



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
SOLID WASTE AND
EMERGENCY RESPONSE

November 28, 2012

MEMORANDUM

SUBJECT: National Remedy Review Board and Contaminated Sediments Technical Advisory Group
Recommendations for the Gowanus Canal Superfund Site

FROM: Amy R. Legare, Chair *A.R. Legare*
National Remedy Review Board

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TO: Walter E. Mugdan, Director
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Purpose

The National Remedy Review Board (Board) and the Contaminated Sediments Technical Advisory Group (CSTAG) have completed their review of the proposed cleanup action for the Gowanus Canal Superfund site, in Brooklyn Borough of New York City, Kings County, New York. This memorandum documents the Board's and CSTAG's advisory recommendations.

Context for Board Review

The Administrator established the Board as one of the October 1995 Superfund Administrative Reforms to help control response costs and promote consistent and cost-effective remedy decisions. The Board furthers these goals by providing a cross-regional, management-level, "real time" review of high cost proposed response actions prior to their being issued for public comment. The Board reviews all proposed cleanup actions that exceed its cost-based review criteria.

The Board review is intended to help control remedy costs and to promote both consistent and cost-effective decisions. Consistent with CERCLA and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), in addition to being protective, all remedies are to be cost-effective. The Board considers the nature of the site; risks posed by the site; regional, state, tribal and potentially responsible party (PRP) opinions on proposed actions; the quality and reasonableness of the cost estimates; and any other relevant factors or program guidance in making our advisory recommendations.

The overall goal of the review is to ensure sound decision making consistent with current law, regulations, and guidance.

Generally, the Board makes the advisory recommendations to the appropriate regional division director. Then, the region will include these recommendations in the administrative record for the site, typically before it issues the proposed cleanup plan for public comment. While the region is expected to give the Board's recommendations substantial weight, other important factors, such as subsequent public comment or technical analyses of response options, may influence the region's final remedy decision. The Board expects the regional division director to respond in writing to its recommendations within a reasonable period of time, noting in particular how the recommendations influenced the proposed cleanup decision, including any effect on the estimated cost of the action. Although the Board's recommendations are to be given substantial weight, the Board does not change the Agency's current delegations or alter the public's role in site decisions; the region has the final decision-making authority.

Office of Solid Waste and Emergency Response (OSWER) Directive 9285.6-08, February 2002, *Principles for Managing Contaminated Sediment Risks at Hazardous Waste Sites*, established the CSTAG as a technical advisory group to "...monitor the progress of and provide advice regarding a small number of large, complex, or controversial contaminated sediment Superfund sites...." One main purpose of the CSTAG is to guide Regional site project managers on how to appropriately manage their sites throughout the cleanup process in accordance with the 11 risk management principles set forth in the OSWER Directive. EPA decided not to have a separate technical review by the CSTAG per OSWER Directive No. 9285.6-20, September 2009, *Changes to the Roles and Responsibilities of the Contaminated Sediments Technical Advisory Group (CSTAG)*, but instead elected to have a combined NRRB/CSTAG meeting for this site. This joint meeting format is the approach EPA plans to take in the future at CSTAG sites.

Overview of the Proposed Action

The Gowanus Canal is a 1.8-mile-long, man-made canal located in a mixed residential-commercial-industrial area in the Brooklyn Borough of New York City in Kings County, New York. Following the construction of the canal in the mid-1800s, it quickly became one of the nation's busiest industrial waterways, servicing heavy industries including manufactured gas plants (MGPs), coal yards, cement manufacturers, tanneries, paint and ink factories, machine shops, chemical plants, and oil refineries. The Gowanus Canal served as an open sewer when it was initially constructed. As a result of poor environmental practices typical of the era, large quantities of wastes from many of the industries on the canal were discharged directly into it.

The preferred remedy consists of a combination of dredging of soft sediments (the deposited sediments located above native sediments), *in-situ* stabilization (ISS) of the native sediments in areas with non-aqueous phase liquid (NAPL), and capping. The dredged NAPL-impacted sediments would be thermally desorbed/beneficially reused off-site, and the lesser-contaminated sediments would be stabilized/beneficially reused off-site or placed in an on-site confined disposal facility (CDF). The preferred remedy would include the excavation of the 1st Street Turning Basin, a former lateral canal extension that was filled with contaminated fill, and institutional controls (ICs), if appropriate, to protect the integrity of the caps and the CDF. The selected institutional controls would also incorporate the existing fish advisory to help ensure protectiveness.

In order for the preferred remedy to be effective and protective of human health and the environment, the upland sources of contamination, including the former MGPs and combined sewer overflows (CSOs), must be controlled to prevent recontamination of the canal.

National Remedy Review Board and Contaminated Sediments Technical Advisory Group Advisory Recommendations

The Board and CSTAG (hereafter, referred to as the “Boards”) reviewed the information package describing this proposal and discussed related issues with Region 2 management and staff (John La Padula, Doug Garbarini, Christos Tsiamis and Brian Carr; Joel Singerman participated via web conference) on June 20, 2012. The New York State Department of Environmental Conservation also participated by web conference. Based on this review and discussion, the Boards offer the following comments:

Site Characterization

The package provided by the Region to the Boards indicates that current background values are based on samples taken within the Gowanus Bay and Upper New York Bay. The Boards note that the open waters of the Gowanus Bay and Upper New York Bay are substantially different environments from the canal, which is a narrow, man-made waterway. The area surrounding the Gowanus Canal is heavily urbanized with a mixture of residential, commercial and light industrial land uses. Therefore, it is expected that polycyclic aromatic hydrocarbon (PAH) concentrations in the canal—even without the former manufactured gas plant (MGP) and combined sewer overflow (CSO) contributions—would be higher than the heavily flushed bay areas directly connected to the open ocean. The Boards recommend that the Region explain the basis for the selection of bay area background values and their applicability to the Gowanus Canal environment as compared to determining values that reflect anthropogenic background PAH concentrations endemic to the Gowanus Canal.

The Boards recommend that the Region provide additional information supporting its finding that contaminant releases from surface water runoff and groundwater discharge, including laterally through porous bulkheads, are not a significant contribution to risk. With regard to groundwater, the Boards also recommend that the Region explain in its decision documents how the approach is consistent with OSWER Directive 9283.1-33, June 2009, *Summary of Key Existing EPA CERCLA Policies for Groundwater Restoration* (e.g., that the cleanup approach does not rely on dilution or dispersion of contaminated groundwater daylighting into the canal).

During the presentations to the Boards the potential for recontamination was discussed. The Boards recommend that the Region: 1) develop short- and long-term monitoring endpoints to assess such potential recontamination before remedy selection to ensure that proper baseline information is collected prior to remedy implementation, and 2) if recontamination occurs, assign appropriate responsibility to mitigate the source.

One of CSTAG’s earlier recommendations was that additional data be collected to improve the understanding of sediment and contaminant transport in the Gowanus Canal and to estimate the mass balance of sediments and contaminants at the site. Additional data can be used to: 1) more accurately estimate the burial rate of contaminated sediments in the canal by clean sediments transported into the

canal from Gowanus Bay, including during flood tides; and 2) calculate the solid and contaminant loadings to the canal from the CSOs. The Boards also believe that additional data would better inform the remedial design for the site. These data should provide better quantification of the sources (specifically from the CSOs, the flushing tunnel and the bay) and help characterize the contaminant levels associated with the solids that deposit in proximity to the CSOs on which benthic feeding organisms will be exposed. The Boards recommend that the Region proceed with this data collection.

Institutional Controls

The Boards note that the Region's package and presentation did not provide detailed information on the institutional controls (ICs), which will be needed for protectiveness and to protect the integrity of the remedy. For example, the Region indicated that, even if the remedy is fully successful in achieving all stated remedial action objectives (RAOs) and cleanup levels, polychlorinated biphenyl (PCB) contaminant levels in fish, while lower, will still pose an unacceptable risk to consumers. The Boards recommend that the decision documents clearly describe the specific ICs, media to which they will apply, and area that they will cover. The Boards note that ICs should also include the existing fish advisories, especially since it is anticipated that fish and crab abundance may increase post remedy due to improvements in water quality and habitat. Current fish advisories should be updated in the event that fish populations rebound after remedy implementation and as fish contaminant levels decrease as a result of remediation.

Remedial Action Objectives/Preliminary Remediation Goals

RAOs - The Region's package included a number of RAOs for the cleanup. The Boards note that several of the RAOs are worded vaguely and recommend that the Region include RAOs that are clearer, measurable and describe the objectives to be achieved by the remedy. The Boards also note that the Region's presentation indicated an unacceptable risk to the environment from direct toxicity to the benthic community as evidenced through the toxicity testing conducted at the site. The Board recommends that the RAOs more clearly reflect this information.

Preliminary Remediation Goals (PRGs) – Based on the presentation to the Boards, urban runoff and CSO overflows will discharge to the canal at some level. These discharges will contribute site related contaminants which may accumulate in the canal sediments. The Region indicated that the individual chemicals' contaminant accumulation might result in recontamination leading to the cleanup no longer being protective of human health and the environment. The Boards recommend that the Region clearly explain the basis for each PRG in the decision document, including the causal linkage between site-related risk and the PRGs.

PRGs for PAHs – Based on the presentation, it was unclear to the Boards how the Region has interpreted and used the data generated for the development of the PAH PRG. For example, it was not clear whether or how the toxicity testing data collected during the remedial investigation have been used to develop an RAO or select a sediment PRG. The Region's preferred approach uses a PRG that is the PAH concentration in surface sediment at which the predicted level of toxicity is low or negligible. This concentration is used to ensure that the remedy achieves protectiveness of human health and the environment regardless of the causative contamination's source. The Boards recommend that the Region clearly explain in the decision documents how the available data are being considered in the

development of the sediment PAH PRG, including how the data were interpreted and used as the basis for the PAH PRG.

The Region's package indicates that the PRGs for PAHs and other contaminants of concern (COCs) are based on ecological risk and human health direct contact. The presentation to the Boards also indicated that subsistence fishing and other exposures occur in the canal; the baseline human health risk assessment, however, only evaluated recreational fish ingestion scenarios. To better reflect the findings of the human health risk assessment, the Boards recommend that the Region develop subsistence fishing PRGs (i.e., the expected concentrations in fish tissue) for PAHs and other COCs in fish and shellfish tissue that is protective of human health through fish/shellfish ingestion; this information can then be used in determining a site-wide final cleanup level that is protective of human health and ecological receptors.

PRGs for Copper and Lead - The Region's package indicates that the PRGs and subsequent cleanup levels for sediments be set at 80 mg/kg for copper and 94 mg/kg for lead. The Boards note that these chemical-specific PRGs and cleanup levels would be used to define the areal extent addressed by the remedial action and to measure remedy performance over time (taking into account potential recontamination). The Boards recommend that the Region explain in its decision documents the scientific and technical basis used for developing individual PRGs; for example, the Region should explain whether and how it evaluated technical issues such as the application of equilibrium partitioning, acid volatile sulfide/simultaneously-extracted metals testing, and other aspects of sediment chemistry that may impact contaminant-specific risks. The Boards note that, given the high organic carbon content, an organo metal complex may prevail as well as the acid volatile sulfides reaction; the differences are that the organo metal complex is mobile, may be toxic, biologically available, and may be the dominant reaction. The Boards also note that a geochemical model would be useful in predicting and determining which reaction may be dominant given site-specific input and field data; results from this modeling can be used as the basis for additional sediment investigation or decision making. The Boards recommend the Region investigate or determine the dominant metal reaction occurring in the sediments that controls metal mobility and aquatic toxicity or bioavailability. Obtaining detailed information on copper speciation in both solids and sediment pore-water is recommended. The Boards also recommend that the decision documents include further clarification on the basis for these PRGs' development.

In addition, based on the package and presentation to the Boards, several COCs were identified, but only a limited number of PRGs were developed. The Boards recommend that the Region in its decision documents explain the basis for the final list of COCs and associated PRGs.

PRGs for PCBs - The Region acknowledged during its presentation that there are unacceptable human health risks arising from the ingestion of PCB-contaminated fish and crabs and, as a result, included an RAO for this pathway. It is unclear to the Boards, however, what the sources of these PCBs are since PCBs in fish tissue from the harbor reference areas were high enough to cause unacceptable risk. Furthermore, it was unclear to the Boards how much risk reduction can be expected from remediating the canal sediments and reducing the CSO releases. The Boards recommend that the decision documents should include sediment and fish tissue PRGs for PCBs and provide the timeframe for when these PRGs are expected to be achieved. The Boards note that this information should help evaluate remedy protectiveness for five-year reviews.

Consistency with the NCP – The Boards note that the PRGs presented by the Region for surface water and sediment are based on a level of protection at 10^{-5} (one in 10 thousand). The Boards note that, consistent with the NCP, remediation goals for carcinogens should be developed using 10^{-6} (one in a million) as the point of departure. The Boards recommend that the PRGs and RAOs be written in a manner that is consistent with the NCP and OSWER Directive 9355.3-01, October 1988, *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA*, and that the Region explain in its decision documents how it developed the surface water and sediment PRGs and RAOs in a manner that is consistent with the NCP and existing Superfund guidance.

Remedy Performance

Source Control – Based on information provided to the Boards, there are multiple sources of contamination causing releases into the canal— primarily, the former MPGs and CSOs. The Boards recommend that all continuing contamination sources be identified and evaluated, in part to determine which ones can be controlled, as discussed in OSWER Directive No. 9285.6-08, February 2002, *Principles for Managing Contaminated Sediment Risks at Hazardous Waste Sites*. The Boards further recommend that the Region determine to what degree contaminant releases should be controlled, inclusive of CSOs (especially at RH-034, as this outfall is a major source of contaminants), in order for the remedy to remain protective.

Long-Term Effectiveness – Based on information presented to the Board indicating multiple contamination sources (e.g., RH-034 and OH-007), which, if left unabated, the PAH contributions of the CSOs in the upper part of the canal may impact the protectiveness and long-term effectiveness of the proposed remedy. The Region expressed its belief that the former MPG sources will be brought under control in a timely manner pursuant to State enforcement orders. The Region also indicated that there is a consent order between New York State and New York City regarding CSO discharges control. With regard to the CSO outfalls, the Region discussed a number of options for reducing the discharge of solids (including PAHs that are associated with these solids) into the canal (e.g., in-line storage, sediment traps, weirs, and retention). The Boards recommend that the Region explain in its decision documents how the comingling of solids and associated addition of PAHs from the CSO outfalls (specifically RH-034 and OH-007, since they are at the head of the canal) with other COCs in the canal potentially impacts the integrity and long-term effectiveness (e.g., through recontamination) of a CERCLA remedial action (i.e., dredging and capping) at this site. The Boards also recommend that the Region consider developing contingencies for the remedy selected to address potential future releases leading to incomplete source control (e.g., if the former MPG cleanups are not 100 percent effective).

CSO Discharges – Based on information presented to the Boards, the Region believes a reduction of CSO solids discharges may be appropriate primarily on the basis of PAH concentrations on CSO solids. The Boards note that the Region stated that the range of PAH concentrations associated with CSO solids overlaps the range of toxicity values under consideration for PRG development. In addition, anthropogenic background contaminant concentrations in an industrial canal (as discussed under site characterization above) may also be within the range of PAH concentrations on CSO solids. The Boards recommend that in its decision documents the Region explain why it believes a CSO response is an appropriate part of the CERCLA preferred remedy; in particular the Region should clearly explain the basis for determining that CSO solid PAH concentrations are elevated compared to anthropogenic background PAH concentrations and establishing the preferred remedy's toxicity-based cleanup levels.

Cap - The preferred remedy presented to the Boards includes a cap with an armor layer consisting of large rocks. The Region indicated that all contamination in the native sediment would not be removed from the canal, and the armor layer is necessary to protect the cap from propeller wash. The Boards note that the armor layer would make it extremely difficult to perform future dredging that may be required as part of the remedy's operation and maintenance. The Boards recommend that the Region consider the need to carry out future dredging operations when evaluating options for designing the cap's protective cover system.

Solidification - The Region indicated that it is considering the use of ISS to prevent the upward migration of NAPL from the native sediment to the soft overlying sediment to prevent recontamination of surface sediments once dredging is complete. Based on the information provided to the Boards, it is not clear whether NAPL is migrating upward from the native sediments to the soft overlying sediments, especially given the low upward groundwater velocity. The Boards note that the NAPL at the interface of the native and overlying sediment could be present from downward migration or from lateral migration. Since the Region indicated that any lateral migration will be addressed by the former MGP cleanups the Boards recommend that the Region document and/or further evaluate whether NAPL is migrating or has the potential to migrate upward such that solidification is necessary in addition to the planned sediment cap to achieve a protective remedy.

With regard to solidification as a way to prevent upward NAPL migration, the Boards note that this approach may adversely affect groundwater flow paths due to the size of the area planned for solidification, as solidification generally decreases the solidified mass' permeability. This decrease can raise the level of groundwater in the aquifer and result in migration of groundwater to other destinations (e.g., negative impacts to nearby basements). The Boards recommend that the Region carefully evaluate how much decreased permeability is acceptable before solidification causes adverse impacts to the groundwater flow. Since it is harder to accurately control solidification agent dosing in the field compared to the laboratory, the Boards recommend that the Region perform a pilot study to evaluate the sensitivity of permeability to the application of the solidification/stabilization agent. The Boards recommend that the decision documents include a contingency to address and mitigate potential adverse impacts on groundwater flow, if the Region decides to consider the solidification process as part of the remedy.

The Boards note that the addition of a one foot oleophilic clay treatment layer as specified in the feasibility study may be adequate to minimize advective transport of PAHs without the underlying native sediment needing to be solidified. The Boards recommends that the Region further evaluate whether the specified cap thickness is adequate without solidifying the native layer or if a thicker cap could eliminate the need to solidify. Whether the native layer is solidified or not, the Boards note that control of gas migration minimizes the release of contamination by ebullition.

Contingency - Based on the package presented to the Boards, the Region's preferred approach would include an oleophilic clay treatment layer to prevent dissolved phase and NAPL from discharging into the canal. The Region indicated that at some point, this treatment layer may become saturated such that it may need to be replaced. The Boards recommend that the Region consider developing and proposing a contingency remedy (and estimated associated costs) to address possible replacement of the treatment layer. The Boards believe that an important factor for the Region to consider in this regard is that

materials may settle on top of the treatment layer (e.g., if upland sources are not controlled sufficiently or in a timely manner).

Alternative Approach – Another of CSTAG’s earlier recommendations was that the Region consider developing and evaluating an alternative (or component of an existing alternative) that includes the temporary draining of all or portions of the canal (e.g., head of canal, shallow areas, turning basins, areas slated for ISS) to facilitate implementation of the current preferred remedial approach. Including such an alternative in the proposed plan should provide the community and other stakeholders with an opportunity for meaningful input in the remedy selection process. If feasible, dewatering would address several complexities of the preferred remedy, including employing ISS under wet conditions, encountering debris while dredging, and placing three distinct cover layers; it would also help facilitate bulkhead replacement. The Boards recognize this may involve temporarily redirecting several outfalls, which the Region appears to have already explored (e.g., RH-034 to the flushing tunnel).

Stakeholders

The Region’s package stated that the remedy would be implemented using an adaptive management approach. During the presentation and subsequent discussions, the Region clarified how this approach might work. The Boards note that many of the decision points were in remedial design. Consistent with the NCP, the public should have meaningful input into the remedy selection process. The Boards recommend that the decision documents include a decision tree or similar visual presentation of the remedy selection and CERCLA decision-making process, as well as clear explanations of the decision points and the rationale for selecting remedial action alternatives, how the Region will make the decisions, and how the public will be given a reasonable opportunity to comment.

Scope of Action

The Region’s package included information on: 1) sources of contamination and potential recontamination of the canal, 2) use of CERCLA authority to select a remedy for the site, and 3) use of State enforcement authorities to secure source control actions at the three former MPGs and to achieve the anticipated extent of CSO improvements by New York City as part of compliance with Clean Water Act (CWA) requirements. The Region’s package also states that the CWA-contemplated actions by themselves will not be sufficient, that other interim or permanent CSO actions are needed, and such actions will be required as part of the Superfund remedy. No specific actions to address CSOs were included in the Superfund alternatives presented, although the use of CSO holding tanks was considered as a conservative high-cost option. The Boards recommend that the Region more clearly explain in its decision documents the full scope of its preferred alternative and include a cost estimate that covers all components of the CERCLA cleanup. In particular, the Boards recommend that the decision documents clarify: 1) the role of CERCLA response authorities with respect to cleanup actions needed to prevent recontamination from CSOs that could undermine the integrity of the CERCLA cleanup; 2) the relationship to the CERCLA cleanup of any CSO interim actions that may be undertaken pursuant to the State enforcement order; and 3) the costs associated with CERCLA response actions needed to prevent or minimize recontamination from CSOs that could undermine the integrity of the canal cleanup.

Conclusion

We commend the Region's collaborative efforts in working with the Board, CSTAG and stakeholder groups at this site. We request that a draft response to these recommendations be included with the draft proposed plan when it is forwarded to the Office of Superfund Remediation and Technology Innovation's Site Assessment and Remedy Decisions (SARD) branch for review. The SARD branch will work with both your staff and the Board to resolve any remaining issues prior to your release of the record of decision. This memo will be posted to the Board's website (<http://www.epa.gov/superfund/programs/nrrb>) and CSTAG's website (<http://www.epa.gov/superfund/health/conmedia/sediment/cstag.htm>) within 30 calendar days of our signatures. Once your response is final and made part of the site's administrative record your response will also be posted on the Boards website.

Thank you for your support and the support of your managers and staff in preparing for this review. Please call Amy Legare at (703) 347-0124 or Steve Ells at (703) 603-8822 should you have any questions.

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