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Ms. Amy Legare
Chair
National Remedy Review Board
United States Environmental Protection Agency
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**Re: Gowanus Canal Superfund Site
National Remedy Review Board Site Review**

Dear Ms. Legare:

The City of New York ("City") submits these supplemental comments to assist in the National Remedy Review Board's ("NRRB") evaluation of the Gowanus Canal Superfund Site because two key documents were issued following the City's timely submission of its NRRB comments on May 18, 2012: (i) EPA Region 2's response to the recommendations of the Contaminated Sediment Technical Advisory Group ("CSTAG"), dated May 29, 2012 ("Region 2 CSTAG Response"); and (ii) National Grid's comment letter to NRRB, dated June 1, 2012 ("Grid NRRB Comments"). Both documents raise significant new concerns that warrant this response.

1. Concerns With EPA CSTAG Response

**(a) Lack of focus on "Threshold Question" Concerning
Need for CSO Controls to comply with CERCLA**

CSTAG recommended that the Region collect more data to evaluate various potential sources, including from CSOs. The City supports this recommendation. To stress the importance of this work, the City met with EPA Headquarters in March 2012 to discuss its concerns with the data presented in the RI/FS. The City provided a detailed technical analysis demonstrating that the existing CSO-related data and analyses are insufficient to demonstrate the need for CSO controls.

At the request of EPA Headquarters, there was a series of technical meetings where the City presented several studies and analysis of the

incomplete CSO data collected, which do not demonstrate that CSOs contribute total PAHs to the Canal at levels that pose unacceptable risks to the environment. Following these meetings, the participants agreed to supplement the existing data and analyses contained in the RI/FS. The City has since submitted a work plan to EPA that is intended to thoroughly evaluate potential impacts of CSOs on canal sediments and additional CSO-related data collection should begin this summer.

In its response to CSTAG, the Region acknowledges the ongoing nature of these technical discussions. Specifically, the Region states: “The Region has not yet achieved a consensus with DEP on the various issues relating to CSOs. The Region recognizes further coordination and discussions are necessary.” See Region 2 CSTAG Response, at 5. Despite these acknowledgements, the Region continues to insist upon the need for significant additional CSO controls, even prior to the necessary collection of the additional data.

The Region cites only two bases for this position. See Region 2 CSTAG Response, at 8. First, the Region relies on the same data, theories and analyses that preceded the technical meetings. And second, the Region relies on a hydrodynamic model that it has never reviewed or validated, an issue which is discussed at length in Section (b). Furthermore, neither the existing data and analysis nor the hydrodynamic model consider the changes to the Gowanus Canal Pumping Station and the upgrade to the Gowanus Canal flushing tunnel and are therefore not representative of future conditions in the Canal.

CERCLA in general and the NCP specifically is intended to follow a stepwise scientific process that bases remedial measures on high quality data and analyses. The City urges EPA not to engage in presumptive remedial decision-making based on incomplete data. For example, despite the need for more data, the Region states that it is “actively seeking to maximize the level of CSO controls” and references what it wrongly describes as “capital cost savings” and “synergies” related to how, in the Region’s view, these maximum CSO controls could be achieved by the City.¹ See Region 2 CSTAG Response, at 5; see also Region 2 CSTAG Response, at 10 (stating “the Region will seek solids reductions for the nonaddressed CSOs consistent or less than levels that will be achieved for the outfalls under DEP’s current CWA program and maintenance of sediment in the canal over the long term”). Further, the response states “[w]hile the Region agrees that additional data collection will be helpful, it is not necessary to delay the remedy selection process while the data are being collected.” See Region 2 CSTAG Response, at 15 (also stating that CSO sampling and other critical work “will be performed as part of pre-design and remedial design activities”). Consistent with the National Contingency Plan (“NCP”), CSTAG recommended filling data gaps *before* selection of remedy, not as the Region now proposes *after* remedy selection and during remedial design.

(b) Premature Reliance on Grid’s Undisclosed Hydrodynamic Model

¹Notably, one of the potential locations for CSO controls that EPA appears to refer to is a public park (the “Fulton Municipal”), and the other is the future site of a planned affordable housing project (“Public Place”).See EPA CSTAG Response, at 5.

In its response to CSTAG, the Region cites to a hydrodynamic model prepared by Grid in support of the hypothesis that CSOs are contributing substantial solids loads to the Canal, over and above tidal sources. See Region 2 CSTAG Response, at 8. The Region further states:

While the Region initially utilized the two-dimensional hydrodynamic model obtained from USACE, National Grid has since developed and refined a detailed hydrodynamic model. Outputs from National Grid's model (which the company continues to refine) are consistent with EPA's CSM. National Grid's work confirms the importance of additional CSO controls in the upper canal.

See Region 2 CSTAG Response, at 15.

From these statements, it appeared to the City that Region was heavily relying on the Grid's hydrodynamic model, and thus the City presumed that the Region had fully reviewed the model's design, inputs, assumptions, and calibration runs. However, when the City requested that EPA provide the model, or at a minimum, the modeling reports produced by Grid, EPA stated that the only documentation it has thus far received concerning the model is an 11-slide power point presentation (two slides of which are entirely non-substantive), which was presented by Grid at a meetings in December 2011 and on April 23, 2012 (see Attachment 1). The City was present for a 15-20 minute introduction to Grid's model at the April 23, 2012 meeting. The City has substantive concerns and questions regarding the calibration and code for the model. The City requested to review the inputs and outputs to the model because the calibration process that was described appeared forced and the model was not demonstrated to be replicating for contaminants, but only for sediments. Since that time, EPA has stated that it possesses no other documentation on the hydrodynamic model constructed by Grid, indicating that EPA has not vetted the model's inputs and assumptions, or conducted a thorough review of its calibration runs. Thus, the Region's reliance on this hydrodynamic model in its CSTAG response must be discounted entirely and demonstrates the absence of any rationale to proceed with remedy selection prior to filling the data gaps identified by CSTAG.

Indeed, it is the City's understanding that the hydrodynamic model is still under development, and limited by the numerous data gaps at the site. In its comments to NRRB, Grid explicitly states:

National Grid has developed and calibrated a hydrodynamic and sediment transport model to better understand [flow dynamics and sediment transport potential]. *Unfortunately, the data gaps identified above limit the utility of this potentially powerful tool.* For example, quantifying the frequency, magnitude, and average annual discharges from the CSO and storm sewer system and knowing the actual flow rates from the soon-to-be upgraded flushing tunnel are critical to evaluating the potential for scour, flooding, and remedial construction approaches. Without first filling these data gaps, it is not possible to predict whether a

potential cap will be stable under average flow conditions let alone under extreme storm surge conditions.

See Grid NRRB Comments, at 5 – 6 (emphasis added).

The fact that the creators of the model expressly acknowledge the model's current limitations, demonstrates that it is not appropriate for the Region to rely on this model to draw any conclusions at this time. Thus, conclusions concerning CSOs in its CSTAG Response should be disregarded, given that the Region itself has not reviewed the actual model, and that Grid openly acknowledges the model's current limitations.

(c) Failure to Address Questions of Implementability

Under the Region's anticipated schedule, CERCLA-related CSO controls for the upper canal (the location of the largest CSO outfalls) would have to be fully designed, constructed, and operational by December 2015, which is only three and a half years from now. CSTAG recommended that the Region carefully consider the extreme difficulty of implementing major new CSO controls on the Gowanus Canal, especially in such a very short time frame.

The Region 2 CSTAG Response expressly recognized CSTAG's concerns, stating "It appears that CSTAG is recommending an interim ROD, primarily, because it believes that the CSO contributions cannot be timely addressed prior to the implementation of the CERCLA remedy." See Region 2 CSTAG Response, at 16. However, rather than directly address this recommendation, the Region continues to refer to its project schedule and insists that any issues, including addressing the multiple existing data gaps, can be resolved during the two year design phase. See, e.g., Region 2 CSTAG Response, at 15 (stating "While the Region agrees that additional data collection will be helpful, it is not necessary to delay the remedy selection process while the data are being collected" and "these investigations...will be performed as part of pre-design and remedial design activities").

The City again stresses that the Region should follow a logical, stepwise process to address the issue of CSO source controls consistent with the NCP. As discussed in Section 1(a) above, the first step in the process is addressing whether CSOs contribute total PAHs to the Canal at levels that pose unacceptable risks to human health or the environment. If the data indicates that the answer to this question is yes, the next step must be to evaluate source control alternatives against the nine NCP criteria, including cost and implementability. If the PRAP and ROD are issued under the current circumstances and without any consideration of the additional data needs that the City has proposed to address in its work plan, then there will be significant uncertainty in the design phase with regard to the level of CSO source controls needed. This ranges from the possibility that no additional controls are required, and stretches over a wide spectrum from the possibility for source control, in-stream controls, or major capital projects that might cost up to a billion dollars, take a decade to design and construct, and would be extremely expensive to operate and maintain. The current absence of this analysis increases the likelihood that any source controls required in the ROD would not only be unnecessary, but also be extremely difficult to construct, especially under EPA's current project schedule.

(d) Adaptive Phasing of Source Control and In-Canal Remedy

CSTAG recommended that the Region adopt a more flexible, adaptive approach to source control and in-canal remedial activities. CSTAG suggested that the Region consider either an interim source control action that addresses buried NAPL and coal tar deposits or, alternatively, postpone in-canal remedies “until sufficient cleanup of the former MGP sites has occurred.” See Region 2 CSTAG Response, at 6. CSTAG also stated that “[the] final remedy for the Gowanus Canal sediments could be implemented after additional source control activities have been implemented *and their effects on improving sediment and water quality are better understood.*” Id. (emphasis added). These source control activities include both remediation of the MGP sites and implementation of the already scheduled CSO upgrades. In other words, CSTAG recommended consideration of post-source control sampling to redefine baseline conditions in the Canal following completion of these upcoming activities.

Post-source control site characterization could better define and inform the scope of penultimate in-canal remedial action. The Region should at least consider an alternative schedule that would allow for the first phase of Gowanus Canal source control improvements (the current CSO upgrades under the Clean Water Act, and the MGP remediation under the State Superfund program) to be fully implemented and then evaluated in order to determine their effect on the sediment conditions within the Canal. This alternative schedule would provide an opportunity for stakeholders to consider the benefits of an adaptive management approach, and also allow for field work to continue to better characterize the site conditions to fill known data gaps and develop a final remedy that is consistent with the NCP.

(e) Known Data Gaps

While there are significant areas of disagreement between the City’s and Grid’s comments to NRRB (discussed in Section 2 below) both letters highlight the known data gaps on issues that are fundamental to adequately characterizing and remediating the site. See generally City Comment Letter to NRRB; see also Grid NRRB Comments, at 6 – 7. CSTAG also noted serious data gaps, including the need for a clearer conceptual site model. See Region 2 CSTAG Response, 13 – 14.

The Region recognizes the need to collect more data and conduct more analyses but, as indicated above, the Region views these activities as “pre-design and remedial design activities.” See Region 2 CSTAG Response, at 15. The existing data gaps, however, are too significant to address as part of the remedial design, and both the City and Grid take the position that the best course of action is that the additional studies should be performed prior to the issuance of the final ROD. Obtaining this data will assist EPA and the stakeholders to craft a more effective remedy for the Canal, and one that will not have any unintended collateral impacts such as bulkhead destabilization or groundwater mounding.

2. Response to Grid NRRB Comments

The City has reviewed the Grid NRRB Comments, which were provided to the City on June 1, 2012, two weeks after the City submitted our NRRB comments according to Region 2’s stated deadline. With the permission of the Region, this is the City’s response to comments and arguments posed by Grid on evaluations developed by the City. The Grid NRRB Comments discuss various analyses and presentations developed by the City for EPA Region 2

and Headquarters. The City does not agree with Grid's characterization of the City's concerns regarding ecological toxicity, testing, the Region's evaluation of the RI data, a PAH study conducted in Boston, or the utility of its sediment transport "model" which, as the City understands, is still in the development phases and does not have the proper data needed for calibration. These and other issues are discussed below.

(a) Development of the Ecological PRG Using Data Collected for the Gowanus RI.

Response to Grid NRRB Comments, Page 20 Para. 1: The City's concern with the repeated testing, the excess holding times, and the lack of dose response is that these three problems introduce uncertainties that are unaccounted for in the calculation of the PRG. Such uncertainties should be addressed before relying on these data to estimate the PRG for such an important project.

The City's position is based upon the information in Appendix K (the Gowanus Canal Ecological Risk Assessment). The City recognizes that only information from the third set of tests performed by EPA was used to estimate a PRG. But the EPA does not provide any information in Appendix K about how the laboratory handled sediments between tests. The City is concerned about whether the test laboratory exhausted the test sediments in performing three tests (two failed *Leptocheirus* tests and the *Nereis* tests) before finally acquiring sufficiently healthy test organisms to proceed with the *Lepthocheirus* testing. This leaves unresolved the questions of whether the tested sediments from sub-samples were previously distributed to test vessels for the first two failed tests, how these samples were stored, and how much sediment handling was required to finally complete the toxicity testing. The uncertainties introduced by these issues can easily be addressed by simply repeating the toxicity testing. This level of care in addressing uncertainties is commensurate with the scale of the Gowanus Canal project.

Response to Grid NRRB Comments, Page 20 Para. 3 and 4: Holding times introduce large uncertainties into the toxicity testing. EPA has violated its own guidance (EPA, 2001; EPA, 1994a; EPA 1994b) for these tests, which recommends two week holding times and always less than 8 weeks to minimize test variability and effects on toxicity (in either direction). As Grid concedes, the EPA toxicity testing program held the sediments for 16 weeks before testing. This is eight times the preferred holding time of 2 weeks, and twice the maximum recommended holding time in EPA Guidance (the guidance which Appendix K purports to have followed). Grid erroneously cites ASTM method E1688-10 as guidance for conducting toxicity tests to justify their point that longer holding times are acceptable. ASTM E1688-10 is not a toxicity test method. It is a Standard Guide for Determination of the Bioaccumulation of Sediment-Associated Contaminants by Benthic Invertebrates, not a "guidance for conducting benthic toxicity tests." In fact, the ASTM guidance for conducting toxicity testing recommends a two week holding time (ASTM, 2000). That error aside, Grid's contention that the longer holding times are acceptable because stable higher molecular weight compounds like PCBs are unlikely to be affected is irrelevant because we do not know the range of chemicals present in the test sediments. In the face of such unknowns, there is considerable uncertainty in violating EPA and ASTM guidance regarding holding times.

Response to Grid NRRB Comment, Page 20 Paras. 5 and 6: The City agrees with Grid regarding the difficulty of “assigning toxicity to a specific contaminant.” This significant source of uncertainty makes it all the more important to control the experimental uncertainty referenced in the above paragraphs. Furthermore, the City notes that any discussion concerning threshold concentrations using these data must account for the confounding factors of oil and tars introduced into the sediment testing and left unacknowledged by the EPA risk assessment. The physical and chemical nature of the toxicity testing samples injects significant uncertainty into EPA’s interpretation of the toxicity test data and their use of these data to calculate a PRG. An examination of the sediment collection logs (EPA, 2010) reveals that the sediment samples were often characterized by having sheens, petroleum odors, tar-like odors, and high PID readings (indicating VOCs in the samples). The presence of these physical impacts (oils and tars in the tested sediments) has the clear potential to confound the interpretation of any possible relationships between the toxicity test results and the concentrations of specific chemical compounds.

(b) Impact of MGP Sites on CSOs.

The City, in its evaluation of the CSO whole water data, has found that three CSOs adjacent to the Fulton MGP site have higher Total PAH values when compared with the other CSOs and could be potentially impacted by the Fulton MGP site. City has provided this evaluation to NRRB in its initial May 18 comment letter. In its comments, Grid has cited to a study on PAHs in urban and suburban stormwater runoff in eastern Massachusetts to argue against that the City’s assertion of the possibility of MGP impact on CSOs that drain the Fulton MGP. There are several problems with Grid’s interpretation and representation of this study and its application in the comment letter. The City’s concerns are as follows:

In citing the Menzie C, *et.al* (2002) study, Grid presents only the stormwater data and not the CSO data which was also collected as part of this study (Menzie-Cura, 1995). In the paper, the stormwater samples collected were analyzed on a whole water basis and reported as mass of PAH per liter. However, the authors also expressed the results as mass of PAH per mass of TSS. The City’s review of the data suggests that there is no relationship between PAH concentration and TSS in these whole water samples. Therefore, the true distribution of the PAHs between the solids and dissolved phases is unknown, especially for the lighter fractions (which are more soluble). Hence the quotient of the mass of PAH per mass of TSS is not a true representation of the PAH concentration on solids from stormwater.

The Grid NRRB Comments state that the Massachusetts stormwater solids conveyed naphthalene and methylnaphthalene (median concentration of 4,800 and 5,370 mg/kg), and from that extrapolate to the conclusion that the presence of these two compounds at higher concentrations in Gowanus Canal CSO cannot be attributed to the Fulton MGP. The City believes that this extrapolation does not follow from the data collected in the Gowanus Canal. First, the median concentrations specified by Grid are three orders of magnitude higher than the values presented in the citation; the correct numbers are 4.8 and 5.37 mg/kg respectively. Second, as discussed above, these concentrations on solids are derived from the whole water data and TSS measurements and not an actual measurement of the Total PAH concentrations on solids from stormwater. The City’s evaluation of the data shows that on a whole water basis, the median naphthalene and methylnaphthalene (C1-naphthalene) concentration in the storm water

samples from the Menzie *et al.* work are 0.1 ug/L and 0.05 ug/L respectively with maximum concentrations of 1 ug/L and 0.7 ug/L. This is significantly lower than the whole water naphthalene and 2-methylnaphthalene concentrations measured by EPA in CSOs adjacent to Fulton Street. In these potentially impacted CSOs, the RI data shows that naphthalene and 2-methylnaphthalene concentrations were as high as 29 ug/L and 3.4 ug/L respectively, roughly 30 and 5 times greater, respectively. This evidence clearly supports the City's assessment, which indicates that these CSOs may be impacted by the Fulton MGP site, or at least by other industrial discharges in these small sewerage areas.

Furthermore, Grid draws its conclusions solely from the stormwater data when CSO data is available from the study (Menzie-Cura, 1995). The CSO data reported by Menzie-Cura supports the City's assessment of CSO data collected by the EPA with respect to magnitude of whole water Total PAH concentration in CSO effluent. The average Total PAH (sum of 16 PAHs) concentration in the CSO in Massachusetts is 2.2 ug/L, which is approximately six times lower than the average Total PAH concentration (13 ug/L).d The average CSO concentration observed in the CSOs which the City defines as unimpacted is 3.8 ug/L).

The comparison made above considers only the 16 PAH compounds included on EPA's target compound list (TCL). The PAH data in the Massachusetts study included the full set of alkylated and non-alkylated PAHs. Grid suggests that the use of EPA's data, which only reports a truncated list of PAH, resulted in the City's misrepresenting the presence of high naphthalene and methylnaphthalene concentrations as attributable to an MGP source. Grid further suggests that these compounds are prominent in petroleum. This assertion is without merit because, when the same truncated list of PAHs is used to asses both the EPA data and the Massachusetts storm water data as described above, naphthalene comprises more than 50 percent of the Total PAH concentration in the samples obtained from the CSOs adjacent to the Fulton MGP, whereas the storm water sites in Massachusetts contain an average of 12 percent naphthalene.

Further evidence for the likely industrial impact on the Fulton Street CSOs is given by the observations of groundwater and sediment samples saturated with MGP NAPL that contain 90 percent or more naphthalene as a fraction of Total PAHs. These observations support the City's position that naphthalene is a major component of the PAH signature in the CSOs adjacent to the Fulton MGP and that it could be due to the impact of the MGP sites or other industrial discharges in the area. The City, in its efforts to understand its CSO contamination, has developed a sampling plan to investigate the impact of MGP sites. The City presented this work plan to Region 2 in May 2012.

(c) Modeling Requirements

The City concurs with Grid's overall conclusion that "key technical studies must be completed prior to evaluating remedial alternatives for effectiveness." The City believes that one of the most important technical studies to complete is the development of a hydrodynamic and sediment transport modeling framework to be shared among and jointly applied by the Region, Grid, and the City. The Gowanus Canal modeling framework should be developed in accordance with EPA's guidance for applying models to a sediment site found in EPA OSWER's

EPA's guidance states that:

Where appropriate, project managers also should make use of numerical models for predicting future conditions at a site. There is a wide range of models, from simple to complex, which can be applied to contaminated sediment sites. Where numerical models are used, verification, calibration, and validation should be typically preformed to yield a scientifically defensible study. While quantitative uncertainty analyses can be performed for watershed loading and food web models, at the current time they cannot be generally performed for fate and transport models. However, frequently a sensitivity analysis can be used to identify the model parameters that have most impact on model results, so that the project team can ensure that these parameters are well constrained by site data.

Based on EPA's guidance, the City requests that NRRB recommend to the Region that the modeling framework under development by Grid must include: verification/peer review, calibration, validation, and sensitivity analysis so that it can be shared and confidently applied by the Region. While the City very much favors a shared modeling framework as the most efficient and cost-effective approach to modeling for the site, the City is prepared to develop its own Gowanus Canal hydrodynamic and sediment transport modeling framework in accordance with EPA guidance if Grid and the Region are not agreeable to moving forward with a shared framework that is developed in accordance with the EPA guidance.

Grid claims to have "already performed a number of studies, including the construction and calibration of a three dimensional hydrodynamic flow and sediment transport model, a critical tool in evaluating alternatives." The City has concerns with the accuracy of this claim related to the construction and calibration of the model. The only model documentation that Grid has provided to EPA is a brief (i.e., 11 slides) PowerPoint presentation, dated April 23, 2012. Some of the Grid model deficiencies are described below

The Grid NRRB Comments describe the modeling as "preliminary results from ongoing hydraulic modeling of the Canal system (being performed by National Grid)". While the words "preliminary" and "ongoing" are accurate descriptors of the status of Grid's modeling effort, the City does not agree that the model is anywhere near being ready to be applied to look at "implementability and long term performance of the remedy" as Grid reports, particularly because the necessary steps of EPA guidance for modeling application to a sediment site have yet to be followed by Grid or requested by the Region.

The Grid NRRB Comments further state, "National Grid has developed and calibrated a hydrodynamic and sediment transport model to better understand these effects. Unfortunately, the data gaps identified above limit the utility of this potentially powerful tool. For example, quantifying the frequency, magnitude, and average annual discharges from the

CSO and storm sewer system and knowing the actual flow rates from the soon-to-be upgraded flushing tunnel are critical to evaluating the potential for scour, flooding, and remedial construction approaches.” The City finds these statements to be very contradictory and at odds with EPA guidance for modeling. A model is not calibrated if large data gaps have been identified. Furthermore, the calibration (model and data comparisons for skill assessment) would not stand on its own merit without presenting skill assessment results to the Region or completing model verification/peer review, validation, and sensitivity analysis and the collection of necessary site data. The Region has confirmed that the only documentation of Grid’s modeling effort, at least as of June 4, 2012, that it has received is a December 2011 and April 23, 2012 PowerPoint presentation.

The April 23, 2012 PowerPoint presentation of Grid’s modeling effort, included as an attachment to this letter, shows model and data comparisons for a single 4-day period for near-surface velocity only at an unidentified location. The graphic (see slide 7) showing the limited model and data comparison has the caption, “*Preliminary Calibration Results*”. The graphic indicates that in order for the model calculations of near-surface velocity to approach the magnitude of the measured velocities, barges had to be considered in the model calculations. The inclusion of barges in a hydrodynamic model is unconventional and is worthy of close scrutiny. The barges may be compensating for a fundamental deficiency in the Grid model. Further, even with the barges included in the model, near-surface velocity calculations and the model and data comparisons are poor both in terms of magnitude and phasing. Further, four days of model and data comparisons, at a single location, for a single depth layer, and for a single parameter do not provide a sufficient basis for determining the status of, or appropriate uses for, a model.

Additional City concerns with Grid’s April 23, 2012 modeling PowerPoint presentation include:

- Grid’s April 23, 2012 modeling presentation is merely an introduction and does not provide sufficient information to decide that the model is calibrated and ready for predictive use. The presentation suggests that the model is still very much under development and it would probably take time and effort to finalize the calibration/validation, complete sensitivity analyses on the calibration, and to develop detailed displays of model inputs and model skill assessment (i.e., model and data comparisons) for the purpose of a thorough technical review and vetting.
- Testing of the Delft model source code being used by Grid against the Mike3 model source code (see slide 2) has no implications whatsoever for the level of calibration and validation that the model is achieving with the Delft model source code. The testing is simply a statement that the Delft3d and Mike3 source codes are similar. The two tools, given similar inputs, presumably (i.e., Grid has not disclosed the model inputs used for code testing yet) will produce similar outputs. This does not say anything about the ability of either the Delft or Mike tool to reproduce real-world data, which is the metric for model calibration.
- If there is only limited representation of CSO inputs included in the Grid model (see slide 4), it is unclear how can the Grid model be already calibrated and applied for

management purposes. If successful calibration and validation have been achieved without detailed CSO inputs, this would imply that CSO inputs are insignificant or something else in the calibration is acting as an offset.

- There is an urgent need for Grid to share information on model inputs and specifications of the model application. Slide 4 is vague, and raises a number of questions, namely: How is the flushing tunnel being specified as a model input? How is tidal exchange being specified in the model input? What are the inputs from groundwater, overland runoff, CSO, and stormwater? etc.
- Is there any demonstration of model calibration and skill assessment (i.e., model and data comparisons) for the Hurricane Irene large surge event mentioned in the presentation on slide 6 in a model prediction context? How is it known that the Grid model will be valid for such large surge event conditions if the model has yet to be fully calibrated and validated and tested for those conditions?
- The comparison of Grid model calculations, either with or without barges, to ADCP measurements is poor as shown on slide 7. This does not appear to be a calibrated model. What is the location of the model and data (ADCP station) comparison? Is the location immediately adjacent to a barge? Is the flushing tunnel considered to be out of operation for the results shown? Are there additional ADCP measurements available at different times and locations?
- Resolution of the computational grid of the Grid model may be very fine as suggested by the figure in the PowerPoint presentation on slide 7. Is this level of resolution practical in terms of computational time and input data requirements? For example, for sediment transport purposes, can a bed map of sediment initial condition properties based on data be specified at this level of resolution? Can multi-decadal periods typically considered for sediment and contaminant transport be simulated with a reasonable turn-around time at this scale?
- What real-world properties of solids transport (settling, resuspension, erosion) does the particle tracking calculation (slide 9) consider? Are the particles being moved as a conservative tracer by the model? Bed scour and deposition are mentioned on slide 3, are these processes included in particle tracking? What solids loadings for CSO are being assumed in the calculations? How is it possible to report particle tracking results when the hydrodynamic model is yet to be completed?
- Particle tracking is not necessarily the same as sediment transport. Does Grid plan to model solids fate beyond particle tracking using a sediment transport model? If so, what sediment transport model will be used?
- Does EPA and/or Grid have intended uses for the model beyond remedial design, mentioned on slides 2 and 10?

As noted in Section A above, a further concern that the City has regarding modeling is that it appears that the Region is also ignoring EPA guidance related to modeling at

sediment sites and is using outputs from the incomplete and technically not yet defensible Grid model to make unfounded assertions and decisions, solely on the basis of 11 PowerPoint slides. See Section A(b), above.

The City strongly believes that further Gowanus Canal modeling needs to incorporate the following additional features which are consistent with EPA's guidance:

- Agreement to share one modeling framework and avoid "dueling models";
- Consensus on model computational grid resolution and location of the model open boundary;
- Consensus on model calibration and validation conditions (usually driven by data availability and representativeness);
- Sufficient data to develop model forcings (meteorology, freshwater, tidal);
- Sufficient data to assess the skill of the hydrodynamic model (i.e., at several locations, time series of water elevation, velocity, temperature, and salinity);
- Sufficient data to define external solids loadings, the sediment bed map, solids settling rates, and critical shear stresses;
- Sufficient data to assess the skill of the sediment transport model (at several locations, times series of TSS and estimates of sediment accumulation rates);
- Sensitivity analyses for key inputs specified for the hydrodynamic and sediment transport models;
- Ability to "challenge" the hydrodynamic and sediment transport calibrations/validations by modeling one or more contaminants;
- Consensus on the appropriate predictive uses of the model. What questions will the model attempt to answer? (e.g., cap stability, others?);
- Convening of an outside peer review panel to evaluate the model for verification purposes;
- Coordination with EPA to meet EPA-typical government modeling requirements (e.g., quality assurance plan, administrative record/docket, ownership/licensing, etc.) It is noted that the Delft model selected by Grid is a commercial software product with user-licensing requirements;
- Plan for all parties to "shadow model" and each run agreed-to projection scenarios using the model;

3. Conclusion

In summary, given the uncertainties in the toxicity data and existing data gaps in the RI/FS that preclude the development of a complete and robust conceptual model for the site, the City has developed a work plan for additional testing and data collection. One of the many studies planned is the collection and analysis of CSO and canal water and sediment samples using high-resolution PAH analysis that will report both alkylated and non-alkylated PAH compounds. This will allow for complete characterization of loads from the CSO, and define PAH fingerprint patterns that will inform the development of the conceptual site model. In addition, the City looks forward to hearing NRRB's recommendations to the Region for the Canal, especially with respect to modeling requirements and its preferred model features.

Sincerely,

A handwritten signature in cursive script, appearing to read "Angela Licata".

Angela Licata
Deputy Commissioner, NYC Environmental Protection

References

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