sewershed are consistent with recently adopted NYC criteria for on-Site stormwater control and green infrastructure.

Response #293: The ROD states that current and future high density residential redevelopment along the banks of the canal and within the sewershed shall adhere to NYC's rules for sewer connections and shall be consistent with current NYCDEP criteria and guidelines to ensure that hazardous substances and solids from additional sewage loads do not compromise the effectiveness of the permanent CSO control measures by exceeding their design capacity. The ROD also states that the size of the sewage retention tanks should be refined during remedial design to ensure that the tanks accommodate projected additional loads to the combined sewer system as a result of current and future residential development, as well as increased rainfall due to climate change. The EPA will undertake the necessary review and oversight to ensure the continued protectiveness of the remedy.

Comment #294: A commenter expressed concern that the construction of luxury housing along the canal would increase pressure to push noxious facilities into Red Hook, especially if new land was created by the proposed CDF. Adding more industry to Red Hook would potentially cause more industrial emissions near the ball fields, park and nearby public housing and would increase heavy truck traffic in the area.

Response #294: The EPA does not have authority over the zoning and planning approval for the development of properties along the canal. A CDF will not be constructed.

Demand Response

Comment #295: Community Board Six inquired whether the EPA can insist that a "demand response" campaign be included amongst the proposed remedies to raise awareness, affect normative behaviors and include a community action component to reduce CSO impacts. The Board also asked whether the EPA can make resources available to implement such a campaign.

Response #295: NYCDEP has been generally proactive in informing the community and involving stakeholders in developing its WWFP and LTCPs throughout NYC and for Gowanus Canal, in particular. NYCDEP convened a Gowanus Canal Waterbody/Watershed Stakeholder Team and followed a community involvement process that is well documented in its plan report. NYCDEP has performed numerous outreach efforts to raise awareness and effect behaviors to reduce CSO impacts for

pollutants, such as trash that is discharged as floatables. NYCDEP's support for water conservation provides additional capacity in its sewer systems for reducing CSOs to some extent. While such NYC-lead efforts could be combined with additional state and federal efforts to achieve some level of reductions, these efforts can only effect change on certain pollutants and contaminant discharges. It is unlikely that behavioral modifications alone would be effective enough to appreciably reduce the amounts and characteristics of solids and contaminants observed by the EPA in the RI and result in meeting the CERCLA goals without further CSO controls.

Utilities

Comment #296: A commenter suggested that the remedy require the elevation of utilities inside the 100-year floodplain surrounding the canal in order to prevent sewage, oil and other forms of contamination from recontaminating the remedy during a flood or storm surge event.

Response #296: The suggested infrastructure change is beyond the scope of the remedy and the EPA's authority. It would need to be addressed by the local government.

Green Considerations

Comment #297: Several commenters requested that the EPA use the lowest carbon footprint possible.

Response #297: The environmental benefits of the remedy will be enhanced by consideration, during the design, of technologies and practices that are sustainable in accordance with the EPA Region 2's Clean and Green Energy Policy and NYSDEC's Green Remediation Policy.[32] This will include consideration of green remediation technologies and practices.

Comment #298: A commenter noted that there are many cities that are taking measures to mitigate CSOs by reducing the contribution of stormwater to the sewers. Two commenters suggested that green infrastructure initiatives be employed at this Site.

Response #298: NYC has a commitment to the State under an Administrative Consent Order to undertake green infrastructure projects in the watershed that affects this part of the Gowanus Canal. NYC has estimated that it can achieve a ten percent further reduction of CSO inflows over the next ten or 20 years. The EPA supports such use of green infrastructure generally, and with respect to such Site-related efforts such as the Sponge Park and green street ends.

[32] See http://epa.gov/region2/superfund/green_remediation and http://www.dec.ny.gov/docs/remediation_hudson_ pdf/der31.pdf.

Institutional Controls

Comment #299: ConEd suggested that existing institutional controls (*i.e.,* the New York State Department of Health fish consumption advisory for Upper New York Harbor) is the best method to address human health risks from exposure to PCBs in the canal because the remedy will not reduce these risks to acceptable levels.

Response #299: The remedy is expected to result in risk reduction and a greater degree of protection for the local fishing community than would be achieved by institutional controls alone. As noted previously, fishing advisories are not typically a fully effective means of avoiding risk exposure, particularly in communities with EJ concerns where subsistence fish is practiced. Because the selected remedy will not fully eliminate the risk, the EPA will continue to support the dissemination of the fish advisory-related information.

Comment #300: NYCDEP noted that no details are provided on the requirements of institutional controls and there is no cost estimate for them. While some of these items will be relatively inexpensive, others–such as navigational dredging–could be significant, particularly if the EPA is successful in extending the navigational channel to the head of the canal.

Response #300: Dredging solely for navigational purposes is not considered to be an institutional control. While institutional controls to prevent damage to the cap armor layer by potential future navigational dredging are needed, the cost of obtaining such controls would not be significant. The FS costs are developed for the purpose of comparing alternatives and are not a detailed project budget.

Water Supply Contamination Concerns

Comment #301: Given the levels of bacterial and industrial contamination in the Gowanus Canal, a commenter asked whether there has been or will there be any testing of nearby residential and business tap water for cross-contamination. The commenter also stated that she tested her tap water with a store-bought water testing kit. Since the results show elevated levels of pesticides and bacteria, she requested that the water of local residents, especially those located near the pump station, former MGP facilities and major CSO outfalls be tested to ensure that there is no potential exposure pathway being generated from local contaminated groundwater impacting the drinking water supply.

Response #301: Water distribution systems are under pressure. As a result, water can leak out of the pipes, but infiltration of contaminants into the system from groundwater and CSOs is virtually impossible. Therefore, with the exception of water main breaks (where special procedures are employed to prevent water contamination), contamination of the water supply system from external sources is virtually impossible.

In order to ensure that tap water is safe to drink, the EPA and NYSDOH prescribe regulations that tell water suppliers what to monitor for and limit the amount of certain contaminants in water provided by public water systems.[33] Contaminants are monitored for microbial presence, turbidity, inorganic chemicals (*i.e.,* lead), organic chemicals (*i.e.,* pesticides and herbicides) and radioactive material. To comply with these requirements, NYCDEP has an extensive monitoring system in place to ensure that the drinking water meets all federal and state standards.

The National Primary Drinking Water Regulations and the NYSDOH Sanitary Code require suppliers of drinking water to prepare an Annual Water Supply and Quality Report. The purpose of this report is to provide the public with an annual statement regarding the quality of their drinking water. The latest NYCDEP report, *2012 Drinking Water Supply and Quality Report*, which can be found using the following link: http://www.nyc.gov/html/dep/pdf/wsstate12.pdf. As can be seen by the table on page 10, NYC is meeting the applicable standards.

Concerns Related to New York City and National Grid

Comment #302: A commenter stated that it is common knowledge that the EPA met with officials from the Bloomberg administration and National Grid, both in New York and in Washington, and that those meetings influenced the remedy proposed in the Proposed Plan. The commenter requested that details of these meetings be shared with the public.

Response #302: While the EPA had numerous meetings with NYCDEP and National Grid in the months prior to the release of the Proposed Plan to discuss technical issues related to the Site, their independent sampling efforts and their concerns about certain aspects of the remedial alternatives that were presented in the FS report, the remedy for the cleanup of the canal that was proposed in the Proposed Plan document was developed by the EPA alone with input from NYSDEC, not NYCDEP or National Grid. Presentations, correspondence and reports submitted to the EPA by the PRPs are included in the Administrative Record. During periodic meetings with the CAG, the EPA project team provided overviews of its meetings with the PRPs. In addition, members of the CAG and the public participated in meetings with officials from the EPA, NYSDEC, NYCDEP and National Grid.

The volume of comments on the Proposed Plan submitted by NYCDEP and National Grid attest to the fact that they have numerous objections to the EPA's proposed remedy (which would not be the case if NYCDEP and National Grid had unduly influenced the remedy proposed in the Proposed Plan).

[33] It should be noted that drinking water may reasonably be expected to contain small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk.

Comment #303: A commenter opined that NYC and National Grid can never be trusted to do a proper cleanup. The commenter suggested that the EPA take over the cleanup of the contaminated upland properties and make NYC and National Grid pay for the cleanups.

Response #303: When viable PRPs are able and willing to perform remedial work, it is the EPA's policy to let the PRPs perform the work under an appropriate enforcement agreement. Based on the results of the EPA's RI, several NYC-owned upland areas were found to have the potential to contribute contamination to the canal and were referred to NYSDEC for investigation and, if necessary, remediation under the State Superfund program. The investigation and remediation of the former MGP facilities, as well as the long-term control planning and CSO control measures under the CWA are being performed under NYSDEC oversight. In addition, it is anticipated that any investigation and remediation of NYC-owned upland properties will be performed under NYSDEC oversight. In the unlikely event that a timely and effective State-selected remedy is not implemented at any upland site, the EPA may implement actions pursuant to CERCLA to ensure the protectiveness of the selected remedy.

Comment #304: A commenter asked whether the EPA believes that NYC has done an appropriate job in keeping the canal clean.

Response #304: Clearly, the Gowanus Canal is not clean. In fact, the Gowanus Canal has served as an open sewer since it was initially constructed in the late 1860s. As a result of the poor environmental practices typical of the era, large quantities of wastes from many of these operations were discharged directly into the canal. By the late 1870s, sewers entering the canal carried a combination of household waste, industrial effluent from the former MGP facilities and other industries and stormwater runoff. While direct discharges to the canal from industrial activities were substantially reduced or controlled over time because of declining industrial activity and the implementation of the CWA in the early 1970s, discharges from upland contaminated areas adjacent to the canal, CSOs, storm sewers and unpermitted pipe outfalls continue to contribute contaminants to the canal. While CSOs are a very visible source of contamination to the canal, they are not the only source of contamination to the canal.

NYSDEC is currently overseeing work being performed by NYCDEP to reduce CSOs to the canal by approximately 34 percent. These reductions, however, affect only the mid- and lower canal CSO outfalls. Annual CSO discharges from outfalls at the upper portion of the canal will still contribute approximately 97 percent of the total annual CSO flow into the canal. To prevent recontamination of the canal by hazardous substances, CSO control measures for the upper reach of the canal need to be implemented under CERCLA.

Litter and Debris

Comment #305: A commenter asked how the garbage and litter will be removed from the canal.

Response #305: Urban waterways often have significant quantities of debris and oversized materials, such as cobbles, bricks, large rocks, tires, cables, bicycles, shopping carts, steel drums, timbers and automobiles located in the bottom sediments. Oversized debris that could impede the dredging will be removed before the dredging commences. Debris removal would likely be performed using an excavator positioned on a barge. Larger debris might require removal using a crane and clamshell bucket. Smaller debris will be screened out after dredging. Although garbage and litter will not be actively sought, it is likely that items located on the bottom of the canal will be captured in the dredging process.

Comment #306: A commenter asked how litter will be kept out of the canal after the remediation is completed.

Response #306: Much of the litter that ends up in the canal is washed off of the ground surface during storm events. Addressing the CSOs will prevent much additional litter from being washed into the canal. Work being performed by NYC under the CWA is expected to result in additional controls of floatables.

Environmental Justice

Comment #307: A commenter asked the EPA take into consideration and examine the Gowanus and Red Hook communities as potential EJ communities. Accordingly, the ROD would need to include an EJ assessment with a Community Involvement Plan (CIP) geared toward the needs of those communities.

Response #307: The EPA defines EJ as the fair treatment and meaningful involvement of all people regardless of race, color, national origin or income with respect to the development, implementation and enforcement of environmental laws, regulations and policies. The EPA recognizes the Red Hook area is an area with EJ concerns. An EJ assessment is included in the ROD and a CIP has been prepared. As noted further below, the EPA believes that the selected remedy will result in significant reductions in environmental exposure to all of the affected communities near the canal, including the communities with EJ concerns.

Comment #308: A commenter opined that the EPA should conduct an analysis of the burden on the EJ community with respect to installing a sewage retention tank at the former Fulton MGP State Superfund site and constructing a CDF. Two commenters stated that the EPA should assess the need to modify the implementation of the selected remedy to minimize any disproportionately high and adverse environmental burdens impacting the EJ community. Two commenters opined that the EPA should minimize any disproportionately high and adverse environmental burdens impacting

communities with EJ concerns and the environmental burdens should be shared by all of the communities along the canal. Another commenter opined that since much of the EJ community lives in close proximity to the upland facilities, the EPA should minimize any adverse environmental burdens to the communities with EF concerns and the impacts to their daily lives and businesses. The commenter further opined that unless the affected residents are involved in the planning, they will suffer health risks and disruptions associated with the cleanup without any benefit. Two commenters noted that concerns about affordable housing and gentrification will grow for the majority of the population in the area as the cleanup progresses. A commenter expressed the belief that there should be federal monitoring of demographic shifts that take place as a result of the remediation and support for a broader community involvement can focus on these issues.

Response #308: While the implementation of the remedy in the canal might present various short-term construction-related impacts to the entire Gowanus Canal community as a result of increased traffic on the roads, more frequent opening of the drawbridges and noise and the implementation of the remedies in the upland areas might present short-term impacts to those living adjacent to those areas as a result of increased traffic on the roads and noise, the actions will be performed in such a way as to not present an environmental burden on the community in terms of exposure to contaminants. In addition, the completed remediation efforts at the upland facilities and in the canal will not present a long-term adverse environmental burden on any portion of the community.

The EPA believes that the remediation of the canal will reduce the environmental burdens on the communities with EJ concerns, as well as the other residents and users of the canal area. Project benefits will include reduced contaminant levels in fish consumed by subsistence fishermen, removal of hazardous substances in sediment and upland areas and reductions in sewage discharges impacting the canal and surrounding areas during flooding.

The EPA acknowledges the desire of the community to minimize and distribute the burdens associated with comprehensively addressing the long-standing canal contamination currently impacting the various neighborhoods. As a practical matter, temporary project impacts related to the dredging, CSO controls, remediation of the three former MGP facilities and other project-related work will necessarily occur throughout the length of the canal. For example, the former MGP facilities are roughly located at the upper, middle and lower ends of the canal. Non-former MGP facilities requiring cleanup are also distributed throughout the area. Dredging will occur over the length of the canal. Approximately 50% of the volume of sediment to be removed is in the lower reach, adjacent to Red Hook. The contemplated CSO retention tanks are located in the upper and middle reach of the canal.

The EPA intends to continue to keep the public informed as to what is going on and what is planned at the Site via its website and community meetings.

One of the objectives of remediating hazardous waste sites is to restore them to productive use. The EPA has no control over the availability of affordable housing and

any gentrification that may occur as a result of the remediation of the canal and upland areas. The nature of the post-remediation use of the upland areas will be determined by local authorities.

Job Opportunities

Comment #309: Several commenters asked about the type and number of jobs that the CDF would create and what kind of training would be necessary for those jobs. A commenter suggested that the cleanup contractor work with local agencies, schools, unions and other training providers to train as many local workers as possible to alleviate local unemployment. A commenter suggested that the approximate $500 million investment in cleaning up the canal should be leveraged to benefit local low and moderate income residents with barriers to employment. The commenter suggested further that the cleanup plan specifically commit to this goal through the JTI. Another commenter noted that offering employment exclusively to people who live in a particular area violates equal employment opportunity laws.

Response #309: Although a CDF will not be constructed, substantial work will still occur. Every construction project creates jobs. At the time of the stimulus program two years ago, the President's Council of Economic Advisors estimated that one job is created for every hundred thousand dollars of construction work. Therefore, a project of this size would be expected to generate a number of jobs. Based on the EPA's experience in the Superfund program, construction jobs for Superfund project typically utilize 70 to 80 percent local workers, particularly for construction jobs that are going to last for several years. Union jobs are also usually filled on a local basis.

The EPA has been a strong supporter of job training initiatives for people who find it difficult to get into the work force because of inadequate education or personal difficulties, such as a criminal record. Through the Job Training Institute (JTI) at the Passaic River and Onondaga Lake Superfund facilities, specialized job training was provided and the PRPs encouraged their contractors to hire from that program. The EPA anticipates supporting a similar job training program at the Site. National Grid, one of the PRPs for this Site, has been a strong supporter of an existing job training program in Brooklyn.

The EPA cannot identify precisely what kind of jobs would have been created related to the CDF or the other components of the remedy. Graduates of JTI would, however, be able to fill mostly entry level jobs, such as Site security, traffic control and air and noise monitoring.

While the EPA does not have the authority to compel the PRPs to hire locally or hire from the portion of the community that is disadvantaged, the EPA is committed to encouraging the PRPs to do so.

Availability of Data in Usable Format

Comment #310: A commenter complained that since the charts and tables in the RI/FS reports are presented in Portable Document Format (PDF), performing any analysis of the data requires parsing the PDF into a usable format, which can be time consuming and inevitably increases the likelihood of transcription errors. The commenter suggested that the data be made available in a more data-friendly format.

Response #310: The RI/FS reports, including the charts and tables, were presented in PDF format on the EPA's website and the compact disc in the repositories to facilitate the public's review of these documents. The original tables and figures were prepared using Excel. These files are available on the EPA's website (see http://www.epa.gov/region2/superfund/npl/gowanus/ri_docs.html).

General Concerns

Comment #311: Two commenters indicated that their primary environmental concerns with respect to the canal were the coal tars in the upland former MPG facilities, the quality of the water in the canal and persistent localized flooding in the area adjacent to the canal that also resulted in sewer backups into the basements of homes along the canal. The commenters expressed disappointment with the fact that CERCLA was not designed to directly address these problems other than the coal tars.

Response #311: The purpose of CERCLA is to address uncontrolled hazardous waste releases; the law is not designed to address every environmental problem. The EPA is confident that the former MGP facilities will be properly addressed under the State Superfund and Brownfield Cleanup programs by National Grid. CSO controls, to the extent additional controls are needed beyond those required for the canal remedy, should be addressed under the CWA LTCP.

Comment #312: Two commenters expressed concern that the increased barge traffic in the canal related to the remediation will require more frequent opening of the drawbridges, resulting in massive traffic jams. The commenters also expressed concern that the dredging and capping effort would impact recreational boating for several years.

Response #312: The use of barges and other project-related watercraft (for sampling, support, etc.) during project operations will impact the use of other commercial and recreational water-based traffic on the canal and will impact road traffic through more frequent opening of the drawbridges. Although the EPA will, in collaboration with the PRPs and the public, develop plans during the remedial design to mitigate such impacts to the extent possible, these impacts cannot be fully eliminated.

Comment #313: A commenter opined that coordination with the NYSDEC-supervised cleanups of the former Fulton, Citizens and Metropolitan MGP facilities and other contaminated properties along the canal, coordination with the USACE on shoreline and bulkhead restoration post cleanup and NYC-wide CSO control efforts under the CWA and the 2012 CSO administrative consent order between NYC and NYSDEC are critically important to the success of the cleanup.

Response #313: The EPA is aware of the need to coordinate the cleanup of the former MGP facilities and other contaminated properties along the canal with NYSDEC, coordinate the NYCDEP-performed CSO control efforts with NYCDEP and NYSDEC and coordinate post-remediation shoreline and bulkhead restoration with the USACE, NYSDEC and NYCDEP.

The cleanup of the former MGP facilities will be completed in accordance with schedules agreed upon between the EPA and NYSDEC to insure that releases from the former MGP facilities are controlled in a timely enough manner so as not to affect the integrity of the canal remedy.

The EPA and NYSDEC are committed to working with NYCDEP throughout the remedial design to ensure that the Superfund remedy is implemented in a timely manner and that the CWA goals are met cost-effectively to the extent that the LTCP development can proceed contemporaneously.

The EPA has prepared a series of approaches to coordinate and expedite bulkhead replacement regardless of the extent to which such bulkhead replacement is part of the remedy. The EPA has already held talks with the USACE, NYSDEC and NYC about cooperative approaches to address bulkhead replacement and restoration along the canal.

Comment #314: A commenter complained that National Grid's website, for the former Fulton MGP State Superfund site, which is supposed to provide regular facility news and updates, has not been updated since September 2012. The commenter also complained that, contrary to the updating requirements of 6 NYCRR Part 375-1. 10, the Citizen Participation Plan for the facility is more than five years old.

Response #314: Since the Public Place and Fulton former MGP facilities are being addressed under state authorities, the complaints were passed on to NYSDEC.

Comment #315: A commenter suggested that the EPA adopt a "Notify NYC" system to quickly notify the public of any potential health and safety concerns regarding the Gowanus Canal cleanup, including but not limited to, flooding, air quality, accidents and spills that may occur under any of the responsible parties or agencies involved in the cleanup.

Response #315: Protocols for the notification of the public of potential health and safety concerns related to the Gowanus Canal remediation will be developed during the design with public input and will be incorporated into a Site-specific health and safety plan.

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