Steps for Completing a Dissolved Oxygen Management Plan/TMDL for NY-NJ Harbor

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This document is intended to provide guidance to the Nutrient Work Group and HydroQual for moving forward with technical work supporting a Harbor Dissolved Oxygen Management Plan, including nutrient TMDL development as necessary.

NYSDEC and NJDEP agreed to have the water quality assessment be based on the New York Marine Dissolved Oxygen Criteria. In areas of the Harbor that require additional regulatory action to fully comply with these criteria, NYSDEC has requested an assessment of the biological benefits related to incremental improvements in dissolved oxygen. HydroQual can proceed with an assessment of the biological benefits based on existing information as part of Phase 1. An adaptive management approach would allow for a Phase 2 plan that could include any additional data collection, assessments, or site specific criteria. A decision will be made on a segment by segment basis as to whether a TMDL is necessary.

Step 1 – Previous Progress - Document Progress to Date on Attainment of Dissolved Oxygen Levels Supporting Highest Attainable Uses.

As part of the overall nutrient/low dissolved oxygen management plan, there is a need to put dissolved oxygen improvements captured in the modeling baseline in an historical context. For this purpose, data from NYCDEP, BCUA, former HMDC (now MERI), and others shall be utilized.

HydroQual Action Item: *A narrative discussion of historical dissolved oxygen improvements in the Harbor and the management actions producing those improvements (e.g., Clean Water Act, secondary treatment requirements for POTWs, etc.) shall be prepared.*

Step 2 – Current Status – Identify Current Dissolved Oxygen Levels and Carbon/Nitrogen Loading Conditions.

A baseline condition, representative of current nutrient loading conditions, has already been modeled. Numerous HEP documents include full descriptions of the baseline loading assumptions and current dissolved oxygen levels with respect to attainment of various enforceable and non-enforceable dissolved oxygen endpoints. This information will be incorporated into the Dissolved Oxygen Management Plan.

The modeling baseline includes the hydrodynamic transport/precipitation of the 24 calendar months 1988 and 1989 coupled with concentration measurements from 1994-95. The 1994-95 measurements represent the most comprehensive modern data set of ambient and loading concentrations inclusive of all the inorganic and organic nutrient forms and organic carbon that the model requires. For model baseline purposes, under State direction, some adjustments were made to account for upgrades to POTWs since 1994/95. Effectively, baseline loadings were determined on the basis of measurements.

Dissolved oxygen management plan/TMDL development efforts in NY/NJ Harbor have been on-going for more than eight years. When these efforts were initiated, hydrodynamic transport calculations representative of 1988 and 1989 precipitation conditions were readily available.

The precipitation conditions of the 24-months included in 1988 and 1989 are important for a number of reasons:

- Simulating through 24-months, allows for a wide range of conditions to be captured. 1988 is also a year of typical rainfall for the NY/NJ Harbor and has been used extensively for Harbor planning purposes.
- The Harbor is part of a larger linked Harbor-Bight-Sound system. A nitrogen TMDL was developed for the Sound for 1988 and 1989 conditions. Severe hypoxia events were also documented for the Bight in the late 1980's. Selecting 1988 and 1989 rainfall and hydrodynamics provides continuity for the Harbor with Long Island Sound and NY Bight management.

While there is no one single critical condition for an estuary with a spatial domain as large as the NY/NJ Harbor (i.e., there is no estuarine equivalent of a river 7Q10 flow condition), the baseline condition selected captures a range (i.e., 24 months) of conditions. Further, the underlying model calibration was performed for 12 different months in the October 1994 through September 1995 water year. The summer of 1995 was a particularly warm and dry summer with August 1995, in particular, representing a near drought condition. In addition to the application of the model to 36 different months of conditions for calibration and baseline projection purposes, the model calibration was further assessed against measured water quality from 2000 – 2005 and was found to be representative.

HydroQual Action Item: *For Phase 1, HydroQual will evaluate biological benefits based on living marine resource metrics previously developed for Long Island Sound. These metrics include mortality – volume – days and biomass reduction - volume - days for specific levels of dissolved oxygen. The metrics will be quantified for baseline conditions and included in the Dissolved Oxygen Management Plan.*

Step 3 – Permit Flow Conditions with Permit/Existing Effluent Quality

The baseline condition includes POTW's operating at current levels. No attempt has been made to allow for growth up to POTW permit capacities. Similarly, loads other than POTWs have not been changed based on population growth. Accordingly, the TMDL baseline assumes no net increase in many inputs of nitrogen and carbon to the system. EPA has tabulated permit discharge levels for the POTWs included in the plan. Permit flows for POTWs are generally higher than existing flows. If plants were to increase flow to permit flow with population growth, water quality conditions would likely get worse in some areas of the Harbor, including headwaters of tributaries.

Since water quality would be expected to worsen with growth, a SWEM simulation is necessary which includes permit flows for POTWs.

States and EPA Action Item: *EPA has prepared tabular information on permitted flows and permitted quality or removal rates for all POTWs. Once reviewed and approved by the States and EPA, the data will be transferred to HydroQual.*
POTWs discharging to Jamaica Bay, the Harlem River, the East River, and Long Island Sound have been intentionally omitted since they are subjected to TMDL and Consent Order limits more stringent than design/permit flows and current quality. It is a

decision point for EPA and the States to report, or not, design/permit flows for POTWs discharging to the Hudson River above the HEP boundary at Piermont Marsh.

HydroQual Action Item: *Prepare a SWEM simulation with POTW loadings based on permitted flow at POTWs operating at permit/existing effluent quality concentrations. Loadings for the simulation shall be tabulated in Dissolved Oxygen Management Plan.*

HydroQual Action Item: *Review information developed by EPA and the States on permitted quality as concentrations or calculated based on percentage removal rates influent to effluent for POTWs. Report to EPA and the States as to whether there is sufficient information for both carbon and nitrogen simultaneously to develop a realistic representation of effluent quality at permit conditions for a majority of POTWs. A SWEM simulation may be developed if the available information is sufficient.*

HydroQual Action Item: *For Phase 1, HydroQual will evaluate biological effects based on living marine resource metrics previously developed for Long Island Sound. These metrics include mortality – volume – days and biomass reduction - volume - days for specific levels of dissolved oxygen. The metrics will be quantified for the design/permit flow condition alternate baseline and included in the Dissolved Oxygen Management Plan.*

Step 4 –Planned Improvements Conditions with No Net Increase in Other Sources

Planned Improvements include actions that are currently legally required or anticipated to be required but have not yet been fully implemented or captured in the baseline condition. Specifically, the Planned Improvements already simulated with SWEM and described in other HEP documents include: Clean Air Interstate Rule (CAIR or equivalent) related reductions to direct atmospheric deposition, overland runoff, and tributary headwaters; Upper Passaic River phosphorus TMDL with current nitrogen loadings; North Bergen POTW effluent relocation to PVSC; updated Owl's Head WWTP load; Jamaica Bay Consent Order; and Long Island Sound Nitrogen TMDL. The implicit assumption in the Planned Improvements Conditions is no net increase in loads prior to additional improvements/ load reductions. Three refinements have since been quantified and need to be incorporated into a revised Planned Improvements SWEM simulation. These are: the phosphorus TMDL on the Upper Raritan River with current nitrogen loadings; reductions to stormwater loadings from the MS4 programs in New York and New Jersey; and in-progress CSO reductions in New York.

For consistency, the Planned Improvements simulation will hold nitrogen loadings in the Upper Passaic River phosphorus TMDL at current levels.

Estimates of MS4 reductions of 5% for N and 10% for C were not available when initial scenario runs were made. These will be included in future runs.

In-progress CSO reductions in New York City resulting from Long Term Control Planning, have been preliminarily quantified for volume reductions only. The volume reductions will be used to develop reductions to nitrogen and carbon for Planned Improvements SWEM simulation purposes. These volume reductions are: 30% in the East River, 5% in the Hudson River, and 6% in the Upper Bay.

HydroQual Action Item: *A revised Planned Improvement model run shall be performed which considers the Upper Raritan and Upper Passaic Phosphorus TMDLs, MS4 program reductions, corrected reductions from NJ CSOs based on PVSC assessment, and New York City CSO reductions. A revised table of Planned Improvement loadings will be included in the Dissolved Oxygen Management Plan.*

HydroQual Action Item: *For Phase 1, HydroQual will evaluate biological benefits based on living marine resource metrics previously developed for Long Island Sound. These metrics include mortality – volume – days and biomass reduction - volume - days for specific levels of dissolved oxygen. The metrics will be quantified for the revised Planned improvements scenario and included in the Dissolved Oxygen Management Plan.*

Step 5 – Improvements for Highest Attainable Dissolved Oxygen

A single SWEM simulation incorporating actions in several Harbor sub-regions, as well as revised Planned Improvements, is described below. A descriptive table including rationale will be prepared for each set of model predictions and a full explanation will be provided for the aggregate statistics. MS4 modifications and updated NJ CSO removal and capture rates will be incorporated into each sub-region.

Hackensack River – The SWEM sub-regional plan simulation already performed is sufficient for this sub-region. The plan includes Limit of Technology (LOT) nitrogen and carbon reductions for BCUA, SMUA, Hackensack River CSO, and Hackensack River stormwater. Existing model outputs demonstrate that for 1988 hydrodynamic conditions, the NY chronic standard would not be met in eight grid cells in the SE2 reach for 19 to 74 days, even after preliminary plan actions in all sub-regions. For 1989 hydrodynamic conditions, only one grid cell in the SE2 reach would not meet the NY chronic standard for 16 days. Existing model outputs will be further analyzed in terms of when and where in the Hackensack River the New York chronic standard (based on federal marine dissolved oxygen criterion for larval recruitment) are met and when not met, what other standards are attained.

Based on the fact that EPA and the States of New York and New Jersey agree that NYSDEC=s chronic marine dissolved oxygen standard constitutes the most scientifically defensible dissolved oxygen standard for marine waters for the protection of aquatic life, the NY chronic dissolved oxygen standard should be used as the endpoint for protecting aquatic life in the open waters of the Harbor, where attainable. For those segments of the Harbor where it is demonstrated that the NYSDEC chronic standard is not fully attainable, the highest attainable dissolved oxygen criteria should be identified and used as the endpoint for aquatic life protection.[1] In this case, a use attainability analysis (UAA) would need to be completed in order to demonstrate that full attainment of the aquatic life designated use is not feasible based upon one or more of the six factors in 40 CFR 131.10(g). Such criteria may be written on a spatial and/or temporal basis as in the case of the Chesapeake Bay, where seasonal aquatic life uses and dissolved oxygen

[1] The identification of the highest attainable dissolved oxygen criteria is necessary based on the fact that limit of technology (LOT) requirements by themselves may not result in the full attainment of the NYSDEC marine dissolved oxygen chronic standard in all segments. The only way to avoid the need for alternative dissolved oxygen criteria is to employ other non-LOT measures (i.e., biomass harvesting, aeration, etc.)

criteria applied in the deeper waters based on critical conditions associated with the summer season.

Re-evaluation of the Hackensack River sub-region shall include all loading adjustments for the Revised Planned Improvements simulation.

Implementation issues for this sub-region include:

- Require carbon based limit of technology load reductions at the two POTWs. Allow for pollutant trading between the two POTWs. **($508M + $30M = $538M = potential cost)** [2]
- Require nitrogen based limit of technology load reductions at the two POTWs. Allow for pollutant trading between the two POTWs. **($584M + $39M = $623M = potential cost)** [2]
- Consider carbon and nitrogen LOT reductions at CSO and SW

HydroQual Action Item: *While the SWEM analysis for the Hackensack River is largely completed, revised SWEM outputs need to be processed to address timing of violations for the NY chronic standard.*

HydroQual Action Item: *In Phase 1, HydroQual will evaluate biological benefits based on living marine resource metrics previously developed for Long Island Sound. These metrics include mortality – volume – days and biomass reduction - volume - days for specific levels of dissolved oxygen. The metrics will be quantified for the Improvements for Highest Attainable Uses scenario and included in the Dissolved Oxygen Management Plan.*

Passaic River/Newark Bay - Similar to the Hackensack River, the SWEM sub-regional plan simulation already performed is largely sufficient for the Passaic River/Newark Bay sub-region; however increases to nitrogen loadings part of the Upper Passaic River phosphorus TMDL must now be considered. Full attainment of the New York chronic dissolved oxygen standard is expected in the Passaic River with completion of sub-regional plans based on existing SWEM outputs. Based on existing SWEM outputs for Newark Bay, the New York chronic dissolved oxygen standard would not be expected to be fully attained for 24 days in two grid cells in Newark Bay for 1988 hydrodynamic conditions. Under1989 hydrodynamic conditions, full attainment would be expected with sub-regional plans. Model outputs will be further analyzed in terms of when and where in Newark Bay the New York chronic standard (based on federal marine dissolved oxygen criterion for larval recruitment) are met and when not met, what other standards are attained. Issues for the Passaic River/Newark Bay sub-region include:

- Adopt NY chronic standard in lieu of NJ FW2NT/SE2 and SE3 standards.
- The Passaic River and Newark Bay do not receive effluent directly from any POTWs; therefore, POTW reductions in the Passaic are not applicable.
- LOT carbon and nitrogen reductions at CSO and SW

[2] These POTW costs are 2007 present costs, including capital and present worth of operations and maintenance. There may be additional ways to reduce costs with seasonal limits and bypass at NJ POTWs.

HydroQual Action Item: *While the SWEM analysis for Passaic River and Newark Bay was largely completed, revised SWEM outputs need to be processed to address timing of violations for the NY chronic standard.*

HydroQual Action Item: *In Phase 1, HydroQual will evaluate biological benefits based on living marine resource metrics previously developed for Long Island Sound. These metrics include mortality – volume – days and biomass reduction - volume - days for specific levels of dissolved oxygen. The metrics will be quantified for the Improvements for Highest Attainable Uses scenario and included in the Dissolved Oxygen Management Plan.*

Raritan River/Bay – NJDEP is currently establishing a phosphorus TMDL to address eutrophication concerns in the Upper Raritan River. Point source flows are set at design flow, which results in an increase of total nitrogen to the watershed. Upper Raritan River dissolved oxygen concentration range form 9 to 10 mg/L which is greater than the water quality standard. This TMDL will establish phosphorus limits to protect drinking water but will not control total nitrogen. Nitrogen loads would be kept at current levels, consistent with a cap on loadings.

NJDEP has indicated that, as necessary, it would implement nitrogen controls in the Upper Raritan River in order to address dissolved oxygen concerns in the lower Raritan River.

Because of the very limited improvements to dissolved oxygen that would be realized by requiring LOT for carbon at Middlesex County Utilities Authority, it is not clear if LOT for carbon at this location is necessary and will not be included at this time.

A new harbor-wide SWEM simulation shall be performed which includes:

- Sub-regional plans in the Hackensack River, Passaic River/Newark Bay, the Kills, and the Hudson River/Upper Bay.
- LOT nitrogen reductions for MCUA.
- Raritan River/Bay CSO and SW LOT reductions for carbon and nitrogen.
- Planned Improvements elsewhere.

Issues for the Raritan River/Bay include:

- See standards discussion in Hackensack River section above.
- Require N LOT at Middlesex County POTW **($892M[3])**, actually located in Raritan Bay.
- Maximize carbon and nitrogen reductions at River/Bay CSOs and SW.
- The magnitude of the dissolved oxygen violations in Raritan Bay is not large. Raritan Bay actions are driven by dissolved oxygen violations in the Raritan River.

[3] These POTW costs are 2007 present costs, including capital and present worth of operations and maintenance. There may be additional ways to reduce costs with seasonal limits and bypass at NJ POTWs.

- While pastoral conditions would resolve non-attainment of the NY chronic dissolved oxygen standard in Raritan Bay, application of LOT nitrogen and carbon reductions system-wide in other sub-regions have already been factored into the analysis for Raritan Bay and do not result in attainment.

HydroQual Action Item*: An overall SWEM simulation shall be performed that incorporates revised LOT loading reductions for the Raritan River/Bay and the Upper Raritan River phosphorus TMDL with other sub-regional TMDL plans and Planned Improvements as noted above. A table of loadings will be prepared.*

HydroQual Action Item: *Revised SWEM outputs need to be processed to address timing of violations for the NY chronic standard.*

HydroQual Action Item: *In Phase 1, HydroQual will evaluate biological benefits based on living marine resource metrics previously developed for Long Island Sound. These metrics include mortality – volume – days and biomass reduction - volume - days for specific levels of dissolved oxygen. The metrics will be quantified for the Improvements for Highest Attainable Uses scenario and included in the Dissolved Oxygen Management Plan.*

Arthur Kill and Kill van Kull – In previous SWEM work, reductions were applied equally to CSOs, SW, and POTWs in both the Arthur Kill and the Kill van Kull; however, the Kill van Kull is in compliance with existing standards without loading reductions. Accordingly, the one additional SWEM simulation identified for the Raritan River/Bay will also consider dischargers to the Kill van Kull and Arthur Kill separately. In addition, model output graphics that previously displayed the Kills collectively will be reworked to display Kill van Kull and Arthur Kill results separately. Issues for the Arthur Kill and Kill van Kull include:

- See standards discussion in Hackensack River section above.
- Non-attainment is in the Arthur Kill, rather than the Kill van Kull, and is worsened with adoption of NY chronic.
- Arthur Kill dissolved oxygen responds to nitrogen more than carbon.
- Require N LOT at Arthur Kill POTWs **($418M + $90M + $160M = $668M).**
- Arthur Kill carbon and nitrogen LOT reductions at CSO and SW.
- To fully achieve compliance with existing standards and marine DO criteria, consider other measures beyond C and N source reductions.

HydroQual Action Item*: HydroQual shall perform an overall SWEM simulation including separate handling of dischargers to the Kill van Kull and Arthur Kill.*

HydroQual Action Item*: Model output graphics shall be re-worked to display the Kill van Kull and Arthur Kill separately. A table of loadings will be prepared.*

HydroQual Action Item: *Revised SWEM outputs need to be processed to address timing of violations for the NY chronic standard.*

HydroQual Action Item: *In Phase 1, HydroQual will evaluate biological benefits based on living marine resource metrics previously developed for Long Island Sound. These metrics*

include mortality – volume – days and biomass reduction - volume - days for specific levels of dissolved oxygen. The metrics will be quantified for the Improvements for Highest Attainable Uses scenario and included in the Dissolved Oxygen Management Plan.

Hudson River and Upper Bay – SWEM results for non-attainment of current NY I and NJ SE2 dissolved oxygen standards in the Hudson River between the Harlem River confluence and the Battery after implementation of plans in other sub-regions are widespread but of small magnitude (i.e., < 2days). The spatial extent of these violations indicates that they should not be ignored. Further measured data collected in the Hudson River by NYCDEP Harbor Survey since 2005 are below 4 mg/L:

			Minimum DO (mg/L)				Count of Measurements				
NAME	Five Year Period Begining	SAMPLE LOCATION	DO	DO_CTD	DO_WINK	DO_YSI	DO	DO_CTD	DO_WINK	DO_YSI	Percent of Measurements < 4.0 mg/L
HARBOR-N02 (Hudson Near the Harlem River)	1990	B	3.4	2.9	4.2		50	24	34		10.2
		T	3.9	3.3	4.7		50	24	34		4.6
	1995	B		3.7	3.2			50	82		6.8
		T		4.2	5.1			57	82		0.0
	2000	B		22.3	10.9			1	1		0.0
		T		14.4	11.7			1	1		0.0
HARBOR-N03 (Hudson Near ~155th St.)	1990	B	2.9	2.8	3.8		50	24	34		14.8
		T	3.2	3.0	4.6		50	24	34		4.6
	1995	B		3.5	4.2			53	82		3.7
		T		3.9	4.7			56	82		0.7
	2000	B		8.8	10.6			2	1		0.0
		T		10.0	8.7			2	2		0.0
HARBOR-N03A (Hudson Near ~130th St.)	1990	B	3.1	2.8	3.6		50	24	34		15.7
		T	3.9	3.2	4.5		50	24	34		3.7
	1995	B		3.4	2.4			51	82		6.0
		T		4.3	4.8			57	82		0.0
	2000	B		11.4	9.5			1	1		0.0
		T		13.6	7.8			2	2		0.0
HARBOR-N03B (Hudson Near ~75th St.)	1990	B	3.0	2.7	3.9		50	23	34		16.8
		T	4.4	3.0	4.6		50	23	34		3.7
	1995	B		3.1	4.1			52	82		4.5
		T		3.9	4.0			56	82		1.4
	2000	B	3.7	0.1	2.4	3.4	37	29	55	22	9.1
		T	5.0	0.0	4.6	4.5	39	29	52	22	3.5
	2005	B		3.6	4.2			79	80		5.7
		T		3.9	4.4			79	91		0.6
HARBOR-N04 (Hudson Near ~Pier 83)	1990	B	1.2	2.8	3.5		49	24	34		12.1
		T	4.2	2.1	4.2		49	25	34		4.6
	1995	B		3.4	3.9			50	81		6.1
		T		4.3	4.9			56	82		0.0
	2000	B	3.8	1.2	3.3	3.0	37	27	53	23	10.0
		T	4.6	1.6	4.6	4.3	39	28	54	23	2.8
	2005	B		3.6	4.5			78	80		3.2
		T		4.0	4.6			78	91		0.0
HARBOR-N05 (Hudson Near the Battery)	1990	B	3.0	0.4	4.1		49	22	34		10.5
		T	3.9	1.9	4.2		49	23	33		4.8
	1995	B		3.5	2.7			54	79		3.0
		T		4.3	4.8			55	81		0.0
	2000	B	4.0	1.3	3.5	3.6	37	28	52	23	8.0
		T	4.2	1.5	4.6	4.1	39	28	52	23	2.8
	2005	B		3.6	4.8			79	81		1.3
		T		4.1	5.0			79	92		0.0

SWEM outputs are therefore consistent with measurements. Therefore, these violations should be considered real and dismissal of them would be a policy decision by the States. Further, the magnitudes of NY chronic standard non-attainment calculated by SWEM are worse (i.e., up to 40 days). SWEM results show that with sub-regional actions in other Harbor sub-regions and low level nitrogen reductions at POTWs in the Hudson River and Upper Bay, the NY chronic standard would be fully attained in the Hudson River for 1988 and 1989 hydrodynamic conditions with only a single grid cell in the Upper Bay with 34 days of non-attainment. A possibility that has not yet been explored is whether or not something less than low level STP N reductions for all Hudson River/Upper Bay POTWs would also achieve the same levels of attainment of the NY chronic standard. Another possibility is whether or not the low level STP N reductions could be limited to fewer Hudson River/Upper Bay POTWs.

Regarding the non-attainment in a single grid cell in the Upper Bay, proximal to PVSCs effluent, high frequency dissolved oxygen data should be collected at that location after the relocation of the North Bergen POTW effluent to PVSC is completed to verify the SWEM prediction and decide (1) if further reductions, beyond low level N reductions, would be needed for PVSC or (2) if no reductions are required at all. In a situation where a violation is

limited to a single grid cell, there is a possibility of a problem with SWEM at the isolated location.

Issues for the Hudson River/Upper Bay include:

- Adopting the NY chronic standard in lieu of the NJ SE2 and the NY I standards.
- Even low level N reductions will be expensive at eight POTWs and/or difficult in some cases. The low N effluent conditions from the discharger costing reports that were simulated include: 19-20 mg/L at PVSC; 24-26 mg/L at Edgewater, North Bergen, NHSA Adams Street and River Road, and Yonkers; and 12 mg/L at North River and Owls Head. Expected costs include: North River $587M[4]; Owls Head $257M[4]; PVSC $1973M[5]; NHSA River Road $35M[5]; North Bergen $11.1M[5]; and Edgewater $14M[5]. Costs were not available for Yonkers. NHSA Adams Street already achieves the required effluent so will not incur a new co
- Work with POTWs and States to identify any alternatives to low level N reductions at 8 POTWs, including trading, the carbon reductions portion of the low level N reductions only, or 50% of low level N reductions, etc.

HydroQual Action Item*: Continue to use the low level nitrogen reductions in the next overall SWEM simulation for Hudson River/Upper Bay POTWs. Perform an additional simulation in the future which considers alternatives to low level N reductions if identified by POTWs and States.*

HydroQual Action Item: *Revised SWEM outputs need to be processed to address timing of violations for the NY chronic standard.*

HydroQual Action Item: *In Phase 1, HydroQual will evaluate biological benefits based on living marine resource metrics previously developed for Long Island Sound. These metrics include mortality – volume – days and biomass reduction - volume - days for specific levels of dissolved oxygen. The metrics will be quantified for the Improvements for Highest Attainable Uses scenario and included in the Dissolved Oxygen Management Plan.*

East and Harlem Rivers – A nitrogen TMDL has already been implemented in these waters; however, the NY chronic standard is not expected to be fully attained. Accordingly, continued coordination between HEP and LISS is required. Given the low level of non-attainment in the Hudson River/Upper Bay and that a low level N POTW reduction, or something less, has been identified as a solution for the Hudson River/Upper Bay, it is unlikely that further reductions in the East and Harlem Rivers would be required for purposes of the Harbor. To the extent that further reductions are required for nitrogen and carbon loading to the East and Harlem Rivers, these should be checked with SWEM to quantify any potential benefits to the Harbor.

Step 6 – Additional Scenario Runs

HydroQual Action Item: *Additional SWEM scenario runs and associated tables will be requested after considering outputs of previous steps..*

[4] For NYC plants, costs are 2007 Capital costs only.
[5] For NJ POTWs, costs are 2007 present costs, including capital and present worth of operations and maintenance. There may be additional ways to reduce costs with seasonal limits and bypass at NJ POTWs.

Prioritization of Steps

Step 5, the single overall SWEM scenario, will be initiated first. Other steps can be completed later or in parallel. Further adjustments, such as alternatives to low level N POTW reductions in the Hudson River, can then be made as necessary in a future SWEM simulation. A second SWEM run, illustrating a condition with the permit POTW flows shall also be performed (see Step 3). A third SWEM run, capturing revised Planned Improvements and no net increase in current flows shall be performed (see Step 4). In summary, the prioritization of steps is: Step 5, Step 3, Step2, and Step 4. Step 1 can be accomplished later or in parallel.