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December 24, 2014

David S. Warne
Assistant Commissioner
NYC Department of Environmental Protection
Bureau of Water Supply
465 Columbus Avenue
Valhalla, NY 10595

Dear Mr. Warne:

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:

- 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.

- 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.

- 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.

- 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 use for this 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.

- 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. 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.

- 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 2100AN) 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. Also, please discuss how NYCDEP will determine statistical significance, and what level of confidence will be used.

- 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.

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.

We would appreciate if you could reply to these comments by January 30, 2015. Please feel free to contact me if you have any questions.

Sincerely,

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