



The Long Island Sound Office

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MEMORANDUM

DATE: March 22, 2000

SUBJ: Progress Report and Recommendations on SWEM

FROM: Systemwide Nutrient Work Group

TO: LISS Management Committee, HEP Management Committee

This memo will summarize the work and recommendations of the Systemwide Nutrient Work Group on the use of the Systemwide Eutrophication Model (SWEM) to support development of Total Maximum Daily Loads (TMDL) for New York/New Jersey Harbor and the New York Bight, and to support the reassessment of the dissolved oxygen Total Maximum Daily Load for Long Island Sound.

SWNWG Charge

Provide recommendations to the Long Island Sound Study (LISS) and New York/New Jersey Harbor Estuary Program (HEP) management conferences on the use of the Systemwide Eutrophication Model to support development of Total Maximum Daily Loads (TMDL) for New York/New Jersey Harbor and the New York Bight, and to support the reassessment of the dissolved oxygen Total Maximum Daily Load for Long Island Sound.

Goals

1. Undertake a thorough assessment of the current Systemwide Eutrophication Model (SWEM) for 1) developing TMDLs for New York/New Jersey Harbor and the New York Bight; 2) reassessing the Long Island Sound TMDL; and 3) evaluating other questions relating to ecosystem health that may be identified by the Systemwide Nutrient Work Group.
 - a. Reconstitute an independent Model Evaluation Group (MEG) to provide advice and counsel on the technical development of the Systemwide Eutrophication Model
 - b. Recommend and implement any additional processes necessary to ensure adequate peer review.
2. Develop workplans, schedules, and budgets for tasks necessary to enhance the

Systemwide Eutrophication Model for TMDLs consistent with the scheduled requirements of the LISS and HEP.

3. Develop options and make recommendations for providing long-term access to the SWEM for ongoing analyses.
4. Develop suitable endpoints for TMDLs, considering dissolved oxygen levels, nutrient concentrations, nuisance algal blooms, submerged aquatic vegetation.
5. Involve the stakeholders through the LISS and HEP technical and citizen advisory committees and other means.

Progress to Date

The work group convened its first meeting on January 20, 1999 and met five additional times over the course of the year, four with a Model Evaluation Group convened to provide an independent assessment of SWEM. A sixth meeting was held on February 16 to review the work group's recommendations provided herein. Work group, MEG, and Work group mailing list members are provided as attachment 1.

The work group and MEG reviewed SWEM over the course of three meetings at which HydroQual, Inc. provided a model overview, information on model hydrodynamics, and information on water quality.

The work group summarized comments on the SWEM resulting from the three meetings. These comments were transmitted to HydroQual and were the subject of a fourth work group/MEG meeting on November 23, 1999 to review information responding to the comments.

The MEG discussed their overall recommendations on SWEM on a December 8, 1999 conference call. The work group reviewed the MEG comments and then developed the recommendations presented below on a January 13, 2000 conference call.

Recommendations on Model Calibration/Validation

1. Additional work is required to calibrate SWEM for the NJ tributaries. This work is estimated at six months and \$150,000.
 - a. NJDEP is willing to fund the required effort and has initiated discussion with HydroQual, Inc. to directly contract for the necessary work.
 - b. No additional data collection is expected to be required. NJDEP will take the lead in confirming the sufficiency of existing data.
 - c. The NJ harbor dischargers are willing to work with the state to provide existing information to accomplish this effort.
2. In regard to overall hydrodynamics, the MEG accepts the model.
 - a. The East River transport is very sensitive to changes in the model (e.g., model geometry in eastern LIS).
 - b. CTDEP remains concerned that adjustments to improve the water quality calibration have resulted in a reduced match between model predictions on East River transport and data.

3. In regard to overall water quality, the MEG accepts the model.
 - a. One issue requires additional assessment. Primary production calculations from available field data were compared to the calibration data as $\text{gO}_2/\text{m}^2/\text{day}$. In some areas the match was good. In other areas the model calculated much less than the measured value. Considering the concerns raised in regard to this issue on the Chesapeake Bay Model (see attachment 3), careful review now is warranted to avoid future delays. It's recommended that summed seasonal and annual primary production calculated by the model over various regions, averaged down to m^2/day , m^2/season , should be compared to available data collected during the same month/season. Because of limited data, the comparisons can be made among data from different years. The purpose of this comparison is to gain additional insight into whether the range of model output matches the range of the natural system. BOD/CBOD data should likewise be compared to model respiration. This information would be provided to the MEG for additional assessment.
 - i. NYCDEP will support HydroQual's work in this area. The work group and MEG will review this information and make any recommendations in terms of model application and interpretation.

Recommendation on Model Application

4. SWEM can be applied to Long Island Sound, Hudson River, and lower Harbor systems. (As described in item 1 above, additional calibration work is still needed for the NJ tributaries portions—Hackensack, Passaic, and Raritan.)
5. Development of a systemwide unit response matrix is not recommended because of the nonlinear response in some areas, particularly NY Harbor, to nutrient reductions. The feasibility of a unit response matrix for the NJ tributaries can be reviewed after completion of the calibration effort.
6. The SWN WG should form subcommittees for LIS and for NY/NJ Harbor for model application work. The Harbor Estuary Program should nominate a chair for its subcommittee. The combined SWN WG will meet to discuss systemwide issues.
7. For Long Island Sound:
 - a. The development of unit responses for each management zone is recommended. These can be used to develop trading ratios or a unit response matrix for screening purposes. Thirty-two model runs are necessary to develop matrices for both nitrogen and carbon and can be accomplished for \$160,000. An additional budget of \$25,000 should be allotted to allow for the actual development of the matrix from the model outputs.
 - b. Initially, LIS 3.0 scenarios should be repeated using SWEM, including the pre-colonial, base case, Phase III, Limit of technology at an estimated cost of \$20,000. These scenarios should incorporate any updates in loading.
8. For New York Harbor:
 - a. TMDL endpoints must be defined and specific commitments made on the area

and scope of TMDLs. These tasks should be the focus of work over the next year. This effort needs to be coordinated with the NYCDEP Use and Standards Attainment study. Once completed, the timeline for TMDL development presented here should be revisited.

- b. A matrix of control options, effectiveness, and costs must be developed. to support the development of model applications and TMDLs.
9. The LISS and HEP should consider a field program for water quality and hydrographic data to validate SWEM for an additional year.

Additional Workplan Tasks

The development of TMDLs will require tasks in addition to the development and application of SWEM identified above. A more detailed work plan and budget provided as attachment 2.

Please let me know if you have any questions.

Attachments

cc: Nutrient Work Group Mailing List
Model Evaluation Group

SWNWG Work Plan and Budget for TMDL Development			
Task	Lead	Timeframe	Cost
COMPLETE MODEL REVIEW			
1. Calibrate SWEM for the NJ tributaries.	NJDEP	June-November 2000	\$150,000
2. Complete review of summed seasonal and annual primary production	SWNWG	March-May 2000	\$50,000 to be covered under existing NYCDEP contract with HydroQual, Inc.
3. Develop subcommittees to address region-specific planning needs.	SWNWG	March-May 2000	-
MODEL APPLICATION FOR LIS			
1. Develop LIS unit responses matrix	SWNWG/ HydroQual	June-October 2000	\$185,000 total
a. 30 model runs for both nitrogen and carbon	HydroQual	4 months	(\$160,000)
b. Development of the matrix from the model outputs.	HydroQual	1 month	(\$25,000)
2. Review/confirm base case loading data and develop control options	SWNWG	November-July 2001	N/C
a. Confirm SWEM base loads	-	2 month	-
b. refine LIS watershed-based loads	-	3 months	-
c. refine controls/costs for watershed controls		4 months	-

SWNWG Work Plan and Budget for TMDL Development			
3. Repeat LIS 3.0 scenarios using SWEM: pre-colonial, base case, Phase III, Limit of technology		August-October 2001	\$25,000
4. Consider marine DO criteria application for LIS	SWNWG	-	-
a. relate DO model outputs to DO criteria develop (consider algorithm developed by CBP)	SWNWG/ contractor	January-October 2001	\$30,000
b. evaluate how nitrogen criteria will relate to DO criteria	SWNWG	January- March 2001	-
5. Redo cost curve analysis for capital and O&M	SWNWG/ contractor	October-March 2002	\$30,000
6. Develop and run new model scenarios for reevaluation of LIS TMDL (assume 5)	SWNWG/ HydroQual	April-September 2002	\$30,000
7. Apply each scenario to DO criteria to identify effects and evaluate alternatives	SWNWG/ contractor	October-December 2002	-
8. Prepare reports documenting modeling results, cost curve analysis, bioeffects	SWNWG/ HydroQual	January-June 2002	\$7,000
9. Complete review of nitrogen reduction targets	LISS	July-February 2003	-
10. Review/Revise LIS TMDL as appropriate	LISS/CTDEP/ NYSDEC	August 2003	-
			Total \$370,000
MODEL APPLICATION FOR NY/NJ HARBOR			
1. Define impairments, regionally and locally	SWNWG	May-August 2000	-

SWNWG Work Plan and Budget for TMDL Development			
compared to current standards			
2. Confirm location and extent of TMDLs, i.e. harborwide or in segments, and schedule	SWNWG	August-December 2000	-
3. Develop endpoints for impairments considering DO, clarity, nutrient concentration	SWNWG	January-October 2001	-
a. Consider marine DO criteria application for Harbor and relate DO model outputs to DO criteria (consider algorithm developed by CBP)	SWNWG/ contractor	January-October 2001	\$25,000
b. evaluate how nitrogen criteria will relate to DO criteria and other impairment endpoints	SWNWG	January- March 2001	-
4. Review/confirm base case loading data and develop control options	SWNWG/ contractor	October-June 2002	\$50,000
a. Confirm SWEM base loads		2 month	-
b. develop watershed-based loads		3 months	-
c. develop controls/costs for watershed controls		4 months	-
4. Develop scenarios for preliminary planning, e.g. effect of controls on Hudson River suspended sediment load (assume 5 runs)	SWNWG/ HydroQual	January- September 2001	\$30,000
5. Develop model scenarios for Harbor TMDLs (assume 10 runs)	SWNWG/ HydroQual	July-March 2002	\$60,000
a. consider cost curve analysis or other procedure to develop scenarios		-	-
6. Apply each scenario to selected endpoint(s) to	SWNWG/	April-June 2002	-

SWNWG Work Plan and Budget for TMDL Development			
identify effects.	contractor		
7. Prepare reports documenting modeling results, bioeffects	SWNWG/ HydroQual	April-September 2002	\$70,000
8. Establish reduction targets to attain endpoints	HEP	October- September 2003	-
9. Begin/Develop NY/NJ Harbor TMDLs	NJDEP/ NYSDEC	October-August 2004	-
			Total \$235,000
JOINT COMMITTEE EFFORTS			
1. Identify atmospheric deposition reductions on direct and watershed loading	SWNWG/ contractor		\$50,000
2. Assess possible climate change effects using SWEM (assume 5 model runs)	SWNWG		\$30,000
2. Validate model for another year: field program and modeling	SWNWG/ Hydroqual/ Contractors		\$5,000,000