Missisquoi Bay Basin Project:
Identifying Critical Source Areas of Pollution

Task 1 Summary Report
October 27, 2009

Description of Task 1

Task 1 of the IJC-NEIWPCC contract is divided into five subtasks, of which this report constitutes the fifth, a "summary report of all subtasks accomplished in Task 1." Subtask 1, or "Definition of Modeling and Monitoring Parameters, Methodologies, Data Requirements and Quality Assurance Measures Needed for the Identification and Delineation of Critical Source Areas", consisted of a series of workshops for local stakeholders to discuss these objectives. Subtask 2, or "Data Acquisition", required the assimilation of data for future use in a pollutant loading model for the Missisquoi Bay Basin and the development of a secondary data QAPP for these data. Subtask 3, or "Data Gap Analysis", identified gaps in existing data needed to model pollution in Vermont and to understand transboundary pollutant loads. Subtask 4, or "Peer Review Planning", required the development of a peer review process of potential modeling methods and desired outcomes. Summaries of each of these subtasks and their accomplishments can be found below.

Summary of Activities

The following account of activities summarizes efforts on Task 1 to-date, organized by subtask.

Subtask 1

- *November 25th, 2008* – LCBP submitted the *Workshop Plan* (appended) for IJC approval outlining the objectives and discussion topics of four workshops and two workgroup meetings designed to address the goals of the subtask.
- *December 15th, 2008* – LCBP convened the *Workshop on Tributary Monitoring in the Missisquoi Bay Basin* to discuss short and long-term tributary monitoring needs in the Missisquoi Basin. The parameters to be measured, sampling intervals and sampling locations for the short term monitoring program to be funded under the IJC-NEIWPCC contract were discussed.
- *January 22nd, 2009* – LCBP convened the *Workshop on Defining Critical Source Areas and Management Needs* to discuss how to define a critical source area and the type of information or outcomes that would be most useful to people working in the Basin to reduce phosphorus pollution.
- *January 23rd, 2009* – LCBP convened a project workgroup meeting. The workgroup debriefed the previous day's workshop, discussed types of approaches (strategic and/or tactical) to identifying critical source areas, and the desired outcomes of the identification. The group also discussed the short-term tributary monitoring program and input from workshop participants before recommending potential monitoring locations and procedures.
- *January 30th, 2009* – LCBP submitted the *Monitoring Design Report* (appended) describing a plan to expand the long-term monitoring network to five tributaries within the Basin for sampling through 2011, while also adding a flow gage on the Sutton River and four meteorological stations.

- *March 12th and 13th, 2009* – LCBP convened the *Workshop on Approaches to Identifying Critical Source Areas in the Missisquoi Bay Basin* to review current and previous research on phosphorus pollution and to explore possible modeling approaches to identifying critical source areas.
- *April 13th, 2009* – LCBP convened a project workgroup meeting. The workgroup discussed the previous workshops and began to outline management and research objectives as well as desired outcomes for the critical source area (CSA) identification. The group also considered possible approaches to CSA identification.
- *April 28th, 2009* – LCBP convened the *Workshop on Data Availability and Data Needs* to review available datasets, identify additional data needs and explore transboundary data coordination.
- *June 5th, 2009* – LCBP submitted the *Workshop Report* (appended) summarizing the proceedings and findings of the four workshops and two workgroup meetings. The workshops helped the LCBP to define CSAs and both strategic and tactical approaches to their identification as well as to outline management objectives and desired outcomes of this project. The workshops also illuminated possible data sources and access limitations as well as needed transboundary data reconciliation efforts. A short-term monitoring plan was also informed by this series.

Subtask 2

- *Ongoing since October 2008* – LCBP has been acquiring and cataloging publicly available geographic datasets relevant to this project and planned modeling efforts, as they become available. These data will be provided to the CSA modeling contractor. The database was reviewed by representatives of relevant regional agencies and groups at the *Workshop on Data Availability and Data Needs*, who were able to direct the LCBP toward additional available data.
- *September 17th, 2009 – The Missisquoi Bay Basin Project: Secondary Data Evaluation, 2009 Quality Assurance Project Plan* (QAPP) was approved and signed by the IJC COR and EPA and NEIWPCC QA/QC Officers (appended). This QAPP outlines the relationship between and responsibilities of the LCBP and CSA modeling contractor (to be determined through an RFP process) regarding data quality and model configuration.
- *September 29th, 2009* – LCBP submitted the *Report on Data Acquisition and Publication* (appended) describing the data acquisition efforts to date, the findings of the *Workshop on Data Availability and Data Needs*, a planned data publication procedure, and next steps. The LCBP will publish modeling data inputs deemed suitable by the Secondary Data Evaluation process after the start of the analysis, as well as the results of the completed project.

Subtask 3

- *April 28th, 2009* – LCBP convened the *Workshop on Data Availability and Data Needs* where participants reviewed the current LCBP project database and other available data in order to determine datasets that could be developed to support CSA analysis. Participants from Vermont and Quebec also discussed datasets that would benefit from transboundary harmonization as well as feasible steps toward that goal.
- *September 29th, 2009* – LCBP submitted the *Report on Data Gaps* (appended) describing both data gaps for modeling CSAs of phosphorus pollution in the Vermont Sector and data gaps that would need to be filled to develop a transboundary understanding of pollutant loads to the Missisquoi Bay. Within the Vermont Sector, gaps where data does not exist and instances where data exists but is not publicly available were noted. Possible mechanisms to fill these gaps are also described.

Subtask 4

- *June 15th, 2009* – LCBP submitted a proposed *Peer Review Process for Critical Source Area Identification* (appended). The peer reviewers will consider materials developed by the LCBP: a project summary, research and management objectives, desired outcomes, and possible analytical approaches, including the models evaluated in the *Workshop on Approaches to Identifying Critical Source Areas in the Missisquoi Bay Basin.* This review is intended to better inform both the IJC and the LCBP in support of RFP development for the CSA analysis and the evaluation of proposals. The document also provided potential evaluation criteria for peer reviewers, a timeline for the review, and the *LCBP Policy and Guidelines on Conflicts of Interest.*
- *July 14th, 2009* – Based on the approved peer review process (above), the LCBP submitted materials to the IJC COR to be reviewed.

Summary of Task 1 Findings

The workshop series helped define a critical source area of nutrient pollution as the intersection between a nutrient source and a transport mechanism. The LCBP has adopted two different approaches to CSA identification, as proposed in the workshop series: (1) strategic – to prioritize tasks and funding to effectively target nutrient sources, (2) tactical – to direct specific management practices to identified CSAs. The strategic approach will consider the entire basin and would determine combinations of characteristics or practices that lead to significant nutrient loading. These combinations will be ranked relatively based on their estimated contributions to loading in order to help prioritize action. The tactical approach will consider the farm-level or micro-watershed scale to locate sites where phosphorus sources and/or transport mechanisms should be mitigated.

Based on the results of the peer review process, the LCBP and partners will release a RFP detailing the research and management objectives and desired outcomes of CSA analysis. The ability of a contractor to meet these objectives while applying the two approaches is dependent on the modeling strategy used and the available data. Multiple modeling approaches were explored during the workshop series, including HSPF, BASINS, SWAT, SPARROW, AVGWLF, WMS, high resolution mapping, and spatial analysis. These modeling methods all appeared reasonable for this project, depending on the management objective(s) being met. Based on these recommendations, the LCBP will allow respondents to propose appropriate modeling approaches rather than to require a particular one.

The LCBP has acquired most of the available datasets to use in this analysis, although much of the potentially useful agricultural data is not currently in a digital format and would have to be organized and aggregated by agency partners. Notable data gaps for the US Sector included crop rotation schedules and locations of tile drainage. In many cases data are not consistent between Vermont and Quebec due to resolution and classification differences. For instance, hydrography data are available at different scales on either side of the border and these data are not edge-matched across the border. Other data identified in the workshop series to be integrated or related include subwatershed boundaries, surface water impairment classification systems, soil types, and phosphorus estimates per animal unit. CSA identification will be limited to the Vermont Sector of the Basin for this project.

Workshop participants emphasized that the final products generated by this project must be useful to both managers and field staff. Managers hope to gain a better understanding of how to allocate resources to most effectively mitigate nutrient pollution, and staff will benefit most from annotated maps highlighting potential CSAs. To facilitate future applications of this model with updated information, the contractor will need to provide careful documentation of the full modeling exercise and all data sets used.

In consideration of the current basin-wide monitoring programs and recommendations from workshop and workgroup participants, the LCBP has designed a short-term monitoring program that will include tributary and meteorological monitoring stations. The LCBP has established six new stream gages, five of which will be co-located with short-term water quality monitoring, and four new meteorological stations within the Missisquoi Bay Basin to be sampled over a two-year period. The water quality monitoring program will include measurements of total and dissolved phosphorus, nitrogen, and suspended sediments. The increased sampling in the Missisquoi Basin will address the need for more detailed spatial data of tributary nutrient loads and meteorological (precipitation) data and will provide calibration/validation inputs to future modeling efforts.

Project Status

The subtasks of Task 1 and their associated deliverables have helped the LCBP and its partners to better understand the role and likely contributions of the Missisquoi Bay Basin Project toward reducing phosphorus pollution to the Bay. The LCBP is better prepared to proceed with the other tasks of this project – acquisition and compilation of new geophysical data, short-term tributary monitoring, and modeling – based on the findings of Task 1. Thus far, the LCBP has been able to meet the objectives and requirements of its contract with the IJC to increase understanding of pollutant loading within the Missisquoi Bay Basin.

Appended Files

1. Workshop Plan
2. Monitoring Design Report
3. Workshop Report
4. The Missisquoi Bay Basin Project: Secondary Data Evaluation, 2009 Quality Assurance Project Plan
5. Report on Data Acquisition and Publication
6. Report on Data Gaps
7. Peer Review Process for Critical Source Area Identification