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Dear Dr. Young and Mr. Sweeney:

Enclosed is the DEP Response to NYSDOH/EPA Comments on the Ashokan Stream Management Program, Water Quality Studies Proposal submitted November 30, 2014, in accordance with the Revised 2007 Filtration Avoidance Determination (FAD).

As always, if you have any questions about these comments or other aspects of the City's watershed protection efforts, please do not hesitate to contact me.

Sincerely,

David S. Warne
Assistant Commissioner

DEP Response to NYSDOH/EPA Comments on the
Ashokan Stream Management Program
Water Quality Studies Proposal
Submitted November 30, 2014
NYSDOH/EPA Comments Dated December 24, 2014
Response Date January 30, 2015

Introduction

Section 4.6 of the Revised 2007 FAD required NYCDEP to submit a proposal for water quality monitoring in the Ashokan watershed. We acknowledge receipt of the Ashokan Stream Management Program Water Quality Studies Proposal ("the Proposal"). An additional requirement was to report on the status of a USGS study investigating sources of turbidity in the Ashokan Watershed. The submittal of the USGS report 2014-5200, Turbidity and Suspended Sediment in the Upper Esopus Creek Watershed, Ulster County. New York ("the USGS Report") satisfies this requirement.

Upon review of the Report and Proposal, we have several comments. Consideration of the following may assist NYCDEP in refining the scope of future efforts focused on Ashokan water quality issues:

Comment 1

The USGS Report (pg. 7), citing Mukundan et al. (2013), states that 80% of the suspended sediment load was transported during large storms during 4% of the time over an 8-year period. It is also noted that loss of power was a frequent problem, especially during large storms (pg. 21), leading to some gaps in the data record during these events. Table 3 (pg. 22) shows that there were data gaps between the measured stream gage discharge and those samples that were used in the SSC/turbidity regression model. Describe the measures NYCDEP will take to ensure the placement of the turbidity sensors in stable, resilient locations that will allow for data collection during large storm events, over the range of discharge conditions, for the stated 10-year period.

DEP Response:

All the comments that pertain to instrumentation and methodology will be more fully addressed in the Study Design, which will be submitted to NYSDOH/EPA nine months following final approval of the Proposal.

The power loss indicated in the comment occurred at Esopus Creek at Coldbrook, Stony Clove Creek at Chichester and Birch Creek where Hach Surface Scatter 7 turbidity monitors were deployed. These monitors were using AC power and were down while AC current was lost. The Study Design will take this into consideration by selecting monitors that do not rely on AC power. The Study Design will also take into consideration placement of sensors, possibly bolting them to large stable boulders, bedrock or bridge abutments. However, damage to stream gages and other monitoring sites is sometimes unavoidable. For example, the Woodland Creek gage was knocked offline during Tropical Storm Irene and one autosampler on Esopus Creek was found about one mile downstream.

We will work with our contractor to maximize DEP's ability to avoid the data gaps that existed in the early study as described above, and will explore any other options that may be feasible depending on the conditions in the field.

Comment 2

The USGS Report notes (pg. 8) that, although the "study was not designed to evaluate the accuracy of the individual probes," the results suggested that the DTS-12 system was better suited for capturing high turbidity levels than the SS7 at the Stony Clove Creek. Describe which instrumentation NYCDEP plans to use (DTS-12, SS7, or both) as part of the planned turbidity monitoring, along with the advantages and disadvantages of that plan.

DEP Response:

All the comments that pertain to instrumentation and methodology will be more fully addressed in the Study Design which will be submitted to NYSDOH/EPA nine months following final approval of the proposal. DEP is anticipating selecting probes of the same type to maintain consistency in the results.

Comment 3

The first proposed study is described (pg. 3 of the Proposal) as a continuation and enhancement of SSC and turbidity monitoring in sub-basins of the Upper Esopus for a "minimum of ten years." In the detailed explanation of this study, it states "The resumed monitoring of variability between sub-basins is planned to continue for up to 10 years." The given time periods are not in agreement. Please clarify the time period over which NYCDEP will perform the Inter-Sub-Basin Suspended Loading/Turbidity Study, and the expected length of time data collection will occur at each gaging station.

DEP Response:

The text will be corrected to show that the duration of the sampling period will be up to 10 years and will not extend beyond 10 years.

Comment 4

The second proposed study will evaluate seven stream projects in the Stony Clove watershed for turbidity reduction effectiveness. NYCDEP proposes to compare pre-2011 turbidity and suspended sediment loading with at least five years of post-construction data. Related to the instrumentation question above (DTS-12 vs. SS7), please describe the instrumentation that NYCDEP will monitoring. If data are collected at higher discharges than previously monitored, and one assumes high flows are associated with high turbidity, explain how NYCDEP plans to characterize the turbidity reduction effectiveness of the stream projects.

DEP Response:

All the comments that pertain to instrumentation and methodology will be more fully addressed in the Study Design which will be submitted to NYSDOH/EPA nine months following final approval of the proposal.

To evaluate the effectiveness of a restoration project on reducing turbidity from the reach in which it is constructed, sufficient pre-construction monitoring data is required to measure pre-construction loading from the reach, comparing upstream

and downstream sampling data. Without reach-level pre-construction data, upstream/downstream sampling post-construction can show current loading from the reach, but not the change resulting from the restoration. These seven stream projects, installed prior to the development and implementation of a study designed with this objective in mind, can nonetheless inform the overall study.

As described in the proposal, the intent of this component of the study is not to determine whether any of these individual projects are effective in reducing turbidity from their respective reaches, but rather to complement a study that includes sufficient pre-construction sampling data. We recommended this approach because we know the work done on restoring stream stability in the Stony Clove Creek at Chichester and in Warner Creek successfully removed the stream from long-term chronic sources of suspended sediment/turbidity at these sites. These sites were selected because they were the obvious reaches of stream that contributed to turbidity at low to moderate flows in the Stony Clove Creek watershed.

These projects may not be sufficiently evaluated individually to determine post-construction reductions in turbidity from each treatment reach , yet they can be evaluated collectively to determine whether, as a group, they may have contributed to a significant reduction of watershed loading, through a before/after comparison of data from the Chichester gage, downstream of all of these projects. Here, sufficient pre-construction data exist to compare with post-construction data to control for longer-term variation in high flows. The study design, will address issues of data comparability over time.

Comment 5

Related to the second proposed study, NYCDEP suggests that the remaining four FAD-required stream restoration projects will be implemented outside of the Stony Clove Creek watershed and proposes deferring "further turbidity reduction treatment projects in Stony Clove Creek" until they are study-eligible. NYSDOH would not prioritize activities for the proposed study over treatment of reaches with high risk bank erosion or known turbidity sources. Please clarify if NYCDEP intends on conducting any work in the Stony Clove Creek (such as CSBI or Riparian Buffer projects) while pre-construction data is gathered for future projects in that watershed.

DEP Response:

Known sources of turbidity from active stream erosion that do not present an imminent flood hazard threat to people and transportation infrastructure that can be targeted for treatment and evaluated in the context of an approved study design will be monitored but not treated until sufficient pre-construction data is acquired. The intent is not to delay treating areas of concern, but where possible, optimizing selection of the remaining four FAD-required treatment projects such that there are a sufficient number of potential treatment sites in the Stony Clove watershed for use in the longer-term study. DEP intends to sponsor further work in the Stony Clove Creek watershed through the AWSMP while pre-construction data is gathered for future turbidity reduction projects. Such work may include CSBI projects, culvert replacements, and bank stabilization as needed and requested by watershed stakeholders.

Also, please provide more information on at least four Ashokan system locations, outside of the Stony Clove watershed, that NYCDEP considers as potential stream restoration candidates.

DEP Response:

It is important to know that stream project locations are selected in collaboration with our AWSMP partners (UCSWCD and CCEUC) as well as AWSMP stakeholders. Another important determining factor of project selection is whether a landowner will support the project through access and easement agreements and/or whether a local municipality will sponsor a project if required by other funding agencies, such as NRCS.

There are possible project locations in the Beaver Kill, Esopus Creek and Broadstreet Hollow Creek watersheds that were on the EWP wait list. Similarly, stream feature inventory assessments in Bushnellsville Creek, Beaver Kill, Birch Creek, Woodland Creek, and Bush Kill have identified a number of potential suspended sediment loading sources that could be mitigated through treatment. In 2015, AWSMP is going to be focused on completing the final EWP eligible project in the Stony Clove watershed (Stony Clove Creek at Wright Road). AWSMP staff will begin the process of identifying the potential 2016 – 2018 treatment sites during the summer of 2015.

The FAD requires that DEP submit brief descriptions of proposed projects annually as they are to be included in the May Annual Action Plans, by March 31st each year.

Comment 6

The third proposed study seeks to evaluate project reach impacts on turbidity and/or suspended sediment loading based on statistically significant differences in measured upstream and downstream data. At least three of the graphs in Figure 1-9 of the USGS Report indicate that the turbidity instrumentation may have reached an upper limit of measurement (that is, they "maxed out"). The stated range in the text for the DTS-12 was up to 1600 FNU. The DTS-12 graph for the Stony Clove Creek clearly indicates a measurement ceiling was reached, although it appears to be higher than 1600 FNU. Similarly, SS7 graphs for the Esopus Creek and Stony Clove Creek appear to show a ceiling around 1400 NTU, although the stated range for this instrument is 0 - 9999 NTU. Data points in Figure 4 for laboratory turbidity measurements (Hach 21OOAN) indicate numerous instances of higher turbidity values (>2000 NTRU). Explain how NYCDEP will ensure that valid turbidity measurements will occur over all expected discharges, and what steps will be taken to ensure that the generated data are of sufficient quality for determining statistically significant differences between the upstream and downstream data.

DEP Response:

All the comments that pertain to instrumentation and methodology will be more fully addressed in the Study Design which will be submitted to NYSDOH/EPA nine months following final approval of the proposal. Values that exceed the measurement limits of an instrument can be handled using standard statistical methods for censored data. We expect to apply these methods when computing descriptive statistics and performing statistical tests.

Since high-frequency data are often highly correlated, we expect that data will be treated appropriately to address this issue. One choice is to use daily mean values. The appropriate treatment for censored data within a time interval would also be applied for computation of the daily mean. Handling the issue of serial correlation along with statistical significance and confidence limits will be made more explicit in the Study Design.

Discrete sampling will also be important to provide information above the instrument ceiling. This will also be addressed in the Study Design.

Also, please discuss how NYCDEP will determine statistical significance, and what level of confidence will be used.

DEP Response:

See response to comment above.

Comment 7

Aside from using measured reductions in turbidity, there are several other ways in which to evaluate the effectiveness of a stream restoration project. For example, sediment yield (as load per unit area) could be used to determine if a restoration project has had a mitigation effect on bank erosion. Particle size distribution could be used to determine if a project has reduced the availability of aluminosilicate clay and quartz, which are the predominant causes of turbidity in the Ashokan watershed. Analysis of particle size distribution may also assist the interpretation of suspended sediment and turbidity results. A cost-benefit analysis may be considered, in which the outlay for a restoration project is viewed in light of the value of residences and/or infrastructure that could be protected by the project. Finally, the durability of a restoration project, and how well it functions over the monitoring period, could be a useful metric.

DEP Response:

DEP agrees that there are other metrics that can be used to evaluate a stream restoration project's effectiveness in reducing turbidity. DEP and our SMP partners include pre-construction surveys and post-construction surveys to record channel morphometrics (channel cross sectional hydraulic geometry, longitudinal profile and bed sediment size distribution). Channel morphometric monitoring will be implemented for up to five years following project construction, so we anticipate having these data available to supplement and inform the water quality monitoring data. An important caveat in relying on this metric is that we know many of the chronic low flow turbidity loading sites are not directly from actual ongoing bank loss but from previous hydraulic erosion at a bank toe causing geotechnical instabilities that in combination with groundwater and surface water runoff result in the constant loading of clay and silt particles entrained from the adjacent hill slope.

We also anticipate including sediment size distribution analysis at the stream bank erosion monitoring sites referenced in the proposal and will describe this in detail in the Study Design. The other metrics mentioned are worthy stand-alone objectives for restoration but are not directly linked to evaluating turbidity reduction and therefore are not planned to be formally incorporated into the study design.

Comment 8

Effective implementation of the Stream Management Program (SMP) provides multiple environmental benefits. During the initial stages of SMP development, an assumption was made that protecting stream banks from erosion minimizes water quality degradation, including a reduction in turbidity. The submitted Proposal demonstrates an approach by NYCDEP to correlate and quantify this reduction in turbidity with the restoration of natural stream channel stability. Data collected through the course of this monitoring study should enhance the scientific understanding, and optimize the management, of watershed systems prone to elevated turbidity.

DEP Response:

DEP agrees that the successful implementation of this set of monitoring-based studies will enhance the scientific understanding of turbidity dynamics in the Catskill Mountain watersheds and will help inform successful stream management strategies intended to reduce turbidity at a feasible range of runoff conditions.